
PROJECT MANUAL

PINE BUSH CENTRAL SCHOOL DISTRICT 2019 CAPITAL IMPROVEMENT PROJECT Phase II

CPL PROJECT NO.: 14533.05

DOCUMENT DATE: MARCH 8, 2021

CIRCLEVILLE ELEMENTARY SCHOOL
PAKANASINK ELEMENTARY SCHOOL
CIRCLEVILLE MIDDLE SCHOOL
PINE BUSH HIGH SCHOOL

SED # 44-04-01-06-0-009-016
SED # 44-04-01-06-0-012-015
SED # 44-04-01-06-0-014-015
SED # 44-04-01-06-0-007-027

DESIGN PROFESSIONAL'S CERTIFICATION

The undersigned certifies that, to the best of his or her knowledge, information and belief, the design conforms to all applicable provisions of the Building Code of New York State, the Energy Conservation Construction Code of New York State, and the Manual of Planning Standards of the New York State Education Department.

ARCHITECT/ENGINEER
CPL
50 Front Street, Suite 202
Newburgh, NY 12550
Phone: (800) 274-9000

OWNER
Pine Bush Central School District
156 NY-302
Pine Bush, NY 12566
Phone: (845) 744-2031

CONSTRUCTION MANAGER
The Pike Company
20 Loudonville Road
Albany, NY 12204
Phone: (518) 371-5900

SECTION 000110 - TABLE OF CONTENTS

DIVISION 00 – PROCUREMENT AND CONTRACTING REQUIREMENTS

000110	TABLE OF CONTENTS
000115	LIST OF DRAWINGS
000150	NOTIFICATION OF ENTRY
001112	ADVERTISEMENT FOR BID
002000	INSTRUCTIONS TO BIDDERS
003126	EXISTING HAZARDOUS MATERIAL INFORMATION
003310	PROJECT FORMS
003350	STATEMENT OF SPECIAL INSPECTIONS AND TESTS
004050	FORM OF PROPOSAL- CONTRACT 1: GENERAL CONSTRUCTION WORK
004051	FORM OF PROPOSAL- CONTRACT 2: MECHANICAL CONSTRUCTION WORK
004052	FORM OF PROPOSAL- CONTRACT 3: ELECTRICAL CONSTRUCTION WORK
004053	FORM OF PROPOSAL- CONTRACT 4: PLUMBING CONSTRUCTION WORK
004550	STATEMENT OF BIDDER’S QUALIFICATIONS – GENERAL CONSTRUCTION WORK
004551	STATEMENT OF BIDDER’S QUALIFICATIONS – MECHANICAL CONSTRUCTION WORK
004552	STATEMENT OF BIDDER’S QUALIFICATIONS – ELECTRICAL CONSTRUCTION WORK
004553	STATEMENT OF BIDDER’S QUALIFICATIONS – PLUMBING CONSTRUCTION WORK
004951	IRAN DIVESTMENT ACT CERTIFICATION
005100	AGREEMENT FORM
007200	GENERAL CONDITIONS
007343	WAGE RATE REQUIREMENTS

DIVISION 01 - GENERAL REQUIREMENTS

011000	SUMMARY
011200	MULTIPLE CONTRACT SUMMARY
012100	ALLOWANCES
012300	ALTERNATES
012500	SUBSTITUTION PROCEDURES
012519	EQUIVALENTS
012600	CONTRACT MODIFICATION PROCEDURES
012900	PAYMENT PROCEDURES
013100	PROJECT MANAGEMENT AND COORDINATION
013200	CONSTRUCTION PROGRESS DOCUMENTATION
013216	CONSTRUCTION SCHEDULE
013233	PHOTOGRAPHIC DOCUMENTATION
013300	SUBMITTAL PROCEDURES
013500	CONTRACTOR SAFETY REQUIREMENTS
014000	QUALITY REQUIREMENTS
014119	REGULATORY REQUIREMENTS (NYS EDUCATION DEPARTMENT)
014200	REFERENCES
014529	ASBESTOS TESTING LABORATORY SERVICES
015001	TEMPORARY FACILITIES AND CONTROLS MULTIPLE PRIME CONTRACTS
016000	PRODUCT REQUIREMENTS
017300	EXECUTION
017310	CUTTING AND PATCHING
017700	CLOSEOUT PROCEDURES

017823	OPERATION AND MAINTENANCE DATA
017839	PROJECT RECORD DOCUMENTS
018200	DEMONSTRATION AND TRAINING
019113	GENERAL COMMISSIONING REQUIREMENTS

DIVISION 02 - EXISTING CONDITIONS

024119	SELECTIVE STRUCTURE DEMOLITION
028213	ASBESTOS ABATEMENT
028214	LEAD SAFE WORK PRACTICES
028416	MISCELLANEOUS HAZARDOUS & SPECIAL WASTES

DIVISION 03 – CONCRETE

033000	CAST-IN-PLACE CONCRETE
035400	HYDRAULIC CEMENT UNDERLAYMENT

DIVISION 04 – MASONRY

040100	MAINTENANCE OF UNIT MASONRY
042000	UNIT MASONRY
047200	CAST STONE MASONRY

DIVISION 05 – METALS

051200	STRUCTURAL STEEL FRAMING
053100	STEEL DECKING
055000	METAL FABRICATIONS

DIVISION 06 - WOOD, PLASTICS, AND COMPOSITES

061053	MISCELLANEOUS ROUGH CARPENTRY
061600	SHEATHING
062013	EXTERIOR FINISH CARPENTRY
064116	PLASTIC-LAMINATE-CLAD ARCHITECTURAL CABINETS

DIVISION 07 - THERMAL AND MOISTURE PROTECTION

072726	FLUID APPLIED VAPOR PERMEABLE AIR BARRIER MEMBRANE
074213.23	METAL COMPOSITE MATERIAL WALL PANELS
075323	EPDM ROOFING
077100	ROOF SPECIALTIES
078413	PENETRATION FIRESTOPPING
079200	JOINT SEALANTS
079500	EXPANSION CONTROL

DIVISION 08 – OPENINGS

081113	HOLLOW METAL DOORS AND FRAMES
081216	ALUMINUM FRAMES
081416	FLUSH WOOD DOORS
081743	FIRE-RATED FRP DOORS AND FRAMES
083313	COILING COUNTER DOORS
083320	OVERHEAD COILING DOORS

084113	ALUMINUM-FRAMED ENTRANCES AND STOREFRONTS
085113	ALUMINUM WINDOWS
088000	GLAZING
088300	MIRRORS

DIVISION 09 – FINISHES

092216	NON-STRUCTURAL METAL FRAMING
092900	GYPSUM BOARD
093000	TILING
095113	ACOUSTICAL PANEL CEILINGS
096513	RESILIENT WALL BASE AND ACCESSORIES
096566	RESILIENT ATHLETIC FLOORING
096620	RESINOUS MATRIX TERRAZZO FLOORING
096723	RESINOUS FLOORING
096813	TILE CARPETING
097200	DIGITAL WALL FILM
099123	INTERIOR PAINTING
099600	HIGH-PERFORMANCE COATINGS
099723	CONCRETE COATINGS

DIVISION 10 – SPECIALTIES

102113	TOILET & SHOWER COMPARTMENTS
102800	TOILET, BATH, AND LAUNDRY ACCESSORIES
104416	FIRE EXTINGUISHERS
105113	METAL LOCKERS

DIVISION 11 – EQUIPMENT

DIVISION 12 – FURNISHINGS

122413	ROLLER WINDOW SHADES
123661.16	SOLID SURFACING COUNTERTOPS

DIVISION 13 – SPECIAL CONSTRUCTION

DIVISION 14 - CONVEYING EQUIPMENT

DIVISION 21 – FIRE SUPPRESSION

DIVISION 22 – PLUMBING

220517	SLEEVES AND SLEEVE SEALS FOR PLUMBING PIPING
220518	ESCUTCHEONS FOR PLUMBING PIPING
220523	GENERAL-DUTY VALVES FOR PLUMBING PIPING
220529	HANGERS AND SUPPORTS FOR PLUMBING PIPING AND EQUIPMENT
220553	IDENTIFICATION FOR PLUMBING PIPING AND EQUIPMENT
220719	PLUMBING PIPING INSULATION
221116	DOMESTIC WATER PIPING
221316	SANITARY WASTE AND VENT PIPING
224213	COMMERCIAL WATER CLOSETS & URINALS
224213.16	COMMERCIAL URINALS
224216.14	COMMERCIAL LAVATORIES

224223	COMMERCIAL SHOWERS, RECEPTORS, AND BASINS
224500	EMERGENCY PLUMBING FIXTURES

DIVISION 23 – HEATING VENTILATING AND AIR CONDITIONING

230001	GENERAL PROVISIONS FOR MECHANICAL WORK
230002	MECHANICAL AND ELECTRICAL COORDINATION
230130	HVAC AIR-DISTRIBUTION SYSTEM CLEANING
230513	COMMON MOTOR REQUIREMENTS FOR HVAC EQUIPMENT
230517	SLEEVES AND SLEEVE SEALS FOR HVAC PIPING
230518	ESCUTCHEONS FOR HVAC PIPING
230519	METERS AND GAGES
230523	GENERAL-DUTY VALVES FOR HVAC PIPING
230529	HANGERS AND SUPPORTS FOR HVAC PIPING AND EQUIPMENT
230553	IDENTIFICATION FOR HVAC PIPING AND EQUIPMENT
230593	TESTING, ADJUSTING, AND BALANCING FOR HVAC
230713	DUCT INSULATION
230719	HVAC PIPING INSULATION
230900	INSTRUMENTATION AND CONTROL FOR HVAC
230993	SEQUENCE OF OPERATIONS FOR HVAC CONTROLS
231000	VARIABLE TORQUE A-C DRIVE CONTROLLERS
232113	HYDRONIC PIPING
232116	HYDRONIC PIPING SPECIALTIES
232123	HYDRONIC PUMPS
232300	REFRIGERANT PIPING
233113	METAL DUCTS
233300	AIR DUCT ACCESSORIES
233713	DIFFUSERS, REGISTERS, AND GRILLES
235100	BREECHINGS, CHIMNEYS, AND STACKS
235223	CAST-IRON BOILERS
235700	HEAT EXCHANGERS FOR HVAC
237200	AIR-TO-AIR ENERGY RECOVERY UNITS
237413	ROOFTOP AIR CONDITIONERS
237440	NATATORIUM DEHUMIDIFICATION AIR HANDLING UNITS
238126	SPLIT-SYSTEM AIR-CONDITIONERS UNITS
238216	AIR COILS
238223	UNIT VENTILATORS
238236	FINNED-TUBE RADIATION HEATERS
238239	CABINET UNIT HEATERS

SECTION 26 – ELECTRICAL

260000	GENERAL PROVISION FOR ELECTRICAL WORK
260513	MEDIUM-VOLTAGE CABLES
260519	LOW-VOLTAGE CONDUCTORS AND CABLES
260526	GROUNDING AND BONDING
260529	HANGERS AND SUPPORTS FOR ELECTRICAL SYSTEMS
260533	RACEWAY AND BOXES
260543	UNDERGROUND DUCTS AND RACEWAYS FOR ELECTRICAL SYSTEMS
260544	SLEEVES AND SLEEVE SEALS FOR ELECTRICAL RACEWAYS & CABLING
260553	ELECTRICAL IDENTIFICATION
260923	LIGHTING CONTROL DEVICES
260924	LOW VOLTAGE LIGHTING CONTROL DEVICES
262413	SWITCHBOARDS

262416	PANELBOARDS
262616	ENCLOSED SWITCHES AND CIRCUIT BREAKERS
262726	WIRING DEVICES
262813	FUSES
265100	INTERIOR LIGHTING

DIVISION 27 – COMMUNICATIONS

270000	COMMUNICATIONS INSTALLATION OVERVIEW
271513	COMMUNICATIONS COPPER HORIZONTAL CABLING

DIVISION 28 – ELECTRONIC SAFETY AND SECURITY

280153	CONDUCTORS AND CABLES FOR ELECTRONIC SAFETY AND SECURITY
283111	FIRE ALARM SYSTEM

END OF SECTION 000110

SECTION 000115 – LIST OF DRAWINGS

GENERAL

T000 TITLE SHEET

STRUCTURAL

GEN S001 PROJECT NOTES

GEN S002 TYPICAL DETAILS

ARCHITECTURAL

GEN A101 GENERAL BUILDING AND ENERGY CODE INFO-CVMS

GEN A101.1 GENERAL BUILDING AND ENERGY CODE INFO-CVMS

GEN A102 GENERAL BUILDING AND ENERGY CODE INFO-PAK

GEN A102.1 GENERAL BUILDING AND ENERGY CODE INFO-PAK

GEN A103 GENERAL BUILDING AND ENERGY CODE INFO-CVES

GEN A104 GENERAL BUILDING AND ENERGY CODE INFO-PBHS

GEN A104.1 GENERAL BUILDING AND ADDITIONS KEY PLAN PBHS SECOND FLOOR &
BASEMENT

GEN A104.2 CODE COMPLIANCE PLAN - PBHS

GEN A801 GENERAL DETAILS

GEN A802 GENERAL DETAILS

GEN A900 TYPICAL CEILING DETAILS

HVAC

GEN H000 HVAC LEGENDS AND ABBREVIATIONS

GEN H500 HVAC CONTROLS & SCHEDULES

GEN H501 HVAC CONTROLS & SCHEDULES

GEN H502 HVAC CONTROLS & SCHEDULES

GEN H503 HVAC CONTROLS & SCHEDULES

GEN H504 HVAC CONTROLS & SCHEDULES

GEN H800 HVAC DETAILS

GEN H801 HVAC DETAILS

GEN H900 HVAC SCHEDULES

GEN H901 HVAC SCHEDULES

PLUMBING

GEN P000 PLUMBING LEGENDS, ABBREVIATIONS AND SCHEDULES

ELECTRICAL

GEN E800 ELECTRICAL DETAILS

ASBESTOS DRAWINGS

CES HM101 CIRCLEVILLE ELEMENTARY SCHOOL HAZARDOUS MATERIAL ABATEMENT
- FIRST FLOOR PLAN

CVMS HM101 CIRCLEVILLE MIDDLE SCHOOL HAZARDOUS MATERIAL ABATEMENT -
FIRST FLOOR PLAN

PAK HM101 PAKANASINK ELEMENTARY SCHOOL HAZARDOUS MATERIAL ABATEMENT
- FIRST FLOOR PLAN

PBHS HM101 PINE BUSH HIGH SCHOOL HAZARDOUS MATERIAL ABATEMENT - PARTIAL
BASEMENT FLOOR PLANS

PBHS HM102 PINE BUSH HIGH SCHOOL HAZARDOUS MATERIAL ABATEMENT - PARTIAL
FIRST FLOOR PLAN - 1

PBHS HM103 PINE BUSH HIGH SCHOOL HAZARDOUS MATERIAL ABATEMENT - PARTIAL
FIRST FLOOR PLAN - 2

PBHS HM104 PINE BUSH HIGH SCHOOL HAZARDOUS MATERIAL ABATEMENT - PARTIAL
FIRST FLOOR PLAN - 3

PBHS HM105 PINE BUSH HIGH SCHOOL HAZARDOUS MATERIAL ABATEMENT - PARTIAL
FIRST FLOOR PLAN - 4
PBHS HM106 PINE BUSH HIGH SCHOOL HAZARDOUS MATERIAL ABATEMENT - SECOND
FLOOR PLAN

CIRCLEVILLE ELEMENTARY SCHOOL

STRUCTURAL

CES S201 STRUCTURAL REINFORCING OF EXISTING ROOF PLAN

ARCHITECTURAL

CES A101 CIRCLEVILLE ELEMENTARY SCHOOL FIRST FLOOR DEMOLITION PLAN
CES A102 CIRCLEVILLE ELEMENTARY SCHOOL SECOND FLOOR DEMOLITION PLAN
CES A103 CIRCLEVILLE ELEMENTARY SCHOOL PARTIAL FIRST FLOOR DEMOLITION
PLAN & DEMOLITION REFLECTED CEILING PLAN
CES A104 CIRCLEVILLE ELEMENTARY SCHOOL DEMOLITION REFERENCE PHOTOS
CES A201 CIRCLEVILLE ELEMENTARY SCHOOL NEW WORK- FIRST FLOOR PLAN
CES A202 CIRCLEVILLE ELEMENTARY SCHOOL NEW WORK- SECOND FLOOR PLAN
CES A301 CIRCLEVILLE ELEMENTARY SCHOOL EXTERIOR ELEVATIONS- 1
CES A401 CIRCLEVILLE ELEMENTARY SCHOOL WALL TYPE DETAILS AND BUILDING
SECTIONS
CES A501 CIRCLEVILLE ELEMENTARY SCHOOL NEW WORK INTERIOR ELEVATIONS
CES A601 CIRCLEVILLE ELEMENTARY SCHOOL PARTIAL FIRST FLOOR NEW WORK
REFLECTED CEILING PLAN - 1
CES A602 CIRCLEVILLE ELEMENTARY SCHOOL PARTIAL FIRST FLOOR NEW WORK
REFLECTED CEILING PLAN - 2
CES A701 CIRCLEVILLE ELEMENTARY SCHOOL NEW WORK- ENLARGED PLANS
CES A900 CIRCLEVILLE ELEMENTARY SCHOOL DOOR SCHEDULES, TYPES AND
DETAILS
CES A901 C.E.S. WINDOWS SCHEDULES, TYPES AND DETAILS
CES A902 CIRCLEVILLE ELEMENTART SCHOOL WINDOWS DETAILS

INTERIORS

CES I000 CIRCLEVILLE ELEMENTARY SCHOOL - INTERIORS GRAL.
CES I201 CIRCLEVILLE ELEMENTARY SCHOOL - FIRST FLOOR FINISH PLAN

HVAC

CES H100 FIRST FLOOR HVAC DEMOLITION PLAN
CES H200 FIRST FLOOR HVAC NEW WORK PLAN
CES H201 FIRST FLOOR HVAC NEW WORK PLAN

PLUMBING

ELECTRICAL

CES E000 LEGEND AND NOTES
CES E001 ELECTRICAL ONE-LINE DIAGRAM - DEMOLITION
CES E002 ELECTRICAL ONE-LINE DIAGRAM - NEW WORK
CES E003 ELECTRICAL DEMOLITION AND NEW WORK SITE PLANS
CES E100 FIRST FLOOR ELECTRICAL DEMOLITION PLAN
CES E101 SECOND FLOOR ELECTRICAL DEMOLITION PLAN
CES E102 FIRST AND SECOND FLOOR ELECTRICAL DEMOLITION PLAN
CES E200 FIRST FLOOR ELECTRICAL NEW WORK PLAN
CES E201 SECOND FLOOR ELECTRICAL NEW WORK PLAN
CES E202 FIRST AND SECOND FLOOR ELECTRICAL NEW WORK PLANS
CES E900 ELECTRICAL SCHEDULES

CIRCLEVILLE MIDDLE SCHOOL

STRUCTURAL

- CVMS S200 ENTRANCE FOUNDATION PLAN & DETAILS
- CVMS S201 ENTRANCE FRAMING PLAN & DETAILS
- CVMS S202 STRUCTURAL REINFORCING OF EXISTING ROOF PLAN

ARCHITECTURAL

- CVMS A101 CIRCLEVILLE MIDDLE SCHOOL FIRST FLOOR DEMOLITION PLAN
- CVMS A102 CIRCLEVILLE MIDDLE SCHOOL SECOND FLOOR DEMOLITION PLAN
- CVMS A103 CIRCLEVILLE MIDDLE SCHOOL PARTIAL FIRST FLOOR DEMOLITION PLANS
- CVMS A104 CIRCLEVILLE MIDDLE SCHOOL PARTIAL FIRST FLOOR DEMOLITION PLANS
- CVMS A105 CIRCLEVILLE MIDDLE SCHOOL PARTIAL FIRST FLOOR DEMOLITION REFLECTED CEILING PLANS
- CVMS A106 CIRCLEVILLE MIDDLE SCHOOL PARTIAL FIRST FLOOR DEMOLITION REFLECTED CEILING PLANS
- CVMS A107 CIRCLEVILLE MIDDLE SCHOOL DEMOLITION REFERENCE PHOTOS
- CVMS A108 CIRCLEVILLE MIDDLE SCHOOL ROOF DEMOLITION PLAN
- CVMS A201 CIRCLEVILLE MIDDLE SCHOOL NEW WORK - FIRST FLOOR PLAN
- CVMS A202 CIRCLEVILLE MIDDLE SCHOOL NEW WORK- SECOND FLOOR PLAN
- CVMS A203 CIRCLEVILLE MIDDLE SCHOOL NEW WORK- ROOF PLAN
- CVMS A301 CIRCLEVILLE MIDDLE SCHOOL EXTERIOR ELEVATIONS - 1
- CVMS A302 CIRCLEVILLE MIDDLE SCHOOL EXTERIOR ELEVATIONS - 2
- CVMS A401 CIRCLEVILLE MIDDLE SCHOOL WALL TYPE DETAILS
- CVMS A402 CIRCLEVILLE MIDDLE SCHOOL WALL SECTIONS
- CVMS A501 CIRCLEVILLE MIDDLE SCHOOL NEW WORK INTERIOR ELEVATIONS - 1
- CVMS A502 CIRCLEVILLE MIDDLE SCHOOL NEW WORK INTERIOR ELEVATIONS - 2
- CVMS A601 CIRCLEVILLE MIDDLE SCHOOL PARTIAL FIRST FLOOR NEW WORK REFLECTED CEILING PLANS
- CVMS A602 CIRCLEVILLE MIDDLE SCHOOL PARTIAL FIRST FLOOR NEW WORK REFLECTED CEILING PLANS
- CVMS A603 CIRCLEVILLE MIDDLE SCHOOL PARTIAL SECOND FLOOR NEW WORK REFLECTED CEILING PLANS
- CVMS A701 CIRCLEVILLE MIDDLE SCHOOL NEW WORK- ENLARGED PLANS
- CVMS A702 CIRCLEVILLE MIDDLE SCHOOL NEW WORK- ENLARGED PLANS
- CVMS A900 CIRCLEVILLE MIDDLE SCHOOL DOOR SCHEDULE, TYPES & DETAILS
- CVMS A901 CIRCLEVILLE MIDDLE SCHOOL WINDOW SCHEDULE, TYPES, & DETAILS

INTERIORS

- CVMS I000 CIRCLEVILLE MIDDLE SCHOOL - INTERIORS GENERAL
- CVMS I201 CIRCLEVILLE MIDDLE SCHOOL - FIRST FLOOR FINISH PLAN
- CVMS I202 CIRCLEVILLE MIDDLE SCHOOL - ENLARGED FINISH PLANS
- CVMS I203 CIRCLEVILLE MIDDLE SCHOOL - ENLARGED FINISH PLAN

HVAC

- CVMS H100 BASEMENT HVAC DEMOLITION PLAN
- CVMS H101 FIRST FLOOR HVAC DEMOLITION PLAN
- CVMS H102 FIRST FLOOR HVAC DEMOLITION PLAN
- CVMS H103 FIRST FLOOR HVAC DEMOLITION PLAN
- CVMS H104 SECOND FLOOR HVAC DEMOLITION PLAN
- CVMS H200 BASEMENT HVAC NEW WORK PLAN
- CVMS H201 FIRST FLOOR HVAC NEW WORK PLAN
- CVMS H202 FIRST FLOOR HVAC NEW WORK PLAN

CVMS H203 FIRST FLOOR HVAC NEW WORK PLAN
CVMS H204 SECOND FLOOR HVAC NEW WORK PLAN

PLUMBING

CVMS P100 FIRST FLOOR PLUMBING DEMOLITION PLAN
CVMS P200 FIRST FLOOR PLUMBING NEW WORK PLAN
CVMS P300 FIRST FLOOR PLUMBING DOMESTIC NEW WORK PLAN

ELECTRICAL

CVMS E000 LEGEND AND NOTES
CVMS E001 ELECTRICAL ONE-LINE DIAGRAM - DEMOLITION
CVMS E002 ELECTRICAL ONE-LINE DIAGRAM - NEW WORK
CVMS E003 ELECTRICAL DEMOLITION SITE PLAN
CVMS E004 ELECTRICAL NEW WORK SITE PLAN
CVMS E100 BASEMENT ELECTRICAL DEMOLITION PLAN
CVMS E101 FIRST FLOOR ELECTRICAL DEMOLITION PLAN
CVMS E102 SECOND FLOOR ELECTRICAL DEMOLITION PLAN
CVMS E103 FIRST FLOOR ELECTRICAL DEMOLITION PARTIAL PLANS
CVMS E200 BASEMENT ELECTRICAL NEW WORK PLAN
CVMS E201 FIRST FLOOR ELECTRICAL KEY PLAN
CVMS E202 SECOND FLOOR ELECTRICAL KEY PLAN
CVMS E203 FIRST FLOOR ELECTRICAL NEW WORK PARTIAL PLAN
CVMS E900 ELECTRICAL SCHEDULES
CVMS E901 ELECTRICAL SCHEDULES

PAKANASINK ELEMENTARY SCHOOL

STRUCTURAL

PAK S200 ENTRANCE FOUNDATION PLAN & DETAILS
PAK S201 ENTRANCE FRAMING PLAN & DETAILS

ARCHITECTURAL

PAK A101 PAKANASINK ELEMENTARY SCHOOL FIRST FLOOR DEMOLITION PLAN
PAK A102 PAKANASINK ELEMENTARY SCHOOL SECOND FLOOR DEMOLITION PLAN
PAK A103 PAKANASINK ELEMENTARY SCHOOL PARTIAL FIRST FLOOR DEMOLITION
PLAN & DEMOLITION REFLECTED CEILING PLAN
PAK A104 PAKANASINK ELEMENTARY SCHOOL PARTIAL FIRST FLOOR DEMOLITION
PLAN & DEMOLITION REFLECTED CEILING PLAN
PAK A105 PAKANASINK ELEMENTARY SCHOOL DEMOLITION REFERENCE PHOTOS
PAK A201 PAKANASINK ELEMENTARY SCHOOL NEW WORK - FIRST FLOOR PLAN
PAK A202 PAKANASINK ELEMENTARY SCHOOL NEW WORK - SECOND FLOOR PLAN
PAK A301 PAKANASINK ELEMENTARY SCHOOL EXTERIOR ELEVATIONS - 1
PAK A302 PAKANASINK ELEMENTARY SCHOOL EXTERIOR ELEVATIONS - 2
PAK A401 PAKANASINK ELEMENTARY SCHOOL INTERIOR WALL TYPES DETAILS
PAK A402 PAKANASINK ELEMENTARY SCHOOL BUILD SECTIONS
PAK A410 PAKANASINK ELEMENTARY SCHOOL EXTERIOR WALL DETAILS
PAK A501 PAKANASINK ELEMENTARY SCHOOL NEW WORK INTERIOR ELEVATIONS
PAK A502 PAKANASINK ELEMENTARY SCHOOL NEW WORK INTERIOR ELEVATIONS
PAK A601 PAKANASINK ELEMENTARY SCHOOL PARTIAL FIRST FLOOR NEW WORK
REFLECTED CEILING PLAN
PAK A602 PAKANASINK ELEMENTARY SCHOOL PARTIAL SECOND FLOOR NEW WORK
REFLECTED CEILING PLAN
PAK A701 PAKANASINK ELEMENTARY SCHOOL NEW WORK- ENLARGED PLANS
PAK A900 PAKANASINK ELEMENTARY SCHOOL DOOR SCHEDULE,
TYPES & DETAILS

PAK A901 PAKANASINK ELEMENTARY SCHOOL WINDOW SCHEDULE, TYPES AND DETAILS

PAK A902 PAKANASINK ELEMENTARY SCHOOL WINDOW DETAILS

INTERIORS

PAK I000 PAKANASINK ELEMENTARY SCHOOL - INTERIORS GENERAL

PAK I201 PAKANASINK ELEMENTARY SCHOOL - FIRST FLOOR FINISH PLAN

PAK I202 PAKANASINK ELEMENTARY SCHOOL - ENLARGED FINISH PLANS

HVAC

PAK H100 FIRST FLOOR HVAC DEMOLITION PLAN

PAK H101 FIRST FLOOR HVAC DEMOLITION PLAN

PAK H200 FIRST FLOOR HVAC NEW WORK PLAN

PAK H201 FIRST FLOOR HVAC NEW WORK PLAN

PAK H202 LOCKER ROOM HVAC NEW WORK PLAN

PLUMBING

PAK P100 FIRST FLOOR PLUMBING DEMOLITION PLAN

PAK P200 FIRST FLOOR PLUMBING NEW WORK PLAN

PAK P201 LOCKER ROOM PLUMBING NEW WORK PLAN

ELECTRICAL

PAK E000 LEGEND AND NOTES

PAK E001 ELECTRICAL ONE-LINE DIAGRAM - DEMOLITION

PAK E002 ELECTRICAL ONE-LINE DIAGRAM - NEW WORK

PAK E100 FIRST FLOOR ELECTRICAL DEMOLITION PLAN

PAK E101 SECOND FLOOR ELECTRICAL DEMOLITION PLAN

PAK E102 FIRST FLOOR ELECTRICAL DEMOLITION PLAN

PAK E200 FIRST FLOOR ELECTRICAL KEY PLAN

PAK E201 SECOND FLOOR ELECTRICAL KEY PLAN

PAK E202 FIRST FLOOR ELECTRICAL NEW WORK PLANS

PAK E900 ELECTRICAL SCHEDULES

PAK E901 ELECTRICAL SCHEDULES

PINE BUSH HIGH SCHOOL

STRUCTURAL

PBHS S200 STRUCTURAL REINFORCING OF EXISTING ROOF PLAN

PBHS S201 STRUCTURAL REINFORCING OF EXISTING ROOF PLAN

PBHS S400 SECTIONS AND DETAILS

ARCHITECTURAL

PBHS A100 PINE BUSH HIGH SCHOOL BASEMENT DEMOLITION PLAN

PBHS A101 PINE BUSH HIGH SCHOOL BASEMENT DEMOLITION PLAN

PBHS A102 PINE BUSH HIGH SCHOOL FIRST FLOOR DEMOLITION
PLAN - AREA A

PBHS A103 PINE BUSH HIGH SCHOOL FIRST FLOOR DEMOLITION
PLAN - AREA B

PBHS A104 PINE BUSH HIGH SCHOOL FIRST FLOOR DEMOLITION
PLAN - AREA C

PBHS A105 PINE BUSH HIGH SCHOOL FIRST FLOOR DEMOLITION
PLAN - AREA D

PBHS A106 PINE BUSH HIGH SCHOOL SECOND FLOOR DEMOLITION PLAN

PBHS A107 PINE BUSH HIGH SCHOOL PARTIAL BASEMENT DEMOLITION FLOOR PLAN &
DEMOLITION REFLECTED CEILING PLAN

PBHS A108 PINE BUSH HIGH SCHOOL PARTIAL BASEMENT DEMOLITION FLOOR PLAN

PBHS A109	PINE BUSH HIGH SCHOOL PARTIAL BASEMENT DEMOLITION REFLECTED CEILING PLAN
PBHS A110	PINE BUSH HIGH SCHOOL PARTIAL BASEMENT DEMOLITION PLAN
PBHS A111	PINE BUSH HIGH SCHOOL PARTIAL BASEMENT DEMOLITION PLAN
PBHS A112	PINE BUSH HIGH SCHOOL PARTIAL FIRST FLOOR DEMOLITION PLAN
PBHS A113	PINE BUSH HIGH SCHOOL PARTIAL FIRST FLOOR DEMOLITION REFLECTED CEILING PLAN
PBHS A114	PINE BUSH HIGH SCHOOL PARTIAL FIRST FLOOR DEMOLITION PLAN
PBHS A115	PINE BUSH HIGH SCHOOL PARTIAL FIRST FLOOR DEMOLITION REFLECTED CEILING PLAN
PBHS A116	PINE BUSH HIGH SCHOOL PARTIAL FIRST FLOOR DEMOLITION PLAN
PBHS A117	PINE BUSH HIGH SCHOOL PARTIAL FIRST FLOOR DEMOLITION REFLECTED CEILING PLAN
PBHS A118	PINE BUSH HIGH SCHOOL DEMOLITION REFERENCE PHOTOS
PBHS A201	PINE BUSH HIGH SCHOOL NEW WORK - BASEMENT PLAN
PBHS A202	PINE BUSH HIGH SCHOOL NEW WORK - PARTIAL FIRST FLOOR PLAN - AREA A
PBHS A203	PINE BUSH HIGH SCHOOL NEW WORK - PARTIAL FIRST FLOOR PLAN - AREA B
PBHS A204	PINE BUSH HIGH SCHOOL NEW WORK - PARTIAL FIRST FLOOR PLAN - AREA C
PBHS A205	PINE BUSH HIGH SCHOOL NEW WORK - PARTIAL FIRST FLOOR PLAN - AREA D
PBHS A206	PINE BUSH HIGH SCHOOL NEW WORK - SECOND FLOOR PLAN
PBHS A207	PINE BUSH HIGH SCHOOL NEW WORK - PARTIAL ROOF PLAN - AREA D
PBHS A301	PINE BUSH HIGH SCHOOL EXTERIOR ELEVATIONS - 1
PBHS A302	PINE BUSH HIGH SCHOOL EXTERIOR ELEVATIONS - 2
PBHS A303	PINE BUSH HIGH SCHOOL EXTERIOR ELEVATIONS - 3
PBHS A304	PINE BUSH HIGH SCHOOL EXTERIOR ELEVATIONS - 4
PBHS A401	PINE BUSH HIGH SCHOOL WALL TYPE DETAILS
PBHS A501	PINE BUSH HIGH SCHOOL NEW WORK INTERIOR ELEVATIONS
PBHS A502	PINE BUSH HIGH SCHOOL NEW WORK INTERIOR ELEVATIONS
PBHS A503	PINE BUSH HIGH SCHOOL NEW WORK INTERIOR ELEVATIONS
PBHS A601	PINE BUSH HIGH SCHOOL PARTIAL BASEMENT NEW WORK REFLECTED CEILING PLAN
PBHS A601A	PINE BUSH HIGH SCHOOL PARTIAL BASEMENT NEW WORK REFLECTED CEILING PLAN
PBHS A602	PINE BUSH HIGH SCHOOL PARTIAL BASEMENT NEW WORK REFLECTED CEILING PLAN
PBHS A603	PINE BUSH HIGH SCHOOL PARTIAL BASEMENT NEW WORK REFLECTED CEILING PLAN
PBHS A604	PINE BUSH HIGH SCHOOL PARTIAL FIRST FLOOR NEW WORK REFLECTED CEILING PLAN
PBHS A605	PINE BUSH HIGH SCHOOL PARTIAL FIRST FLOOR NEW WORK REFLECTED CEILING PLAN
PBHS A606	PINE BUSH HIGH SCHOOL PARTIAL FIRST FLOOR NEW WORK REFLECTED CEILING PLAN
PBHS A607	PINE BUSH HIGH SCHOOL PARTIAL SECOND FLOOR NEW WORK REFLECTED CEILING PLAN
PBHS A701	PINE BUSH HIGH SCHOOL NEW WORK- ENLARGED PLANS
PBHS A702	PINE BUSH HIGH SCHOOL NEW WORK- ENLARGED PLANS

PBHS A703	PINE BUSH HIGH SCHOOL NEW WORK- ENLARGED PLANS
PBHS A704	PINE BUSH HIGH SCHOOL NEW WORK- ENLARGED PLANS
PBHS A801	PINE BUSH HIGH SCHOOL NEW WORK- DETAILS
PBHS A901	PINE BUSH HIGH SCHOOL WINDOW SCHEDULE, NOTES AND ELEVATIONS
PBHS A902	PINE BUSH HIGH SCHOOL WINDOW TYPES
PBHS A903	PINE BUSH HIGH SCHOOL WINDOWS DETAILS

INTERIORS

PBHS I000	PBHS - INTERIORS GENERAL
PBHS I201	PBHS - BASEMENT FINISH PLAN
PBHS I202	PBHS - PARTIAL FIRST FLOOR FINISH PLAN
PBHS I203	PBHS - BASEMENT ENLARGED FINISH PLANS
PBHS I204	PBHS - BASEMENT ENLARGED FINISH PLANS
PBHS I205	PBHS - FIRST FLOOR ENLARGED FINISH PLAN
PBHS I206	PBHS - FIRST FLOOR ENLARGED FINISH PLAN
PBHS I207	PBHS - FIRST FLOOR ENLARGED FINISH PLANS
PBHS I208	PBHS - PARTIAL BASEMENT FINISH PLAN
PBHS I209	PBHS - PARTIAL BASEMENT FINISH PLAN
PBHS I300	PBHS - FLOOR PATTERN GENERAL, ENLARGED DETAILS
PBHS I301	PBHS - FLOOR PATTERN PLAN BASEMENT LOCKER ROOMS
PBHS I302	PBHS - FLOOR PATTERN PLANS POOL LOCKER ROOMS
PBHS I303	PBHS - FLOOR PATTERN PLAN FIRST FLOOR LOCKER ROOMS

HVAC

PBHS H000	HVAC LEGENDS AND ABBREVIATIONS
PBHS H101	BASEMENT HVAC DEMOLITION PLAN
PBHS H102	BASEMENT POOL AREA HVAC DEMOLITION PLAN
PBHS H103	FIRST FLOOR HVAC DEMOLITION PLAN
PBHS H104	SECOND FLOOR HVAC DEMOLITION PLAN
PBHS H201	BASEMENT HVAC NEW WORK PLAN
PBHS H202	BASEMENT POOL AREA HVAC NEW WORK PLAN
PBHS H203	FIRST FLOOR HVAC NEW WORK PLAN
PBHS H204	SECOND FLOOR HVAC NEW WORK PLAN
PBHS H500	HVAC CONTROLS & SCHEDULES
PBHS H501	HVAC CONTROLS & SCHEDULES
PBHS H800	HVAC DETAILS
PBHS H801	HVAC DETAILS
PBHS H900	HVAC SCHEDULES AND DETAILS
PBHS H901	HVAC SCHEDULES AND DETAILS

PLUMBING

PBHS P100	BASEMENT POOL AREA PLUMBING DEMOLITION PLAN
PBHS P101	BASEMENT POOL AREA PLUMBING DEMOLITION PLAN
PBHS P102	SPORTS LOCKER ROOM PLUMBING DEMOLITION PLAN
PBHS P103	SPORTS LOCKER ROOM PLUMBING DEMOLITION PLAN
PBHS P200	BASEMENT POOL AREA PLUMBING NEW WORK PLAN
PBHS P201	BASEMENT POOL AREA PLUMBING SANITARY NEW WORK PLAN
PBHS P202	SPORTS LOCKER ROOM PLUMBING SANITARY NEW WORK PLAN
PBHS P203	SPORTS LOCKER ROOM PLUMBING SANITARY NEW WORK PLAN
PBHS P301	BASEMENT POOL AREA PLUMBING DOMESTIC NEW WORK PLAN
PBHS P302	SPORTS LOCKER ROOM PLUMBING DOMESTIC NEW WORK PLAN

ELECTRICAL

PBHS E000	LEGEND AND NOTES
-----------	------------------

PBHS E100	BASEMENT ELECTRICAL DEMOLITION PLAN
PBHS E101	FIRST FLOOR ELECTRICAL DEMOLITION PLAN
PBHS E102	SECOND FLOOR ELECTRICAL DEMOLITION PLAN
PBHS E103	BASEMENT ELECTRICAL DEMOLITION PLAN
PBHS E104	FIRST FLOOR ELECTRICAL DEMOLITION PLAN
PBHS E200	BASEMENT ELECTRICAL KEY PLAN
PBHS E201	FIRST FLOOR ELECTRICAL KEY PLAN
PBHS E202	SECOND FLOOR ELECTRICAL NEW WORK PLAN
PBHS E203	BASEMENT ELECTRICAL NEW WORK PLAN
PBHS E204	FIRST FLOOR ELECTRICAL NEW WORK PLAN
PBHS E900	ELECTRICAL SCHEDULES
PBHS E901	ELECTRICAL SCHEDULES

END OF SECTION 000115

ANY PERSON WHO IS NOT A DISTRICT EMPLOYEE AND ENTERS A SCHOOL BUILDING WHILE IN THE PROCESS OF PERFORMING CONSTRUCTION WORK, MAINTAINING EQUIPMENT, MAKING DELIVERIES, OR FOR ANY OTHER REASON, MUST ENTER THEIR NAME IN THE VISITOR'S SIGN-IN LOG LOCATED IN THE BUILDING'S MAIN OFFICE.

END OF SECTION 00 0150

SECTION 00 1112 – ADVERTISEMENT FOR BIDS

The **Pine Bush Central School District** (Owner) invites bids for **“2019 Capital Improvement Project – Phase 2”** which involves work at **Circleville Elementary School (CES)**, located at 2000 NY-302, Circleville, NY 10919, **Pakanasink Elementary School (PAK)**, located at 1953 NY-302 Circleville, NY 10919, **Circleville Middle School (CVMS)**, located at 1951 NY-302 Circleville, NY 10919, **Pine Bush High School (PBHS)**, located at 118 NY-302 Pine Bush, NY 12566.

Separate sealed bids will be received at the Pine Bush Central School District, District Offices (**attention: Michael Pacella, Assistant Superintendent for Business**) **156 NY-302, Pine Bush, NY 12566**, until **12:00 pm (local time) on April 6th 2021** at which time they will publicly opened and read aloud through a live video conference/stream due to the COVID-19 situation in an effort to minimize large groups of people. Bids received after that time will not be accepted.

The Work of the project will be let for the following Contracts:

Contract 1	General Construction Work
Contract 2	Mechanical Work
Contract 3	Electrical Work
Contract 4	Plumbing Work

Complete digital sets of Bidding Documents, drawings and specifications, may be obtained online as a download at **www.cplplanroom.com** under 'public projects' for a non-refundable reproduction fee of \$49.00.

Complete sets of Bidding Documents, Drawings and Specifications, may be obtained from **Rev, 330 Route 17A, Suite #2, Goshen, New York 10924 Tel: 1-877-272-0216**, for a refundable reproduction fee of \$100.00 for each combined set of documents. Checks or money orders shall be made payable to Pine Bush Central School District. Any bidder requiring documents to be shipped shall make arrangements with the printer and pay for all packaging and shipping costs.

All bid addenda will be transmitted to registered plan holders via email and will be available at **www.cplplanroom.com**. Plan holders who have paid for hard copies of the bid documents will need to make the determination if hard copies of the addenda are required for their use and coordinate directly with the printer for hard copies of addenda to be issued. There will be no charge for registered plan holders to obtain hard copies of the bid addenda.

A Bidder, upon 1) making the deposit required for the Bid Documents, 2) submitting a Proposal accompanied by a certified check or other security in accordance with the requirements contained in the plans and specifications and public advertisement for bids, and 3) returning the plans and specifications used by such Bidder in good condition within thirty (30) days following the award of the Contract, or rejection of the Bid, shall have returned to them the full amount of the deposit for one copy of the plans and specifications.

Bidding Documents may be examined on or after **March 8, 2021** at the following locations:

1. **www.cplplanroom.com**
2. **Eastern Contractors Association, Inc.,**
6 Airline Drive, Albany, NY 12205-1095, 518-869-096
3. **McGraw Hill Construction (Dodge):**
71 Fuller Road, Albany, NY 12205, phone: 1-800-393-6343, fax: 518-725-4733, e-mail:
Support@construction.com

A Pre-Bid Meeting/walk-through for this Project will be held on **March 16, 2021** starting at **2:45 am** at Pine Bush High School (convene at main entrance). Due to the COVID-19 situation, please RSVP your spot for the pre-bid meeting/walk-through by emailing your request to both Chris Ladanyi (Architect for the District at CLadanyi@CPLteam.com) and Terry Damon (Owner's Representative for the District at Terry@adplnmgt.com). Please limit one representative per company for the pre-bid meeting/walk-through. Attendance by bidders is strongly recommended, but not required, for submitting a bid.

Attention of the Bidder is particularly called to the Owner's sales tax exemption, the requirements as to conditions of employment to be observed, and the minimum wage rates to be paid under the Contract. In addition, the Bidding Documents contain detailed requirements for the qualification of Bidders. These include, among other things, rigid bonding and insurance requirements, financial statements, bank references, lists of lawsuits, arbitrations or other proceedings in which the Bidder has been named as a party, a statement of surety's intent to issue Performance and Payment Bonds, and a description of other projects of similar size and scope completed by the Bidder.

Bids shall be prepared as set forth in "INSTRUCTIONS TO BIDDERS", enclosed in a sealed envelope bearing on its face the name and address of the Bidder and the title of the Work to which the bid enclosed relates.

Each Bidder shall deposit with its bid, security in an amount not less than five percent (5%) of the base bid in the form and subject to the conditions provided in the "INSTRUCTIONS TO BIDDERS."

No Bidder may withdraw his bid within forty-five (45) days after the actual bid opening.

The Owner reserves the right to waive any and all informalities in, or to reject, any or all bids.

The Owner further reserves its right to disqualify Bidders for any material failure to comply with the "INSTRUCTIONS TO BIDDERS".

Pine Bush Central School District
156 NY-302
Pine Bush, NY 12566

END OF SECTION 00 1112

SECTION 00 2000 INSTRUCTIONS TO BIDDERS

PART 1 - GENERAL

1.1 SUMMARY

- A. Attached is AIA Document A701-2018, Instructions to Bidders.
 - 1. AIA Document A701-2018 defines the conditions affecting award of contract and procedures with which Bidders must comply.
- B. All Pre-Bid RFIs and questions shall be directed to the Construction Manager, The Pike Company, to Chris Thomas at thomc@pikeco.com.

PART 2 - PRODUCTS (Not Used)

PART 3 - EXECUTION (Not Used)

END OF SECTION 00 2000



AIA® Document A701™ – 2018

Instructions to Bidders

for the following Project:
(Name, location, and detailed description)

PINE BUSH CENTRAL SCHOOL DISTRICT 2019 CAPITAL IMPROVEMENT PROJECT – PHASE II

Pine Bush High School
156 State Route 302
Pine Bush, NY 12566
SED #44-04-01-06-0-007-027

Pakanasink Elementary School
1953 State Route 302
Circleville, NY 10919
SED #44-04-01-06-0-012-015

Circleville Middle School
1951 State Route 302
Circleville, NY 10919
SED #44-04-01-06-0-014-015

Circleville Elementary School
2000 State Route 302
Circleville, NY 10919
SED #44-04-01-06-0-009-016

THE OWNER: (Name, legal status, address, and other information)

PINE BUSH CENTRAL SCHOOL DISTRICT
156 State Route 302
Pine Bush, NY 12566

THE ARCHITECT: (Name, legal status, address, and other information)

CPL
50 Front Street, Suite 202
Newburgh, NY 12550

ADDITIONS AND DELETIONS:

The author of this document has added information needed for its completion. The author may also have revised the text of the original AIA standard form. An *Additions and Deletions Report* that notes added information as well as revisions to the standard form text is available from the author and should be reviewed. A vertical line in the left margin of this document indicates where the author has added necessary information and where the author has added to or deleted from the original AIA text.

This document has important legal consequences. Consultation with an attorney is encouraged with respect to its completion or modification.

FEDERAL, STATE, AND LOCAL LAWS MAY IMPOSE REQUIREMENTS ON PUBLIC PROCUREMENT CONTRACTS. CONSULT LOCAL AUTHORITIES OR AN ATTORNEY TO VERIFY REQUIREMENTS APPLICABLE TO THIS PROCUREMENT BEFORE COMPLETING THIS FORM.

It is intended that AIA Document G612™–2017, Owner's Instructions to the Architect, Parts A and B will be completed prior to using this document.

TABLE OF ARTICLES

1	DEFINITIONS
2	BIDDER'S REPRESENTATIONS
3	BIDDING DOCUMENTS
4	BIDDING PROCEDURES
5	CONSIDERATION OF BIDS
6	POST-BID INFORMATION
7	PERFORMANCE BOND AND PAYMENT BOND
8	ENUMERATION OF THE PROPOSED CONTRACT DOCUMENTS

ARTICLE 1 DEFINITIONS

§ 1.1 Bidding Documents include the Bidding Requirements and the Proposed Contract Documents. The Bidding Requirements consist of the advertisement or invitation to bid, Instructions to Bidders, supplementary instructions to bidders, the bid form, and any other bidding forms, including Addenda and the Project Manual, drawings and exhibits. The Proposed Contract Documents consist of the Bidding Documents, Contractor's Bid, the unexecuted form of Agreement between the Owner and Contractor and that Agreement's Exhibits, Conditions of the Contract (General, Supplementary and other Conditions), Drawings, Specifications, all Addenda, and all other documents enumerated in Article 8 of these Instructions.

§ 1.2 Definitions set forth in the General and Supplementary (if required) Conditions of the Contract for Construction, or in other Proposed Contract Documents apply to the Bidding Documents.

§ 1.3 Addenda are written or graphic instruments issued by the Architect, prior to the execution of the Contract, which, by additions, deletions, clarifications, or corrections, modify or interpret the Bidding Documents.

§ 1.4 A Bid is a complete and properly executed proposal to do the Work for the sums stipulated therein, submitted in accordance with the Bidding Documents.

§ 1.5 The Base Bid is the sum stated in the Bid for which the Bidder offers to perform the Work described in the Bidding Documents, to which Work may be added or deleted by sums stated in Alternate Bids.

§ 1.6 An Alternate Bid (or Alternate) is an amount stated in the Bid to be added to or deducted from, or that does not change, the Base Bid if the corresponding change in the Work, as described in the Bidding Documents, is accepted.

§ 1.7 A Unit Price is an amount stated in the Bid as a price per unit of measurement for materials, equipment, or services, or a portion of the Work, as described in the Bidding Documents.

§ 1.8 A Bidder is a person or entity who has the authority to submit a Bid and who meets the requirements set forth in the Bidding Documents.

§ 1.9 A Sub-bidder is a person or entity who submits a bid to a Bidder for materials, equipment, or labor for a portion of the Work pursuant to the requirements of the proposed work and the Bidder is responsible for the sub-bidders pricing and work.

ARTICLE 2 BIDDER'S REPRESENTATIONS

§ 2.1 By submitting a Bid, the Bidder represents that:

- .1 the Bidder has read and understands the Bidding Documents;
- .2 the Bidder understands how the Bidding Documents relate to other portions of the Project, if any, being bid concurrently or presently under construction;
- .3 the Bid complies with the Bidding Documents;
- .4 the Bidder has visited the site, become familiar with local conditions under which the Work is to be performed, and has correlated the Bidder's observations with the requirements of the Proposed Contract Documents;
- .5 the Bid is based upon the materials, equipment, and systems required by the Bidding Documents without exception; and
- .6 the Bidder has read and understands the provisions for liquidated damages, if any, set forth in the form of Agreement between the Owner and Contractor.

ARTICLE 3 BIDDING DOCUMENTS

§ 3.1 Distribution

§ 3.1.1 Bidders

(Paragraphs deleted)

may obtain Bidding Documents as designated in the Advertisement or Invitation to Bid, for the deposit sum and method stated therein.

§ 3.1.2 Any required deposit shall be refunded to Bidders who submit a bona fide Bid and returns the paper Bidding Documents in good condition to the Owner within thirty (30) days following the award of the Contract or rejection of the Bids. The cost to replace missing or damaged paper documents will be deducted from the deposit. A Bidder receiving a

Contract award may retain the paper Bidding Documents, and the Bidder's deposit will be refunded. Good condition as used in this section means that the Bidding Documents must be returned bound as issued, legible, and containing only the markings necessary for bidding purposes.

§ 3.1.3 Bidding Documents will not be issued directly to Sub-bidders unless specifically offered in the advertisement or invitation to bid, or in supplementary instructions to bidders.

§ 3.1.4 Bidders shall use complete Bidding Documents in preparing Bids. Neither the Owner nor Architect assumes responsibility for Bidder's errors or misinterpretations resulting from the Bidder's use of incomplete Bidding Documents.

§ 3.1.5 The Bidding Documents will be available for the sole purpose of obtaining Bids on the Work. No license or grant of use is conferred by distribution of the Bidding Documents.

§ 3.2 Modification or Interpretation of Bidding Documents

§ 3.2.1 The Bidder shall carefully study the Bidding Documents, shall examine the site and local conditions, shall consider federal, state and local Laws and Regulations and shall notify the Architect of any errors, inconsistencies, or ambiguities discovered and request clarification or interpretation pursuant to Section 3.2.2.

§ 3.2.2 Requests for clarification or interpretation of the Bidding Documents shall be submitted by the Bidder in writing via email and shall be received by the Architect at least seven working days prior to the date for receipt of Bids, or as follows:

(Indicate how, such as by email, website, host site/platform, paper copy, or other method Bidders shall submit requests for clarification and interpretation.)

§ 3.2.3 Modifications and interpretations of the Bidding Documents shall be made by written Addendum. Modifications and interpretations of the Bidding Documents made in any other manner, including phone calls, shall not be binding, and Bidders shall not rely upon them.

§ 3.2.4 In the absence of an written interpretation, correction or change, should the Drawings disagree in themselves or with the Specifications, the Bidder should rely on and estimate their bid based on the better quality, the costlier or the greater quantity of work or materials, and unless otherwise ordered, shall be furnished.

§ 3.2.5 Communications regarding the Bidding Documents shall be directed to....., Telephone.....

§ 3.2.6 EQUIVALENCY

§ 3.2.6.1 In the Specifications, if two or more kinds, types, brands, or manufacturers or materials are named, they shall be regarded as the required standard of quality, and are presumed to be equal. The Contractor may select one of these items or, if the Contractor desires to use any kind, type, brand, manufacturer or material other than those named in the Specification, he/she shall indicate in writing to the Architect and Owner, and prior to the award of Contract, what kind, type, brand or manufacturer is included in the Base Bid for the specified item. Refer to Specification 012519 Equivalents for Equivalent Certification Form.

§ 3.3 Substitutions

§ 3.3.1 The materials, products, and equipment described in the Bidding Documents establish a standard of required function, dimension, appearance, and quality to be met by any proposed substitution.

§ 3.3.2 Substitution Process

§ 3.3.2.1 Written requests for substitutions shall be received by the Architect at least ten days prior to the date for receipt of Bids. Requests shall be submitted in the same manner as that established for submitting clarifications and interpretations in Section 3.2.2.

§ 3.3.2.2 Bidders shall submit written substitution requests on a Substitution Request Form if one is provided in the Bidding Documents.

§ 3.3.2.3 If a Substitution Request Form is not provided, the Bidder shall submit substitution requests in writing which shall include (1) the name of the material or equipment specified in the Bidding Documents; (2) the reason for the requested substitution; (3) a complete description of the proposed substitution, including the name of the material or

equipment proposed as the substitute, performance and test data, sizing, quantity, and relevant drawings; and (4) any other information necessary for an evaluation. The written request shall include a statement setting forth changes in other materials, equipment, or other portions of the Work, including changes in the work of other contracts or the impact on any Project Certifications (such as LEED), that will result from incorporation of the proposed substitution.

§ 3.3.3 The burden of proof of the merit of the proposed substitution is upon the proposer. The Architect's decision of approval or disapproval of a proposed substitution shall be final.

§ 3.3.4 If the Architect approves a proposed substitution prior to receipt of Bids, such approval shall be set forth in a written Addendum. Approvals made in any other manner shall not be binding, and Bidders shall not rely upon them.

§ 3.3.5 No substitutions will be considered after the Contract award unless specifically provided for in the Contract Documents. The procedure for review and approval of Substitutions is set forth in the § 3.4.2 of the General and Supplementary (if required) Conditions of the Contract and in the General Requirements (Division 1 of the Specifications).

§ 3.4 Addenda

§ 3.4.1 Addenda will be transmitted to Bidders known by the issuing office to have received complete Bidding Documents through the print method stated in the Advertisement or Invitation to Bid, or as follows:

(Indicate how, such as by email, website, host site/platform, paper copy, or other method Addenda will be transmitted.)

§ 3.4.2 Addenda will be available where Bidding Documents are on file.

§ 3.4.3 Addenda will be issued no later than two calendar days prior to the date for receipt of Bids, except an Addendum withdrawing the request for Bids or one which includes postponement of the date for receipt of Bids.

§ 3.4.4 Prior to submitting a Bid, each Bidder assumes the sole responsibility to ascertain that the Bidder has received all Addenda issued, and the Bidder shall acknowledge their receipt of all Addenda and their responsibility to do so in the Bid.

ARTICLE 4 BIDDING PROCEDURES

§ 4.1 Preparation of Bids

§ 4.1.1 Bids shall be submitted in writing on the forms included with or identified in the Bidding Documents.

§ 4.1.2 All blanks on the bid form shall be legibly executed. Paper bid forms shall be executed in a non-erasable medium.

§ 4.1.3 Sums shall be expressed in both words and numbers, unless noted otherwise on the bid form. In case of discrepancy, the amount entered in words shall govern.

§ 4.1.4 Edits to entries made on paper bid forms must be initialed by the signer of the Bid.

§ 4.1.5 All requested Alternates shall be bid. If no change in the Base Bid is required, enter "No Change" or as required by the bid form.

§ 4.1.6 Each copy of the Bid shall state the legal name and legal status of the Bidder. As part of the documentation submitted with the Bid, the Bidder shall provide evidence of its legal authority to perform the Work in the jurisdiction where the Project is located. Each copy of the Bid shall be signed by the person or persons legally authorized to bind the Bidder to a contract. A Bid by a corporation shall further name the state of incorporation and have the corporate seal affixed. A Bid submitted by an agent shall have a current power of attorney attached, certifying the agent's authority to bind the Bidder.

§ 4.1.7 A Bidder shall incur all costs associated with the preparation and submittal of its Bid.

(Paragraphs deleted)

§ 4.1.8 In accordance with the Wicks Reform 2008, Single Prime Contracts for projects under the monetary threshold of \$500,000, the bid shall be accompanied by a separate sealed envelope naming each subcontractor for the Plumbing, HVAC and Electrical work, with the amounts paid to each sub-contractor. This list may not be changed unless the public owner finds a legitimate construction need, including a change in specifications or costs. This list must be open for public inspection.

4.2.1 Each Bid shall be accompanied by the following bid security: Bid Security of not less than five percent (5%) of the amount of the Bid, in the form of a Bid Bond or a Certified Check made payable to the Owner.
(Insert the form and amount of bid security.)

§ 4.2.2 Except as stated under **§ 4.4.3**, the Bidder pledges to enter into a Contract with the Owner on the terms stated in the Bid, with the understanding that the Bid Security shall guarantee that the Bidder will not withdraw its Bid for a period of forty-five (45) days after the scheduled closing time for the receipt of Bids, and that if its Bid is accepted, the Bidder will enter into a formal contract with the Owner in accordance with the terms stated in the Bid and will furnish any required performance and payment bonds and insurance documents at the time required. In the event of the withdrawal of said Bid within the forty-five (45) day period or the failure of the successful Bidder to enter into the Contract with the Owner or the failure of the successful Bidder to furnish required performance and payment bonds and insurance documents at the time required, the bid security shall be forfeited to the Owner as liquidated damages, not as a penalty, which represents the damage the Owner incurred as a result of the Bidder's default.

In the event the Owner fails to comply with Section 6.2, the amount of the bid security shall not be forfeited to the Owner.

§ 4.2.3 If a surety bond is required as bid security, it shall be written on AIA Document A310™, Bid Bond, unless otherwise provided in the Bidding Documents. The attorney-in-fact who executes the bond on behalf of the surety shall affix to the bond a certified and current copy of an acceptable power of attorney. The Bidder shall provide surety bonds from a company or companies lawfully authorized to issue surety bonds in the jurisdiction where the Project is located.

§ 4.2.4 The Bid Securities shall be returned to all Bidders except the three (3) lowest Bidders within three (3) days after the formal opening of bids. The remaining Bid Securities will be returned within forty-eight (48) hours after the Owner and the successful Bidder have executed the Contract and executed performance and payment bonds and insurance documents have been approved by the Owner. If a Contract has not been executed or performance and payment bonds and insurance documents have not been approved by the Owner within forty-five (45) days after the scheduled closing time for the receipt of bids, then Bid Securities will be returned within three (3) days after the expiration of this forty-five (45) day period unless the Bid Security has been forfeited under **§ 4.2.2**.

§ 4.3 Submission of Bids

§ 4.3.1 A Bidder shall submit its Bid as
(Paragraphs deleted)
a paper Bid:

§ 4.3.2 Paper copies of the Bid, the bid security, and any other documents required to be submitted with the Bid shall be enclosed in a sealed opaque envelope. The envelope shall be addressed to the party receiving the Bids and shall be identified with the Project name, the Bidder's name and address, and, if applicable, the designated portion of the Work for which the Bid is submitted. If the Bid is sent by mail, the sealed envelope shall be enclosed in a separate mailing envelope with the notation "SEALED BID ENCLOSED" on the face thereof.

§ 4.3.3 Bids shall be submitted by the date and time and at the place indicated in the invitation to bid. Bids submitted after the date and time for receipt of Bids, or at an incorrect place, will not be accepted.

§ 4.3.4 The Bidder shall assume full responsibility for timely delivery at the location designated for receipt of Bids.

§ 4.3.5 A Bid submitted by any method other than as provided in this Section 4.3 will not be accepted and shall remain unopened.

§ 4.4 Modification or Withdrawal of Bid

§ 4.4.1 Prior to the date and time designated for receipt of Bids, a Bidder may submit a new Bid to replace a Bid previously submitted, or withdraw its Bid entirely, by written notice to the party designated to receive the Bids. Such written notice shall be received and duly recorded by the receiving party on or before the date and time set for receipt of

Bids. The receiving party shall verify that replaced or withdrawn Bids are removed from the other submitted Bids and not considered. Notice of submission of a replacement Bid or withdrawal of a Bid shall be worded so as not to reveal the amount of the original Bid.

§ 4.4.2 Withdrawn Bids may be resubmitted up to the date and time designated for the receipt of Bids in the same format as that established in Section 4.3, provided they fully conform with these Instructions to Bidders. Bid security shall be in an amount sufficient for the Bid as resubmitted.

§ 4.4.3 After the date and time designated for receipt of Bids, a Bidder who discovers that it made a clerical error in its Bid shall notify the Architect of such error within three days, or pursuant to a timeframe specified by the law of the jurisdiction where the Project is located, requesting withdrawal of its Bid. Upon providing evidence of such error to the reasonable satisfaction of the Architect, the Bid shall be withdrawn and not resubmitted. If a Bid is withdrawn pursuant to this Section 4.4.3, the bid security will be returned.

§ 4.4.4 Unless a Bid error complies with § 4.4.3, a Bid may not be modified, withdrawn or canceled by the Bidder for a period of forty-five (45) days following the time and date designated for the receipt of Bids, and each Bidder agrees to this requirement in submitting a Bid.

ARTICLE 5 CONSIDERATION OF BIDS

§ 5.1 Opening of Bids

If stipulated in an advertisement or invitation to bid, or when otherwise required by law, Bids properly identified and received within the specified time limits will be publicly opened and read aloud. A summary of the Bids may be made available to Bidders.

§ 5.2 Rejection of Bids

Unless otherwise prohibited by law, the Owner shall have the right to reject any or all Bids.

§ 5.3 Acceptance of Bid (Award)

§ 5.3.1 It is the intent of the Owner, for Public projects, to award a Contract to the lowest responsive and responsible Bidder, provided the Bid has been submitted in accordance with the requirements of the Bidding Documents and does not exceed the funds available. Unless otherwise prohibited by law, the Owner shall have the right to waive informalities and irregularities in a Bid received and to accept the Bid which, in the Owner's judgment, is in the Owner's best interests.

§ 5.3.2 Unless otherwise prohibited by law, the Owner shall have the right to accept Alternates in any order or combination, unless otherwise specifically provided in the Bidding Documents, and to determine the lowest responsive and responsible Bidder on the basis of the sum of the Base Bid and Alternates accepted.

ARTICLE 6 POST-BID INFORMATION

§ 6.1 Contractor's Qualification Statement

Bidders to whom award of a Contract is under consideration shall submit to the Architect, upon request and within the timeframe specified by the Architect, a properly executed AIA Document A305™, Contractor's Qualification Statement, or other document included in the Project Manual, unless such a Statement has been previously required and submitted for this Bid.

(Paragraphs deleted)

§ 6.3 Submittals

§ 6.3.1 After notification of selection for the award of the Contract, the Bidder shall, as soon as practicable or as stipulated in the Bidding Documents, submit in writing to the Owner through the Architect:

- .1 a designation of the Work to be performed with the Bidder's own forces;
- .2 names of the principal products and systems proposed for the Work and the manufacturers and suppliers of each; and
- .3 names of persons or entities (including those who are to furnish materials or equipment fabricated to a special design), including sub-contractors proposed for the principal portions of the Work.

§ 6.3.2 The Bidder will be required to establish to the satisfaction of the Architect and Owner the reliability and responsibility of the persons or entities proposed to furnish and perform the Work described in the Bidding Documents.

§ 6.3.3 Prior to the execution of the Contract, the Architect will notify the Bidder if either the Owner or Architect, after due investigation, has reasonable objection to a person or entity proposed by the Bidder. If the Owner or Architect has reasonable objection to a proposed person or entity, the Bidder may, at the Bidder's option, withdraw the Bid or submit an acceptable substitute person or entity. The Bidder may also submit any required adjustment in the Base Bid or Alternate Bid to account for the difference in cost occasioned by such substitution. The Owner may accept the adjusted bid price or disqualify the Bidder. In the event of either withdrawal or disqualification, bid security will not be forfeited.

§ 6.3.4 Persons and entities proposed by the Bidder and to whom the Owner and Architect have made no reasonable objection must be used on the Work for which they were proposed and shall not be changed except with the written consent of the Owner and Architect.

ARTICLE 7 PERFORMANCE BOND AND PAYMENT BOND AND INSURANCE

§ 7.1 Bond Requirements

§ 7.1.1 The Bidder shall furnish bonds covering the faithful performance of the Contract and payment of all obligations arising thereunder in accordance with the Bid requirements and subject to the approval of the Owner.

§ 7.1.2 The cost of bonds shall be included in the Bid. If the furnishing of such bonds is required after receipt of bids and before execution of the Contract, the cost of such bonds shall be added to the Bid in determining the Contract Sum.

§ 7.1.3 The Bidder shall provide surety bonds from a company or companies lawfully authorized to issue surety bonds in the jurisdiction where the Project is located.

§ 7.1.4 Unless otherwise indicated below, the Penal Sum of the Payment and Performance Bonds shall each be equal to one hundred (100) percent of the Contract Sum.

(If Payment or Performance Bonds are to be in an amount other than 100% of the Contract Sum, indicate the dollar amount or percentage of the Contract Sum.)

§ 7.2 Time of Delivery and Form of Bonds

§ 7.2.1 The Bidder shall deliver the required bonds as required by the Bidding requirements and the Contract documents to the satisfaction of the Owner not later than ten (10) days after the Bidder has received notice of the acceptance of its Bid, but in no event shall bonds be delivered later than the date of execution of the Contract. If the Work is to commence sooner in response to a letter of intent, the Bidder shall, prior to commencement of the Work, submit to the Owner such bonds in accordance with the Bid requirements and Sections 7.1 and 7.2

§ 7.2.2 Unless otherwise provided, the bonds shall be written on AIA Document A312, Performance Bond and Payment Bond.

§ 7.2.3 The bonds shall be dated on the date of the Contract.

§ 7.2.4 The Bidder shall require the attorney-in-fact who executes the required bonds on behalf of the surety to affix to the bond a certified and current copy of the power of attorney.

§ 7.2.5 The Bidder is precluded from submitting any claims based on delay when such delay is caused by Bidders failure to submit bonds that fully comply with the requirements of Sections 7.1 and 7.2 and the Bidding requirements.

§ 7.3 Insurance Requirements

§ 7.3.1 The Bidder shall furnish documentation that it has purchased and maintains insurance of the types and limits of liability, containing the endorsements, subject to the terms and conditions as described in the Bidding requirements and Contract Documents.

§ 7.3.1 The Bidder shall provide insurance from a company or companies lawfully licensed to provide insurance in the State of New York in the jurisdiction where the Project is located.

§ 7.3.1 The Bidder shall provide insurance naming the Owner, Owner's Architect and Construction Manager as additional insureds.

§ 7.4 Time of Delivery and Form of Insurance

§ 7.4.1 The Bidder shall deliver the required insurance documents to the Owner not later than ten (10) days after the Bidder has received notice of the acceptance of its Bid, but in no event shall insurance documents be delivered later than the date of execution of the Contract. If the Work is to commence sooner in response to a letter of intent, the Bidder shall, prior to commencement of the Work, submit to the Owner such insurance in accordance with Bidding requirements and Contract Documents and this Sections 7.3. and 7.4.

§ 7.4.2 Unless otherwise provided, the Insurance shall be written on AIA Document.

§ 7.3.3 The insurance shall be effective no later than the date of the Contract.

§ 7.2.5 The Bidder is precluded from submitting any claims based on delay when such delay is caused by Bidders failure to submit the insurance documents that fully comply with the requirements of Sections 7.3 and 7.4 and the Bidding requirements and Contract documents.

ARTICLE 8 ENUMERATION OF THE PROPOSED CONTRACT DOCUMENTS

§ 8.1 Copies of the proposed Contract Documents have been made available to the Bidder and consist of the following documents:

.1 AIA Document A101™-2017, Standard Form of Agreement Between Owner and Contractor, unless otherwise stated below.
(Insert the complete AIA Document number, including year, and Document title.)

.2 AIA Document A101™-2017, Exhibit A, Insurance and Bonds, unless otherwise stated below.
(Insert the complete AIA Document number, including year, and Document title.)

.3 AIA Document A201™-2017, General Conditions of the Contract for Construction, unless otherwise stated below.
(Insert the complete AIA Document number, including year, and Document title.)

.4 AIA Document E203™-2013, Building Information Modeling and Digital Data Exhibit, dated as indicated below:
(Insert the date of the E203-2013.)

.5 Drawings

Number	Title	Date
--------	-------	------

.6 Specifications

Section	Title	Date	Pages
---------	-------	------	-------

.7 Addenda:

- | Number | Date | Pages |
|--|---|-------|
| .8 Other Exhibits:
(Check all boxes that apply and include appropriate information identifying the exhibit where required.) | | |
| <input type="checkbox"/> | AIA Document E204™-2017, Sustainable Projects Exhibit, dated as indicated below:
(Insert the date of the E204-2017.) | |

- ☐ The Sustainability Plan:

Title	Date	Pages
-------	------	-------

- ☐ Supplementary and other Conditions of the Contract:

Document	Title	Date	Pages
----------	-------	------	-------

- .9 Other documents listed below:
(List here any additional documents that are intended to form part of the Proposed Contract Documents.)

The invitation to bid, Instructions to Bidders, supplementary instructions to bidders, the bid form, and any other bidding forms, including Addenda and the Project Manual, and exhibits and the Contractor's Bid,

ARTICLE 9: NEWFORMA REQUIREMENTS

9.1 After notification of selection for the award of the Contract, the Bidder shall be required to use the Newforma Info Exchange for the transfer of Submittals, Shop Drawings and RFI's. There will be **no exceptions** to this requirement. The contractor will be given a Login and Password free of charge.

ARTICLE 10: TAXES

10.1 The Owner is an organization, which is exempt from New York State and Local Sales and Use Taxes. Materials purchased for use in fulfilling this Contract will be exempt from New York Sales Tax. The Owner will provide the Contractor with a completed Form ST-119.1, Exempt Organization Certification. The Contractor shall present a copy of this Form and a completed Form ST-120.1, Contractor Exempt Purchase Certificate, to each supplier. Should sales tax be assessed, the Owner agrees that the Contract Sum shall be increased by the full amount of such assessment.

00 3126 - EXISTING HAZARDOUS MATERIAL INFORMATION

1.1 EXISTING HAZARDOUS MATERIAL INFORMATION

A. Attached, for Bidder's information and reference only, are the following documents:

1. Pakanasink Elementary School:

a. *Limited Hazardous Material Pre-Renovation Survey Report*, dated 9/14/2020.

2. Pine Bush High School:

a. *Limited Hazardous Material Pre-Renovation Survey Report*, dated 9/14/2020.

3. Circleville Elementary School:

a. *Limited Hazardous Material Pre-Renovation Survey Report*, dated 9/14/2020.

4. Circleville Middle School:

a. *Limited Hazardous Material Pre-Renovation Survey Report*, dated 9/14/2020.

B. The Owner and Architect take no responsibility for the information presented in the document(s) attached to this Section.

END OF SECTION 00 3126



Limited Hazardous Material Pre-Renovation Survey Report

Pine Bush Central School District – 2019 CIP, Phase 2 Activities

Circleville Elementary School
2000 NYS Route 302
Circleville, New York 10919

Prepared for:

Mr. Christopher M. Ladanyi, AIS
Clark Patterson Lee, Architecture, Engineering & Planning, P.C.
50 Front Street, Suite 202
Newburgh, New York 12550

Prepared by:

Asbestos & Environmental Consulting Corporation (AECC)
6308 Fly Road
East Syracuse, New York 13057



September 14, 2020

Mr. Christopher M. Ladanyi, AIS
Clark Patterson Lee, Architecture, Engineering & Planning, P.C.
50 Front Street, Suite 202
Newburgh, New York 12550

**RE: Limited Hazardous Material Pre-Renovation Survey Report
Pine Bush Central School District – 2019 CIP, Phase 2 Activities
Circleville Elementary School – 2000 NYS Route 302, Circleville, New York 10919
AECC Project Number: 20-146**

Dear Mr. Ladanyi:

The Asbestos & Environmental Consulting Corporation (AECC) conducted a limited hazardous material pre-renovation survey at Circleville Elementary School, located at 2000 New York State Route 302, in Circleville, New York. The survey was limited nature. Only specific areas anticipated to be impacted by proposed Phase II activities of the Pine Bush 2019 Capital Improvement Project were included, as per the direction of the Project Architect (CPL). The following sections summarize the results:

ASBESTOS PRE-RENOVATION SURVEY

The asbestos bulk samples were collected by Mr. Bruce Osterman, Mr. Nicholas Coulombe, Mr. Hayden Haas and Mr. Steven Martinez, New York State Department of Labor (NYSDOL)-certified Asbestos Building Inspectors. The following building materials were collected, labeled, and shipped to AmeriSci New York for laboratory analysis:

Table 1: Asbestos Bulk Sampling Summary

SAMPLE NUMBER	MATERIAL DESCRIPTION	SAMPLE LOCATION(S)	ASBESTOS CONTENT
CLK-001A,B	Window Caulk (Brown)	1 st Floor - Principal 150 & Classroom 106	NAD
GLZ-002A,B	Window Glazing Compound (Gray)	1 st Floor - Principal 150 & Classroom 106	NAD
GLZ-003A,B	Window Glazing Compound (Black)	1 st Floor - Office 115 & Classroom 111	NAD
CLK-004A,B	Window Caulk (Black)	1 st Floor - Classroom 111 & Classroom 106	NAD
CLK-005A,B	Window Caulk (Brown)	1 st Floor - Special Education 110 & Cafetorium 156	NAD

Mr. Christopher M. Ladanyi, AIS
 Clark Patterson Lee, Architecture, Engineering & Planning, P.C.
Limited Hazardous Material Pre-Renovation Survey Report
Circleville Elementary School – 2000 State Route 302, Circleville, New York 10919

Table 1: Asbestos Bulk Sampling Summary

SAMPLE NUMBER	MATERIAL DESCRIPTION	SAMPLE LOCATION(S)	ASBESTOS CONTENT
ACT-006A,B	2'x2' Acoustical Ceiling Tile (White, Pinholes/Fissures)	1 st Floor - Lobby 135	NAD
CB-007A,B	4" Cove Base (Maroon)	1 st Floor - Lobby 135	NAD
CBM-008A,B	Cove Base Mastic (Tan/Black)	1 st Floor - Lobby 135	NAD
TRZO-009A,B	Terrazzo Flooring (White/Maroon)	1 st Floor - Lobby 135	NAD
CTG-010A,B	Ceramic Wall Tile Grout (Gray)	1 st Floor - Lobby 135	NAD
CTM-011A,B	Ceramic Wall Tile Mastic (Brown)	1st Floor - Lobby 135	3.4% Chrysotile
CTT-012A,B	Ceramic Tile Wall Thin Set (Gray)	1 st Floor - Lobby 135	NAD
FT-013A,B	12"x12" Floor Tile (Gray)	1st Floor - Stage 169	7.7% Chrysotile
FTM-014A,B	Floor Tile Mastic (Black)	1st Floor - Stage 169	1.9% Chrysotile
CB-015A,B	4" Cove Base (Gray)	1 st Floor - Stage 169	NAD
CBM-016A,B	Cove Base Mastic (Brown)	1 st Floor - Stage 169	NAD
STRD-017A,B	Stair Tread (Gray)	1 st Floor - Stage 169	NAD
STM-018A,B	Stair Tread Mastic (Brown)	1 st Floor - Stage 169	NAD
ACT-019A,B	2'x4' Acoustical Ceiling Tile (White, Pinholes/Fissures)	1 st Floor - Stage 169	NAD
CLK-020A,B	Door Caulk (Gray)	1 st Floor - Lobby 135	NAD

Table Notes:

NAD = No Asbestos Detected

Mr. Christopher M. Ladanyi, AIS
Clark Patterson Lee, Architecture, Engineering & Planning, P.C.
Limited Hazardous Material Pre-Renovation Survey Report
Circleville Elementary School – 2000 State Route 302, Circleville, New York 10919

The following asbestos-containing materials (ACMs) were identified within the renovation areas during the completion of this survey:

Table 2: Approximate Quantities of ACMs

ACM DESCRIPTION	ACM LOCATION(S)	ESTIMATED QUANTITY	MATERIAL CONDITION
Brown Ceramic Wall Tile Mastic (CTM-011)	1 st Floor - Lobby 135	430 SF	NF, Intact
Gray 12"x12" Floor Tile (FT-013)	1 st Floor - Stage 169, On Stair Landings	40 SF	NF, Intact
Black Floor Tile Mastic (FTM-014)			

Table Notes:

SF = Square Feet

NF = Non-Friable

Asbestos Bulk Sampling Summary – By regulatory definition, a building material must be greater than one percent (1%) asbestos to be considered an asbestos-containing material (ACM). During this survey, brown ceramic wall tile mastic, gray 12"x12" floor tile, and black floor tile mastic were determined to be ACMs by laboratory analysis. According to state and federal laws, ACMs and presumed asbestos-containing materials (PACMs) must be handled and disposed of by a licensed abatement contractor prior to any renovation or demolition-related activities. The associated laboratory analysis report has been included in Attachment B of this report.

Transmittal of Building / Structure Asbestos Survey Information – As required by New York State Industrial Code Rule 56, copies of this report shall be immediately transmitted by the building / structure owner (prior to any renovation-related activities), as follows:

- (1) One (1) copy of the completed asbestos survey shall be sent by the owner or their agent to the local entity charged with issuing a permit for such demolition, renovation, remodeling or repair work under state or local laws.
- (2) One (1) copy of completed asbestos survey shall be kept on the construction site with the asbestos notification and variance, if required, for the duration of the asbestos project and any associated demolition, renovation, remodeling or repair project.

LEAD-BASED PAINT INSPECTION

AECC's subcontractor, EcoSpect, Inc. (EcoSpect), performed a representative lead-based paint (LBP) inspection of the proposed renovation areas on August 31, 2020. No LBP was identified during EcoSpect's inspection.

Please reference EcoSpect's *XRF Lead Inspection* report (report dated September 10, 2020), found in Attachment C of this report, for additional details pertaining to the investigation techniques, sampling methodologies, and results from the lead-based paint inspection.

Mr. Christopher M. Ladanyi, AIS
Clark Patterson Lee, Architecture, Engineering & Planning, P.C.
Limited Hazardous Material Pre-Renovation Survey Report
Circleville Elementary School – 2000 State Route 302, Circleville, New York 10919

CAULK SAMPLING FOR PCBs

AECC collected representative building caulk applications from the proposed renovation areas and shipped them to Schneider Laboratories Global, Inc. for polychlorinated biphenyls (PCB) analysis. The following table summarizes the results:

Table 3: PCB Bulk Sampling Summary

SAMPLE NUMBER	CAULK DESCRIPTION	SAMPLE LOCATION	PCB CONTENT
CLK-001P	Window Caulk (Brown)	1 st Floor - Principal 150	BRL
CLK-004P	Window Caulk (Black)	1 st Floor - Classroom 106	BRL
CLK-005P	Window Caulk (Brown)	1 st Floor - Special Education 110	BRL
CLK-020P	Door Caulk (Gray)	1 st Floor - Lobby 135	BRL

Table Notes:

BRL = Below Reporting Limit

PCB Bulk Sampling Summary – By regulatory definition, a PCB-containing bulk material is defined as any building material containing at least 50 parts per million (ppm) of PCBs. The caulk applications collected during this survey are not PCB-containing bulk materials, as determined by laboratory analysis. The associated laboratory analysis report has been included in Attachment D of this report.

MISCELLANEOUS HAZARDOUS / SPECIAL WASTE INVENTORY

The following items were observed during AECC's survey of the proposed renovation areas and presumed to contain the specified hazardous / special wastes in the table below:

Table 4: Miscellaneous Hazardous / Special Waste Inventory

ITEM DESCRIPTION	ITEM LOCATION(S)	ESTIMATED COUNT	PRESUMED HAZ MATERIAL	ITEM CONDITION
Fluorescent Light Tubes / Bulbs	1 st Floor - Lobby 135 & Stage 169	44	Mercury	Intact
Light Ballasts		22	PCBs	Intact
Exit Signs (Bulbs & Batteries)	1 st Floor - Lobby 135 & Stage 169	3	Mercury, Lead	Intact
Interior Emergency Flood Light Batteries	1 st Floor - Lobby 135 & Stage 169	3	Lead	Intact

Mr. Christopher M. Ladanyi, AIS
Clark Patterson Lee, Architecture, Engineering & Planning, P.C.
Limited Hazardous Material Pre-Renovation Survey Report
Circleville Elementary School – 2000 State Route 302, Circleville, New York 10919

Table 4: Miscellaneous Hazardous / Special Waste Inventory

ITEM DESCRIPTION	ITEM LOCATION(S)	ESTIMATED COUNT	PRESUMED HAZ MATERIAL	ITEM CONDITION
Thermostat	Stage 169	1	Mercury	Intact

Miscellaneous Hazardous / Special Wastes Summary – Additional investigation into the status of these materials / items may be performed to prove that hazardous materials are not present. However, without conducting this additional investigation, these materials must be presumed to contain potentially hazardous materials and handled / disposed of in accordance with all applicable state, federal, and local regulations.

Report Note – In the event that other building materials (materials not specifically identified in this report) are identified prior to or during the course of the renovation activities, the materials shall be presumed to be hazardous until examined by an appropriately certified individual and laboratory analysis proves otherwise.

If you have any questions pertaining to this report, please do not hesitate to contact me directly at AECC's corporate office (315-432-9400).

Sincerely,
Asbestos & Environmental Consulting Corporation



Bryan Bowers
President / Owner

Attachment A: AECC Company License & Personnel Certifications
Attachment B: Asbestos Bulk Sampling Laboratory Results
Attachment C: EcoSpect's *XRF Lead Inspection* Report
Attachment D: PCB Bulk Sampling Laboratory Results
Attachment E: Figures 1, 2, 3, 4 & 5

ATTACHMENT A

AECC Company License & Personnel Certifications

New York State – Department of Labor

Division of Safety and Health
License and Certificate Unit
State Campus, Building 12
Albany, NY 12240

ASBESTOS HANDLING LICENSE

Asbestos & Environmental Consulting Corporation
6308 Fly Road
E. Syracuse, NY 13057

FILE NUMBER: 09-42909
LICENSE NUMBER: 42909
LICENSE CLASS: RESTRICTED
DATE OF ISSUE: 02/14/2020
EXPIRATION DATE: 02/28/2021

Duly Authorized Representative – Bryan Bowers:

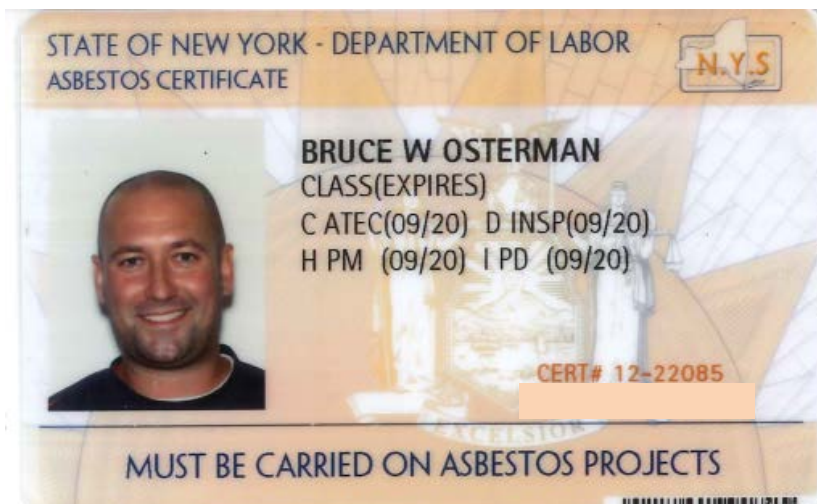
This license has been issued in accordance with applicable provisions of Article 30 of the Labor Law of New York State and of the New York State Codes, Rules and Regulations (12 NYCRR Part 56). It is subject to suspension or revocation for a (1) serious violation of state, federal or local laws with regard to the conduct of an asbestos project, or (2) demonstrated lack of responsibility in the conduct of any job involving asbestos or asbestos material.

This license is valid only for the contractor named above and this license or a photocopy must be prominently displayed at the asbestos project worksite. This license verifies that all persons employed by the licensee on an asbestos project in New York State have been issued an Asbestos Certificate, appropriate for the type of work they perform, by the New York State Department of Labor.



Eileen M. Franko, Director
For the Commissioner of Labor

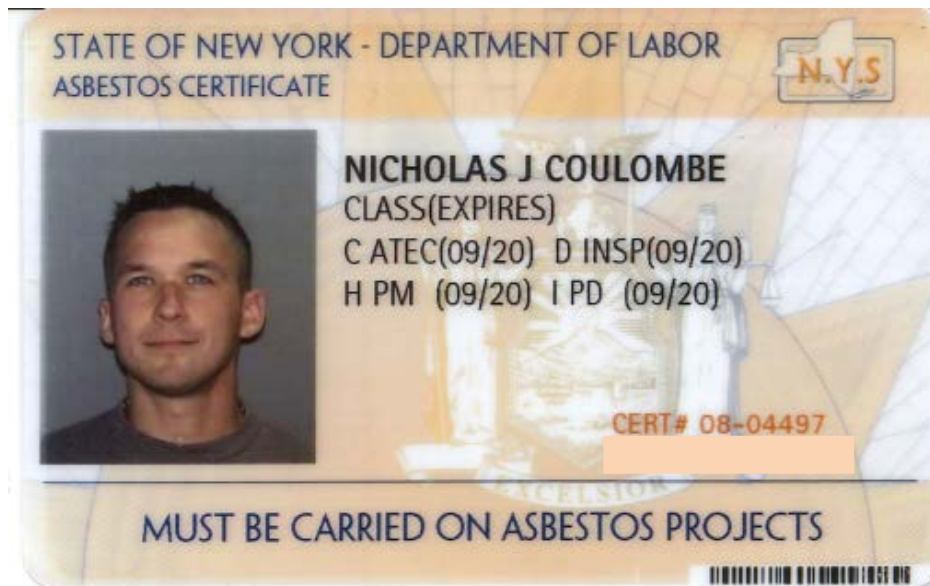
ASBESTOS CERTIFICATION



The following letter codes (as shown on the handling certificate) represent the corresponding asbestos classifications.

A – Asbestos Handler	D – Asbestos Inspector	G – Asbestos Supervisor
B – Allied Trades	E – Management Planner	H – Asbestos Project Monitor
C – Air sampling Technician	F – Operations & Maintenance	I – Asbestos Project Designer

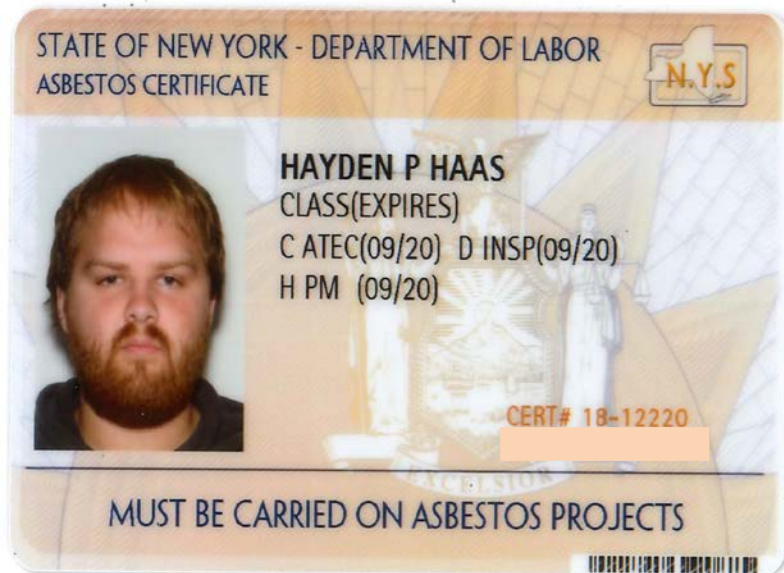
ASBESTOS CERTIFICATION



The following letter codes (as shown on the handling certificate) represent the corresponding asbestos classifications.

A – Asbestos Handler	D – Asbestos Inspector	G – Asbestos Supervisor
B – Allied Trades	E – Management Planner	H – Asbestos Project Monitor
C – Air sampling Technician	F – Operations & Maintenance	I – Asbestos Project Designer

ASBESTOS CERTIFICATION



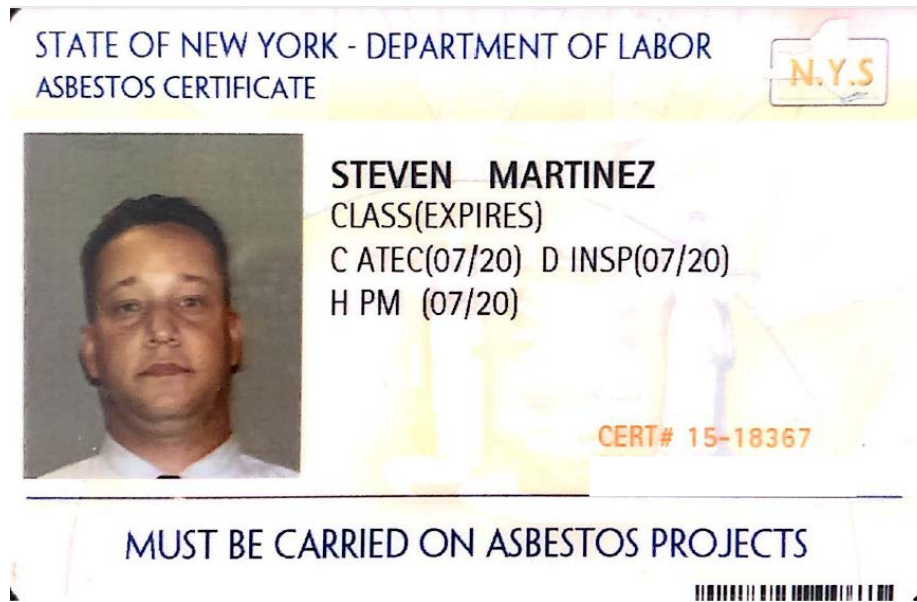
The following letter codes (as shown on the handling certificate) represent the corresponding asbestos classifications.

A – Asbestos Handler
B – Allied Trades
C – Air sampling Technician

D – Asbestos Inspector
E – Management Planner
F – Operations & Maintenance

G – Asbestos Supervisor
H – Asbestos Project Monitor
I – Asbestos Project Designer

ASBESTOS CERTIFICATION



The following letter codes (as shown on the handling certificate) represent the corresponding asbestos classifications.

A – Asbestos Handler	D – Asbestos Inspector	G – Asbestos Supervisor
B – Allied Trades	E – Management Planner	H – Asbestos Project Monitor
C – Air sampling Technician	F – Operations & Maintenance	I – Asbestos Project Designer

ATTACHMENT B

Asbestos Bulk Sampling Laboratory Results

**AmeriSci New York**

117 EAST 30TH ST.

NEW YORK, NY 10016

TEL: (212) 679-8600 • FAX: (212) 679-3114

PLM Bulk Asbestos Report

Asbestos & Environmental Consulting C
Attn: Bryan Bowers
6308 Fly Road

East Syracuse, NY 13057

Date Received 08/22/20 **AmeriSci Job #** 220083317
Date Examined 08/24/20 **P.O. #**
ELAP # 11480 **Page** 1 **of** 8
RE: 20-146; Clark Patterson Lee Architects; Circleville Elementary
School, 2000 NY-302, Circleville, NY, 10919

Client No. / HGA	Lab No.	Asbestos Present	Total % Asbestos
CLK-001A 1	220083317-01 Location: Main Entrance & Classroom 106 - Window - Window Frame Caulk (Brown)	No	NAD ¹ (by NYS ELAP 198.6) by Valeriu Voicu on 08/24/20
Analyst Description: Dark Brown, Homogeneous, Non-Fibrous, Bulk Material Asbestos Types: Other Material: Non-fibrous 8.7 %			
CLK-001B 1	220083317-02 Location: Main Entrance & Classroom 106 - Window - Window Frame Caulk (Brown)	No	NAD (by NYS ELAP 198.6) by Valeriu Voicu on 08/24/20
Analyst Description: Dark Brown, Homogeneous, Non-Fibrous, Bulk Material Asbestos Types: Other Material: Non-fibrous 6.5 %			
GLZ-002A 2	220083317-03 Location: Main Entrance & Classroom 106 - Window - Window Glazing Compound (Gray)	No	NAD (by NYS ELAP 198.6) by Valeriu Voicu on 08/24/20
Analyst Description: Grey/Black, Homogeneous, Non-Fibrous, Bulk Material Asbestos Types: Other Material: Non-fibrous 20.5 %			
GLZ-002B 2	220083317-04 Location: Main Entrance & Classroom 106 - Window - Window Glazing Compound (Gray)	No	NAD (by NYS ELAP 198.6) by Valeriu Voicu on 08/24/20
Analyst Description: Grey/Black, Homogeneous, Non-Fibrous, Bulk Material Asbestos Types: Other Material: Non-fibrous 29.6 %			
GLZ-003A 3	220083317-05 Location: Main Entrance - Window - Window Glazing Compound (Black)	No	NAD (by NYS ELAP 198.6) by Valeriu Voicu on 08/24/20
Analyst Description: Black, Homogeneous, Non-Fibrous, Bulk Material Asbestos Types: Other Material: Non-fibrous 13.8 %			

Client Name: Asbestos & Environmental Consulting Corp.

PLM Bulk Asbestos Report

20-146; Clark Patterson Lee Architects; Circleville Elementary School, 2000 NY-302, Circleville, NY, 10919

Client No. / HGA	Lab No.	Asbestos Present	Total % Asbestos
GLZ-003B 3	220083317-06 Location: Main Entrance - Window - Window Glazing Compound (Black)	No	NAD (by NYS ELAP 198.6) by Valeriu Voicu on 08/24/20
Analyst Description: Black, Homogeneous, Non-Fibrous, Bulk Material Asbestos Types: Other Material: Non-fibrous 9.5 %			
CLK-004A 4	220083317-07 Location: Classroom 106 & Main Entrance - Window - Window Seam Caulk (Black)	No	NAD (by NYS ELAP 198.6) by Valeriu Voicu on 08/24/20
Analyst Description: Black, Homogeneous, Non-Fibrous, Bulk Material Asbestos Types: Other Material: Non-fibrous 16.3 %			
CLK-004B 4	220083317-08 Location: Classroom 106 & Main Entrance - Window - Window Seam Caulk (Black)	No	NAD (by NYS ELAP 198.6) by Valeriu Voicu on 08/24/20
Analyst Description: Black, Homogeneous, Non-Fibrous, Bulk Material Asbestos Types: Other Material: Non-fibrous 11.2 %			
CLK-005A 5	220083317-09 Location: Special Ed Room 110 Window - Window Frame Caulk (Brown)	No	NAD (by NYS ELAP 198.6) by Valeriu Voicu on 08/24/20
Analyst Description: Brown, Homogeneous, Non-Fibrous, Bulk Material Asbestos Types: Other Material: Non-fibrous 1.6 %			
CLK-005B 5	220083317-10 Location: Special Ed Room 110 Window - Window Frame Caulk (Brown)	No	NAD (by NYS ELAP 198.6) by Valeriu Voicu on 08/24/20
Analyst Description: Brown, Homogeneous, Non-Fibrous, Bulk Material Asbestos Types: Other Material: Non-fibrous 2.6 %			
ACT-006A 6	220083317-11 Location: Lobby 135 - 2' x 2' Pinhole/Fissured Ceiling Tile (White)	No	NAD (by NYS ELAP 198.6) by Valeriu Voicu on 08/24/20
Analyst Description: White/Beige, Homogeneous, Non-Fibrous, Bulk Material Asbestos Types: Other Material: Non-fibrous 42.3 %			

Client Name: Asbestos & Environmental Consulting Corp.

PLM Bulk Asbestos Report20-146; Clark Patterson Lee Architects; Circleville Elementary
School, 2000 NY-302, Circleville, NY, 10919

Client No. / HGA	Lab No.	Asbestos Present	Total % Asbestos
ACT-006B 6	220083317-12 Location: Lobby 135 - 2' x 2' Pinhole/Fissured Ceiling Tile (White)	No	NAD (by NYS ELAP 198.6) by Valeriu Voicu on 08/24/20
Analyst Description: White/Beige, Homogeneous, Non-Fibrous, Bulk Material Asbestos Types: Other Material: Non-fibrous 45.9 %			
CB-007A 7	220083317-13 Location: Lobby 135 - 4" Cove Base (Maroon)	No	NAD (by NYS ELAP 198.6) by Valeriu Voicu on 08/24/20
Analyst Description: Purple, Homogeneous, Non-Fibrous, Bulk Material Asbestos Types: Other Material: Non-fibrous 18.6 %			
CB-007B 7	220083317-14 Location: Lobby 135 - 4" Cove Base (Maroon)	No	NAD (by NYS ELAP 198.6) by Valeriu Voicu on 08/24/20
Analyst Description: Purple, Homogeneous, Non-Fibrous, Bulk Material Asbestos Types: Other Material: Non-fibrous 20.5 %			
CBM-008A 8	220083317-15 Location: Lobby 135 - Cove Base Mastic (Tan/Black)	No	NAD (by NYS ELAP 198.6) by Valeriu Voicu on 08/24/20
Analyst Description: Tan/Black, Homogeneous, Non-Fibrous, Bulk Material Asbestos Types: Other Material: Non-fibrous 27.7 %			
CBM-008B 8	220083317-16 Location: Lobby 135 - Cove Base Mastic (Tan/Black)	No	NAD (by NYS ELAP 198.6) by Valeriu Voicu on 08/24/20
Analyst Description: Tan/Black, Heterogeneous, Non-Fibrous, Bulk Material Asbestos Types: Other Material: Non-fibrous 28.7 %			
TRZO-009A 9	220083317-17 Location: Lobby 135 - Terrazzo Flooring (White/Maroon)	No	NAD (by NYS ELAP 198.1) by Valeriu Voicu on 08/24/20
Analyst Description: White/Maroon, Homogeneous, Non-Fibrous, Bulk Material Asbestos Types: Other Material: Cellulose Trace, Non-fibrous 100 %			

Client Name: Asbestos & Environmental Consulting Corp.

PLM Bulk Asbestos Report20-146; Clark Patterson Lee Architects; Circleville Elementary
School, 2000 NY-302, Circleville, NY, 10919

Client No. / HGA	Lab No.	Asbestos Present	Total % Asbestos
TRZO-009B 9	220083317-18 Location: Lobby 135 - Terrazzo Flooring (White/Maroon)	No	NAD (by NYS ELAP 198.1) by Valeriu Voicu on 08/24/20
Analyst Description: White/Maroon, Homogeneous, Non-Fibrous, Bulk Material Asbestos Types: Other Material: Cellulose Trace, Non-fibrous 100 %			
CTG-010A 10	220083317-19 Location: Lobby 135 - Ceramic Tile Wall Grout (Gray)	No	NAD (by NYS ELAP 198.1) by Valeriu Voicu on 08/24/20
Analyst Description: White, Homogeneous, Non-Fibrous, Bulk Material Asbestos Types: Other Material: Cellulose Trace, Non-fibrous 100 %			
CTG-010B 10	220083317-20 Location: Lobby 135 - Ceramic Tile Wall Grout (Gray)	No	NAD (by NYS ELAP 198.1) by Valeriu Voicu on 08/24/20
Analyst Description: White, Homogeneous, Non-Fibrous, Bulk Material Asbestos Types: Other Material: Cellulose Trace, Non-fibrous 100 %			
CTM-011A 11	220083317-21 Location: Lobby 135 - Ceramic Tile Wall Mastic (Brown)	Yes	3.4 % (by NYS ELAP 198.6) by Valeriu Voicu on 08/24/20
Analyst Description: Tan/Brown, Homogeneous, Fibrous, Bulk Material Asbestos Types: Chrysotile 3.4 % Other Material: Non-fibrous 13.5 %			
CTM-011B 11	220083317-22 Location: Lobby 135 - Ceramic Tile Wall Mastic (Brown)		NAP/PS
Analyst Description: Bulk Material Asbestos Types: Other Material:			
CTT-012A 12	220083317-23 Location: Lobby 135 - Ceramic Tile Wall Thinset (Gray)	No	NAD (by NYS ELAP 198.1) by Valeriu Voicu on 08/24/20
Analyst Description: Tan/Grey, Heterogeneous, Non-Fibrous, Cementitious, Bulk Material Asbestos Types: Other Material: Cellulose Trace, Non-fibrous 100 %			

Client Name: Asbestos & Environmental Consulting Corp.

PLM Bulk Asbestos Report20-146; Clark Patterson Lee Architects; Circleville Elementary
School, 2000 NY-302, Circleville, NY, 10919

Client No. / HGA	Lab No.	Asbestos Present	Total % Asbestos
CTT-012B 12	220083317-24 Location: Lobby 135 - Ceramic Tile Wall Thinset (Gray)	No	NAD (by NYS ELAP 198.1) by Valeriu Voicu on 08/24/20
Analyst Description: Tan/Grey, Heterogeneous, Non-Fibrous, Cementitious, Bulk Material Asbestos Types: Other Material: Cellulose Trace, Non-fibrous 100 %			
FT-013A 13	220083317-25 Location: Stage 169 - 12" Floor Tile (Gray)	Yes	Trace (<0.25 % pc) ² (EPA 400 PC) by Valeriu Voicu on 08/24/20
Analyst Description: Beige/Tan, Homogeneous, Non-Fibrous, Bulk Material Asbestos Types: Chrysotile <0.25 % pc Other Material: Non-fibrous 1 %			
FT-013B 13	220083317-26 Location: Stage 169 - 12" Floor Tile (Gray)	Yes	7.7 % (by NYS ELAP 198.6) by Valeriu Voicu on 08/24/20
Analyst Description: Beige/Tan, Homogeneous, Fibrous, Bulk Material Asbestos Types: Chrysotile 7.7 % Other Material: Non-fibrous 15.4 %			
FTM-014A 14	220083317-27 Location: Stage 169 - Floor Tile Mastic (Black)	Yes	1.9 % (by NYS ELAP 198.6) by Valeriu Voicu on 08/24/20
Analyst Description: Black, Homogeneous, Fibrous, Bulk Material Asbestos Types: Chrysotile 1.9 % Other Material: Non-fibrous 15.1 %			
FTM-014B 14	220083317-28 Location: Stage 169 - Floor Tile Mastic (Black)		NA/PS
Analyst Description: Bulk Material Asbestos Types: Other Material:			
CB-015A 15	220083317-29 Location: Stage 169 - 4" Cove Base (Gray)	No	NAD (by NYS ELAP 198.6) by Valeriu Voicu on 08/24/20
Analyst Description: Tan, Homogeneous, Non-Fibrous, Bulk Material Asbestos Types: Other Material: Non-fibrous 1.4 %			

Client Name: Asbestos & Environmental Consulting Corp.

PLM Bulk Asbestos Report20-146; Clark Patterson Lee Architects; Circleville Elementary
School, 2000 NY-302, Circleville, NY, 10919

Client No. / HGA	Lab No.	Asbestos Present	Total % Asbestos
CB-015B 15 Location: Stage 169 - 4" Cove Base (Gray) Analyst Description: Tan, Homogeneous, Non-Fibrous, Bulk Material Asbestos Types: Other Material: Non-fibrous 1.4 %	220083317-30	No	NAD (by NYS ELAP 198.6) by Valeriu Voicu on 08/24/20
CBM-016A 16 Location: Stage 169 - Cove Base Mastic (Brown) Analyst Description: Tan, Homogeneous, Non-Fibrous, Bulk Material Asbestos Types: Other Material: Non-fibrous 34.6 %	220083317-31	No	NAD (by NYS ELAP 198.6) by Valeriu Voicu on 08/24/20
CBM-016B 16 Location: Stage 169 - Cove Base Mastic (Brown) Analyst Description: Tan, Homogeneous, Non-Fibrous, Bulk Material Asbestos Types: Other Material: Non-fibrous 40.8 %	220083317-32	No	NAD (by NYS ELAP 198.6) by Valeriu Voicu on 08/24/20
STRD-017A 17 Location: Stage 169 - Stair Tread (Gray) Analyst Description: Brown, Homogeneous, Non-Fibrous, Bulk Material Asbestos Types: Other Material: Non-fibrous 34.4 %	220083317-33	No	NAD (by NYS ELAP 198.6) by Valeriu Voicu on 08/24/20
STRD-017B 17 Location: Stage 169 - Stair Tread (Gray) Analyst Description: Brown, Homogeneous, Non-Fibrous, Bulk Material Asbestos Types: Other Material: Non-fibrous 36.9 %	220083317-34	No	NAD (by NYS ELAP 198.6) by Valeriu Voicu on 08/24/20
STM-018A 18 Location: Stage 169 - Stair Tread Mastic (Brown) Analyst Description: Brown, Homogeneous, Non-Fibrous, Bulk Material Asbestos Types: Other Material: Non-fibrous 46.7 %	220083317-35	No	NAD (by NYS ELAP 198.6) by Valeriu Voicu on 08/24/20

Client Name: Asbestos & Environmental Consulting Corp.

PLM Bulk Asbestos Report

20-146; Clark Patterson Lee Architects; Circleville Elementary
School, 2000 NY-302, Circleville, NY, 10919

Client No. / HGA	Lab No.	Asbestos Present	Total % Asbestos
STM-018B 18	220083317-36 Location: Stage 169 - Stair Tread Mastic (Brown)	No	NAD (by NYS ELAP 198.6) by Valeriu Voicu on 08/24/20
Analyst Description: Brown, Homogeneous, Non-Fibrous, Bulk Material Asbestos Types: Other Material: Non-fibrous 41.9 %			
ACT-019A 19	220083317-37 Location: Stage 169 - 2' x 4' Pinhole/Fissured Ceiling Tile (White)	No	NAD (by NYS ELAP 198.6) by Valeriu Voicu on 08/24/20
Analyst Description: Brown, Homogeneous, Non-Fibrous, Bulk Material Asbestos Types: Other Material: Non-fibrous 18.5 %			
ACT-019B 19	220083317-38 Location: Stage 169 - 2' x 4' Pinhole/Fissured Ceiling Tile (White)	No	NAD (by NYS ELAP 198.6) by Valeriu Voicu on 08/24/20
Analyst Description: White/Beige, Homogeneous, Non-Fibrous, Bulk Material Asbestos Types: Other Material: Non-fibrous 22.8 %			
CLK-020A 20	220083317-39 Location: Lobby 135 - Door Caulk (Gray)	No	NAD (by NYS ELAP 198.6) by Valeriu Voicu on 08/24/20
Analyst Description: White/Beige, Homogeneous, Non-Fibrous, Bulk Material Asbestos Types: Other Material: Non-fibrous 10 %			
CLK-020B 20	220083317-40 Location: Lobby 135 - Door Caulk (Gray)	No	NAD (by NYS ELAP 198.6) by Valeriu Voicu on 08/24/20
Analyst Description: Light Grey, Homogeneous, Non-Fibrous, Bulk Material Asbestos Types: Other Material: Non-fibrous 10.5 %			

Client Name: Asbestos & Environmental Consulting Corp.

PLM Bulk Asbestos Report

20-146; Clark Patterson Lee Architects; Circleville Elementary
School, 2000 NY-302, Circleville, NY, 10919

Reporting Notes:

- (1) This PLM job was analyzed using Olympus BH-2 Pol Scope S/N 229915
- (2) Sample prepared for analysis by ELAP 198.6 method

Analyzed by: Valeriu Voicu 

*NAD/NSD =no asbestos detected; NA =not analyzed; NA/PS=not analyzed/positive stop, (SOF-V) = Sprayed On Fireproofing containing Vermiculite; (SM-V) = Surfacing Material containing Vermiculite; PLM Bulk Asbestos Analysis by Appd E to Subpt E, 40 CFR 763 (NVLAP 200546-0), ELAP PLM Method 198.1 for NY friable samples, which includes the identification and quantitation of vermiculite or ELAP 198.6 for NOB samples or EPA 400 pt ct by EPA 600-M4-82-020 (NY ELAP Lab 11480); Note:PLM is not consistently reliable in detecting asbestos in floor coverings and similar non-friable organically bound materials. NAD or Trace results by PLM are inconclusive, TEM is currently the only method that can be used to determine if this material can be considered or treated as non asbestos-containing in NY State (also see EPA Advisory for floor tile, FR 59,146,38970,8/1/94) National Institute of Standards and Technology Accreditation requirements mandate that this report must not be reproduced except in full without the approval of the lab. This PLM report relates ONLY to the items tested. AIHA-LAP, LLC Lab ID 102843, RI Cert AAL-094, CT Cert PH-0186, Mass Cert AA000054.

Reviewed By:  END OF REPORT _____

Table I
Summary of Bulk Asbestos Analysis Results

20-146; Clark Patterson Lee Architects; Circleville Elementary School, 2000 NY-302, Circleville, NY, 10919

AmeriSci Sample #	Client Sample#	HG Area	Sample Weight (gram)	Heat Sensitive Organic %	Acid Soluble Inorganic %	Insoluble Non-Asbestos Inorganic %	** Asbestos % by PLM/DS	** Asbestos % by TEM
01	CLK-001A	1	0.155	70.6	20.7	8.7	NAD	NAD
Location: Main Entrance & Classroom 106 - Window - Window Frame Caulk (Brown)								
02	CLK-001B	1	0.157	66.1	27.4	6.5	NAD	NAD
Location: Main Entrance & Classroom 106 - Window - Window Frame Caulk (Brown)								
03	GLZ-002A	2	0.229	33.2	46.2	20.5	NAD	NAD
Location: Main Entrance & Classroom 106 - Window - Window Glazing Compound (Gray)								
04	GLZ-002B	2	0.240	32.1	38.3	29.6	NAD	NAD
Location: Main Entrance & Classroom 106 - Window - Window Glazing Compound (Gray)								
05	GLZ-003A	3	0.173	32.1	54.0	13.8	NAD	NAD
Location: Main Entrance - Window - Window Glazing Compound (Black)								
06	GLZ-003B	3	0.153	38.2	52.3	9.5	NAD	NAD
Location: Main Entrance - Window - Window Glazing Compound (Black)								
07	CLK-004A	4	0.201	79.3	4.3	16.3	NAD	NAD
Location: Classroom 106 & Main Entrance - Window - Window Seam Caulk (Black)								
08	CLK-004B	4	0.197	85.9	2.9	11.2	NAD	NAD
Location: Classroom 106 & Main Entrance - Window - Window Seam Caulk (Black)								
09	CLK-005A	5	0.116	23.3	75.0	1.6	NAD	NAD
Location: Special Ed Room 110 Window - Window Frame Caulk (Brown)								
10	CLK-005B	5	0.190	23.2	74.2	2.6	NAD	NAD
Location: Special Ed Room 110 Window - Window Frame Caulk (Brown)								
11	ACT-006A	6	0.090	20.0	37.6	42.3	NAD	NAD
Location: Lobby 135 - 2' x 2' Pinhole/Fissured Ceiling Tile (White)								
12	ACT-006B	6	0.151	17.7	36.4	45.9	NAD	NAD
Location: Lobby 135 - 2' x 2' Pinhole/Fissured Ceiling Tile (White)								
13	CB-007A	7	0.192	50.9	30.5	18.6	NAD	NAD
Location: Lobby 135 - 4" Cove Base (Maroon)								
14	CB-007B	7	0.196	50.8	28.7	20.5	NAD	NAD
Location: Lobby 135 - 4" Cove Base (Maroon)								
15	CBM-008A	8	0.176	66.3	6.0	27.7	NAD	NAD
Location: Lobby 135 - Cove Base Mastic (Tan/Black)								
16	CBM-008B	8	0.157	64.7	6.6	28.7	NAD	NAD
Location: Lobby 135 - Cove Base Mastic (Tan/Black)								

Client Name: Asbestos & Environmental Consulting Corp.

Table I
Summary of Bulk Asbestos Analysis Results

20-146; Clark Patterson Lee Architects; Circleville Elementary School, 2000 NY-302, Circleville, NY, 10919

AmeriSci Sample #	Client Sample#	HG Area	Sample Weight (gram)	Heat Sensitive Organic %	Acid Soluble Inorganic %	Insoluble Non-Asbestos Inorganic %	** Asbestos % by PLM/DS	** Asbestos % by TEM
17	TRZO-009A	9	----	----	----	----	NAD	NA
Location: Lobby 135 - Terrazzo Flooring (White/Maroon)								
18	TRZO-009B	9	----	----	----	----	NAD	NA
Location: Lobby 135 - Terrazzo Flooring (White/Maroon)								
19	CTG-010A	10	----	----	----	----	NAD	NA
Location: Lobby 135 - Ceramic Tile Wall Grout (Gray)								
20	CTG-010B	10	----	----	----	----	NAD	NA
Location: Lobby 135 - Ceramic Tile Wall Grout (Gray)								
21	CTM-011A	11	0.313	47.5	35.6	13.5	Chrysotile 3.4	NA
Location: Lobby 135 - Ceramic Tile Wall Mastic (Brown)								
22	CTM-011B	11	0.241	54.7	26.0	19.3	NA/PS	NA
Location: Lobby 135 - Ceramic Tile Wall Mastic (Brown)								
23	CTT-012A	12	----	----	----	----	NAD	NA
Location: Lobby 135 - Ceramic Tile Wall Thinset (Gray)								
24	CTT-012B	12	----	----	----	----	NAD	NA
Location: Lobby 135 - Ceramic Tile Wall Thinset (Gray)								
25	FT-013A	13	0.162	25.6	73.4	1.0	Chrysotile <0.25	NA
Location: Stage 169 - 12" Floor Tile (Gray)								
26	FT-013B	13	0.182	26.4	50.5	15.4	Chrysotile 7.7	NA
Location: Stage 169 - 12" Floor Tile (Gray)								
27	FTM-014A	14	0.199	42.4	40.5	15.1	Chrysotile 1.9	NA
Location: Stage 169 - Floor Tile Mastic (Black)								
28	FTM-014B	14	0.083	58.3	28.4	13.3	NA/PS	NA
Location: Stage 169 - Floor Tile Mastic (Black)								
29	CB-015A	15	0.258	31.6	67.0	1.4	NAD	NAD
Location: Stage 169 - 4" Cove Base (Gray)								
30	CB-015B	15	0.190	30.4	68.2	1.4	NAD	NAD
Location: Stage 169 - 4" Cove Base (Gray)								
31	CBM-016A	16	0.175	53.2	12.2	34.6	NAD	NAD
Location: Stage 169 - Cove Base Mastic (Brown)								
32	CBM-016B	16	0.254	53.9	5.4	40.8	NAD	NAD
Location: Stage 169 - Cove Base Mastic (Brown)								

See Reporting notes on last page

Client Name: Asbestos & Environmental Consulting Corp.

Table I
Summary of Bulk Asbestos Analysis Results

20-146; Clark Patterson Lee Architects; Circleville Elementary School, 2000 NY-302, Circleville, NY, 10919

AmeriSci Sample #	Client Sample#	HG Area	Sample Weight (gram)	Heat Sensitive Organic %	Acid Soluble Inorganic %	Insoluble Non-Asbestos Inorganic %	** Asbestos % by PLM/DS	** Asbestos % by TEM
33	STRD-017A	17	0.260	59.6	6.0	34.4	NAD	NAD
Location: Stage 169 - Stair Tread (Gray)								
34	STRD-017B	17	0.180	55.5	7.6	36.9	NAD	NAD
Location: Stage 169 - Stair Tread (Gray)								
35	STM-018A	18	0.305	51.3	2.0	46.7	NAD	NAD
Location: Stage 169 - Stair Tread Mastic (Brown)								
36	STM-018B	18	0.233	50.8	7.3	41.9	NAD	NAD
Location: Stage 169 - Stair Tread Mastic (Brown)								
37	ACT-019A	19	0.105	12.3	69.2	18.5	NAD	NAD
Location: Stage 169 - 2' x 4' Pinhole/Fissured Ceiling Tile (White)								
38	ACT-019B	19	0.113	14.0	63.3	22.8	NAD	NAD
Location: Stage 169 - 2' x 4' Pinhole/Fissured Ceiling Tile (White)								
39	CLK-020A	20	0.243	42.0	48.0	10.0	NAD	NAD
Location: Lobby 135 - Door Caulk (Gray)								
40	CLK-020B	20	0.147	35.7	53.8	10.5	NAD	NAD
Location: Lobby 135 - Door Caulk (Gray)								

Analyzed by: A Barengolts-Hitachi#542/Noran ; Date Analyzed 8/26/2020

**Quantitative Analysis (Semi/Full); Bulk Asbestos Analysis - PLM by Appd E to Subpt E, 40 CFR 763 or NYSDOH ELAP 198.1 for New York friable samples or NYSDOH ELAP 198.6 for New York NOB samples; TEM (Semi/Full) by EPA 600/R-93/116 (or NYSDOH ELAP 198.4; for New York samples); NAD = no asbestos detected during a quantitative analysis; NA = not analyzed; Trace = <1%; (SOF-V) = Sprayed On Fireproofing containing Vermiculite; (SM-V) = Surfacing Material containing Vermiculite; Quantitation for beginning weights of <0.1 grams should be considered as qualitative only; Qualitative Analysis: Asbestos analysis results of "Present" or "NVA = No Visible Asbestos" represents results for Qualitative PLM or TEM Analysis only (no accreditation coverage available from any regulatory agency for qualitative analyses); NVLAP (PLM) 200546-0, NYSDOH ELAP Lab 11480, AIHA-LAP, LLC (PLM) Lab ID 102843.

Warning Note: PLM limitation, only TEM will resolve fibers <0.25 micrometers in diameter. TEM bulk analysis is representative of the fine grained matrix material and may not be representative of non-uniformly dispersed debris for which PLM evaluation is recommended (i.e. soils and other heterogenous materials).

Reviewed By: 



#220083317

Asbestos Bulk Sample Chain of Custody

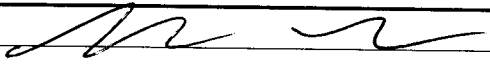

Project No. 20-146
Client Clark Patterson Lee Architects
Address **Circleville Elementary School**
2000 NY-302, Circleville, NY 10919

AECC Contact: Bryan Bowers
Office Phone: 315-432-9400
Office Fax: 315-432-9405
E-mail: labdata@aecgroup.com

Sample ID	Material Description	Sample Location
CLK-001A,B	Window Frame Caulk (Brown)	Main Entrance & Classroom 106 – Window
GLZ-002A,B	Window Glazing Compound (Gray)	Main Entrance & Classroom 106 – Window
GLZ-003A,B	Window Glazing Compound (Black)	Main Entrance – Window
CLK-004A,B	Window Seam Caulk (Black)	Classroom 106 & Main Entrance – Window
CLK-005A,B	Window Frame Caulk (Brown)	Special Ed Room 110 Window
ACT-006A,B	2'X2' Pinhole/Fissured Ceiling Tile (White)	Lobby 135
CB-007A,B	4" Cove Base (Maroon)	Lobby 135
CBM-008A,B	Cove Base Mastic (Tan/Black)	Lobby 135
TRZO-009A,B	Terrazzo Flooring (White/Maroon)	Lobby 135
CTG-010A,B	Ceramic Tile Wall Grout (Gray)	Lobby 135
CTM-011A,B	Ceramic Tile Wall Mastic (Brown)	Lobby 135
CTT-012A,B	Ceramic Tile Wall Thinset (Gray)	Lobby 135
FT-013A,B	12" Floor Tile (Gray)	Stage 169
FTM-014A,B	Floor Tile Mastic (Black)	Stage 169
CB-015A,B	4" Cove Base (Gray)	Stage 169
CBM-016A,B	Cove Base Mastic (Brown)	Stage 169
STRD-017A,B	Stair Tread (Gray)	Stage 169
STM-018A,B	Stair Tread Mastic (Brown)	Stage 169
ACT-019A,B	2'x4' Pinhole/Fissured Ceiling Tile (White)	Stage 169
CLK-020A,B	Door Caulk (Gray)	Lobby 135

Analyzing Sequence: 1 - Separate layers/mastics for individual analysis, if applicable.
2 - Determine method of analysis for PLM (198.1 or 198.6).
3 - If the PLM NOB result is equal to or greater than 1% asbestos, testing of material is complete.
If the PLM NOB result is less than 1% asbestos, please analyze utilizing TEM.
4 - If submitted in series (A, B, C), please stop at first positive.
5 - Report results as % Asbestos via e-mail.

Sample Turnaround Time: 5 DAY Verbal To: _____ Phone: _____

Sampled By: 	Date: 8/20/20
Shipped By:	Date:
Received By Lab: 	Date: 8/22/2020 1150
Results e-mailed By:	Date:

ATTACHMENT C

EcoSpect's XRF Lead Inspection Report



Healthy Basement. Healthy Home.

XRF Lead Inspection

Project:

Circleville Elementary
2000 NY-302
Circleville, NY 10919

Date Tested:

8/31/2020

Prepared by:

Daryl Heffron
Ecospect, Inc.
5785 State Route 96, PO Box 25,
Romulus, NY 14541

Prepared For:

AECC
East Syracuse, NY 13057
6308 Fly Road

9/10/2020



9/10/2020

To:

Nick Columbe

AECC

6308 Fly Road, East Syracuse, NY 13057

East Syracuse, NY 13057

RE: Circleville Elementary

2000 NY-302

Circleville, NY 10919

Dear Nick :

On August 31, 2020, EcoSpect, Inc. conducted XRF testing for the presence of lead-based paint, as directed by AECC, at the above captioned location.

The instruments were operated with the guidance from the Performance Characteristics Sheets published by the US Department of HUD and the results classified as positive or negative based the HUD action level of 1.00 mg/cm². Results less than 1.00 mg/cm² are considered negative and results greater than 1.00 mg/cm² are considered positive. For renovation purposes, as well as OSHA implications, it should be noted the lead present in levels less than 1.00 mg/cm² could generate dust that exceeds acceptable levels depending on the renovation or demolition being performed. For OSHA purposes, there are no accepted standards other than "zero" for lead content in surfaces that are affected so as to release lead in the form of dust. XRF readings at the lower end of the range (close to zero) are less likely to create toxic situations. XRF readings with negative prefixes correlate to very low lead levels in that particular surface. For conclusive, task-oriented results, contractors should follow all applicable OSHA requirements found in regulation 1926.62.

The walls in each space oriented in a clockwise fashion, with wall #1 oriented to the front of the building. Please refer to the building plans for clarification. An "NA" indicates that the room was not accessible during testing, and "NP" indicates that there were no painted surfaces within that space. During the testing procedures, EcoSpect personnel were able to gain access to the designated spaces and tested all of the selected rooms that were requested.

Summary of Positive Findings

LOCATION ADDRESS: 2000 NY-302, Circleville, NY 10919

Positive test results for the presence of lead-based paint in concentrations equal to or greater than 1.00 mg/cm² are:

Positive components by substrate:

None

If you have any questions regarding this report, please feel free to give us a call at any time.

Sincerely Yours,

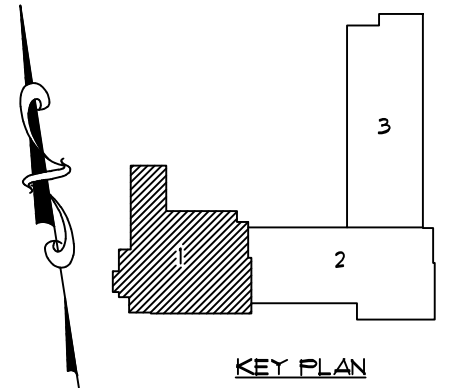
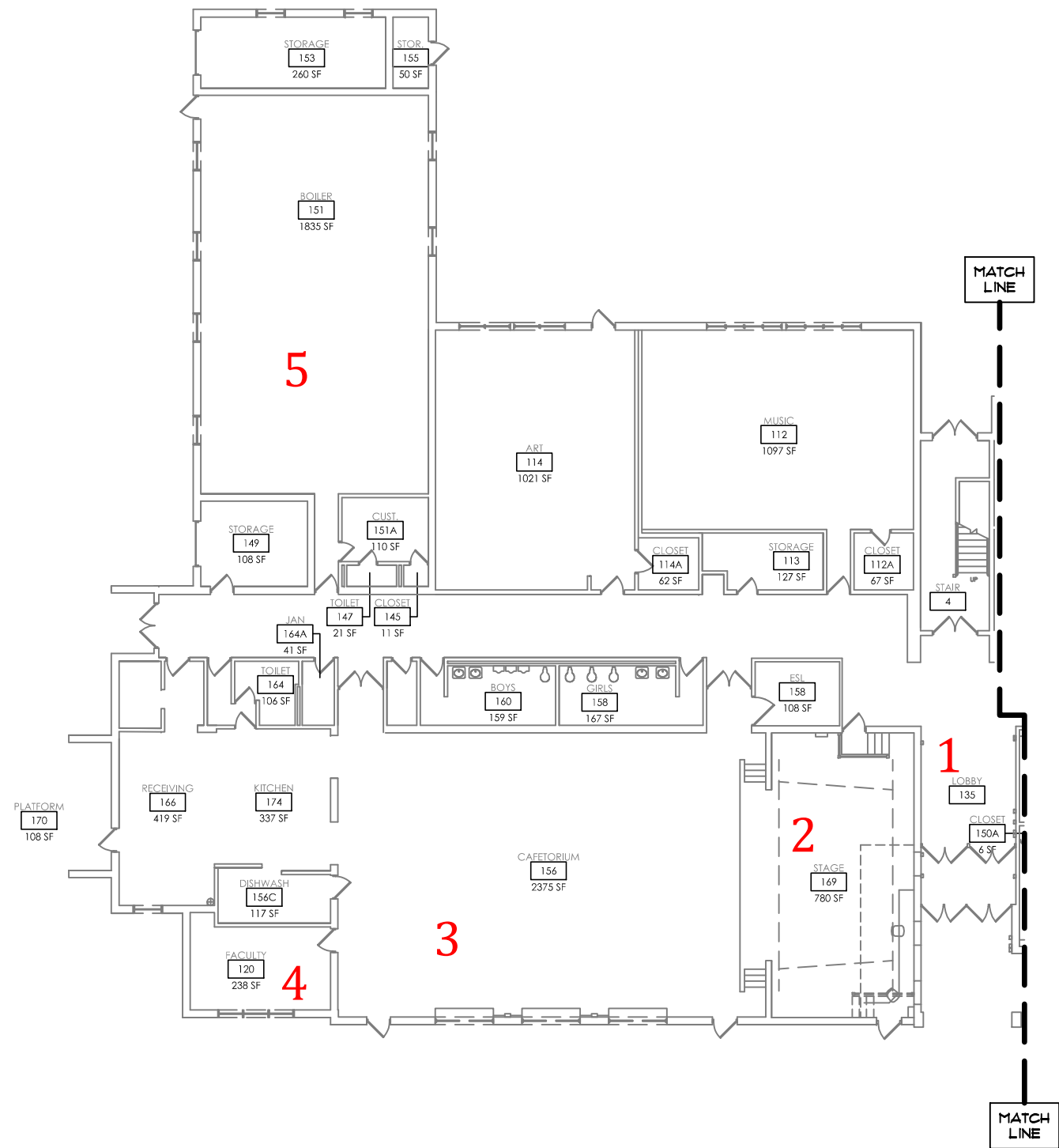
A handwritten signature in black ink, appearing to read 'D. Heffron', with a long horizontal flourish extending to the right.

Daryl Heffron EcoSpect, Inc.

Summary

Summary Analysis							
#	Component	# Tested Negative	% Negative	# Tested Positive	% Positive	Total Tested	Total %
1	Balluster	1	100.00%	0	0%	1	100.00%
2	Baseboard	1	100.00%	0	0%	1	100.00%
3	Door	3	100.00%	0	0%	3	100.00%
4	Door Header	1	100.00%	0	0%	1	100.00%
5	Door Molding	2	100.00%	0	0%	2	100.00%
6	Floor	1	100.00%	0	0%	1	100.00%
7	I-Beam Wall	1	100.00%	0	0%	1	100.00%
8	Newel Post	1	100.00%	0	0%	1	100.00%
9	Structural Steel	2	100.00%	0	0%	2	100.00%
10	Wall	7	100.00%	0	0%	7	100.00%
11	Window Mldg	38	100.00%	0	0%	38	100.00%

Confirmed Positive Component Types

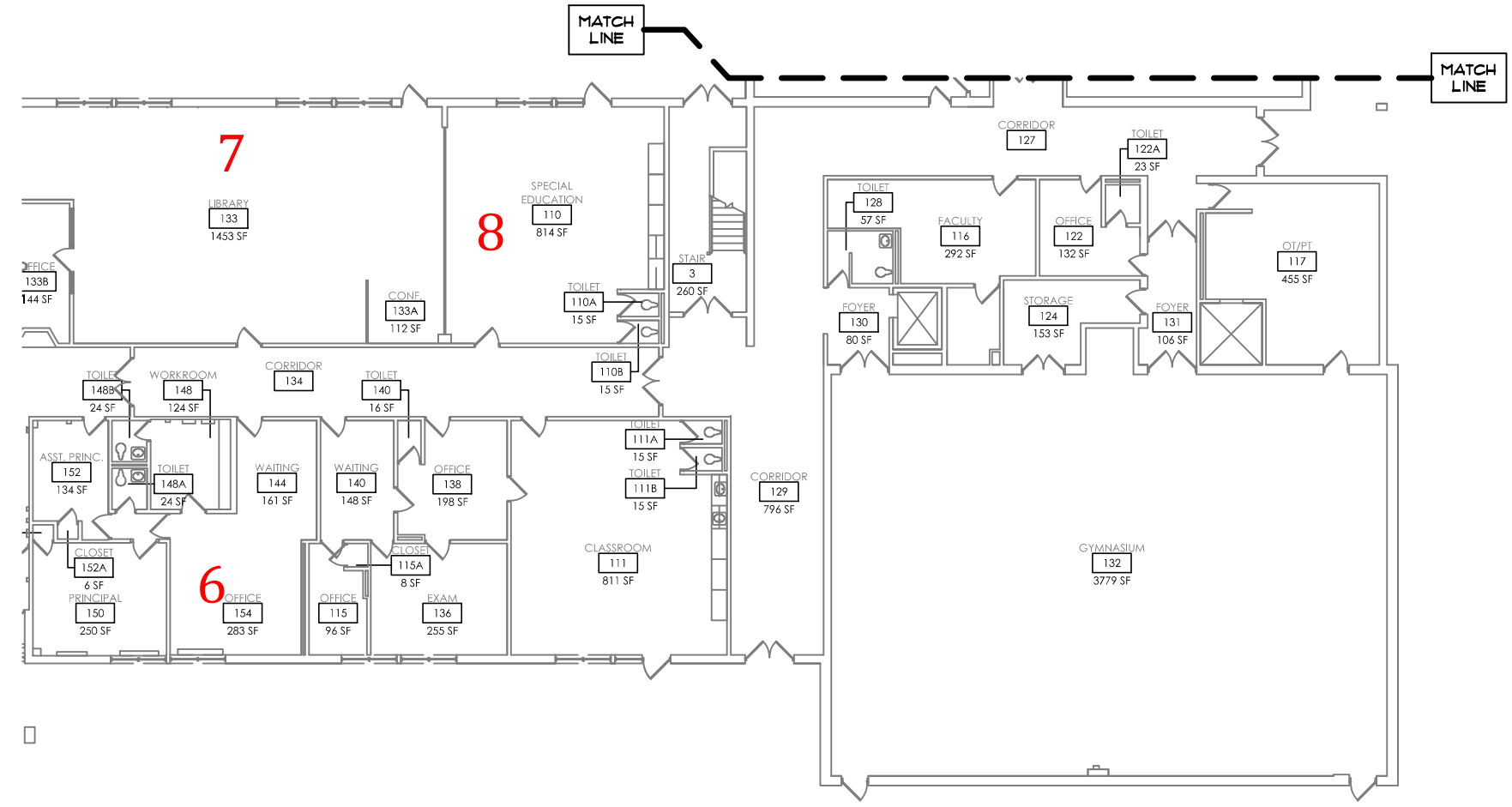
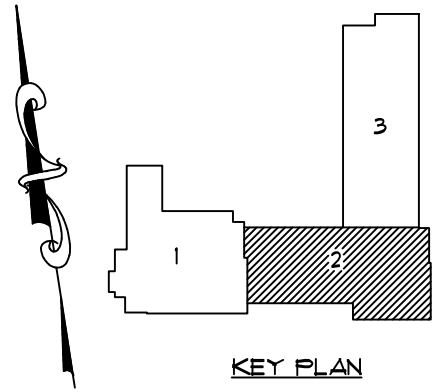


Exterior 16

THE INFORMATION INCLUDED ON THIS GRAPHIC REPRESENTATION HAS BEEN COMPILED FROM A VARIETY OF SOURCES AND IS SUBJECT TO CHANGE WITHOUT NOTICE. AECC MAKES NO REPRESENTATIONS OR WARRANTIES, EXPRESS OR IMPLIED, AS TO ACCURACY, COMPLETENESS, TIMELINESS, OR RIGHTS TO THE USE OF SUCH INFORMATION. THIS DOCUMENT IS NOT INTENDED FOR USE AS A LAND SURVEY PRODUCT NOR IS IT DESIGNED OR INTENDED AS A CONSTRUCTION DESIGN DOCUMENT. THE USE OR MISUSE OF THE INFORMATION CONTAINED ON THIS GRAPHIC REPRESENTATION IS AT THE SOLE RISK OF THE PARTY USING OR MISUSING THE INFORMATION.

AECC
ENVIRONMENTAL CONSULTING
Asbestos & Environmental
Consulting Corporation
6308 Fly Road
East Syracuse, NY 13057

PROJECT NO.	20-146	Pine Bush CSD - Circleville Elementary School 2000 New York - 302 Circleville, New York 10919 Partial First Floor Plan	FIGURE 1
DRAWN:	SEPT. 2020		
DRAWN BY:	NP	Lead XRF Survey	
CHECKED BY:	BB		

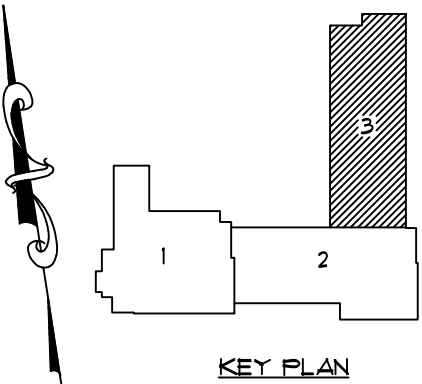
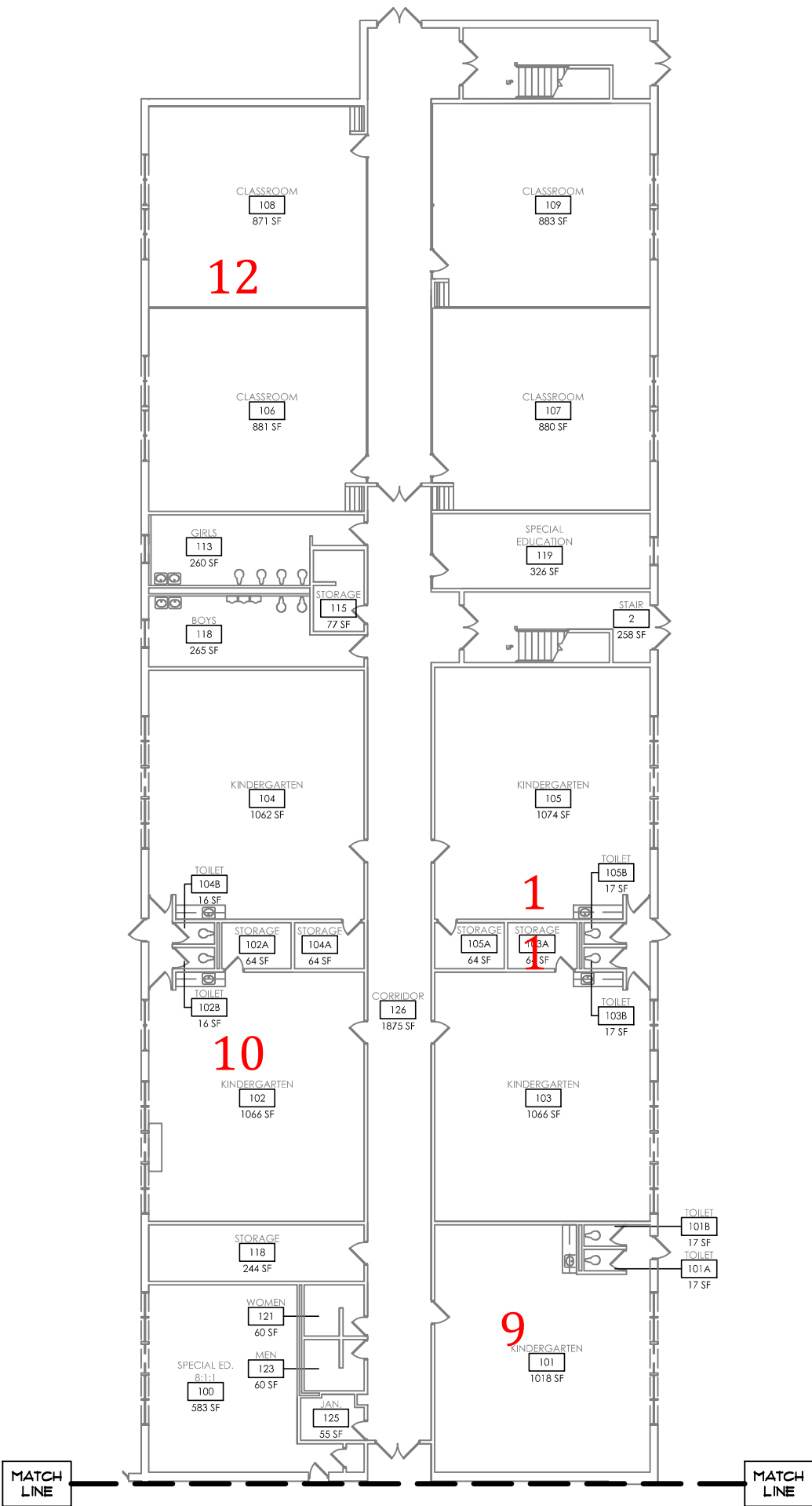


THE INFORMATION INCLUDED ON THIS GRAPHIC REPRESENTATION HAS BEEN COMPILED FROM A VARIETY OF SOURCES AND IS SUBJECT TO CHANGE WITHOUT NOTICE. AECC MAKES NO REPRESENTATIONS OR WARRANTIES, EXPRESS OR IMPLIED, AS TO ACCURACY, COMPLETENESS, TIMELINESS, OR RIGHTS TO THE USE OF SUCH INFORMATION. THIS DOCUMENT IS NOT INTENDED FOR USE AS A LAND SURVEY PRODUCT NOR IS IT DESIGNED OR INTENDED AS A CONSTRUCTION DESIGN DOCUMENT. THE USE OR MISUSE OF THE INFORMATION CONTAINED ON THIS GRAPHIC REPRESENTATION IS AT THE SOLE RISK OF THE PARTY USING OR MISUSING THE INFORMATION.



AECC
ENVIRONMENTAL CONSULTING
Asbestos & Environmental
Consulting Corporation
6308 Fly Road
East Syracuse, NY 13057

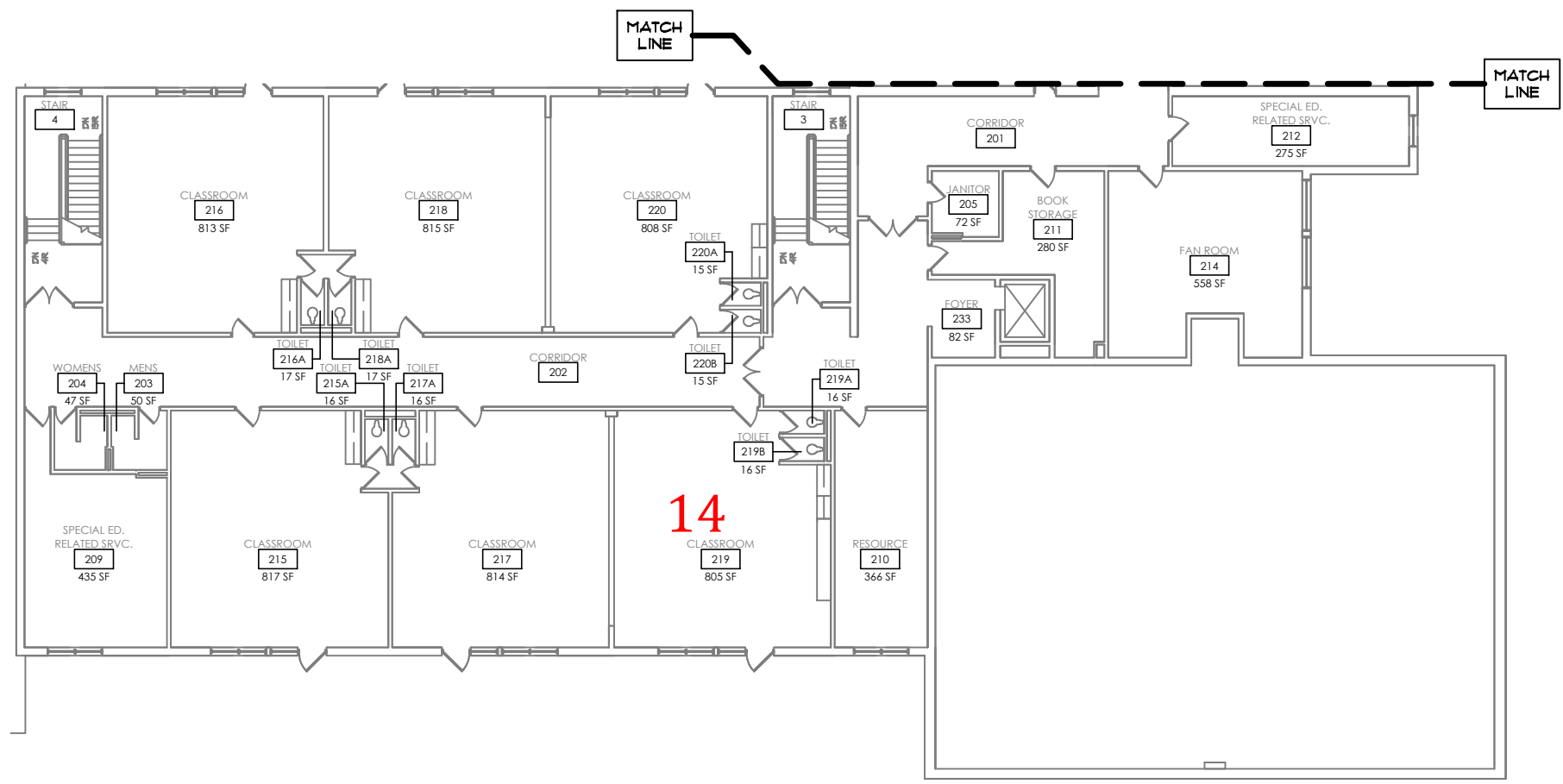
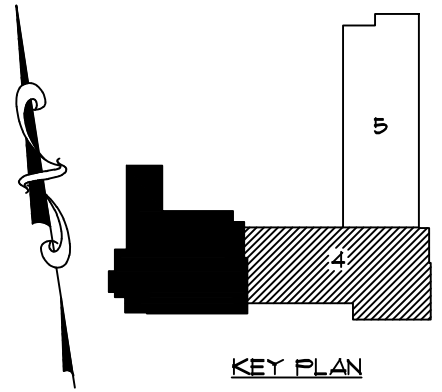
		Pine Bush CSD - Circleville Elementary School 2000 New York - 302 Circleville, New York 10919 Partial First Floor Plan	FIGURE 2
PROJECT NO.	20-146		
DRAWN:	SEPT. 2020		
DRAWN BY:	NP		
CHECKED BY:	BB	Lead XRF Survey	



THE INFORMATION INCLUDED ON THIS GRAPHIC REPRESENTATION HAS BEEN COMPILED FROM A VARIETY OF SOURCES AND IS SUBJECT TO CHANGE WITHOUT NOTICE. AECC MAKES NO REPRESENTATIONS OR WARRANTIES, EXPRESS OR IMPLIED, AS TO ACCURACY, COMPLETENESS, TIMELINESS, OR RIGHTS TO THE USE OF SUCH INFORMATION. THIS DOCUMENT IS NOT INTENDED FOR USE AS A LAND SURVEY PRODUCT NOR IS IT DESIGNED OR INTENDED AS A CONSTRUCTION DESIGN DOCUMENT. THE USE OR MISUSE OF THE INFORMATION CONTAINED ON THIS GRAPHIC REPRESENTATION IS AT THE SOLE RISK OF THE PARTY USING OR MISUSING THE INFORMATION.

AECC
ENVIRONMENTAL CONSULTING
Asbestos & Environmental
Consulting Corporation
6308 Fly Road
East Syracuse, NY 13057

PROJECT NO.	20-146	Pine Bush CSD - Circleville Elementary School 2000 New York - 302 Circleville, New York 10919 Partial First Floor Plan	FIGURE 3
DRAWN:	SEPT. 2020		
DRAWN BY:	NP	Lead XRF Survey	
CHECKED BY:	BB		



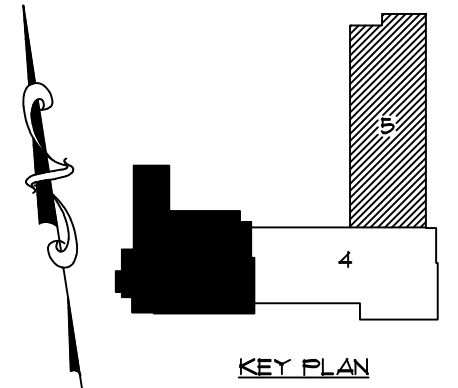
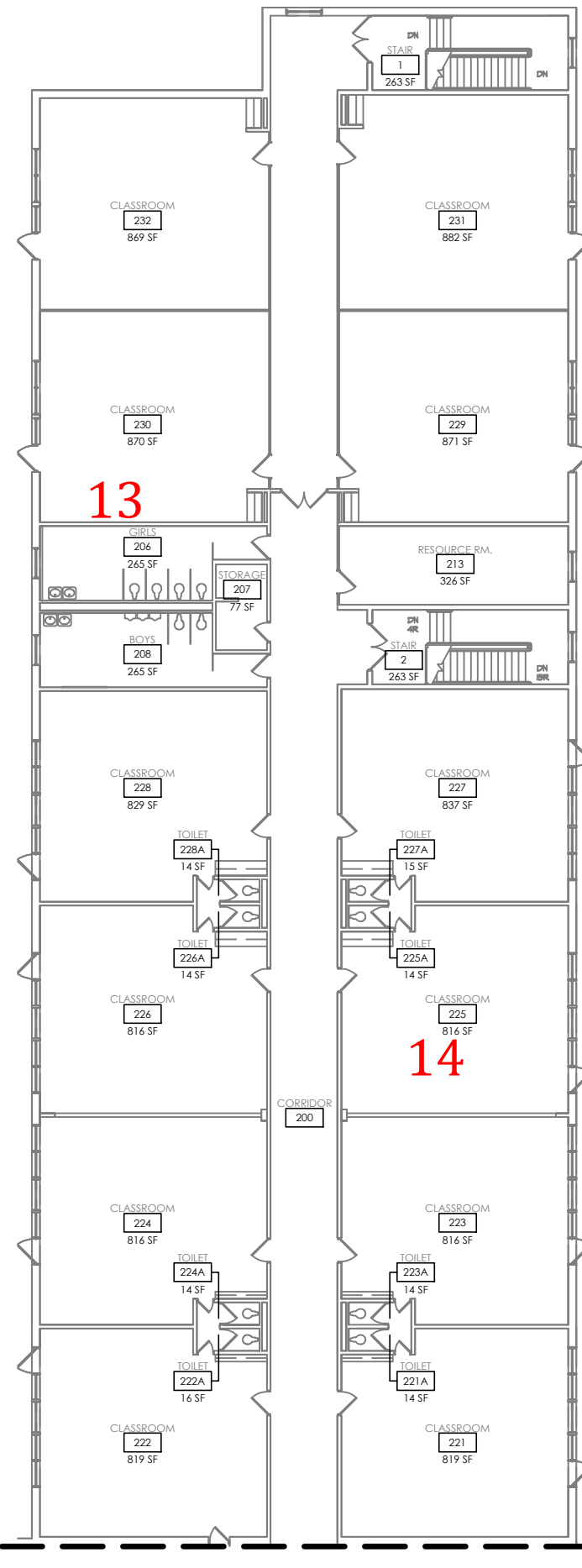
THE INFORMATION INCLUDED ON THIS GRAPHIC REPRESENTATION HAS BEEN COMPILED FROM A VARIETY OF SOURCES AND IS SUBJECT TO CHANGE WITHOUT NOTICE. AECC MAKES NO REPRESENTATIONS OR WARRANTIES, EXPRESS OR IMPLIED, AS TO ACCURACY, COMPLETENESS, TIMELINESS, OR RIGHTS TO THE USE OF SUCH INFORMATION. THIS DOCUMENT IS NOT INTENDED FOR USE AS A LAND SURVEY PRODUCT NOR IS IT DESIGNED OR INTENDED AS A CONSTRUCTION DESIGN DOCUMENT. THE USE OR MISUSE OF THE INFORMATION CONTAINED ON THIS GRAPHIC REPRESENTATION IS AT THE SOLE RISK OF THE PARTY USING OR MISUSING THE INFORMATION.



AECC
ENVIRONMENTAL CONSULTING
Asbestos & Environmental
Consulting Corporation
6308 Fly Road
East Syracuse, NY 13057

PROJECT NO.	20-146	Pine Bush CSD - Circleville Elementary School 2000 New York - 302 Circleville, New York 10919 Partial Second Floor Plan
DRAWN:	SEPT. 2020	
DRAWN BY:	NP	Lead XRF Survey
CHECKED BY:	BB	

FIGURE
4



THE INFORMATION INCLUDED ON THIS GRAPHIC REPRESENTATION HAS BEEN COMPILED FROM A VARIETY OF SOURCES AND IS SUBJECT TO CHANGE WITHOUT NOTICE. AECC MAKES NO REPRESENTATIONS OR WARRANTIES, EXPRESS OR IMPLIED, AS TO ACCURACY, COMPLETENESS, TIMELINESS, OR RIGHTS TO THE USE OF SUCH INFORMATION. THIS DOCUMENT IS NOT INTENDED FOR USE AS A LAND SURVEY PRODUCT NOR IS IT DESIGNED OR INTENDED AS A CONSTRUCTION DESIGN DOCUMENT. THE USE OR MISUSE OF THE INFORMATION CONTAINED ON THIS GRAPHIC REPRESENTATION IS AT THE SOLE RISK OF THE PARTY USING OR MISUSING THE INFORMATION.

AECC
ENVIRONMENTAL CONSULTING
Asbestos & Environmental
Consulting Corporation
6308 Fly Road
East Syracuse, NY 13057

PROJECT NO.	20-146	Pine Bush CSD - Circleville Elementary School 2000 New York - 302 Circleville, New York 10919 Partial Second Floor Plan	FIGURE 5
DRAWN:	SEPT. 2020		
DRAWN BY:	NP	Lead XRF Survey	
CHECKED BY:	BB		

Daily Calibrations

Calibrations					
#	Date	Time	Type	Nom Secs	mg/cm2
1	8/31/2020	13:36:50	Calibration	5	1
2	8/31/2020	13:37:04	Calibration	5	1
3	8/31/2020	13:37:17	Calibration	5	1
137	8/31/2020	15:11:57	Calibration	5	1
138	8/31/2020	15:44:00	Calibration	5	0.9
197	8/31/2020	16:21:37	Calibration	5	0.9
198	8/31/2020	16:26:58	Calibration	5	0.9
276	8/31/2020	17:27:29	Calibration	5	1
277	8/31/2020	17:30:47	Calibration	5	0.9
336	8/31/2020	18:14:49	Calibration	5	1

Confirmed Positives

EcoSpect, Inc
5785 Route 96, PO Box 25, Romulus NY 14541

Client:
AECC

Project: Circleville Elementary
2000 NY-302, Circleville, NY 10919

Confirmed Positives								
Reading #	Room	#	Wall	Component	Substrate	Condition	Results	mg/cm2

XRF Results

XRF & Labs								
Reading #	Room	#	Wall	Component	Substrate	Condition	Results	mg/cm2
139	1		Wall 1	Structural Steel	Steel	Brown	Negative	0.3
140	1		Wall 1	Structural Steel	Steel	Brown	Negative	0.2
141	1		Wall 1	Wall	Ceramic	Yellow	Negative	-0.2
142	1		Wall 1	Door Molding	Steel	Gray	Negative	0.1
143	1		Wall 1	Door	Steel	Gray	Negative	-0.1
144	1		Wall 1	Door	Steel	Gray	Negative	0.1
145	1		Wall 2	Wall	Ceramic	Yellow	Negative	-0.3
146	1		Wall 4	Wall	Ceramic	Yellow	Negative	-0.1
147	2		Wall 1	Wall	Masonry	White	Negative	-0.1
148	2		Wall 1	Baseboard	Steel	Yellow	Negative	0.1
149	2		Wall 1	Door Molding	Steel	Gray	Negative	-0.1
150	2		Wall 1	Door	Steel	Gray	Negative	-0.2
151	2		Wall 1	Door Header	Steel	Brown	Negative	-0.2
152	2		Wall 2	Wall	Masonry	White	Negative	0
153	2		Wall 4	Wall	Masonry	Blue	Negative	-0.2
154	2		Wall 3	Wall	Masonry	White	Negative	-0.2
155	2		Wall 3	I-Beam Wall	Steel	White	Negative	0
156	2		Wall 3	Newel Post	Steel	Brown	Negative	0
157	2		Wall 3	Balluster	Steel	Brown	Negative	0
158	2		Wall 3	Floor	Wood	Brown	Negative	0
159	3		Wall 1	Window Mldg	Steel	Black	Negative	-0.1
160	3		Wall 1	Window Mldg	Steel	Gray	Negative	0.1
161	3		Wall 1	Window Mldg	Steel	Gray	Negative	0.1
162	3		Wall 1	Window Mldg	Steel	Black	Negative	0.1
163	4		Wall 1	Window Mldg	Steel	Black	Negative	-0.1
164	4		Wall 1	Window Mldg	Steel	Gray	Negative	0.1
165	5		Wall 2	Window Mldg	Steel	Gray	Negative	0
166	5		Wall 2	Window Mldg	Steel	Black	Negative	0
167	6		Wall 1	Window Mldg	Steel	Black	Negative	0
168	6		Wall 3	Window Mldg	Steel	Black	Negative	-0.1
169	6		Wall 3	Window Mldg	Steel	Gray	Negative	0.1
170	7		Wall 3	Window Mldg	Steel	Black	Negative	0.3
171	8		Wall 3	Window Mldg	Steel	Black	Negative	0.1
172	9		Wall 4	Window Mldg	Steel	Black	Negative	-0.1
173	9		Wall 4	Window Mldg	Steel	Gray	Negative	0.2
174	10		Wall 2	Window Mldg	Steel	Gray	Negative	0.6
175	10		Wall 2	Window Mldg	Steel	Black	Negative	0.2
176	11		Wall 4	Window Mldg	Steel	Black	Negative	0.2
177	11		Wall 4	Window Mldg	Steel	Gray	Negative	0.1
178	12		Wall 2	Window Mldg	Steel	Gray	Negative	0
179	12		Wall 2	Window Mldg	Steel	Black	Negative	0.5
180	13		Wall 2	Window Mldg	Steel	Black	Negative	0
181	13		Wall 2	Window Mldg	Steel	Gray	Negative	0
182	14		Wall 4	Window Mldg	Steel	Gray	Negative	0.2
183	14		Wall 4	Window Mldg	Steel	Black	Negative	0

XRF & Labs								
Reading #	Room	#	Wall	Component	Substrate	Condition	Results	mg/cm2
184	15		Wall 1	Window Mldg	Steel	Black	Negative	0.1
185	15		Wall 1	Window Mldg	Steel	Gray	Negative	-0.2
186	16		Wall 1	Window Mldg	Steel	Black	Negative	0
187	16		Wall 4	Window Mldg	Steel	Black	Negative	0.1
188	16		Wall 4	Window Mldg	Steel	Black	Negative	0.1
189	16		Wall 2	Window Mldg	Steel	Black	Negative	0
190	16		Wall 2	Window Mldg	Steel	Black	Negative	0.1
191	16		Wall 2	Window Mldg	Steel	Black	Negative	0.1
192	16		Wall 3	Window Mldg	Steel	Black	Negative	0
193	16		Wall 3	Window Mldg	Steel	Black	Negative	0
194	16		Wall 2	Window Mldg	Steel	Black	Negative	0.1
195	16		Wall 1	Window Mldg	Steel	Black	Negative	0.1
196	16		Wall 1	Window Mldg	Steel	Black	Negative	-0.7

Performance Characteristic Sheet

EFFECTIVE DATE: December 1, 2015

MANUFACTURER AND MODEL:

Make: *Heuresis*
Models: *Model Pb200i*
Source: *⁵⁷Co, 5 mCi (nominal – new source)*

FIELD OPERATION GUIDANCE

OPERATING PARAMETERS:

Action Level mode

XRF CALIBRATION CHECK LIMITS:

0.8 to 1.2 mg/cm ² (inclusive)

SUBSTRATE CORRECTION:

Not applicable

INCONCLUSIVE RANGE OR THRESHOLD:

ACTION LEVEL MODE READING DESCRIPTION	SUBSTRATE	THRESHOLD (mg/cm ²)
Results not corrected for substrate bias on any substrate	Brick	1.0
	Concrete	1.0
	Drywall	1.0
	Metal	1.0
	Plaster	1.0
	Wood	1.0

BACKGROUND INFORMATION

EVALUATION DATA SOURCE AND DATE:

This sheet is supplemental information to be used in conjunction with Chapter 7 of the HUD *Guidelines for the Evaluation and Control of Lead-Based Paint Hazards in Housing* ("HUD Guidelines"). Performance parameters shown on this sheet are calculated using test results on building components in the HUD archive. Testing was conducted on 146 test samples in November 2015, with two separate instruments running software version 2.1-2 in Action Level test mode. The actual source strength of each instrument on the day of testing was approximately 2.0 mCi; source ages were approximately one year.

OPERATING PARAMETERS

Performance parameters shown in this sheet are applicable only when properly operating the instrument using the manufacturer's instructions and procedures described in Chapter 7 of the HUD Guidelines.

XRF CALIBRATION CHECK:

The calibration of the XRF instrument should be checked using the paint film nearest 1.0 mg/cm² in the NIST Standard Reference Material (SRM) used (e.g., for NIST SRM 2579, use the 1.02 mg/cm² film).

If the average (rounded to 1 decimal place) of three readings is outside the acceptable calibration check range, follow the manufacturer's instructions to bring the instrument into control before XRF testing proceeds.

SUBSTRATE CORRECTION VALUE COMPUTATION:

Chapter 7 of the HUD Guidelines provides guidance on correcting XRF results for substrate bias. Supplemental guidance for using the paint film nearest 1.0 mg/cm² for substrate correction is provided:

XRF results are corrected for substrate bias by subtracting from each XRF result a correction value determined separately in each house for single-family housing or in each development for multifamily housing, for each substrate. The correction value is an average of XRF readings taken over the NIST SRM paint film nearest to 1.0 mg/cm² at test locations that have been scraped bare of their paint covering. Compute the correction values as follows:

Using the same XRF instrument, take three readings on a bare substrate area covered with the NIST SRM paint film nearest 1 mg/cm². Repeat this procedure by taking three more readings on a second bare substrate area of the same substrate covered with the NIST SRM.

Compute the correction value for each substrate type where XRF readings indicate substrate correction is needed by computing the average of all six readings as shown below.

For each substrate type (the 1.02 mg/cm² NIST SRM is shown in this example; use the actual lead loading of the NIST SRM used for substrate correction):

$$\text{Correction value} = (1\text{st} + 2\text{nd} + 3\text{rd} + 4\text{th} + 5\text{th} + 6\text{th Reading})/6 - 1.02 \text{ mg/cm}^2$$

Repeat this procedure for each substrate requiring substrate correction in the house or housing development.

EVALUATING THE QUALITY OF XRF TESTING:

Randomly select ten testing combinations for retesting from each house or from two randomly selected units in multifamily housing.

Conduct XRF re-testing at the ten testing combinations selected for retesting.

Determine if the XRF testing in the units or house passed or failed the test by applying the steps below.

Compute the Retest Tolerance Limit by the following steps:

Determine XRF results for the original and retest XRF readings. Do not correct the original or retest results for substrate bias. In single-family and multi-family housing, a result is defined as a single reading. Therefore, there will be ten original and ten retest XRF results for each house or for the two selected units.

Calculate the average of the original XRF result and the retest XRF result for each testing combination.

Square the average for each testing combination.

Add the ten squared averages together. Call this quantity C.

Multiply the number C by 0.0072. Call this quantity D.

Add the number 0.032 to D. Call this quantity E.

Take the square root of E. Call this quantity F.

Multiply F by 1.645. The result is the Retest Tolerance Limit.

Compute the average of all ten original XRF readings.

Compute the average of all ten re-test XRF readings.

Find the absolute difference of the two averages.

If the difference is less than the Retest Tolerance Limit, the inspection has passed the retest. If the difference of the overall averages equals or exceeds the Retest Tolerance Limit, this procedure should be repeated with ten new testing combinations. If the difference of the overall averages is equal to or greater than the Retest Tolerance Limit a second time, then the inspection should be considered deficient.

Use of this procedure is estimated to produce a spurious result approximately 1% of the time. That is, results of this procedure will call for further examination when no examination is warranted in approximately 1 out of 100 dwelling units tested.

TESTING TIMES:

In the Action Level paint test mode, the instrument takes the longest time to complete readings close to the Federal standard of 1.0 mg/cm². The table below shows the mean and standard deviation of actual reading times by reading level for paint samples during the November 2015 archive testing. The tested instruments reported readings to one decimal place. No significant differences in reading times by substrate were observed. These times apply only to instruments with the same source strength as those tested (2.0 mCi). Instruments with stronger sources will have shorter reading times and those with weaker sources, longer reading times, than those in the table.

Mean and Standard Deviation of Reading Times in Action Level Mode by Reading Level		
Reading (mg/cm ²)	Mean Reading Time (seconds)	Standard Deviation (seconds)
< 0.7	3.48	0.47
0.7	7.29	1.92
0.8	13.95	1.78
0.9 – 1.2	15.25	0.66
1.3 – 1.4	6.08	2.50
≥ 1.5	3.32	0.05

CLASSIFICATION OF RESULTS:

XRF results are classified as **positive** if they are **greater than or equal** to the stated threshold for the instrument (1.0 mg/cm²), and *negative* if they are *less than* the threshold.

DOCUMENTATION:

A report titled *Methodology for XRF Performance Characteristic Sheets* (EPA 747-R-95-008) provides an explanation of the statistical methodology used to construct the data in the sheets, and provides empirical results from using the recommended inconclusive ranges or thresholds for specific XRF instruments. The report may be downloaded at <http://www2.epa.gov/lead/methodology-xrf-performance-characteristic-sheets-epa-747-r-95-008-september-1997>.

This XRF Performance Characteristic Sheet (PCS) was developed by QuanTech, Inc., under a contract with the XRF manufacturer.

ATTACHMENT D

PCB Bulk Sampling Laboratory Results



Analysis Report

Schneider Laboratories Global, Inc

2512 W. Cary Street • Richmond, Virginia • 23220-5117
804-353-6778 • 800-785-LABS (5227) • Fax 804-359-1475

Customer: Asbestos & Environmental Consulting Corp. (4307)
Address: 6308 Fly Road
East Syracuse, NY 13057

Order #: 382644

Matrix Bulk
Received 08/24/20
Reported 08/25/20

Attn:

Project: Circleville Elementary School
Location: 2000 NY-302, Circleville, NY
Number: 20-146

PO Number:

Sample ID	Cust. Sample ID	Location	Result	RL*	Units	Analysis Date	Analyst
Parameter		Method					
382644-001	CLK-001P	Main Entrance Window					
Semi-volatile Organic Compounds							
Aroclor - 1016		SW846 8082A	<476	475	µg/kg	08/24/20	THN
Aroclor - 1221		SW846 8082A	<476	475	µg/kg	08/24/20	THN
Aroclor - 1232		SW846 8082A	<476	475	µg/kg	08/24/20	THN
Aroclor - 1242		SW846 8082A	<476	475	µg/kg	08/24/20	THN
Aroclor - 1248		SW846 8082A	<476	475	µg/kg	08/24/20	THN
Aroclor - 1254		SW846 8082A	<476	475	µg/kg	08/24/20	THN
Aroclor - 1260		SW846 8082A	<476	475	µg/kg	08/24/20	THN
Aroclor - 1262		SW846 8082A	<476	475	µg/kg	08/24/20	THN
Aroclor - 1268		SW846 8082A	<476	475	µg/kg	08/24/20	THN
PCB - Surrogate Recoveries							
DCB		MI					
TCMX		71%					
382644-002	CLK-004P	Classroom 106 Window					
Semi-volatile Organic Compounds							
Aroclor - 1016		SW846 8082A	<1200	1200	µg/kg	08/24/20	THN
Aroclor - 1221		SW846 8082A	<1200	1200	µg/kg	08/24/20	THN
Aroclor - 1232		SW846 8082A	<1200	1200	µg/kg	08/24/20	THN
Aroclor - 1242		SW846 8082A	<1200	1200	µg/kg	08/24/20	THN
Aroclor - 1248		SW846 8082A	<1200	1200	µg/kg	08/24/20	THN
Aroclor - 1254		SW846 8082A	<1200	1200	µg/kg	08/24/20	THN
Aroclor - 1260		SW846 8082A	<1200	1200	µg/kg	08/24/20	THN
Aroclor - 1262		SW846 8082A	<1200	1200	µg/kg	08/24/20	THN
Aroclor - 1268		SW846 8082A	<1200	1200	µg/kg	08/24/20	THN
PCB - Surrogate Recoveries							
DCB		67%					
TCMX		126%					

All internal QC parameters were met. Unusual sample conditions, if any, are described. Surrogate Spike results designated with "D" indicate that the analyte was diluted out. "MI" indicates matrix interference. Concentration and *Reporting Limit (RL) based on areas provided by client. Values are reported to three significant figures. Solid PPM = mg/kg | PPB = µg/kg and Water PPM = mg/L | PPB = µg/L. The test results reported relate only to the samples submitted.



Analysis Report

Schneider Laboratories Global, Inc

2512 W. Cary Street • Richmond, Virginia • 23220-5117
804-353-6778 • 800-785-LABS (5227) • Fax 804-359-1475

Customer: Asbestos & Environmental Consulting Corp. (4307)
Address: 6308 Fly Road
East Syracuse, NY 13057

Order #: 382644

Matrix Bulk
Received 08/24/20
Reported 08/25/20

Attn:

Project: Circleville Elementary School
Location: 2000 NY-302, Circleville, NY
Number: 20-146

PO Number:

Sample ID	Cust. Sample ID	Location	Result	RL*	Units	Analysis Date	Analyst
Parameter		Method					
382644-003	CLK-005P	Special Ed Room 110					
Semi-volatile Organic Compounds							
Aroclor - 1016		SW846 8082A	<468	468	µg/kg	08/24/20	THN
Aroclor - 1221		SW846 8082A	<468	468	µg/kg	08/24/20	THN
Aroclor - 1232		SW846 8082A	<468	468	µg/kg	08/24/20	THN
Aroclor - 1242		SW846 8082A	<468	468	µg/kg	08/24/20	THN
Aroclor - 1248		SW846 8082A	<468	468	µg/kg	08/24/20	THN
Aroclor - 1254		SW846 8082A	<468	468	µg/kg	08/24/20	THN
Aroclor - 1260		SW846 8082A	<468	468	µg/kg	08/24/20	THN
Aroclor - 1262		SW846 8082A	<468	468	µg/kg	08/24/20	THN
Aroclor - 1268		SW846 8082A	<468	468	µg/kg	08/24/20	THN
PCB - Surrogate Recoveries							
DCB		MI					
TCMX		61%					
382644-004	CLK-020P	Main Entrance Door					
Semi-volatile Organic Compounds							
Aroclor - 1016		SW846 8082A	<715	715	µg/kg	08/24/20	THN
Aroclor - 1221		SW846 8082A	<715	715	µg/kg	08/24/20	THN
Aroclor - 1232		SW846 8082A	<715	715	µg/kg	08/24/20	THN
Aroclor - 1242		SW846 8082A	<715	715	µg/kg	08/24/20	THN
Aroclor - 1248		SW846 8082A	<715	715	µg/kg	08/24/20	THN
Aroclor - 1254		SW846 8082A	<715	715	µg/kg	08/24/20	THN
Aroclor - 1260		SW846 8082A	<715	715	µg/kg	08/24/20	THN
Aroclor - 1262		SW846 8082A	<715	715	µg/kg	08/24/20	THN
Aroclor - 1268		SW846 8082A	<715	715	µg/kg	08/24/20	THN
PCB - Surrogate Recoveries							
DCB		MI					
TCMX		MI					

All internal QC parameters were met. Unusual sample conditions, if any, are described. Surrogate Spike results designated with "D" indicate that the analyte was diluted out. "MI" indicates matrix interference. Concentration and *Reporting Limit (RL) based on areas provided by client. Values are reported to three significant figures. Solid PPM = mg/kg | PPB = µg/kg and Water PPM = mg/L | PPB = µg/L. The test results reported relate only to the samples submitted.



Analysis Report

Schneider Laboratories Global, Inc

2512 W. Cary Street • Richmond, Virginia • 23220-5117
804-353-6778 • 800-785-LABS (5227) • Fax 804-359-1475

Customer: Asbestos & Environmental Consulting Corp. (4307)
Address: 6308 Fly Road
East Syracuse, NY 13057

Order #: 382644

Matrix Bulk
Received 08/24/20
Reported 08/25/20

Attn:

Project: Circleville Elementary School
Location: 2000 NY-302, Circleville, NY
Number: 20-146

PO Number:

Sample ID	Cust. Sample ID	Location	Result	RL*	Units	Analysis Date	Analyst
Parameter		Method					
382644-08/25/20 05:33 PM							

Reviewed By: **Jennifer Lee**
Manager

State Certifications

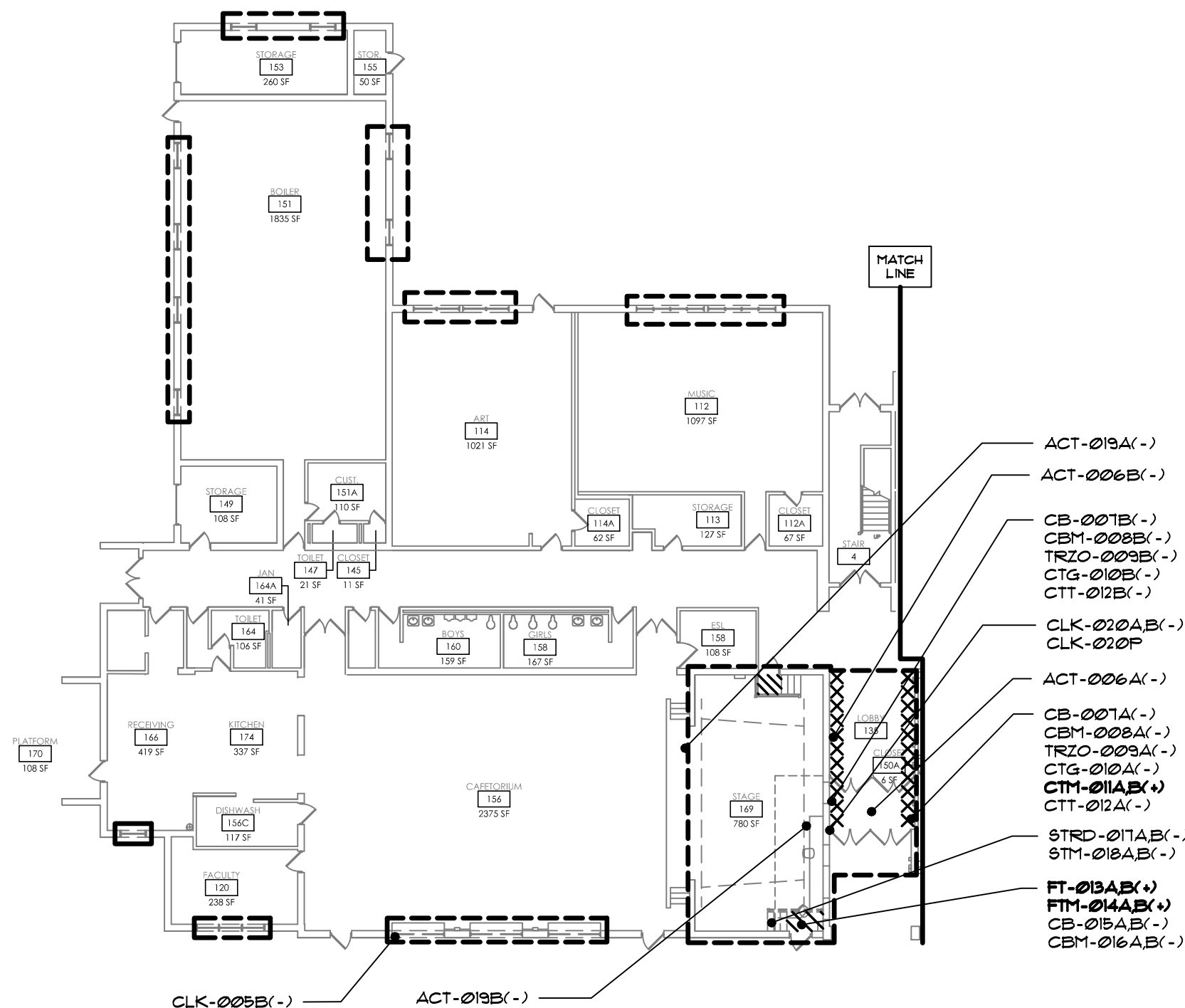
Method	Parameter	New York	Virginia
SW846 8082A	Aroclor - 1016	ELAP Certified	VELAP Certified
SW846 8082A	Aroclor - 1221	ELAP Certified	VELAP Certified
SW846 8082A	Aroclor - 1232	ELAP Certified	VELAP Certified
SW846 8082A	Aroclor - 1242	ELAP Certified	VELAP Certified
SW846 8082A	Aroclor - 1248	ELAP Certified	VELAP Certified
SW846 8082A	Aroclor - 1254	ELAP Certified	VELAP Certified
SW846 8082A	Aroclor - 1260	ELAP Certified	VELAP Certified
SW846 8082A	Aroclor - 1262	ELAP Certified	VELAP Certified
SW846 8082A	Aroclor - 1268	ELAP Certified	VELAP Certified

State	Certificate Number
New York	ELAP 61372
Virginia	VELAP 10779

All internal QC parameters were met. Unusual sample conditions, if any, are described. Surrogate Spike results designated with "D" indicate that the analyte was diluted out. "MI" indicates matrix interference. Concentration and *Reporting Limit (RL) based on areas provided by client. Values are reported to three significant figures. Solid PPM = mg/kg | PPB = µg/kg and Water PPM = mg/L | PPB = µg/L. The test results reported relate only to the samples submitted.

ATTACHMENT E

Figures 1, 2, 3, 4, & 5



- ACT-019A(-)
- ACT-006B(-)
- CB-007B(-)
- CBM-008B(-)
- TRZO-009B(-)
- CTG-010B(-)
- CTT-012B(-)
- CLK-020A,B(-)
- CLK-020P
- ACT-006A(-)
- CB-007A(-)
- CBM-008A(-)
- TRZO-009A(-)
- CTG-010A(-)
- CTM-011A,B(+)
- CTT-012A(-)
- STRD-017A,B(-)
- STM-018A,B(-)
- FT-013A,B(+)
- FTM-014A,B(+)
- CB-015A,B(-)
- CBM-016A,B(-)

LEGEND:


ASBESTOS-CONTAINING FLOOR TILE AND ASSOCIATED MASTIC

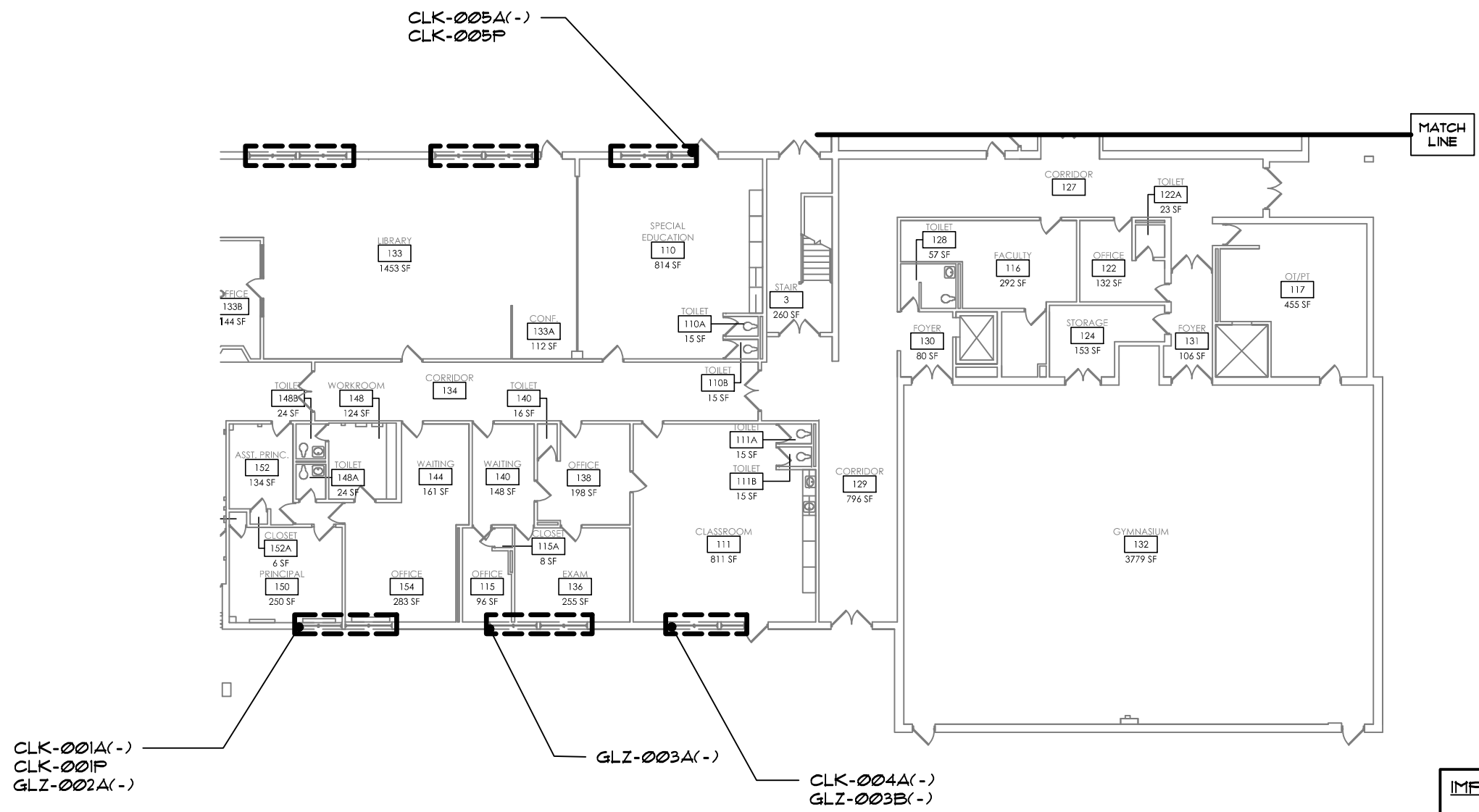
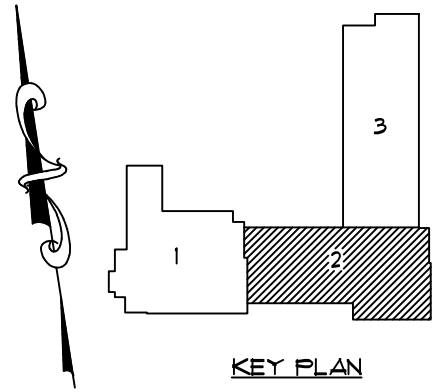
ASBESTOS-CONTAINING CERAMIC WALL TILE MASTIC

IMPORTANT SURVEY NOTE:

THIS SURVEY WAS LIMITED IN NATURE. ONLY SPECIFIC BUILDING MATERIALS WITHIN THE DASHED BOUNDARIES WERE INVESTIGATED/SAMPLED, AS PER THE DIRECTION OF THE PROJECT ARCHITECT. ANY BUILDING MATERIALS NOT SPECIFICALLY SAMPLED WITHIN THE DASHED BOUNDARIES AND ALL BUILDING MATERIALS LOCATED OUTSIDE THE DASHED BOUNDARIES SHALL NEED TO BE TREATED AS POTENTIALLY HAZARDOUS MATERIALS, UNTIL EXAMINED BY AN ENVIRONMENTAL CONSULTANT AND LABORATORY RESULTS PROVE OTHERWISE.

THE INFORMATION INCLUDED ON THIS GRAPHIC REPRESENTATION HAS BEEN COMPILED FROM A VARIETY OF SOURCES AND IS SUBJECT TO CHANGE WITHOUT NOTICE. AECC MAKES NO REPRESENTATIONS OR WARRANTIES, EXPRESS OR IMPLIED, AS TO ACCURACY, COMPLETENESS, TIMELINESS, OR RIGHTS TO THE USE OF SUCH INFORMATION. THIS DOCUMENT IS NOT INTENDED FOR USE AS A LAND SURVEY PRODUCT NOR IS IT DESIGNED OR INTENDED AS A CONSTRUCTION DESIGN DOCUMENT. THE USE OR MISUSE OF THE INFORMATION CONTAINED ON THIS GRAPHIC REPRESENTATION IS AT THE SOLE RISK OF THE PARTY USING OR MISUSING THE INFORMATION.


<div><p>Asbestos & Environmental Consulting Corporation</p><p>6308 Fly Road East Syracuse, NY 13057</p></div>	PROJECT NO.	20-146	Circleville Elementary School 2000 New York State Route 302 Circleville, New York 10919 Partial First Floor Plan	FIGURE 1
	DRAWN:	SEPT. 2020		
	DRAWN BY:	NP	Limited Hazardous Material Pre-Renovation Survey	
	CHECKED BY:	BB		



IMPORTANT SURVEY NOTE:

THIS SURVEY WAS LIMITED IN NATURE. ONLY SPECIFIC BUILDING MATERIALS WITHIN THE DASHED BOUNDARIES WERE INVESTIGATED/SAMPLED, AS PER THE DIRECTION OF THE PROJECT ARCHITECT. ANY BUILDING MATERIALS NOT SPECIFICALLY SAMPLED WITHIN THE DASHED BOUNDARIES AND ALL BUILDING MATERIALS LOCATED OUTSIDE THE DASHED BOUNDARIES SHALL NEED TO BE TREATED AS POTENTIALLY HAZARDOUS MATERIALS, UNTIL EXAMINED BY AN ENVIRONMENTAL CONSULTANT AND LABORATORY RESULTS PROVE OTHERWISE.

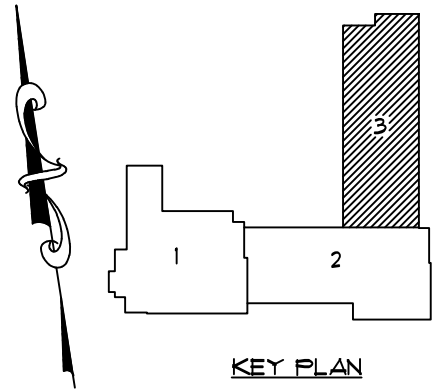
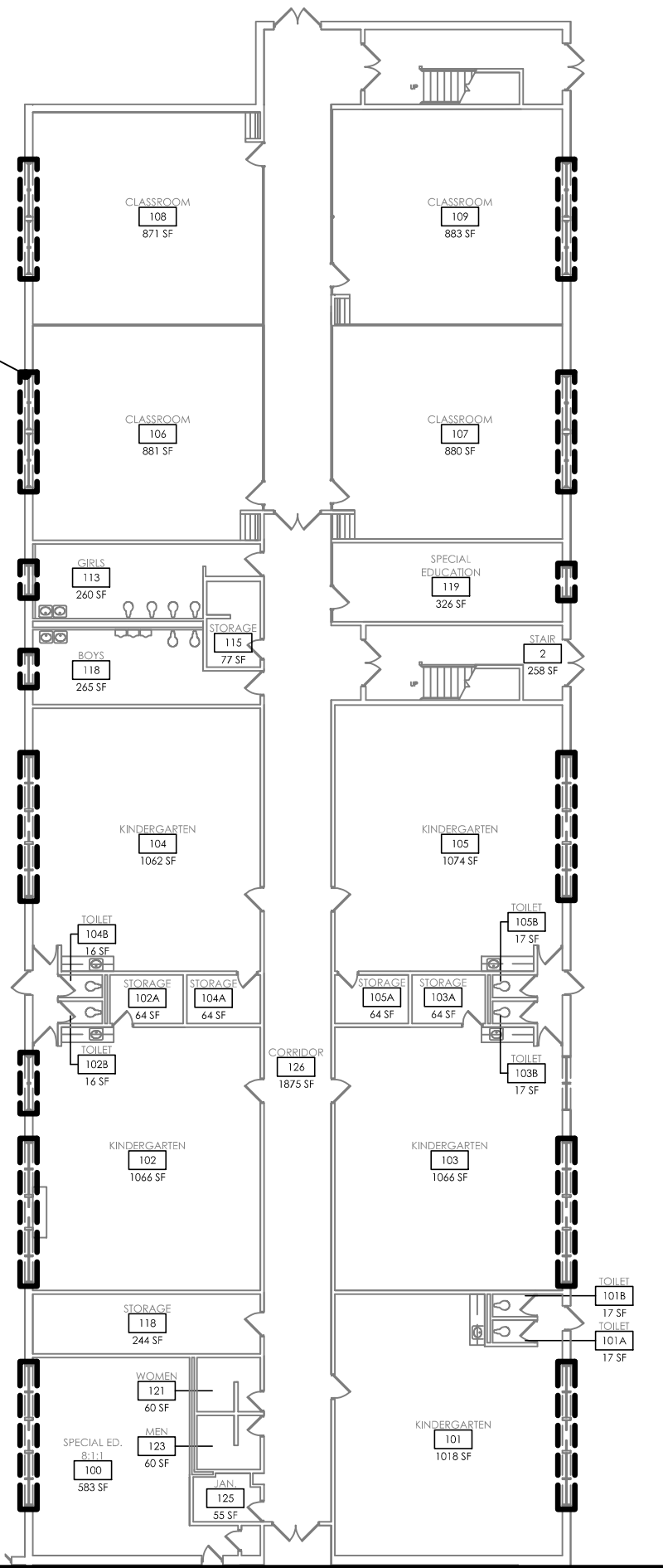
THE INFORMATION INCLUDED ON THIS GRAPHIC REPRESENTATION HAS BEEN COMPILED FROM A VARIETY OF SOURCES AND IS SUBJECT TO CHANGE WITHOUT NOTICE. AECC MAKES NO REPRESENTATIONS OR WARRANTIES, EXPRESS OR IMPLIED, AS TO ACCURACY, COMPLETENESS, TIMELINESS, OR RIGHTS TO THE USE OF SUCH INFORMATION. THIS DOCUMENT IS NOT INTENDED FOR USE AS A LAND SURVEY PRODUCT NOR IS IT DESIGNED OR INTENDED AS A CONSTRUCTION DESIGN DOCUMENT. THE USE OR MISUSE OF THE INFORMATION CONTAINED ON THIS GRAPHIC REPRESENTATION IS AT THE SOLE RISK OF THE PARTY USING OR MISUSING THE INFORMATION.

 Asbestos & Environmental Consulting Corporation 6308 Fly Road East Syracuse, NY 13057	PROJECT NO.	20-146	Circleville Elementary School 2000 New York State Route 302 Circleville, New York 10919 Partial First Floor Plan	FIGURE 2
	DRAWN:	SEPT. 2020		
	DRAWN BY:	NP	Limited Hazardous Material Pre-Renovation Survey	
	CHECKED BY:	BB		

CLK-001B(-)
GLZ-002B(-)
CLK-004B(-)
CLK-004P


MATCH
LINE

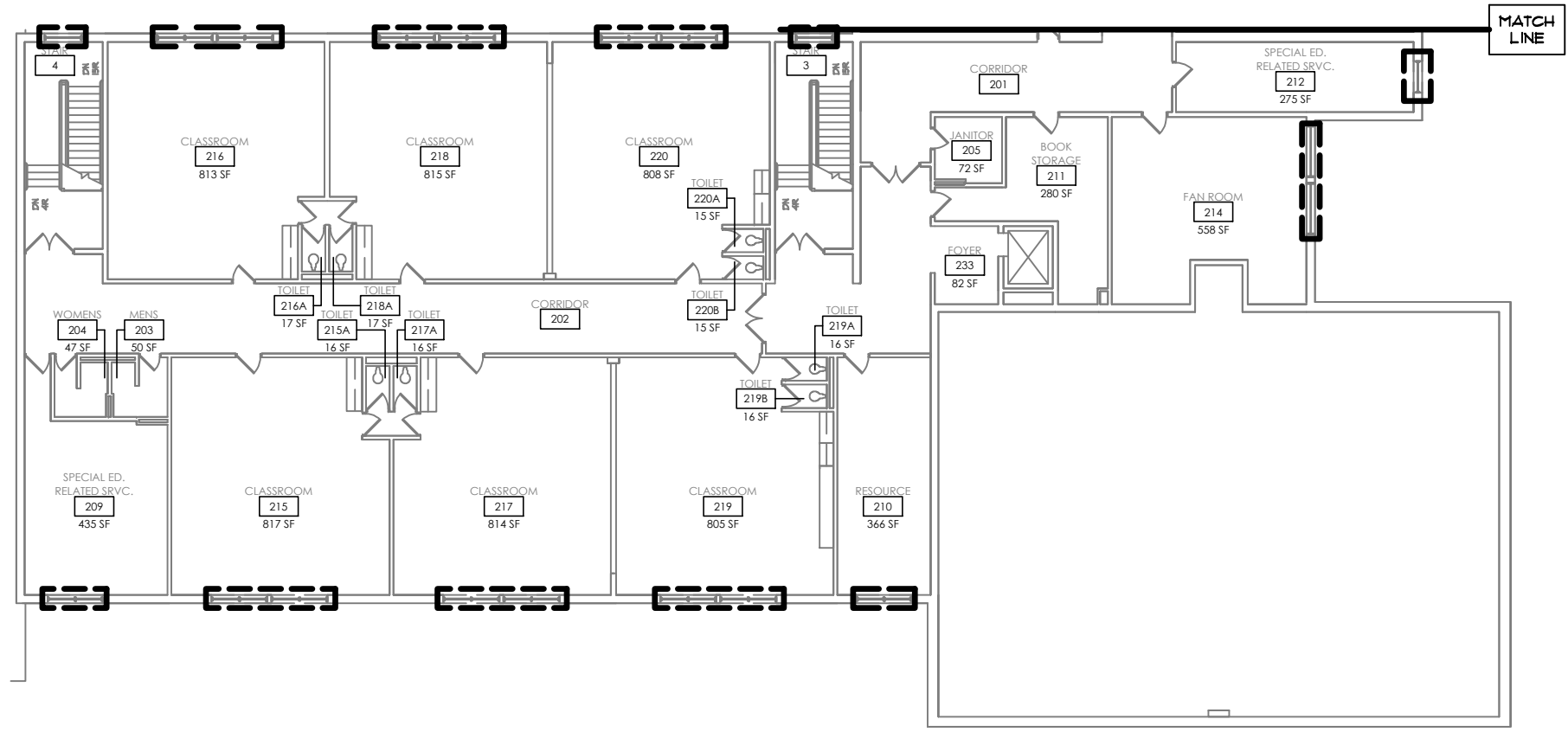
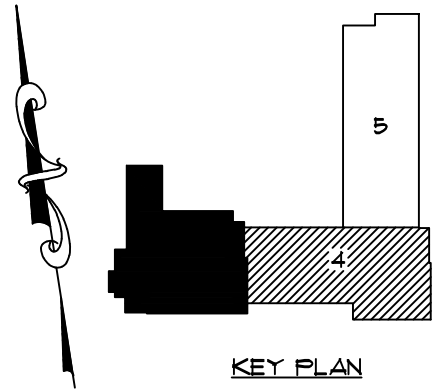
THE INFORMATION INCLUDED ON THIS GRAPHIC REPRESENTATION HAS BEEN COMPILED FROM A VARIETY OF SOURCES AND IS SUBJECT TO CHANGE WITHOUT NOTICE. AECC MAKES NO REPRESENTATIONS OR WARRANTIES, EXPRESS OR IMPLIED, AS TO ACCURACY, COMPLETENESS, TIMELINESS, OR RIGHTS TO THE USE OF SUCH INFORMATION. THIS DOCUMENT IS NOT INTENDED FOR USE AS A LAND SURVEY PRODUCT NOR IS IT DESIGNED OR INTENDED AS A CONSTRUCTION DESIGN DOCUMENT. THE USE OR MISUSE OF THE INFORMATION CONTAINED ON THIS GRAPHIC REPRESENTATION IS AT THE SOLE RISK OF THE PARTY USING OR MISUSING THE INFORMATION.



IMPORTANT SURVEY NOTE:

THIS SURVEY WAS LIMITED IN NATURE. ONLY SPECIFIC BUILDING MATERIALS WITHIN THE DASHED BOUNDARIES WERE INVESTIGATED/SAMPLED, AS PER THE DIRECTION OF THE PROJECT ARCHITECT. ANY BUILDING MATERIALS NOT SPECIFICALLY SAMPLED WITHIN THE DASHED BOUNDARIES AND ALL BUILDING MATERIALS LOCATED OUTSIDE THE DASHED BOUNDARIES SHALL NEED TO BE TREATED AS POTENTIALLY HAZARDOUS MATERIALS, UNTIL EXAMINED BY AN ENVIRONMENTAL CONSULTANT AND LABORATORY RESULTS PROVE OTHERWISE.


<div><p>Asbestos & Environmental Consulting Corporation</p><p>6308 Fly Road East Syracuse, NY 13057</p></div>	PROJECT NO. 20-146	Circleville Elementary School 2000 New York State Route 302 Circleville, New York 10919 Partial First Floor Plan	FIGURE 3
	DRAWN: SEPT. 2020		
	DRAWN BY: NP	Limited Hazardous Material Pre-Renovation Survey	
	CHECKED BY: BB		



IMPORTANT SURVEY NOTE:

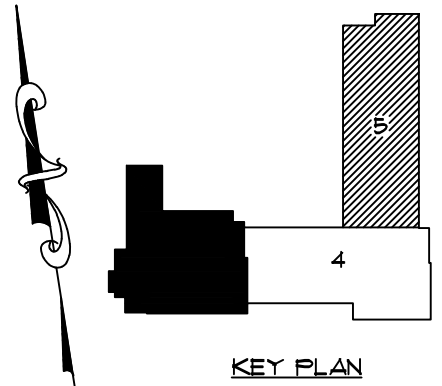
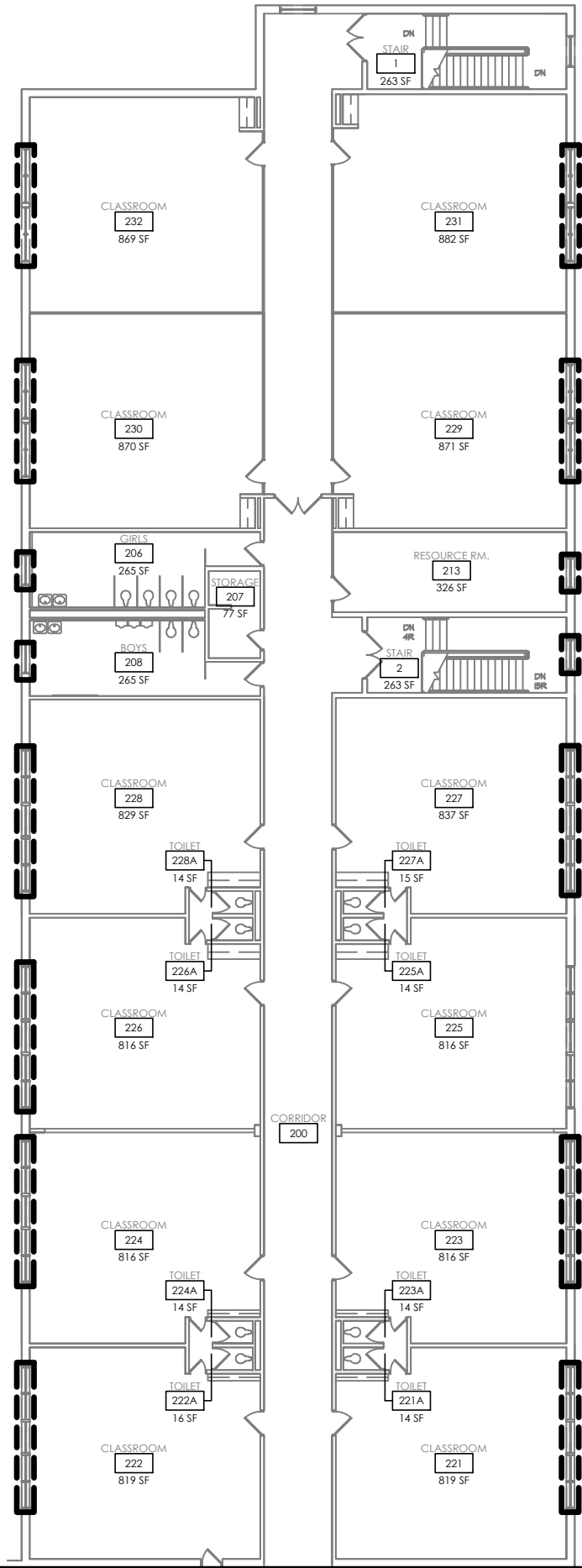
THIS SURVEY WAS LIMITED IN NATURE. ONLY SPECIFIC BUILDING MATERIALS WITHIN THE DASHED BOUNDARIES WERE INVESTIGATED/SAMPLED, AS PER THE DIRECTION OF THE PROJECT ARCHITECT. ANY BUILDING MATERIALS NOT SPECIFICALLY SAMPLED WITHIN THE DASHED BOUNDARIES AND ALL BUILDING MATERIALS LOCATED OUTSIDE THE DASHED BOUNDARIES SHALL NEED TO BE TREATED AS POTENTIALLY HAZARDOUS MATERIALS, UNTIL EXAMINED BY AN ENVIRONMENTAL CONSULTANT AND LABORATORY RESULTS PROVE OTHERWISE.

THE INFORMATION INCLUDED ON THIS GRAPHIC REPRESENTATION HAS BEEN COMPILED FROM A VARIETY OF SOURCES AND IS SUBJECT TO CHANGE WITHOUT NOTICE. AECC MAKES NO REPRESENTATIONS OR WARRANTIES, EXPRESS OR IMPLIED, AS TO ACCURACY, COMPLETENESS, TIMELINESS, OR RIGHTS TO THE USE OF SUCH INFORMATION. THIS DOCUMENT IS NOT INTENDED FOR USE AS A LAND SURVEY PRODUCT NOR IS IT DESIGNED OR INTENDED AS A CONSTRUCTION DESIGN DOCUMENT. THE USE OR MISUSE OF THE INFORMATION CONTAINED ON THIS GRAPHIC REPRESENTATION IS AT THE SOLE RISK OF THE PARTY USING OR MISUSING THE INFORMATION.

 Asbestos & Environmental Consulting Corporation 6308 Fly Road East Syracuse, NY 13057	PROJECT NO. 20-146	Circleville Elementary School 2000 New York State Route 302 Circleville, New York 10919 Partial Second Floor Plan	FIGURE 4
	DRAWN: SEPT. 2020		
	DRAWN BY: NP	Limited Hazardous Material Pre-Renovation Survey	
	CHECKED BY: BB		


THE INFORMATION INCLUDED ON THIS GRAPHIC REPRESENTATION HAS BEEN COMPILED FROM A VARIETY OF SOURCES AND IS SUBJECT TO CHANGE WITHOUT NOTICE. AECC MAKES NO REPRESENTATIONS OR WARRANTIES, EXPRESS OR IMPLIED, AS TO ACCURACY, COMPLETENESS, TIMELINESS, OR RIGHTS TO THE USE OF SUCH INFORMATION. THIS DOCUMENT IS NOT INTENDED FOR USE AS A LAND SURVEY PRODUCT NOR IS IT DESIGNED OR INTENDED AS A CONSTRUCTION DESIGN DOCUMENT. THE USE OR MISUSE OF THE INFORMATION CONTAINED ON THIS GRAPHIC REPRESENTATION IS AT THE SOLE RISK OF THE PARTY USING OR MISUSING THE INFORMATION.

MATCH
LINE



IMPORTANT SURVEY NOTE:

THIS SURVEY WAS LIMITED IN NATURE. ONLY SPECIFIC BUILDING MATERIALS WITHIN THE DASHED BOUNDARIES WERE INVESTIGATED/SAMPLED, AS PER THE DIRECTION OF THE PROJECT ARCHITECT. ANY BUILDING MATERIALS NOT SPECIFICALLY SAMPLED WITHIN THE DASHED BOUNDARIES AND ALL BUILDING MATERIALS LOCATED OUTSIDE THE DASHED BOUNDARIES SHALL NEED TO BE TREATED AS POTENTIALLY HAZARDOUS MATERIALS, UNTIL EXAMINED BY AN ENVIRONMENTAL CONSULTANT AND LABORATORY RESULTS PROVE OTHERWISE.

 Asbestos & Environmental Consulting Corporation 6308 Fly Road East Syracuse, NY 13057	PROJECT NO. 20-146	Circleville Elementary School 2000 New York State Route 302 Circleville, New York 10919 Partial Second Floor Plan	FIGURE 5
	DRAWN: SEPT. 2020		
	DRAWN BY: NP	Limited Hazardous Material Pre-Renovation Survey	
	CHECKED BY: BB		



Limited Hazardous Material Pre-Renovation Survey Report

Pine Bush Central School District – 2019 CIP, Phase 2 Activities

Circleville Middle School
1951 NYS Route 302
Circleville, New York 10919

Prepared for:

Mr. Christopher M. Ladanyi, AIS
Clark Patterson Lee, Architecture, Engineering & Planning, P.C.
50 Front Street, Suite 202
Newburgh, New York 12550

Prepared by:

Asbestos & Environmental Consulting Corporation (AECC)
6308 Fly Road
East Syracuse, New York 13057



September 14, 2020

Mr. Christopher M. Ladanyi, AIS
Clark Patterson Lee, Architecture, Engineering & Planning, P.C.
50 Front Street, Suite 202
Newburgh, New York 12550

**RE: Limited Hazardous Material Pre-Renovation Survey Report
Pine Bush Central School District – 2019 CIP, Phase 2 Activities
Circleville Middle School – 1951 NYS Route 302, Circleville, New York 10919
AECC Project Number: 20-146**

Dear Mr. Ladanyi:

The Asbestos & Environmental Consulting Corporation (AECC) conducted a limited hazardous material pre-renovation survey at Circleville Middle School, located at 1951 New York State Route 302, in Circleville, New York. The survey was limited nature. Only specific areas anticipated to be impacted by proposed Phase II activities of the Pine Bush 2019 Capital Improvement Project were included, as per the direction of the Project Architect (CPL). The following sections summarize the results:

ASBESTOS PRE-RENOVATION SURVEY

The asbestos bulk samples were collected by Mr. Bruce Osterman, Mr. Nicholas Coulombe, Mr. Hayden Haas and Mr. Steven Martinez, New York State Department of Labor (NYSDOL)-certified Asbestos Building Inspectors. The following building materials were collected, labeled, and shipped to AmeriSci New York for laboratory analysis:

Table 1: Asbestos Bulk Sampling Summary

SAMPLE NUMBER	MATERIAL DESCRIPTION	SAMPLE LOCATION(S)	ASBESTOS CONTENT
CLK-001A,B	Window Caulk (Gray)	1 st Floor – Special Education 45 & Tech Laboratory 24	NAD
GLZ-002A,B	Window Glazing Compound (Black)	1 st Floor - Stairwell 1 & Stairwell 2	NAD
CLK-003A,B	Window Caulk (Gray)	1 st Floor - Classroom 104 & Classroom 151	NAD
VAP-004A,B	Vapor Barrier (Black)	1 st Floor - Library 144	NAD

Mr. Christopher M. Ladanyi, AIS
 Clark Patterson Lee, Architecture, Engineering & Planning, P.C.
Limited Hazardous Material Pre-Renovation Survey Report
Circleville Middle School – 1951 NYS Route 302, Circleville, New York 10919

Table 1: Asbestos Bulk Sampling Summary

SAMPLE NUMBER	MATERIAL DESCRIPTION	SAMPLE LOCATION(S)	ASBESTOS CONTENT
CLK-005A,B	Window Caulk (Black)	1 st Floor - Library 144	NAD
CB-006A,B	4" Cove Base (Black)	1 st Floor - South Link 100	NAD
CBM-007A,B	Cove Base Mastic (Tan)	1 st Floor - South Link 100	NAD
SR-008A,B	Sheetrock (Gray)	1 st Floor - South Link 100	NAD
JC-009A,B	Joint Compound (White)	1 st Floor - South Link 100	NAD
TRZO-010A,B	Terrazzo Flooring (White/Green)	1 st Floor - South Link 100	NAD
TECT-011A,B	Tectum Ceiling Panel (White)	1 st Floor - South Link 100	NAD
GLZ-012A,B	Window Glazing Compound (Black)	1st Floor - South Link 100	3.1% Chrysotile
CLK-013A,B	Window Caulk (Brown)	1 st Floor - South Link 100	NAD
CTT-014A,B	Ceramic Floor Tile Thin Set (Gray)	1 st Floor - Men's Toilet & Boys Bathroom 61	NAD
CTG-015A,B	Ceramic Floor Tile Grout (Gray)	1 st Floor - Men's Toilet & Boys Bathroom 61	NAD
ACT-016A,B	2'x4' Acoustical Ceiling Tile (White, Pinholes/Fissures)	1 st Floor - Men's Toilet & Boys Bathroom 61	NAD
CTG-017A,B	Ceramic Wall Tile Grout (White)	1 st Floor - Shower Room 84 & Drying Room 77	NAD
CTT-018A,B	Ceramic Wall Tile Thin Set (Gray)	1 st Floor - Shower Room 84 & Drying Room 77	NAD
PLB-019A,B,C	Plaster - Base Coat (Gray)	1 st Floor - Shower Room 84 & Drying Room 77	NAD
PLS-020A,B,C	Plaster - Skim Coat (White)	1 st Floor - Shower Room 84 & Drying Room 77	NAD
GLZ-021A,B	Window Glazing Compound (Brown)	1 st Floor – North Link 155	NAD

Table Notes:

NAD = No Asbestos Detected

Mr. Christopher M. Ladanyi, AIS
Clark Patterson Lee, Architecture, Engineering & Planning, P.C.
Limited Hazardous Material Pre-Renovation Survey Report
Circleville Middle School – 1951 NYS Route 302, Circleville, New York 10919

The following asbestos-containing material (ACM) was identified within the renovation areas during the completion of this survey:

Table 2: Approximate Quantity of ACM

ACM DESCRIPTION	ACM LOCATION(S)	ESTIMATED QUANTITY	MATERIAL CONDITION
Black Window Glazing Compound (GLZ-012)	1 st Floor – Cafeteria 42, South Link 100, Home Economics 52A, Home Economics 52B, Art 57, Art 58 & North Link 155	34 SF	NF, Intact

Table Notes:

SF = Square Feet

NF = Non-Friable

Asbestos Bulk Sampling Summary – By regulatory definition, a building material must be greater than one percent (1%) asbestos to be considered an asbestos-containing material (ACM). During this survey, black window glazing compound was determined to be an ACM by laboratory analysis. According to state and federal laws, ACMs and presumed asbestos-containing materials (PACMs) must be handled and disposed of by a licensed abatement contractor prior to any renovation or demolition-related activities. The associated laboratory analysis report has been included in Attachment B of this report.

Transmittal of Building / Structure Asbestos Survey Information – As required by New York State Industrial Code Rule 56, copies of this report shall be immediately transmitted by the building / structure owner (prior to any renovation-related activities), as follows:

- (1) One (1) copy of the completed asbestos survey shall be sent by the owner or their agent to the local entity charged with issuing a permit for such demolition, renovation, remodeling or repair work under state or local laws.
- (2) One (1) copy of completed asbestos survey shall be kept on the construction site with the asbestos notification and variance, if required, for the duration of the asbestos project and any associated demolition, renovation, remodeling or repair project.

LEAD-BASED PAINT INSPECTION

AECC's subcontractor, EcoSpect, Inc. (EcoSpect), performed a representative lead-based paint (LBP) inspection of the proposed renovation areas on August 31, 2020. During this inspection, LBP was identified on the following building substrates (number of positive readings in parentheses):

- Steel Window Moldings (4)
- Ceramic Walls (4)

Please reference EcoSpect's *XRF Lead Inspection* report (report dated September 10, 2020), found in Attachment C of this report, for additional details pertaining to the investigation techniques, sampling methodologies, and results from the lead-based paint inspection.

Mr. Christopher M. Ladanyi, AIS
 Clark Patterson Lee, Architecture, Engineering & Planning, P.C.
Limited Hazardous Material Pre-Renovation Survey Report
Circleville Middle School – 1951 NYS Route 302, Circleville, New York 10919

CAULK SAMPLING FOR PCBs

AECC collected representative building caulk applications from the proposed renovation areas and shipped them to Schneider Laboratories Global, Inc. for polychlorinated biphenyls (PCB) analysis. The following table summarizes the results:

Table 3: PCB Bulk Sampling Summary

SAMPLE NUMBER	CAULK DESCRIPTION	SAMPLE LOCATION	PCB CONTENT
CLK-001P	Window Caulk (Gray)	1 st Floor – Special Education 45	BRL
CLK-003P	Window Caulk (Gray)	1 st Floor - Classroom 104	BRL
CLK-005P	Window Caulk (Black)	1 st Floor - Library 144	BRL
CLK-013P	Window Caulk (Brown)	1 st Floor - South Link 100	BRL

Table Notes:

BRL = Below Reporting Limit

PCB Bulk Sampling Summary – By regulatory definition, a PCB-containing bulk material is defined as any building material containing at least 50 parts per million (ppm) of PCBs. The caulk applications collected during this survey are not PCB-containing bulk materials, as determined by laboratory analysis. The associated laboratory analysis report has been included in Attachment D of this report.

MISCELLANEOUS HAZARDOUS / SPECIAL WASTE INVENTORY

The following items were observed during AECC's survey of the proposed renovation areas and presumed to contain the specified hazardous / special wastes in the table below:

Table 4: Miscellaneous Hazardous / Special Waste Inventory

ITEM DESCRIPTION	ITEM LOCATION(S)	ESTIMATED COUNT	PRESUMED HAZ MATERIAL	ITEM CONDITION
Fluorescent Light Tubes / Bulbs	1 st Floor - South Link 100, Girl's Locker Room Areas, Boy's Locker Room Areas, Boys Bathroom 61, Girls Bathroom 62, Women's Toilet Room & Men's Toilet Room	132	Mercury	Intact
Light Ballasts		66	PCBs	Intact
Exit Signs (Bulbs & Batteries)	1 st Floor - South Link 100	2	Mercury, Lead	Intact

Mr. Christopher M. Ladanyi, AIS
Clark Patterson Lee, Architecture, Engineering & Planning, P.C.
Limited Hazardous Material Pre-Renovation Survey Report
Circleville Middle School – 1951 NYS Route 302, Circleville, New York 10919

Miscellaneous Hazardous / Special Wastes Summary – Additional investigation into the status of these materials / items may be performed to prove that hazardous materials are not present. However, without conducting this additional investigation, these materials must be presumed to contain potentially hazardous materials and handled / disposed of in accordance with all applicable state, federal, and local regulations.

Report Note – In the event that other building materials (materials not specifically identified in this report) are identified prior to or during the course of the renovation activities, the materials shall be presumed to be hazardous until examined by an appropriately certified individual and laboratory analysis proves otherwise.

If you have any questions pertaining to this report, please do not hesitate to contact me directly at AECC's corporate office (315-432-9400).

Sincerely,
Asbestos & Environmental Consulting Corporation



Bryan Bowers
President / Owner

Attachment A: AECC Company License & Personnel Certifications
Attachment B: Asbestos Bulk Sampling Laboratory Results
Attachment C: EcoSpect's *XRF Lead Inspection* Report
Attachment D: PCB Bulk Sampling Laboratory Results
Attachment E: Figures 1, 2, 3 & 4

ATTACHMENT A

AECC Company License & Personnel Certifications

New York State – Department of Labor

Division of Safety and Health
License and Certificate Unit
State Campus, Building 12
Albany, NY 12240

ASBESTOS HANDLING LICENSE

Asbestos & Environmental Consulting Corporation
6308 Fly Road
E. Syracuse, NY 13057

FILE NUMBER: 09-42909
LICENSE NUMBER: 42909
LICENSE CLASS: RESTRICTED
DATE OF ISSUE: 02/14/2020
EXPIRATION DATE: 02/28/2021

Duly Authorized Representative – Bryan Bowers:

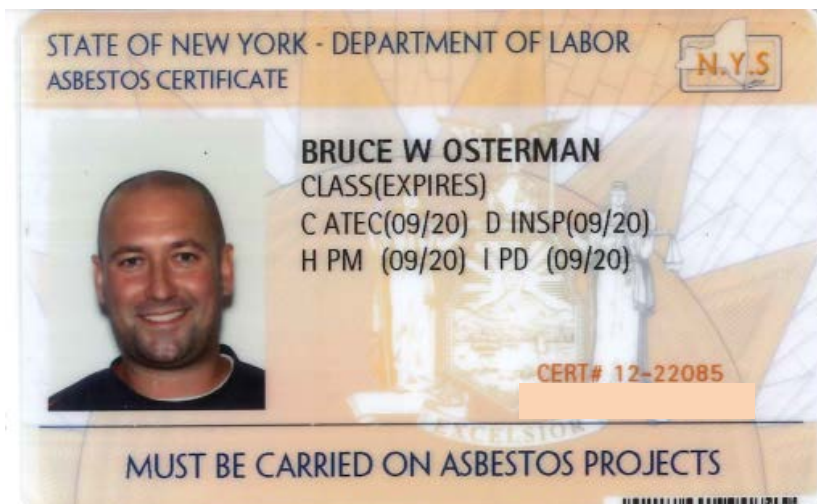
This license has been issued in accordance with applicable provisions of Article 30 of the Labor Law of New York State and of the New York State Codes, Rules and Regulations (12 NYCRR Part 56). It is subject to suspension or revocation for a (1) serious violation of state, federal or local laws with regard to the conduct of an asbestos project, or (2) demonstrated lack of responsibility in the conduct of any job involving asbestos or asbestos material.

This license is valid only for the contractor named above and this license or a photocopy must be prominently displayed at the asbestos project worksite. This license verifies that all persons employed by the licensee on an asbestos project in New York State have been issued an Asbestos Certificate, appropriate for the type of work they perform, by the New York State Department of Labor.



Eileen M. Franko, Director
For the Commissioner of Labor

ASBESTOS CERTIFICATION



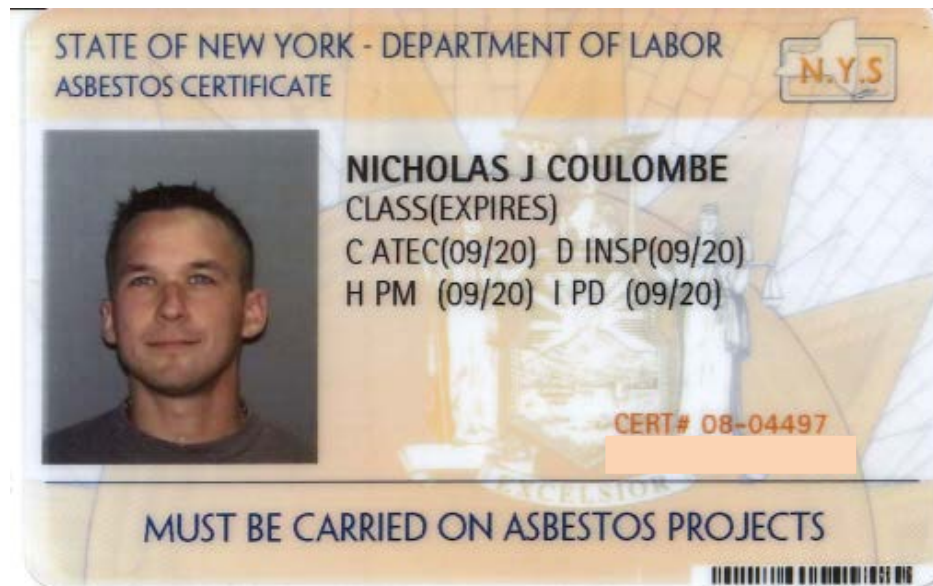
The following letter codes (as shown on the handling certificate) represent the corresponding asbestos classifications.

A – Asbestos Handler
B – Allied Trades
C – Air sampling Technician

D – Asbestos Inspector
E – Management Planner
F – Operations & Maintenance

G – Asbestos Supervisor
H – Asbestos Project Monitor
I – Asbestos Project Designer

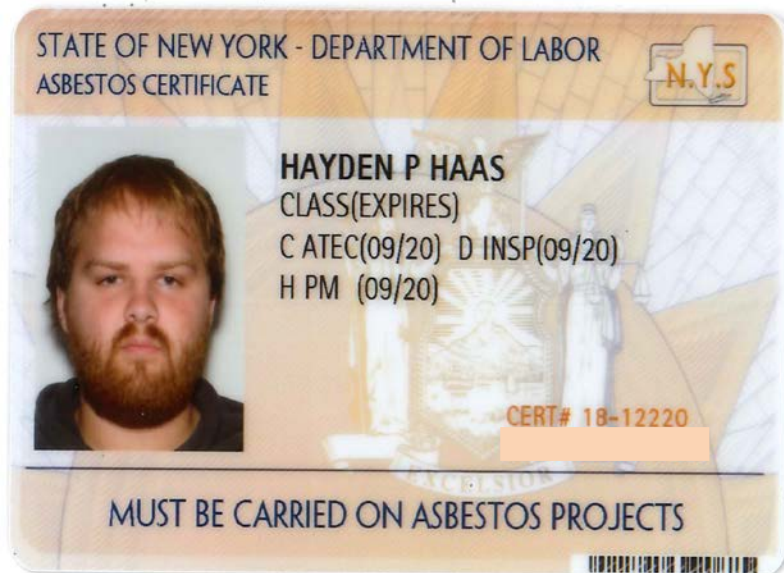
ASBESTOS CERTIFICATION



The following letter codes (as shown on the handling certificate) represent the corresponding asbestos classifications.

A – Asbestos Handler	D – Asbestos Inspector	G – Asbestos Supervisor
B – Allied Trades	E – Management Planner	H – Asbestos Project Monitor
C – Air sampling Technician	F – Operations & Maintenance	I – Asbestos Project Designer

ASBESTOS CERTIFICATION



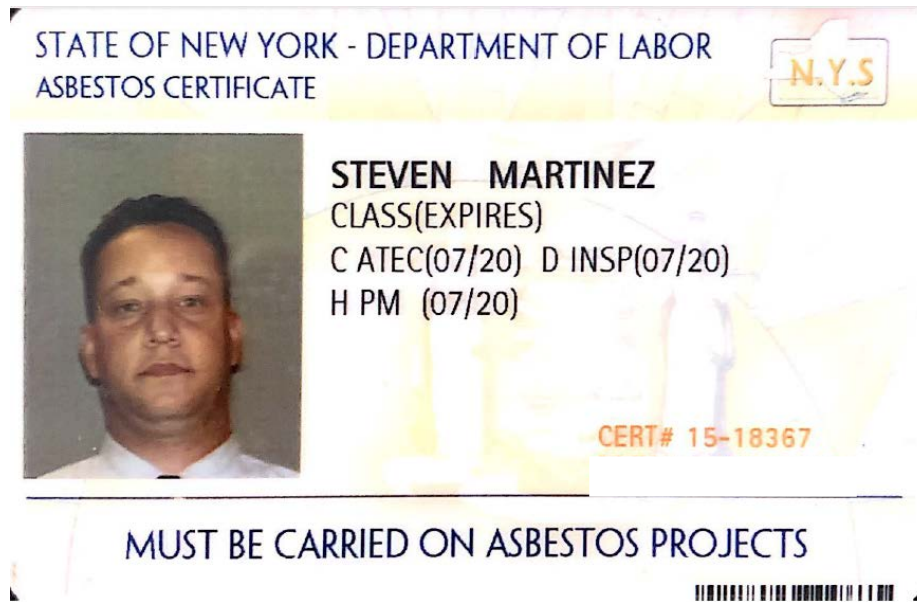
The following letter codes (as shown on the handling certificate) represent the corresponding asbestos classifications.

A – Asbestos Handler
B – Allied Trades
C – Air sampling Technician

D – Asbestos Inspector
E – Management Planner
F – Operations & Maintenance

G – Asbestos Supervisor
H – Asbestos Project Monitor
I – Asbestos Project Designer

ASBESTOS CERTIFICATION



The following letter codes (as shown on the handling certificate) represent the corresponding asbestos classifications.

A – Asbestos Handler	D – Asbestos Inspector	G – Asbestos Supervisor
B – Allied Trades	E – Management Planner	H – Asbestos Project Monitor
C – Air sampling Technician	F – Operations & Maintenance	I – Asbestos Project Designer

ATTACHMENT B

Asbestos Bulk Sampling Laboratory Results

**AmeriSci New York**

117 EAST 30TH ST.
NEW YORK, NY 10016
TEL: (212) 679-8600 • FAX: (212) 679-3114

PLM Bulk Asbestos Report

Asbestos & Environmental Consulting C
Attn: Bryan Bowers
6308 Fly Road

East Syracuse, NY 13057

Date Received 08/22/20 **AmeriSci Job #** 220083314
Date Examined 08/24/20 **P.O. #**
ELAP # 11480 **Page** 1 **of** 8
RE: 20-146; Clark Patterson Lee Architects; Circleville Middle
School, 1951 NY-302, Circleville, New York, 10919

Client No. / HGA	Lab No.	Asbestos Present	Total % Asbestos
CLK-001A 1	220083314-01 Location: Main Entrance & North Stairwell - Window - Window Caulk (Gray)	No	NAD ¹ (by NYS ELAP 198.6) by Valeriu Voicu on 08/24/20
Analyst Description: Grey, Homogeneous, Non-Fibrous, Bulk Material Asbestos Types: Other Material: Non-fibrous 48.9 %			
CLK-001B 1	220083314-02 Location: Main Entrance & North Stairwell - Window - Window Caulk (Gray)	No	NAD (by NYS ELAP 198.6) by Valeriu Voicu on 08/24/20
Analyst Description: Grey, Homogeneous, Non-Fibrous, Bulk Material Asbestos Types: Other Material: Non-fibrous 37.5 %			
GLZ-002A 2	220083314-03 Location: Stairwell - Window - Window Glazing Compound (Black)	No	NAD (by NYS ELAP 198.6) by Valeriu Voicu on 08/25/20
Analyst Description: Black, Homogeneous, Non-Fibrous, Bulk Material Asbestos Types: Other Material: Non-fibrous 34.6 %			
GLZ-002B 2	220083314-04 Location: Stairwell - Window - Window Glazing Compound (Black)	No	NAD (by NYS ELAP 198.6) by Valeriu Voicu on 08/25/20
Analyst Description: Black, Homogeneous, Non-Fibrous, Bulk Material Asbestos Types: Other Material: Non-fibrous 31.3 %			
CLK-003A 3	220083314-05 Location: Classroom 104 - Window - Window Caulk (Gray)	No	NAD (by NYS ELAP 198.6) by Valeriu Voicu on 08/25/20
Analyst Description: Dark Brown, Homogeneous, Non-Fibrous, Bulk Material Asbestos Types: Other Material: Fibrous Talc Trace, Non-fibrous 18.5 %			

Client Name: Asbestos & Environmental Consulting Corp.

PLM Bulk Asbestos Report

20-146; Clark Patterson Lee Architects; Circleville Middle School, 1951 NY-302, Circleville, New York, 10919

Client No. / HGA	Lab No.	Asbestos Present	Total % Asbestos
CLK-003B 3	220083314-06 Location: Classroom 104 - Window - Window Caulk (Gray)	No	NAD (by NYS ELAP 198.6) by Valeriu Voicu on 08/25/20
Analyst Description: Dark Brown, Homogeneous, Non-Fibrous, Bulk Material Asbestos Types: Other Material: Non-fibrous 20.8 %			
VAP-004A 4	220083314-07 Location: Library - Window - Vapor Barrier (Black)	No	NAD (by NYS ELAP 198.6) by Valeriu Voicu on 08/25/20
Analyst Description: Silver/Black, Heterogeneous, Non-Fibrous, Bulk Material Asbestos Types: Other Material: Non-fibrous 45.2 %			
VAP-004B 4	220083314-08 Location: Library - Window - Vapor Barrier (Black)	No	NAD (by NYS ELAP 198.6) by Valeriu Voicu on 08/25/20
Analyst Description: Silver/Black, Heterogeneous, Non-Fibrous, Bulk Material Asbestos Types: Other Material: Non-fibrous 47.7 %			
CLK-005A 5	220083314-09 Location: Library - Window - Window Caulk (Black)	No	NAD (by NYS ELAP 198.6) by Valeriu Voicu on 08/25/20
Analyst Description: Dark Brown, Homogeneous, Non-Fibrous, Bulk Material Asbestos Types: Other Material: Non-fibrous 11.7 %			
CLK-005B 5	220083314-10 Location: Library - Window - Window Caulk (Black)	No	NAD (by NYS ELAP 198.6) by Valeriu Voicu on 08/25/20
Analyst Description: Dark Brown, Homogeneous, Non-Fibrous, Bulk Material Asbestos Types: Other Material: Non-fibrous 23.8 %			
CB-006A 6	220083314-11 Location: South Entry 100 - 4" Cove Base (Black)	No	NAD (by NYS ELAP 198.6) by Valeriu Voicu on 08/25/20
Analyst Description: Black, Homogeneous, Non-Fibrous, Bulk Material Asbestos Types: Other Material: Non-fibrous 26.1 %			

Client Name: Asbestos & Environmental Consulting Corp.

PLM Bulk Asbestos Report

20-146; Clark Patterson Lee Architects; Circleville Middle School, 1951 NY-302, Circleville, New York, 10919

Client No. / HGA	Lab No.	Asbestos Present	Total % Asbestos
CB-006B 6	220083314-12 Location: South Entry 100 - 4" Cove Base (Black)	No	NAD (by NYS ELAP 198.6) by Valeriu Voicu on 08/25/20
Analyst Description: Black, Homogeneous, Non-Fibrous, Bulk Material Asbestos Types: Other Material: Non-fibrous 11.3 %			
CBM-007A 7	220083314-13 Location: South Entry 100 - Cove Base Mastic (Tan)	No	NAD (by NYS ELAP 198.6) by Valeriu Voicu on 08/25/20
Analyst Description: Beige, Homogeneous, Non-Fibrous, Bulk Material Asbestos Types: Other Material: Non-fibrous 6.9 %			
CBM-007B 7	220083314-14 Location: South Entry 100 - Cove Base Mastic (Tan)	No	NAD (by NYS ELAP 198.6) by Valeriu Voicu on 08/25/20
Analyst Description: Beige, Homogeneous, Non-Fibrous, Bulk Material Asbestos Types: Other Material: Non-fibrous 13.1 %			
SR-008A 8	220083314-15 Location: South Entry 100 - Sheetrock (Gray)	No	NAD (by NYS ELAP 198.1) by Valeriu Voicu on 08/25/20
Analyst Description: White/Brown, Heterogeneous, Fibrous, Bulk Material Asbestos Types: Other Material: Cellulose 10 %, Non-fibrous 90 %			
SR-008B 8	220083314-16 Location: South Entry 100 - Sheetrock (Gray)	No	NAD (by NYS ELAP 198.1) by Valeriu Voicu on 08/25/20
Analyst Description: White, Homogeneous, Fibrous, Bulk Material Asbestos Types: Other Material: Cellulose 2 %, Non-fibrous 98 %			
JC-009A 9	220083314-17 Location: South Entry 100 - Joint Compound (White)	No	NAD (by NYS ELAP 198.1) by Valeriu Voicu on 08/25/20
Analyst Description: White, Homogeneous, Non-Fibrous, Bulk Material Asbestos Types: Other Material: Cellulose Trace, Non-fibrous 100 %			

Client Name: Asbestos & Environmental Consulting Corp.

PLM Bulk Asbestos Report

20-146; Clark Patterson Lee Architects; Circleville Middle School, 1951 NY-302, Circleville, New York, 10919

Client No. / HGA	Lab No.	Asbestos Present	Total % Asbestos
JC-009B 9	220083314-18 Location: South Entry 100 - Joint Compound (White)	No	NAD (by NYS ELAP 198.1) by Valeriu Voicu on 08/25/20
Analyst Description: White, Homogeneous, Non-Fibrous, Bulk Material Asbestos Types: Other Material: Cellulose Trace, Non-fibrous 100 %			
TRZO-010A 10	220083314-19 Location: South Entry 100 - Terrazzo Flooring	No	NAD (by NYS ELAP 198.1) by Valeriu Voicu on 08/25/20
Analyst Description: White/Green, Homogeneous, Non-Fibrous, Bulk Material Asbestos Types: Other Material: Non-fibrous 100 %			
TRZO-010B 10	220083314-20 Location: South Entry 100 - Terrazzo Flooring	No	NAD (by NYS ELAP 198.1) by Valeriu Voicu on 08/25/20
Analyst Description: White/Green, Homogeneous, Non-Fibrous, Bulk Material Asbestos Types: Other Material: Non-fibrous 100 %			
TECT-011A 11	220083314-21 Location: South Entry 100 - Tectum Ceiling Panel (White)	No	NAD (by NYS ELAP 198.6) by Valeriu Voicu on 08/25/20
Analyst Description: White/Beige, Homogeneous, Non-Fibrous, Bulk Material Asbestos Types: Other Material: Non-fibrous 8.3 %			
TECT-011B 11	220083314-22 Location: South Entry 100 - Tectum Ceiling Panel (White)	No	NAD (by NYS ELAP 198.6) by Valeriu Voicu on 08/25/20
Analyst Description: White/Beige, Homogeneous, Non-Fibrous, Bulk Material Asbestos Types: Other Material: Non-fibrous 8.2 %			
GLZ-012A 12	220083314-23 Location: South Entry 100 - Window Glazing Compound (Black)	Yes	3.1 % (by NYS ELAP 198.6) by Valeriu Voicu on 08/25/20
Analyst Description: Black, Homogeneous, Fibrous, Bulk Material Asbestos Types: Chrysotile 3.1 % Other Material: Non-fibrous 28.5 %			

Client Name: Asbestos & Environmental Consulting Corp.

PLM Bulk Asbestos Report

20-146; Clark Patterson Lee Architects; Circleville Middle School, 1951 NY-302, Circleville, New York, 10919

Client No. / HGA	Lab No.	Asbestos Present	Total % Asbestos
GLZ-012B 12	220083314-24 Location: South Entry 100 - Window Glazing Compound (Black)		NA/PS
Analyst Description: Bulk Material Asbestos Types: Other Material:			
CLK-013A 13	220083314-25 Location: South Entry 100 - Window Glazing (Brown)	No	NAD (by NYS ELAP 198.6) by Valeriu Voicu on 08/25/20
Analyst Description: Dark Brown, Homogeneous, Non-Fibrous, Bulk Material Asbestos Types: Other Material: Non-fibrous 23.4 %			
CLK-013B 13	220083314-26 Location: South Entry 100 - Window Glazing (Brown)	No	NAD (by NYS ELAP 198.6) by Valeriu Voicu on 08/25/20
Analyst Description: Dark Brown, Homogeneous, Non-Fibrous, Bulk Material Asbestos Types: Other Material: Non-fibrous 23.3 %			
CTT-014A 14	220083314-27 Location: Men's Toilet & Boy's 61 - Ceramic Floor Tile Thinset (Gray)	No	NAD (by NYS ELAP 198.1) by Valeriu Voicu on 08/25/20
Analyst Description: Grey, Homogeneous, Non-Fibrous, Cementitious, Bulk Material Asbestos Types: Other Material: Cellulose Trace, Non-fibrous 100 %			
CTT-014B 14	220083314-28 Location: Men's Toilet & Boy's 61 - Ceramic Floor Tile Thinset (Gray)	No	NAD (by NYS ELAP 198.1) by Valeriu Voicu on 08/25/20
Analyst Description: Grey, Homogeneous, Non-Fibrous, Cementitious, Bulk Material Asbestos Types: Other Material: Cellulose Trace, Non-fibrous 100 %			
CTG-015A 15	220083314-29 Location: Men's Toilet & Boy's 61 - Ceramic Floor Tile Grout (Gray)	No	NAD (by NYS ELAP 198.1) by Valeriu Voicu on 08/25/20
Analyst Description: Grey, Homogeneous, Non-Fibrous, Cementitious, Bulk Material Asbestos Types: Other Material: Cellulose Trace, Non-fibrous 100 %			

Client Name: Asbestos & Environmental Consulting Corp.

PLM Bulk Asbestos Report20-146; Clark Patterson Lee Architects; Circleville Middle
School, 1951 NY-302, Circleville, New York, 10919

Client No. / HGA	Lab No.	Asbestos Present	Total % Asbestos
CTG-015B 15	220083314-30 Location: Men's Toilet & Boy's 61 - Ceramic Floor Tile Grout (Gray)	No	NAD (by NYS ELAP 198.1) by Valeriu Voicu on 08/25/20
Analyst Description: Grey, Homogeneous, Non-Fibrous, Cementitious, Bulk Material Asbestos Types: Other Material: Cellulose Trace, Non-fibrous 100 %			
ACT-016A 16	220083314-31 Location: Men's Toilet & Boy's 61 - 2' x 4' Pinhole/Fissured Ceiling Tile (White)	No	NAD (by NYS ELAP 198.6) by Valeriu Voicu on 08/25/20
Analyst Description: White/Beige, Homogeneous, Non-Fibrous, Bulk Material Asbestos Types: Other Material: Non-fibrous 39.5 %			
ACT-016B 16	220083314-32 Location: Men's Toilet & Boy's 61 - 2' x 4' Pinhole/Fissured Ceiling Tile (White)	No	NAD (by NYS ELAP 198.6) by Valeriu Voicu on 08/25/20
Analyst Description: White/Beige, Homogeneous, Non-Fibrous, Bulk Material Asbestos Types: Other Material: Non-fibrous 40.6 %			
CTB-017A 17	220083314-33 Location: Boy's Locker Room 85 & Girl's Locker Room 75 - Ceramic Wall Tile Grout (White)	No	NAD (by NYS ELAP 198.1) by Valeriu Voicu on 08/25/20
Analyst Description: White, Homogeneous, Non-Fibrous, Bulk Material Asbestos Types: Other Material: Cellulose Trace, Non-fibrous 100 %			
CTB-017B 17	220083314-34 Location: Boy's Locker Room 85 & Girl's Locker Room 75 - Ceramic Wall Tile Grout (White)	No	NAD (by NYS ELAP 198.1) by Valeriu Voicu on 08/25/20
Analyst Description: White, Homogeneous, Non-Fibrous, Bulk Material Asbestos Types: Other Material: Cellulose Trace, Non-fibrous 100 %			
CTT-018A 18	220083314-35 Location: Boy's Locker Room 85 & Girl's Locker Room 75 - Ceramic Wall Tile Thinset (Gray)	No	NAD (by NYS ELAP 198.1) by Valeriu Voicu on 08/25/20
Analyst Description: White, Homogeneous, Non-Fibrous, Cementitious, Bulk Material Asbestos Types: Other Material: Cellulose Trace, Non-fibrous 100 %			

Client Name: Asbestos & Environmental Consulting Corp.

PLM Bulk Asbestos Report20-146; Clark Patterson Lee Architects; Circleville Middle
School, 1951 NY-302, Circleville, New York, 10919

Client No. / HGA	Lab No.	Asbestos Present	Total % Asbestos
CTT-018B 18	220083314-36 Location: Boy's Locker Room 85 & Girl's Locker Room 75 - Ceramic Wall Tile Thinset (Gray)	No	NAD (by NYS ELAP 198.1) by Valeriu Voicu on 08/25/20
Analyst Description: White, Homogeneous, Non-Fibrous, Cementitious, Bulk Material Asbestos Types: Other Material: Cellulose Trace, Non-fibrous 100 %			
PLB-019A 19	220083314-37 Location: Boy's Locker Room 85 & Girl's Locker Room 75 - Plaster Base Coat (Gray)	No	NAD (by NYS ELAP 198.1) by Valeriu Voicu on 08/25/20
Analyst Description: Grey, Homogeneous, Non-Fibrous, Cementitious, Bulk Material Asbestos Types: Other Material: Cellulose Trace, Non-fibrous 100 %			
PLB-019B 19	220083314-38 Location: Boy's Locker Room 85 & Girl's Locker Room 75 - Plaster Base Coat (Gray)	No	NAD (by NYS ELAP 198.1) by Valeriu Voicu on 08/25/20
Analyst Description: Grey, Homogeneous, Non-Fibrous, Cementitious, Bulk Material Asbestos Types: Other Material: Cellulose Trace, Non-fibrous 100 %			
PLB-019C 19	220083314-39 Location: Boy's Locker Room 85 & Girl's Locker Room 75 - Plaster Base Coat (Gray)	No	NAD (by NYS ELAP 198.1) by Valeriu Voicu on 08/25/20
Analyst Description: Grey, Homogeneous, Non-Fibrous, Cementitious, Bulk Material Asbestos Types: Other Material: Cellulose Trace, Non-fibrous 100 %			
PLS-020A 20	220083314-40 Location: Boy's Locker Room 85 & Girl's Locker Room 75 - Plaster Base Coat (White)	No	NAD (by NYS ELAP 198.1) by Valeriu Voicu on 08/25/20
Analyst Description: White, Homogeneous, Non-Fibrous, Bulk Material Asbestos Types: Other Material: Non-fibrous 100 %			
PLS-020B 20	220083314-41 Location: Boy's Locker Room 85 & Girl's Locker Room 75 - Plaster Base Coat (White)	No	NAD (by NYS ELAP 198.1) by Valeriu Voicu on 08/25/20
Analyst Description: White, Homogeneous, Non-Fibrous, Bulk Material Asbestos Types: Other Material: Cellulose Trace, Non-fibrous 100 %			

Client Name: Asbestos & Environmental Consulting Corp.

PLM Bulk Asbestos Report

20-146; Clark Patterson Lee Architects; Circleville Middle School, 1951 NY-302, Circleville, New York, 10919

Client No. / HGA	Lab No.	Asbestos Present	Total % Asbestos
PLS-020C 20	220083314-42	No	NAD
Location: Boy's Locker Room 85 & Girl's Locker Room 75 - Plaster Base Coat (White)			(by NYS ELAP 198.1) by Valeriu Voicu on 08/25/20
Analyst Description: White, Homogeneous, Non-Fibrous, Bulk Material			
Asbestos Types:			
Other Material: Non-fibrous 100 %			
GLZ-021A 21	220083314-43	No	NAD
Location: North Hallway Room 155 - Window Glazing Compound (Brown)			(by NYS ELAP 198.6) by Valeriu Voicu on 08/25/20
Analyst Description: Brown, Homogeneous, Non-Fibrous, Bulk Material			
Asbestos Types:			
Other Material: Fibrous Talc Trace, Non-fibrous 31.3 %			
GLZ-021B 21	220083314-44	No	NAD
Location: North Hallway Room 155 - Window Glazing Compound (Brown)			(by NYS ELAP 198.6) by Valeriu Voicu on 08/25/20
Analyst Description: Brown, Homogeneous, Non-Fibrous, Bulk Material			
Asbestos Types:			
Other Material: Non-fibrous 32.4 %			

Reporting Notes:

(1) This PLM job was analyzed using Olympus BH-2 Pol Scope S/N 229915

Analyzed by: Valeriu Voicu 

*NAD/NSD =no asbestos detected; NA =not analyzed; NA/PS=not analyzed/positive stop, (SOF-V) = Sprayed On Fireproofing containing Vermiculite; (SM-V) = Surfacing Material containing Vermiculite; PLM Bulk Asbestos Analysis by Appd E to Subpt E, 40 CFR 763 (NVLAP 200546-0), ELAP PLM Method 198.1 for NY friable samples, which includes the identification and quantitation of vermiculite or ELAP 198.6 for NOB samples or EPA 400 pt ct by EPA 600-M4-82-020 (NY ELAP Lab 11480); Note:PLM is not consistently reliable in detecting asbestos in floor coverings and similar non-friable organically bound materials. NAD or Trace results by PLM are inconclusive, TEM is currently the only method that can be used to determine if this material can be considered or treated as non asbestos-containing in NY State (also see EPA Advisory for floor tile, FR 59,146,38970,8/1/94) National Institute of Standards and Technology Accreditation requirements mandate that this report must not be reproduced except in full without the approval of the lab. This PLM report relates ONLY to the items tested. AIHA-LAP, LLC Lab ID 102843, RI Cert AAL-094, CT Cert PH-0186, Mass Cert AA000054.

Reviewed By: 

END OF REPORT

Client Name: Asbestos & Environmental Consulting Corp.

Table I
Summary of Bulk Asbestos Analysis Results

20-146; Clark Patterson Lee Architects; Circleville Middle School, 1951 NY-302, Circleville, New York, 10919

AmeriSci Sample #	Client Sample#	HG Area	Sample Weight (gram)	Heat Sensitive Organic %	Acid Soluble Inorganic %	Insoluble Non-Asbestos Inorganic %	** Asbestos % by PLM/DS	** Asbestos % by TEM
01	CLK-001A	1	0.227	20.2	31.0	48.9	NAD	NAD
Location: Main Entrance & North Stairwell - Window - Window Caulk (Gray)								
02	CLK-001B	1	0.234	34.2	28.3	37.5	NAD	NAD
Location: Main Entrance & North Stairwell - Window - Window Caulk (Gray)								
03	GLZ-002A	2	0.137	44.4	21.0	34.6	NAD	NAD
Location: Stairwell - Window - Window Glazing Compound (Black)								
04	GLZ-002B	2	0.132	28.4	40.3	31.3	NAD	NAD
Location: Stairwell - Window - Window Glazing Compound (Black)								
05	CLK-003A	3	0.153	37.9	43.6	18.5	NAD	NAD
Location: Classroom 104 - Window - Window Caulk (Gray)								
06	CLK-003B	3	0.147	36.7	42.5	20.8	NAD	NAD
Location: Classroom 104 - Window - Window Caulk (Gray)								
07	VAP-004A	4	0.183	10.0	44.7	45.2	NAD	NAD
Location: Library - Window - Vapor Barrier (Black)								
08	VAP-004B	4	0.497	10.7	41.7	47.7	NAD	NAD
Location: Library - Window - Vapor Barrier (Black)								
09	CLK-005A	5	0.125	83.8	4.6	11.7	NAD	NAD
Location: Library - Window - Window Caulk (Black)								
10	CLK-005B	5	0.122	57.3	18.9	23.8	NAD	NAD
Location: Library - Window - Window Caulk (Black)								
11	CB-006A	6	0.206	37.4	36.5	26.1	NAD	NAD
Location: South Entry 100 - 4" Cove Base (Black)								
12	CB-006B	6	0.221	57.7	31.0	11.3	NAD	NAD
Location: South Entry 100 - 4" Cove Base (Black)								
13	CBM-007A	7	0.232	38.4	54.6	6.9	NAD	NAD
Location: South Entry 100 - Cove Base Mastic (Tan)								
14	CBM-007B	7	0.291	48.1	38.8	13.1	NAD	NAD
Location: South Entry 100 - Cove Base Mastic (Tan)								
15	SR-008A	8	----	----	----	----	NAD	NA
Location: South Entry 100 - Sheetrock (Gray)								
16	SR-008B	8	----	----	----	----	NAD	NA
Location: South Entry 100 - Sheetrock (Gray)								

See Reporting notes on last page

Client Name: Asbestos & Environmental Consulting Corp.

Table I
Summary of Bulk Asbestos Analysis Results

20-146; Clark Patterson Lee Architects; Circleville Middle School, 1951 NY-302, Circleville, New York, 10919

AmeriSci Sample #	Client Sample#	HG Area	Sample Weight (gram)	Heat Sensitive Organic %	Acid Soluble Inorganic %	Insoluble Non-Asbestos Inorganic %	** Asbestos % by PLM/DS	** Asbestos % by TEM
17	JC-009A	9	----	----	----	----	NAD	NA
Location: South Entry 100 - Joint Compound (White)								
18	JC-009B	9	----	----	----	----	NAD	NA
Location: South Entry 100 - Joint Compound (White)								
19	TRZO-010A	10	----	----	----	----	NAD	NA
Location: South Entry 100 - Terrazzo Flooring								
20	TRZO-010B	10	----	----	----	----	NAD	NA
Location: South Entry 100 - Terrazzo Flooring								
21	TECT-011A	11	0.064	58.8	32.9	8.3	NAD	NAD
Location: South Entry 100 - Tectum Ceiling Panel (White)								
22	TECT-011B	11	0.151	59.2	32.6	8.2	NAD	NA
Location: South Entry 100 - Tectum Ceiling Panel (White)								
23	GLZ-012A	12	0.231	48.2	20.2	28.5	Chrysotile 3.1	NA
Location: South Entry 100 - Window Glazing Compound (Black)								
24	GLZ-012B	12	0.157	47.6	20.6	31.7	NA/PS	NA
Location: South Entry 100 - Window Glazing Compound (Black)								
25	CLK-013A	13	0.140	50.0	26.6	23.4	NAD	NAD
Location: South Entry 100 - Window Glazing (Brown)								
26	CLK-013B	13	0.156	51.9	24.8	23.3	NAD	NAD
Location: South Entry 100 - Window Glazing (Brown)								
27	CTT-014A	14	----	----	----	----	NAD	NA
Location: Men's Toilet & Boy's 61 - Ceramic Floor Tile Thinset (Gray)								
28	CTT-014B	14	----	----	----	----	NAD	NA
Location: Men's Toilet & Boy's 61 - Ceramic Floor Tile Thinset (Gray)								
29	CTG-015A	15	----	----	----	----	NAD	NA
Location: Men's Toilet & Boy's 61 - Ceramic Floor Tile Grout (Gray)								
30	CTG-015B	15	----	----	----	----	NAD	NA
Location: Men's Toilet & Boy's 61 - Ceramic Floor Tile Grout (Gray)								
31	ACT-016A	16	0.142	29.9	30.7	39.5	NAD	NAD
Location: Men's Toilet & Boy's 61 - 2' x 4' Pinhole/Fissured Ceiling Tile (White)								
32	ACT-016B	16	0.100	22.7	36.7	40.6	NAD	NAD
Location: Men's Toilet & Boy's 61 - 2' x 4' Pinhole/Fissured Ceiling Tile (White)								

See Reporting notes on last page

Client Name: Asbestos & Environmental Consulting Corp.

Table I
Summary of Bulk Asbestos Analysis Results

20-146; Clark Patterson Lee Architects; Circleville Middle School, 1951 NY-302, Circleville, New York, 10919

AmeriSci Sample #	Client Sample#	HG Area	Sample Weight (gram)	Heat Sensitive Organic %	Acid Soluble Inorganic %	Insoluble Non-Asbestos Inorganic %	** Asbestos % by PLM/DS	** Asbestos % by TEM
33	CTB-017A	17	----	----	----	----	NAD	NA
Location: Boy's Locker Room 85 & Girl's Locker Room 75 - Ceramic Wall Tile Grout (White)								
34	CTB-017B	17	----	----	----	----	NAD	NA
Location: Boy's Locker Room 85 & Girl's Locker Room 75 - Ceramic Wall Tile Grout (White)								
35	CTT-018A	18	----	----	----	----	NAD	NA
Location: Boy's Locker Room 85 & Girl's Locker Room 75 - Ceramic Wall Tile Thinset (Gray)								
36	CTT-018B	18	----	----	----	----	NAD	NA
Location: Boy's Locker Room 85 & Girl's Locker Room 75 - Ceramic Wall Tile Thinset (Gray)								
37	PLB-019A	19	----	----	----	----	NAD	NA
Location: Boy's Locker Room 85 & Girl's Locker Room 75 - Plaster Base Coat (Gray)								
38	PLB-019B	19	----	----	----	----	NAD	NA
Location: Boy's Locker Room 85 & Girl's Locker Room 75 - Plaster Base Coat (Gray)								
39	PLB-019C	19	----	----	----	----	NAD	NA
Location: Boy's Locker Room 85 & Girl's Locker Room 75 - Plaster Base Coat (Gray)								
40	PLS-020A	20	----	----	----	----	NAD	NA
Location: Boy's Locker Room 85 & Girl's Locker Room 75 - Plaster Base Coat (White)								
41	PLS-020B	20	----	----	----	----	NAD	NA
Location: Boy's Locker Room 85 & Girl's Locker Room 75 - Plaster Base Coat (White)								
42	PLS-020C	20	----	----	----	----	NAD	NA
Location: Boy's Locker Room 85 & Girl's Locker Room 75 - Plaster Base Coat (White)								
43	GLZ-021A	21	0.169	36.2	32.5	31.3	NAD	NAD
Location: North Hallway Room 155 - Window Glazing Compound (Brown)								
44	GLZ-021B	21	0.141	36.5	31.2	32.4	NAD	NAD
Location: North Hallway Room 155 - Window Glazing Compound (Brown)								

Client Name: Asbestos & Environmental Consulting Corp.

Table I
Summary of Bulk Asbestos Analysis Results

20-146; Clark Patterson Lee Architects; Circleville Middle School, 1951 NY-302, Circleville, New York, 10919

AmeriSci Sample #	Client Sample#	HG Area	Sample Weight (gram)	Heat Sensitive Organic %	Acid Soluble Inorganic %	Insoluble Non-Asbestos Inorganic %	** Asbestos % by PLM/DS	** Asbestos % by TEM
----------------------	----------------	------------	----------------------------	--------------------------------	--------------------------------	--	----------------------------	-------------------------

Analyzed by: A Barengolts-Hitachi#542/Noran ; Date Analyzed 8/26/2020

**Quantitative Analysis (Semi/Full); Bulk Asbestos Analysis - PLM by Appd E to Subpt E, 40 CFR 763 or NYSDOH ELAP 198.1 for New York friable samples or NYSDOH ELAP 198.6 for New York NOB samples; TEM (Semi/Full) by EPA 600/R-93/116 (or NYSDOH ELAP 198.4; for New York samples); NAD = no asbestos detected during a quantitative analysis; NA = not analyzed; Trace = <1%; (SOF-V) = Sprayed On Fireproofing containing Vermiculite; (SM-V) = Surfacing Material containing Vermiculite; Quantitation for beginning weights of <0.1 grams should be considered as qualitative only; Qualitative Analysis: Asbestos analysis results of "Present" or "NVA = No Visible Asbestos" represents results for Qualitative PLM or TEM Analysis only (no accreditation coverage available from any regulatory agency for qualitative analyses); NVLAP (PLM) 200546-0, NYSDOH ELAP Lab 11480, AIHA-LAP, LLC (PLM) Lab ID 102843.

Warning Note: PLM limitation, only TEM will resolve fibers <0.25 micrometers in diameter. TEM bulk analysis is representative of the fine grained matrix material and may not be representative of non-uniformly dispersed debris for which PLM evaluation is recommended (i.e. soils and other heterogenous materials).

Reviewed By: 



#220083314

Asbestos Bulk Sample Chain of Custody

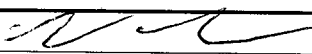
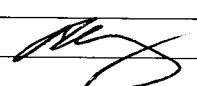
Project No. 20-146
Client Clark Patterson Lee Architects
Address **Circleville Middle School**
1951 NY-302, Circleville, New York 10919

AECC Contact: Bryan Bowers
Office Phone: 315-432-9400
Office Fax: 315-432-9405
E-mail: labdata@aeccgroup.com

Sample ID	Material Description	Sample Location
CLK-001A,B	Window Caulk (Gray)	Main Entrance & North Stairwell – Window
GLZ-002A,B	Window Glazing Compound (Black)	Stairwell – Window
CLK-003A,B	Window Caulk (Gray)	Classroom 104 – Window
VAP-004A,B	Vapor Barrier (Black)	Library - Window
CLK-005A,B	Window Caulk (Black)	Library – Window
CB-006A,B	4" Cove Base (Black)	South Entry 100
CBM-007A,B	Cove Base Mastic (Tan)	South Entry 100
SR-008A,B	Sheetrock (Gray)	South Entry 100
JC-009A,B	Joint Compound (White)	South Entry 100
TRZO-010A,B	Terrazzo Flooring	South Entry 100
TECT-011A,B	Tectum Ceiling Panel (White)	South Entry 100
GLZ-012A,B	Window Glazing Compound (Black)	South Entry 100
CLK-013A,B	Window Caulk (Brown)	South Entry 100
CTT-014A,B	Ceramic Floor Tile Thinset (Gray)	Men's Toilet & Boy's 61
CTG-015A,B	Ceramic Floor Tile Grout (Gray)	Men's Toilet & Boy's 61
ACT-016A,B	2'x4' Pinhole/Fissured Ceiling Tile (White)	Men's Toilet & Boy's 61
CTG-017A,B	Ceramic Wall Tile Grout (White)	Boy's Locker Room 85 & Girl's Locker Room 75
CTT-018A,B	Ceramic Wall Tile Thinset (Gray)	Boy's Locker Room 85 & Girl's Locker Room 75
PLB-019A,B,C	Plaster Base Coat (Gray)	Boy's Locker Room 85 & Girl's Locker Room 75
PLS-020A,B,C	Plaster Skim Coat (White)	Boy's Locker Room 85 & Girl's Locker Room 75
GLZ-021A,B	Window Glazing Compound (Brown)	North Hallway Room 155

- Analyzing Sequence:
- 1 - Separate layers/mastics for individual analysis, if applicable.
 - 2 - Determine method of analysis for PLM (198.1 or 198.6).
 - 3 - If the PLM NOB result is equal to or greater than 1% asbestos, testing of material is complete.
If the PLM NOB result is less than 1% asbestos, please analyze utilizing TEM.
 - 4 - If submitted in series (A, B, C), please stop at first positive.
 - 5 - Report results as % Asbestos via e-mail.

Sample Turnaround Time: 5 Day Verbal To: _____ Phone: _____

Sampled By: 	Date: 8/20/20
Shipped By:	Date:
Received By Lab: 	Date: 8/22/2020 1150
Results e-mailed By:	Date:

ATTACHMENT C

EcoSpect's XRF Lead Inspection Report



Healthy Basement. Healthy Home.

XRF Lead Inspection

Project:

Circleville Middle
1951 NY-302
Circleville, NY 10919

Date Tested:

8/31/2020

Prepared by:

Daryl Heffron
Ecospect, Inc.
5785 State Route 96, PO Box 25,
Romulus, NY 14541

Prepared For:

AECC
East Syracuse, NY 13057
6308 Fly Road

9/10/2020



9/10/2020

To:

Nick Columbe

AECC

6308 Fly Road, East Syracuse, NY 13057

East Syracuse, NY 13057

RE: Circleville Middle

1951 NY-302

Circleville, NY 10919

Dear Nick :

On August 31, 2020, EcoSpect, Inc. conducted XRF testing for the presence of lead-based paint, as directed by AECC, at the above captioned location.

The instruments were operated with the guidance from the Performance Characteristics Sheets published by the US Department of HUD and the results classified as positive or negative based the HUD action level of 1.00 mg/cm². Results less than 1.00 mg/cm² are considered negative and results greater than 1.00 mg/cm² are considered positive. For renovation purposes, as well as OSHA implications, it should be noted the lead present in levels less than 1.00 mg/cm² could generate dust that exceeds acceptable levels depending on the renovation or demolition being performed. For OSHA purposes, there are no accepted standards other than "zero" for lead content in surfaces that are affected so as to release lead in the form of dust. XRF readings at the lower end of the range (close to zero) are less likely to create toxic situations. XRF readings with negative prefixes correlate to very low lead levels in that particular surface. For conclusive, task-oriented results, contractors should follow all applicable OSHA requirements found in regulation 1926.62.

The walls in each space oriented in a clockwise fashion, with wall #1 oriented to the front of the building. Please refer to the building plans for clarification. An "NA" indicates that the room was not accessible during testing, and "NP" indicates that there were no painted surfaces within that space. During the testing procedures, EcoSpect personnel were able to gain access to the designated spaces and tested all of the selected rooms that were requested.

Summary of Positive Findings

LOCATION ADDRESS: 1951 NY-302, Circleville, NY 10919

Positive test results for the presence of lead-based paint in concentrations equal to or greater than 1.00 mg/cm² are:

Positive components by substrate:

Steel: Window Molding (4)

Ceramic: Wall (4)

If you have any questions regarding this report, please feel free to give us a call at any time.

Sincerely Yours,

A handwritten signature in black ink, appearing to read 'Daryl Heffron', with a long horizontal flourish extending to the right.

Daryl Heffron EcoSpect, Inc.

Summary

Summary Analysis							
#	Component	# Tested Negative	% Negative	# Tested Positive	% Positive	Total Tested	Total %
1	Baseboard	6	100.00%	0	0.00%	6	100.00%
2	Ceiling	2	100.00%	0	0.00%	2	100.00%
3	Door	4	100.00%	0	0.00%	4	100.00%
4	Door Molding	6	100.00%	0	0.00%	6	100.00%
5	Grate	1	100.00%	0	0.00%	1	100.00%
6	I-Beam Ceiling	2	100.00%	0	0.00%	2	100.00%
7	Locker	3	100.00%	0	0.00%	3	100.00%
8	Stall	3	100.00%	0	0.00%	3	100.00%
9	Structural Steel	2	100.00%	0	0.00%	2	100.00%
10	Unit Ventilator	1	100.00%	0	0.00%	1	100.00%
11	Wall	18	81.82%	4	18.18%	22	100.00%
12	Window Mldg	21	84.00%	4	16.00%	25	100.00%

Confirmed Positive Component Types



Circleville ms
Rm9
Wall



Circleville ms
Window Midg

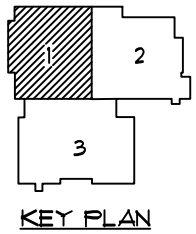
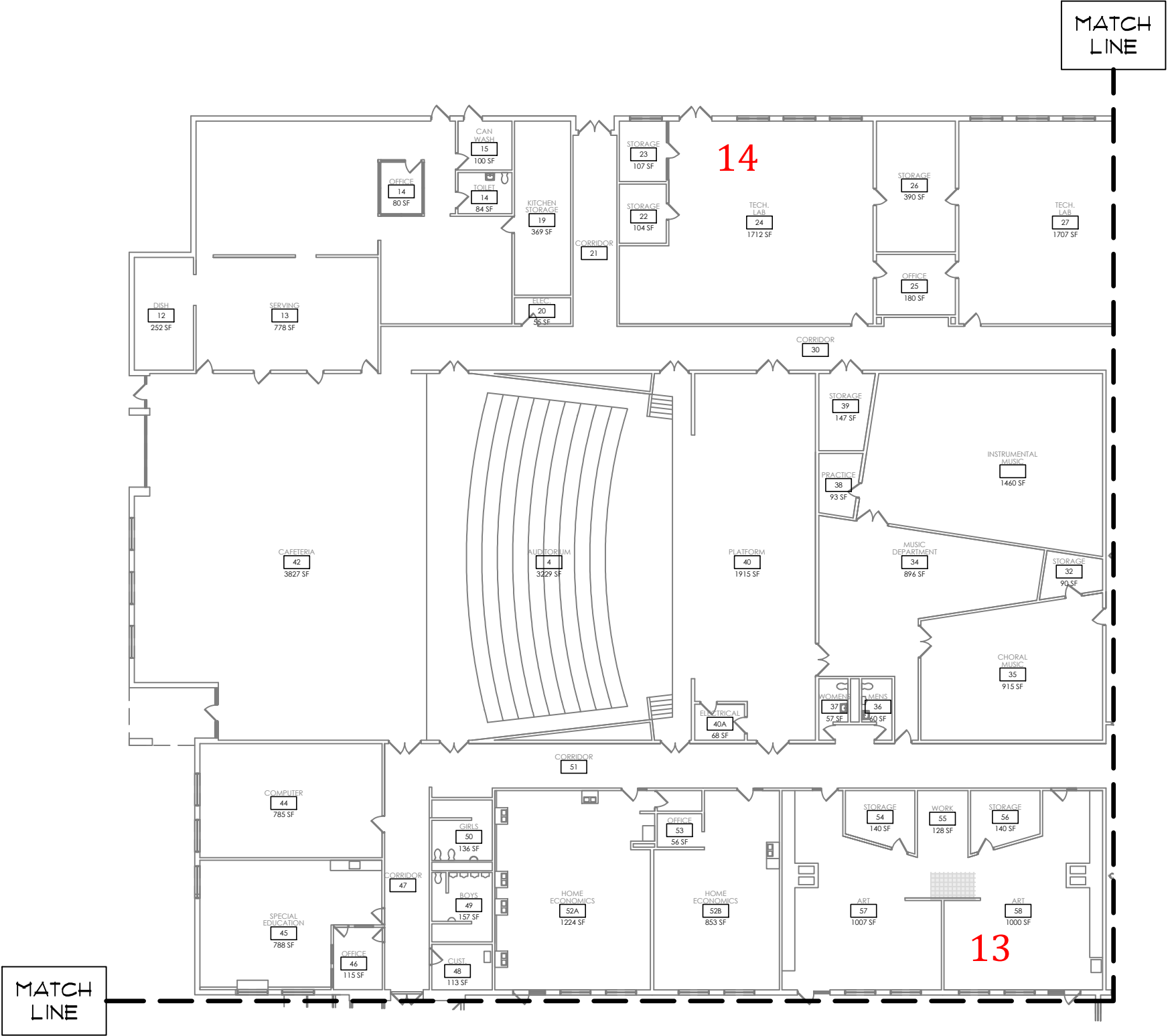


Circleville ms
Rm17
Window



Circleville ms
Rm11
Wall

Floor Plans



THE INFORMATION INCLUDED ON THIS GRAPHIC REPRESENTATION HAS BEEN COMPILED FROM A VARIETY OF SOURCES AND IS SUBJECT TO CHANGE WITHOUT NOTICE. AECC MAKES NO REPRESENTATIONS OR WARRANTIES, EXPRESS OR IMPLIED, AS TO ACCURACY, COMPLETENESS, TIMELINESS, OR RIGHTS TO THE USE OF SUCH INFORMATION. THIS DOCUMENT IS NOT INTENDED FOR USE AS A LAND SURVEY PRODUCT NOR IS IT DESIGNED OR INTENDED AS A CONSTRUCTION DESIGN DOCUMENT. THE USE OR MISUSE OF THE INFORMATION CONTAINED ON THIS GRAPHIC REPRESENTATION IS AT THE SOLE RISK OF THE PARTY USING OR MISUSING THE INFORMATION.

 **AECC**
ENVIRONMENTAL CONSULTING
Asbestos & Environmental
Consulting Corporation
6308 Fly Road
East Syracuse, NY 13057

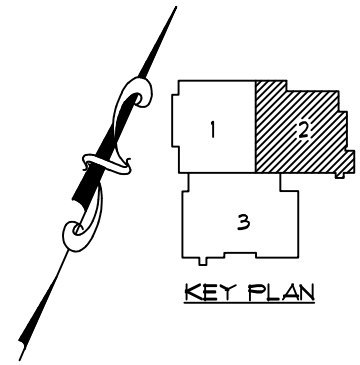
PROJECT NO.	20-146
DRAWN:	SEPT. 2020
DRAWN BY:	NP
CHECKED BY:	BB

Pine Bush CSD - Circleville Middle School
1951 New York - 302
Circleville, New York 10919
Partial First Floor Plan

Lead XRF Survey

FIGURE
1

MATCH LINE



THE INFORMATION INCLUDED ON THIS GRAPHIC REPRESENTATION HAS BEEN COMPILED FROM A VARIETY OF SOURCES AND IS SUBJECT TO CHANGE WITHOUT NOTICE. AECC MAKES NO REPRESENTATIONS OR WARRANTIES, EXPRESS OR IMPLIED, AS TO ACCURACY, COMPLETENESS, TIMELINESS, OR RIGHTS TO THE USE OF SUCH INFORMATION. THIS DOCUMENT IS NOT INTENDED FOR USE AS A LAND SURVEY PRODUCT NOR IS IT DESIGNED OR INTENDED AS A CONSTRUCTION DESIGN DOCUMENT. THE USE OR MISUSE OF THE INFORMATION CONTAINED ON THIS GRAPHIC REPRESENTATION IS AT THE SOLE RISK OF THE PARTY USING OR MISUSING THE INFORMATION.

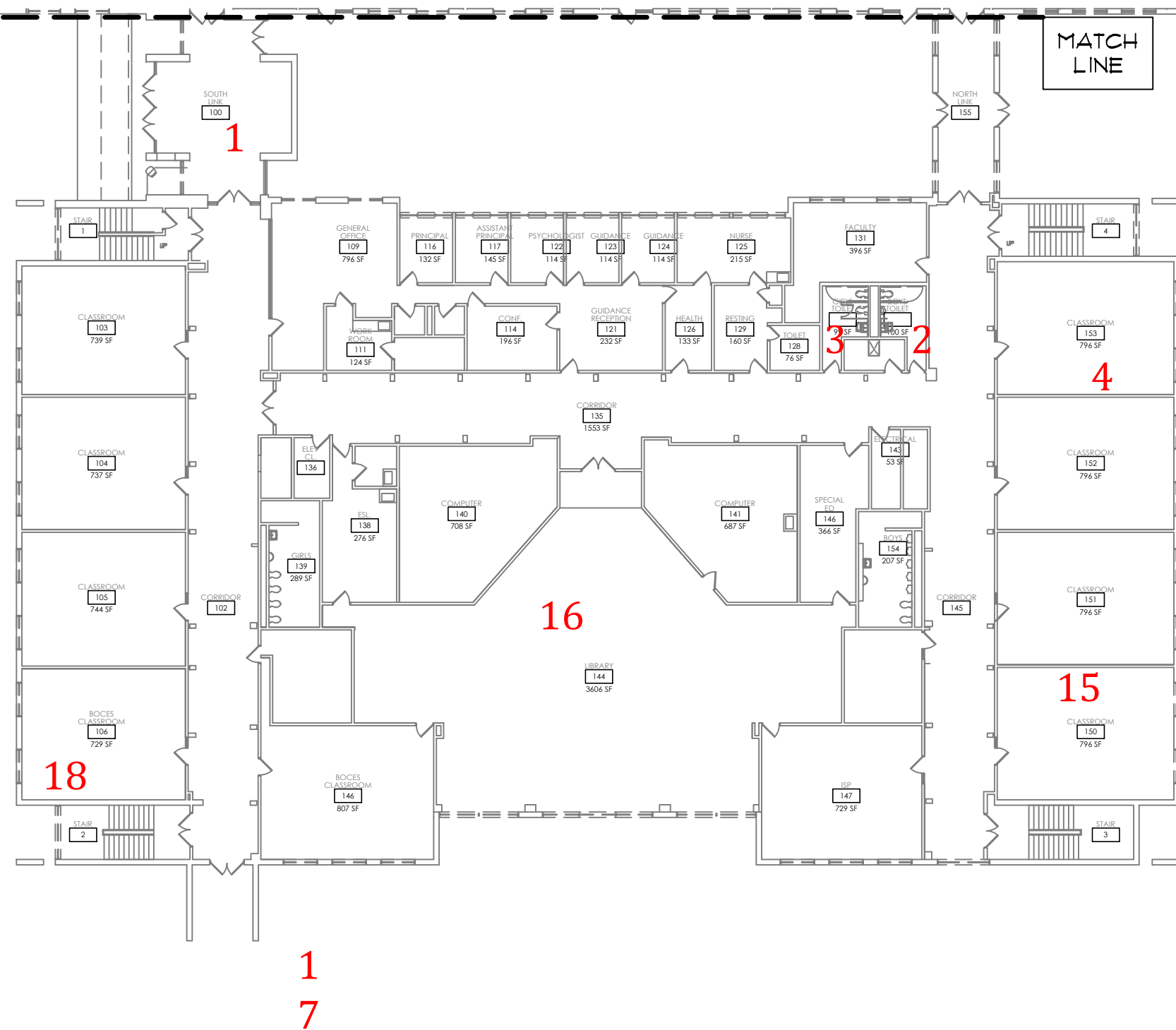
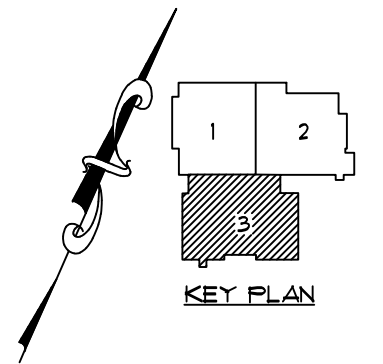
AECC
ENVIRONMENTAL CONSULTING
Asbestos & Environmental
Consulting Corporation
6308 Fly Road
East Syracuse, NY 13057

PROJECT NO.	20-146
DRAWN:	SEPT. 2020
DRAWN BY:	NP
CHECKED BY:	BB

Pine Bush CSD - Circleville Middle School 1951 New York - 302 Circleville, New York 10919 Partial First Floor Plan
Lead XRF Survey

MATCH LINE

MATCH LINE



THE INFORMATION INCLUDED ON THIS GRAPHIC REPRESENTATION HAS BEEN COMPILED FROM A VARIETY OF SOURCES AND IS SUBJECT TO CHANGE WITHOUT NOTICE. AECC MAKES NO REPRESENTATIONS OR WARRANTIES, EXPRESS OR IMPLIED, AS TO ACCURACY, COMPLETENESS, TIMELINESS, OR RIGHTS TO THE USE OF SUCH INFORMATION. THIS DOCUMENT IS NOT INTENDED FOR USE AS A LAND SURVEY PRODUCT NOR IS IT DESIGNED OR INTENDED AS A CONSTRUCTION DESIGN DOCUMENT. THE USE OR MISUSE OF THE INFORMATION CONTAINED ON THIS GRAPHIC REPRESENTATION IS AT THE SOLE RISK OF THE PARTY USING OR MISUSING THE INFORMATION.

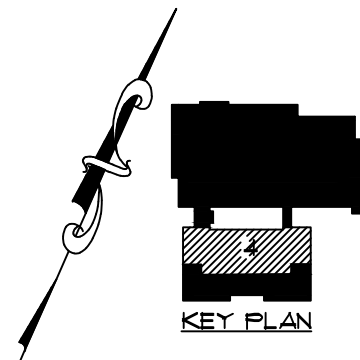
AECC
ENVIRONMENTAL CONSULTING
Asbestos & Environmental
Consulting Corporation
6308 Fly Road
East Syracuse, NY 13057

PROJECT NO.	20-146
DRAWN:	SEPT. 2020
DRAWN BY:	NP
CHECKED BY:	BB

Pine Bush CSD - Circleville Middle School
1951 New York - 302
Circleville, New York 10919
Partial First Floor Plan

Lead XRF Survey

FIGURE
3



THE INFORMATION INCLUDED ON THIS GRAPHIC REPRESENTATION HAS BEEN COMPILED FROM A VARIETY OF SOURCES AND IS SUBJECT TO CHANGE WITHOUT NOTICE. AECC MAKES NO REPRESENTATIONS OR WARRANTIES, EXPRESS OR IMPLIED, AS TO ACCURACY, COMPLETENESS, TIMELINESS, OR RIGHTS TO THE USE OF SUCH INFORMATION. THIS DOCUMENT IS NOT INTENDED FOR USE AS A LAND SURVEY PRODUCT NOR IS IT DESIGNED OR INTENDED AS A CONSTRUCTION DESIGN DOCUMENT. THE USE OR MISUSE OF THE INFORMATION CONTAINED ON THIS GRAPHIC REPRESENTATION IS AT THE SOLE RISK OF THE PARTY USING OR MISUSING THE INFORMATION.



AECC
ENVIRONMENTAL CONSULTING

Asbestos & Environmental
Consulting Corporation

6308 Fly Road
East Syracuse, NY 13057

PROJECT NO.	20-146	Pine Bush CSD - Circleville Middle School 1951 New York - 302 Circleville, New York 10919 Second Floor Plan
DRAWN:	SEPT. 2020	
DRAWN BY:	NP	Lead XRF Survey
CHECKED BY:	BB	

Daily Calibrations

Calibrations					
#	Date	Time	Type	Nom Secs	mg/cm2
1	8/31/2020	13:36:50	Calibration	5	1
2	8/31/2020	13:37:04	Calibration	5	1
3	8/31/2020	13:37:17	Calibration	5	1
137	8/31/2020	15:11:57	Calibration	5	1
138	8/31/2020	15:44:00	Calibration	5	0.9
197	8/31/2020	16:21:37	Calibration	5	0.9
198	8/31/2020	16:26:58	Calibration	5	0.9
276	8/31/2020	17:27:29	Calibration	5	1
277	8/31/2020	17:30:47	Calibration	5	0.9
336	8/31/2020	18:14:49	Calibration	5	1

Confirmed Positives

Confirmed Positives								
Reading #	Room	#	Wall	Component	Substrate	Condition	Results	mg/cm2
242	9		Wall 1	Wall	Ceramic	Yellow	Positive	2.2
243	9		Wall 2	Wall	Ceramic	Yellow	Positive	1.8
253	11		Wall 1	Wall	Ceramic	White	Positive	2.4
254	11		Wall 2	Wall	Ceramic	White	Positive	2.2
256	12		Wall 1	Window Mldg	Steel	Brown	Positive	1.2
257	13		Wall 1	Window Mldg	Steel	Brown	Positive	1.1
258	14		Wall 3	Window Mldg	Steel	Brown	Positive	1.7
262	17		Wall 1	Window Mldg	Steel	Brown	Positive	1.9

XRF Results

XRF & Labs								
Reading #	Room	#	Wall	Component	Substrate	Condition	Results	mg/cm2
199	1		Wall 1	Wall	Brick	Brown	Negative	0.1
200	1		Wall 1	Door Molding	Steel	Blue	Negative	0
201	1		Wall 1	Door	Steel	Blue	Negative	0
202	1		Wall 2	Window Mldg	Steel	Blue	Negative	0.2
203	1		Wall 2	Door Molding	Steel	Black	Negative	0.1
204	1		Wall 2	Door	Steel	Black	Negative	0
205	1		Wall 3	Wall	Brick	Brown	Negative	-0.2
206	1		Wall 3	Unit Ventilator	Steel	Brown	Negative	0
207	1		Wall 4	Wall	Brick	Brown	Negative	-0.2
208	1		Wall 1	Wall	Sheetrock	Blue	Negative	0.3
209	1		Wall 1	Grate	Steel	White	Negative	0
210	2		Wall 1	Wall	Masonry	White	Negative	-0.4
211	2		Wall 1	Door Molding	Steel	Brown	Negative	0.1
212	2		Wall 1	Door	Steel	Brown	Negative	0
213	2		Wall 2	Baseboard	Ceramic	White	Negative	-0.2
214	2		Wall 2	Stall	Steel	Blue	Negative	-0.2
215	2		Wall 2	Wall	Masonry	White	Negative	-0.2
216	2		Wall 4	Wall	Masonry	White	Negative	-0.3
217	3		Wall 1	Wall	Masonry	White	Negative	-0.2
218	3		Wall 1	Door Molding	Steel	Brown	Negative	0.5
219	3		Wall 1	Door	Steel	Brown	Negative	-0.1
220	3		Wall 2	Baseboard	Ceramic	White	Negative	-0.3
221	3		Wall 2	Wall	Masonry	White	Negative	-0.3
222	3		Wall 4	Stall	Steel	Pink	Negative	0.2
223	3		Wall 4	Structural Steel	Steel	Brown	Negative	-0.1
224	4		Wall 4	Window Mldg	Steel	Brown	Negative	0.1
225	5		Wall 2	Window Mldg	Steel	Blue	Negative	0.1
226	5		Wall 4	Window Mldg	Steel	Blue	Negative	0.1
227	6		Wall 1	Wall	Masonry	Blue	Negative	-0.2
228	6		Wall 1	Baseboard	Ceramic	White	Negative	0
229	6		Wall 3	Wall	Masonry	Blue	Negative	-0.3
230	6		Wall 4	Wall	Masonry	Blue	Negative	-0.3
231	7		Wall 1	Wall	Masonry	Blue	Negative	-0.5
232	7		Wall 1	Baseboard	Ceramic	White	Negative	-0.3
233	7		Wall 3	Wall	Masonry	Blue	Negative	-0.4
234	8		Wall 1	Wall	Masonry	White	Negative	-0.2
235	8		Wall 1	Baseboard	Ceramic	White	Negative	-0.4
236	8		Wall 1	Locker	Steel	Blue	Negative	0
237	8		Wall 2	Door Molding	Steel	Brown	Negative	0.3
238	8		Wall 2	I-Beam Ceiling	Steel	White	Negative	-0.1
239	8		Wall 2	Structural Steel	Steel	White	Negative	0.1
240	8		Wall 3	Wall	Masonry	White	Negative	-0.3
241	9		Wall 1	Ceiling	Sheetrock	White	Negative	-0.4
242	9		Wall 1	Wall	Ceramic	Yellow	Positive	2.2
243	9		Wall 2	Wall	Ceramic	Yellow	Positive	1.8

XRF & Labs								
Reading #	Room	#	Wall	Component	Substrate	Condition	Results	mg/cm2
244	9		Wall 4	Stall	Steel	Orange	Negative	0.7
245	10		Wall 1	Wall	Masonry	Blue	Negative	0
246	10		Wall 2	Wall	Masonry	Blue	Negative	-0.5
247	10		Wall 2	Window Mldg	Steel	Brown	Negative	0.1
248	10		Wall 1	Door Molding	Steel	Brown	Negative	0.3
249	10		Wall 1	Baseboard	Ceramic	White	Negative	-0.3
250	10		Wall 3	Locker	Steel	Blue	Negative	0
251	10		Wall 3	Locker	Steel	Blue	Negative	0
252	10		Wall 3	I-Beam Ceiling	Steel	White	Negative	0
253	11		Wall 1	Wall	Ceramic	White	Positive	2.4
254	11		Wall 2	Wall	Ceramic	White	Positive	2.2
255	11		Wall 2	Ceiling	Sheetrock	White	Negative	-0.2
256	12		Wall 1	Window Mldg	Steel	Brown	Positive	1.2
257	13		Wall 1	Window Mldg	Steel	Brown	Positive	1.1
258	14		Wall 3	Window Mldg	Steel	Brown	Positive	1.7
259	15		Wall 4	Window Mldg	Steel	Brown	Negative	0.1
260	15		Wall 4	Window Mldg	Steel	Brown	Negative	0.7
261	16		Wall 1	Window Mldg	Steel	Brown	Negative	0.2
262	17		Wall 1	Window Mldg	Steel	Brown	Positive	1.9
263	18		Wall 2	Window Mldg	Steel	Brown	Negative	0.5
264	18		Wall 2	Window Mldg	Steel	Brown	Negative	0.6
265	19		Wall 1	Window Mldg	Steel	Brown	Negative	0.6
266	19		Wall 1	Window Mldg	Steel	Brown	Negative	0.1
267	19		Wall 2	Window Mldg	Steel	Brown	Negative	0.9
268	19		Wall 2	Window Mldg	Steel	Brown	Negative	0.2
269	19		Wall 2	Window Mldg	Steel	Brown	Negative	0.7
270	19		Wall 2	Window Mldg	Steel	Brown	Negative	0.2
271	19		Wall 3	Window Mldg	Steel	Brown	Negative	0.7
272	19		Wall 3	Window Mldg	Steel	Brown	Negative	0.1
273	19		Wall 3	Window Mldg	Steel	Brown	Negative	0.1
274	19		Wall 3	Window Mldg	Steel	Brown	Negative	0.3
275	19		Wall 4	Window Mldg	Steel	Brown	Negative	-0.2

Performance Characteristic Sheet

EFFECTIVE DATE: December 1, 2015

MANUFACTURER AND MODEL:

Make: *Heuresis*
Models: *Model Pb200i*
Source: *⁵⁷Co, 5 mCi (nominal – new source)*

FIELD OPERATION GUIDANCE

OPERATING PARAMETERS:

Action Level mode

XRF CALIBRATION CHECK LIMITS:

0.8 to 1.2 mg/cm ² (inclusive)

SUBSTRATE CORRECTION:

Not applicable

INCONCLUSIVE RANGE OR THRESHOLD:

ACTION LEVEL MODE READING DESCRIPTION	SUBSTRATE	THRESHOLD (mg/cm ²)
Results not corrected for substrate bias on any substrate	Brick	1.0
	Concrete	1.0
	Drywall	1.0
	Metal	1.0
	Plaster	1.0
	Wood	1.0

BACKGROUND INFORMATION

EVALUATION DATA SOURCE AND DATE:

This sheet is supplemental information to be used in conjunction with Chapter 7 of the HUD *Guidelines for the Evaluation and Control of Lead-Based Paint Hazards in Housing* ("HUD Guidelines"). Performance parameters shown on this sheet are calculated using test results on building components in the HUD archive. Testing was conducted on 146 test samples in November 2015, with two separate instruments running software version 2.1-2 in Action Level test mode. The actual source strength of each instrument on the day of testing was approximately 2.0 mCi; source ages were approximately one year.

OPERATING PARAMETERS

Performance parameters shown in this sheet are applicable only when properly operating the instrument using the manufacturer's instructions and procedures described in Chapter 7 of the HUD Guidelines.

XRF CALIBRATION CHECK:

The calibration of the XRF instrument should be checked using the paint film nearest 1.0 mg/cm² in the NIST Standard Reference Material (SRM) used (e.g., for NIST SRM 2579, use the 1.02 mg/cm² film).

If the average (rounded to 1 decimal place) of three readings is outside the acceptable calibration check range, follow the manufacturer's instructions to bring the instrument into control before XRF testing proceeds.

SUBSTRATE CORRECTION VALUE COMPUTATION:

Chapter 7 of the HUD Guidelines provides guidance on correcting XRF results for substrate bias. Supplemental guidance for using the paint film nearest 1.0 mg/cm² for substrate correction is provided:

XRF results are corrected for substrate bias by subtracting from each XRF result a correction value determined separately in each house for single-family housing or in each development for multifamily housing, for each substrate. The correction value is an average of XRF readings taken over the NIST SRM paint film nearest to 1.0 mg/cm² at test locations that have been scraped bare of their paint covering. Compute the correction values as follows:

Using the same XRF instrument, take three readings on a bare substrate area covered with the NIST SRM paint film nearest 1 mg/cm². Repeat this procedure by taking three more readings on a second bare substrate area of the same substrate covered with the NIST SRM.

Compute the correction value for each substrate type where XRF readings indicate substrate correction is needed by computing the average of all six readings as shown below.

For each substrate type (the 1.02 mg/cm² NIST SRM is shown in this example; use the actual lead loading of the NIST SRM used for substrate correction):

$$\text{Correction value} = (1\text{st} + 2\text{nd} + 3\text{rd} + 4\text{th} + 5\text{th} + 6\text{th Reading})/6 - 1.02 \text{ mg/cm}^2$$

Repeat this procedure for each substrate requiring substrate correction in the house or housing development.

EVALUATING THE QUALITY OF XRF TESTING:

Randomly select ten testing combinations for retesting from each house or from two randomly selected units in multifamily housing.

Conduct XRF re-testing at the ten testing combinations selected for retesting.

Determine if the XRF testing in the units or house passed or failed the test by applying the steps below.

Compute the Retest Tolerance Limit by the following steps:

Determine XRF results for the original and retest XRF readings. Do not correct the original or retest results for substrate bias. In single-family and multi-family housing, a result is defined as a single reading. Therefore, there will be ten original and ten retest XRF results for each house or for the two selected units.

Calculate the average of the original XRF result and the retest XRF result for each testing combination.

Square the average for each testing combination.

Add the ten squared averages together. Call this quantity C.

Multiply the number C by 0.0072. Call this quantity D.

Add the number 0.032 to D. Call this quantity E.

Take the square root of E. Call this quantity F.

Multiply F by 1.645. The result is the Retest Tolerance Limit.

Compute the average of all ten original XRF readings.

Compute the average of all ten re-test XRF readings.

Find the absolute difference of the two averages.

If the difference is less than the Retest Tolerance Limit, the inspection has passed the retest. If the difference of the overall averages equals or exceeds the Retest Tolerance Limit, this procedure should be repeated with ten new testing combinations. If the difference of the overall averages is equal to or greater than the Retest Tolerance Limit a second time, then the inspection should be considered deficient.

Use of this procedure is estimated to produce a spurious result approximately 1% of the time. That is, results of this procedure will call for further examination when no examination is warranted in approximately 1 out of 100 dwelling units tested.

TESTING TIMES:

In the Action Level paint test mode, the instrument takes the longest time to complete readings close to the Federal standard of 1.0 mg/cm². The table below shows the mean and standard deviation of actual reading times by reading level for paint samples during the November 2015 archive testing. The tested instruments reported readings to one decimal place. No significant differences in reading times by substrate were observed. These times apply only to instruments with the same source strength as those tested (2.0 mCi). Instruments with stronger sources will have shorter reading times and those with weaker sources, longer reading times, than those in the table.

Mean and Standard Deviation of Reading Times in Action Level Mode by Reading Level		
Reading (mg/cm ²)	Mean Reading Time (seconds)	Standard Deviation (seconds)
< 0.7	3.48	0.47
0.7	7.29	1.92
0.8	13.95	1.78
0.9 – 1.2	15.25	0.66
1.3 – 1.4	6.08	2.50
≥ 1.5	3.32	0.05

CLASSIFICATION OF RESULTS:

XRF results are classified as **positive** if they are **greater than or equal** to the stated threshold for the instrument (1.0 mg/cm²), and *negative* if they are *less than* the threshold.

DOCUMENTATION:

A report titled *Methodology for XRF Performance Characteristic Sheets* (EPA 747-R-95-008) provides an explanation of the statistical methodology used to construct the data in the sheets, and provides empirical results from using the recommended inconclusive ranges or thresholds for specific XRF instruments. The report may be downloaded at <http://www2.epa.gov/lead/methodology-xrf-performance-characteristic-sheets-epa-747-r-95-008-september-1997>.

This XRF Performance Characteristic Sheet (PCS) was developed by QuanTech, Inc., under a contract with the XRF manufacturer.

ATTACHMENT D

PCB Bulk Sampling Laboratory Results



Analysis Report

Schneider Laboratories Global, Inc

2512 W. Cary Street • Richmond, Virginia • 23220-5117
804-353-6778 • 800-785-LABS (5227) • Fax 804-359-1475

Customer: Asbestos & Environmental Consulting Corp. (4307)
Address: 6308 Fly Road
East Syracuse, NY 13057

Order #: 382642

Matrix Bulk
Received 08/24/20
Reported 08/25/20

Attn:

Project: Circleville Middle School
Location: 1951 NY-302, Circleville, NY
Number: 20-146

PO Number:

Sample ID	Cust. Sample ID	Location	Result	RL*	Units	Analysis Date	Analyst
Parameter		Method					
382642-001	CLK-001P	Main Entrance-Window					
Semi-volatile Organic Compounds							
Aroclor - 1016		SW846 8082A	<471	470	µg/kg	08/24/20	THN
Aroclor - 1221		SW846 8082A	<471	470	µg/kg	08/24/20	THN
Aroclor - 1232		SW846 8082A	<471	470	µg/kg	08/24/20	THN
Aroclor - 1242		SW846 8082A	<471	470	µg/kg	08/24/20	THN
Aroclor - 1248		SW846 8082A	<471	470	µg/kg	08/24/20	THN
Aroclor - 1254		SW846 8082A	<471	470	µg/kg	08/24/20	THN
Aroclor - 1260		SW846 8082A	<471	470	µg/kg	08/24/20	THN
Aroclor - 1262		SW846 8082A	<471	470	µg/kg	08/24/20	THN
Aroclor - 1268		SW846 8082A	<471	470	µg/kg	08/24/20	THN
PCB - Surrogate Recoveries							
DCB		MI					
TCMX		MI					
382642-002	CLK-003P	Classroom 104-Window					
Semi-volatile Organic Compounds							
Aroclor - 1016		SW846 8082A	<462	462	µg/kg	08/24/20	THN
Aroclor - 1221		SW846 8082A	<462	462	µg/kg	08/24/20	THN
Aroclor - 1232		SW846 8082A	<462	462	µg/kg	08/24/20	THN
Aroclor - 1242		SW846 8082A	<462	462	µg/kg	08/24/20	THN
Aroclor - 1248		SW846 8082A	<462	462	µg/kg	08/24/20	THN
Aroclor - 1254		SW846 8082A	<462	462	µg/kg	08/24/20	THN
Aroclor - 1260		SW846 8082A	<462	462	µg/kg	08/24/20	THN
Aroclor - 1262		SW846 8082A	<462	462	µg/kg	08/24/20	THN
Aroclor - 1268		SW846 8082A	<462	462	µg/kg	08/24/20	THN
PCB - Surrogate Recoveries							
DCB		MI					
TCMX		58%					

All internal QC parameters were met. Unusual sample conditions, if any, are described. Surrogate Spike results designated with "D" indicate that the analyte was diluted out. "MI" indicates matrix interference. Concentration and *Reporting Limit (RL) based on areas provided by client. Values are reported to three significant figures. Solid PPM = mg/kg | PPB = µg/kg and Water PPM = mg/L | PPB = µg/L. The test results reported relate only to the samples submitted.



Analysis Report

Schneider Laboratories Global, Inc

2512 W. Cary Street • Richmond, Virginia • 23220-5117
804-353-6778 • 800-785-LABS (5227) • Fax 804-359-1475

Customer: Asbestos & Environmental Consulting Corp. (4307)
Address: 6308 Fly Road
East Syracuse, NY 13057

Order #: 382642

Matrix Bulk
Received 08/24/20
Reported 08/25/20

Attn:

Project: Circleville Middle School
Location: 1951 NY-302, Circleville, NY
Number: 20-146

PO Number:

Sample ID	Cust. Sample ID	Location	Result	RL*	Units	Analysis Date	Analyst
Parameter		Method					
382642-003	CLK-005P	Library-Window					
Semi-volatile Organic Compounds							
Aroclor - 1016		SW846 8082A	<471	470	µg/kg	08/24/20	THN
Aroclor - 1221		SW846 8082A	<471	470	µg/kg	08/24/20	THN
Aroclor - 1232		SW846 8082A	<471	470	µg/kg	08/24/20	THN
Aroclor - 1242		SW846 8082A	<471	470	µg/kg	08/24/20	THN
Aroclor - 1248		SW846 8082A	<471	470	µg/kg	08/24/20	THN
Aroclor - 1254		SW846 8082A	<471	470	µg/kg	08/24/20	THN
Aroclor - 1260		SW846 8082A	<471	470	µg/kg	08/24/20	THN
Aroclor - 1262		SW846 8082A	<471	470	µg/kg	08/24/20	THN
Aroclor - 1268		SW846 8082A	<471	470	µg/kg	08/24/20	THN
PCB - Surrogate Recoveries							
DCB		MI					
TCMX		117%					
382642-004	CLK-013P	Main Entrance-Window					
Semi-volatile Organic Compounds							
Aroclor - 1016		SW846 8082A	<704	704	µg/kg	08/24/20	THN
Aroclor - 1221		SW846 8082A	<704	704	µg/kg	08/24/20	THN
Aroclor - 1232		SW846 8082A	<704	704	µg/kg	08/24/20	THN
Aroclor - 1242		SW846 8082A	<704	704	µg/kg	08/24/20	THN
Aroclor - 1248		SW846 8082A	<704	704	µg/kg	08/24/20	THN
Aroclor - 1254		SW846 8082A	<704	704	µg/kg	08/24/20	THN
Aroclor - 1260		SW846 8082A	<704	704	µg/kg	08/24/20	THN
Aroclor - 1262		SW846 8082A	<704	704	µg/kg	08/24/20	THN
Aroclor - 1268		SW846 8082A	<704	704	µg/kg	08/24/20	THN
PCB - Surrogate Recoveries							
DCB		MI					
TCMX		75%					

All internal QC parameters were met. Unusual sample conditions, if any, are described. Surrogate Spike results designated with "D" indicate that the analyte was diluted out. "MI" indicates matrix interference. Concentration and *Reporting Limit (RL) based on areas provided by client. Values are reported to three significant figures. Solid PPM = mg/kg | PPB = µg/kg and Water PPM = mg/L | PPB = µg/L. The test results reported relate only to the samples submitted.



Analysis Report

Schneider Laboratories Global, Inc

2512 W. Cary Street • Richmond, Virginia • 23220-5117
804-353-6778 • 800-785-LABS (5227) • Fax 804-359-1475

Customer: Asbestos & Environmental Consulting Corp. (4307)
Address: 6308 Fly Road
East Syracuse, NY 13057

Order #: 382642

Matrix Bulk
Received 08/24/20
Reported 08/25/20

Attn:

Project: Circleville Middle School
Location: 1951 NY-302, Circleville, NY
Number: 20-146

PO Number:

Sample ID	Cust. Sample ID	Location	Result	RL*	Units	Analysis Date	Analyst
Parameter		Method					
382642-08/25/20 05:30 PM							

Reviewed By: **Jennifer Lee**
Manager

State Certifications

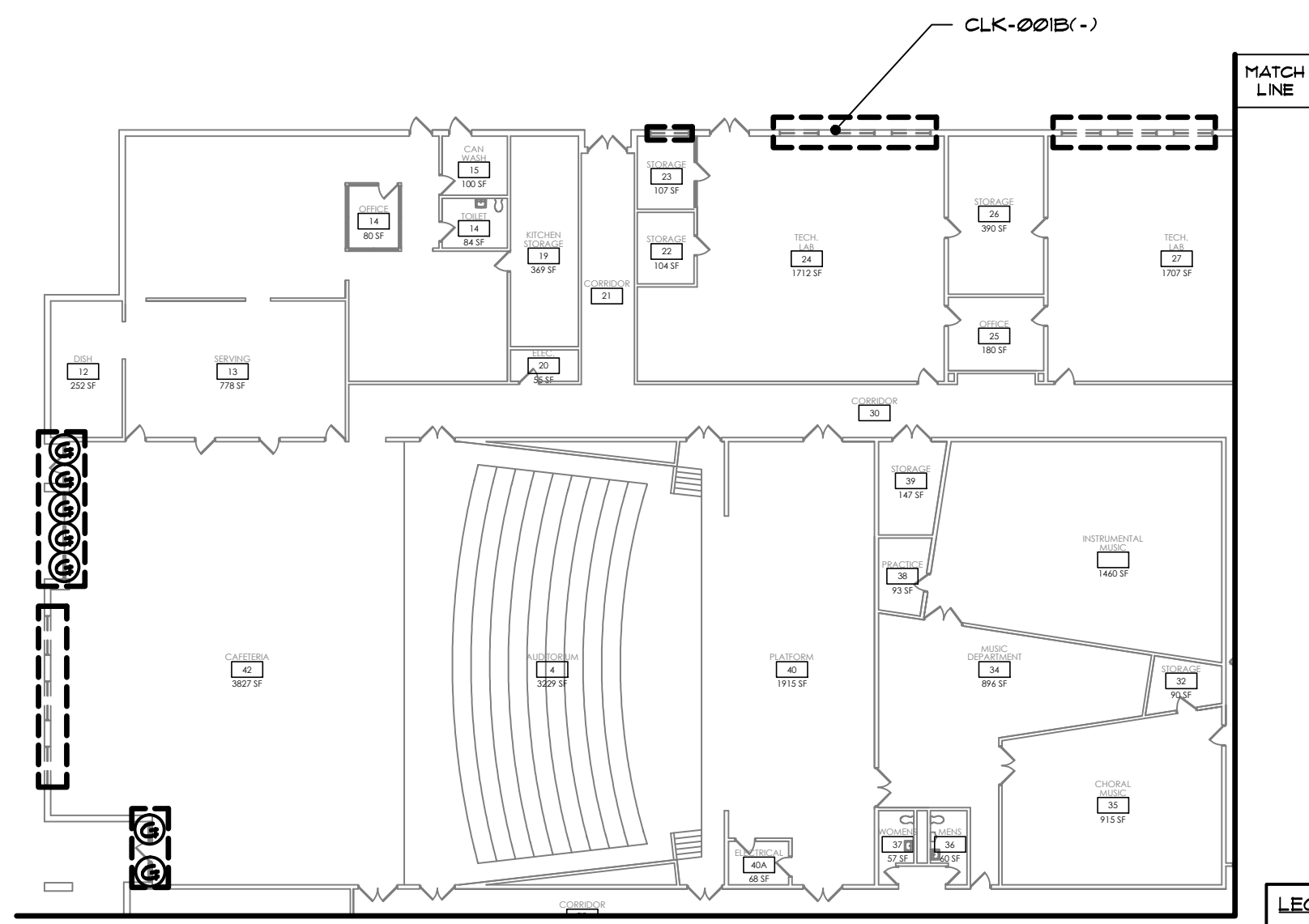
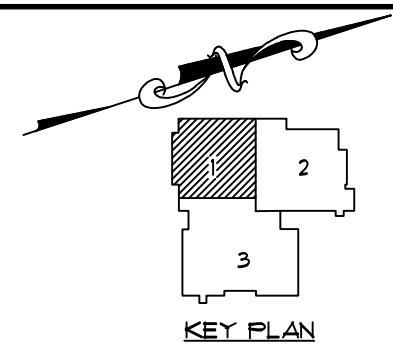
Method	Parameter	New York	Virginia
SW846 8082A	Aroclor - 1016	ELAP Certified	VELAP Certified
SW846 8082A	Aroclor - 1221	ELAP Certified	VELAP Certified
SW846 8082A	Aroclor - 1232	ELAP Certified	VELAP Certified
SW846 8082A	Aroclor - 1242	ELAP Certified	VELAP Certified
SW846 8082A	Aroclor - 1248	ELAP Certified	VELAP Certified
SW846 8082A	Aroclor - 1254	ELAP Certified	VELAP Certified
SW846 8082A	Aroclor - 1260	ELAP Certified	VELAP Certified
SW846 8082A	Aroclor - 1262	ELAP Certified	VELAP Certified
SW846 8082A	Aroclor - 1268	ELAP Certified	VELAP Certified

State	Certificate Number
New York	ELAP 61372
Virginia	VELAP 10779


All internal QC parameters were met. Unusual sample conditions, if any, are described. Surrogate Spike results designated with "D" indicate that the analyte was diluted out. "MI" indicates matrix interference. Concentration and *Reporting Limit (RL) based on areas provided by client. Values are reported to three significant figures. Solid PPM = mg/kg | PPB = µg/kg and Water PPM = mg/L | PPB = µg/L. The test results reported relate only to the samples submitted.

ATTACHMENT E

Figures 1, 2, 3, & 4




LEGEND:

 ASBESTOS-CONTAINING WINDOW GLAZING COMPOUND

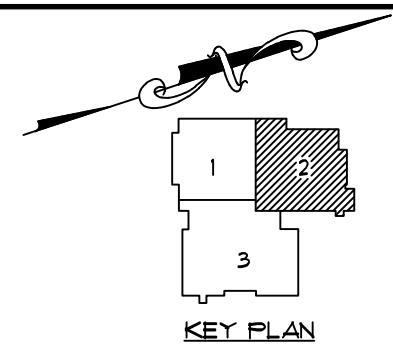
IMPORTANT SURVEY NOTE:

THIS SURVEY WAS LIMITED IN NATURE. ONLY SPECIFIC BUILDING MATERIALS WITHIN THE DASHED BOUNDARIES WERE INVESTIGATED/SAMPLED, AS PER THE DIRECTION OF THE PROJECT ARCHITECT. ANY BUILDING MATERIALS NOT SPECIFICALLY SAMPLED WITHIN THE DASHED BOUNDARIES AND ALL BUILDING MATERIALS LOCATED OUTSIDE THE DASHED BOUNDARIES SHALL NEED TO BE TREATED AS POTENTIALLY HAZARDOUS MATERIALS, UNTIL EXAMINED BY AN ENVIRONMENTAL CONSULTANT AND LABORATORY RESULTS PROVE OTHERWISE.

THE INFORMATION INCLUDED ON THIS GRAPHIC REPRESENTATION HAS BEEN COMPILED FROM A VARIETY OF SOURCES AND IS SUBJECT TO CHANGE WITHOUT NOTICE. AECC MAKES NO REPRESENTATIONS OR WARRANTIES, EXPRESS OR IMPLIED, AS TO ACCURACY, COMPLETENESS, TIMELINESS, OR RIGHTS TO THE USE OF SUCH INFORMATION. THIS DOCUMENT IS NOT INTENDED FOR USE AS A LAND SURVEY PRODUCT NOR IS IT DESIGNED OR INTENDED AS A CONSTRUCTION DESIGN DOCUMENT. THE USE OR MISUSE OF THE INFORMATION CONTAINED ON THIS GRAPHIC REPRESENTATION IS AT THE SOLE RISK OF THE PARTY USING OR MISUSING THE INFORMATION.

 Asbestos & Environmental Consulting Corporation 6308 Fly Road East Syracuse, NY 13057	PROJECT NO. 20-146	Cirleville Middle School 1951 New York State Route 302 Cirleville, New York 10919 Partial First Floor Plan	FIGURE 1
	DRAWN: SEPT. 2020		
	DRAWN BY: NP	Limited Hazardous Material Pre-Renovation Survey	
	CHECKED BY: BB		

MATCH LINE



CTT-014B(-)
CTG-015B(-)
ACT-016B(-)

CTG-017A(-)
CTT-018A(-)

FLB-019A,B(-)
PLS-020A,B(-)

CTG-017B(-)
CTT-018B(-)

FLB-019C(-)
PLS-020C(-)

IMPORTANT SURVEY NOTE:

THIS SURVEY WAS LIMITED IN NATURE. ONLY SPECIFIC BUILDING MATERIALS WITHIN THE DASHED BOUNDARIES WERE INVESTIGATED/SAMPLED, AS PER THE DIRECTION OF THE PROJECT ARCHITECT. ANY BUILDING MATERIALS NOT SPECIFICALLY SAMPLED WITHIN THE DASHED BOUNDARIES AND ALL BUILDING MATERIALS LOCATED OUTSIDE THE DASHED BOUNDARIES SHALL NEED TO BE TREATED AS POTENTIALLY HAZARDOUS MATERIALS, UNTIL EXAMINED BY AN ENVIRONMENTAL CONSULTANT AND LABORATORY RESULTS PROVE OTHERWISE.

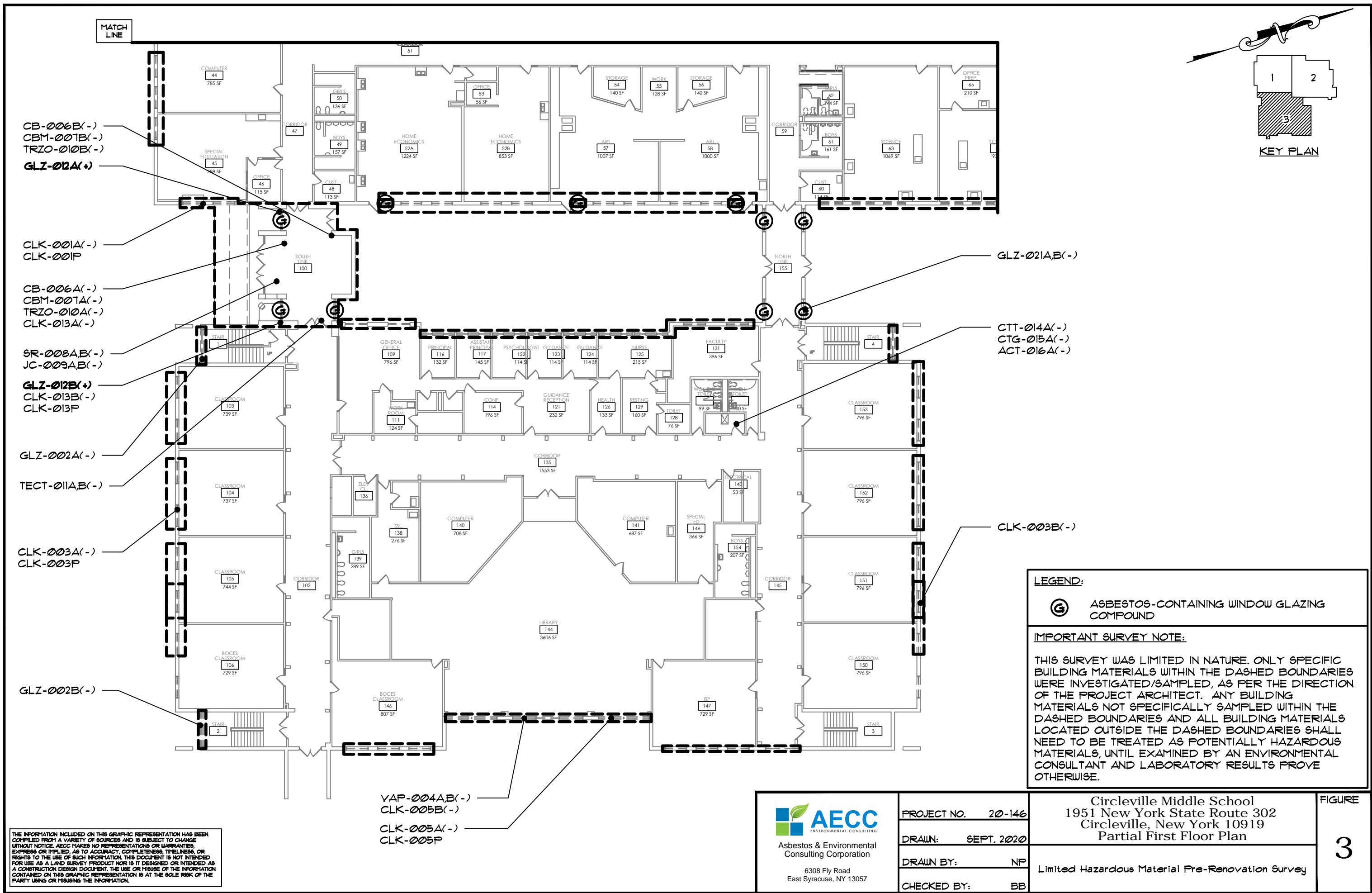
THE INFORMATION INCLUDED ON THIS GRAPHIC REPRESENTATION HAS BEEN COMPILED FROM A VARIETY OF SOURCES AND IS SUBJECT TO CHANGE WITHOUT NOTICE. AECC MAKES NO REPRESENTATIONS OR WARRANTIES, EXPRESS OR IMPLIED, AS TO ACCURACY, COMPLETENESS, TIMELINESS, OR RIGHTS TO THE USE OF SUCH INFORMATION. THIS DOCUMENT IS NOT INTENDED FOR USE AS A LAND SURVEY PRODUCT NOR IS IT DESIGNED OR INTENDED AS A CONSTRUCTION DESIGN DOCUMENT. THE USE OR MISUSE OF THE INFORMATION CONTAINED ON THIS GRAPHIC REPRESENTATION IS AT THE SOLE RISK OF THE PARTY USING OR MISUSING THE INFORMATION.

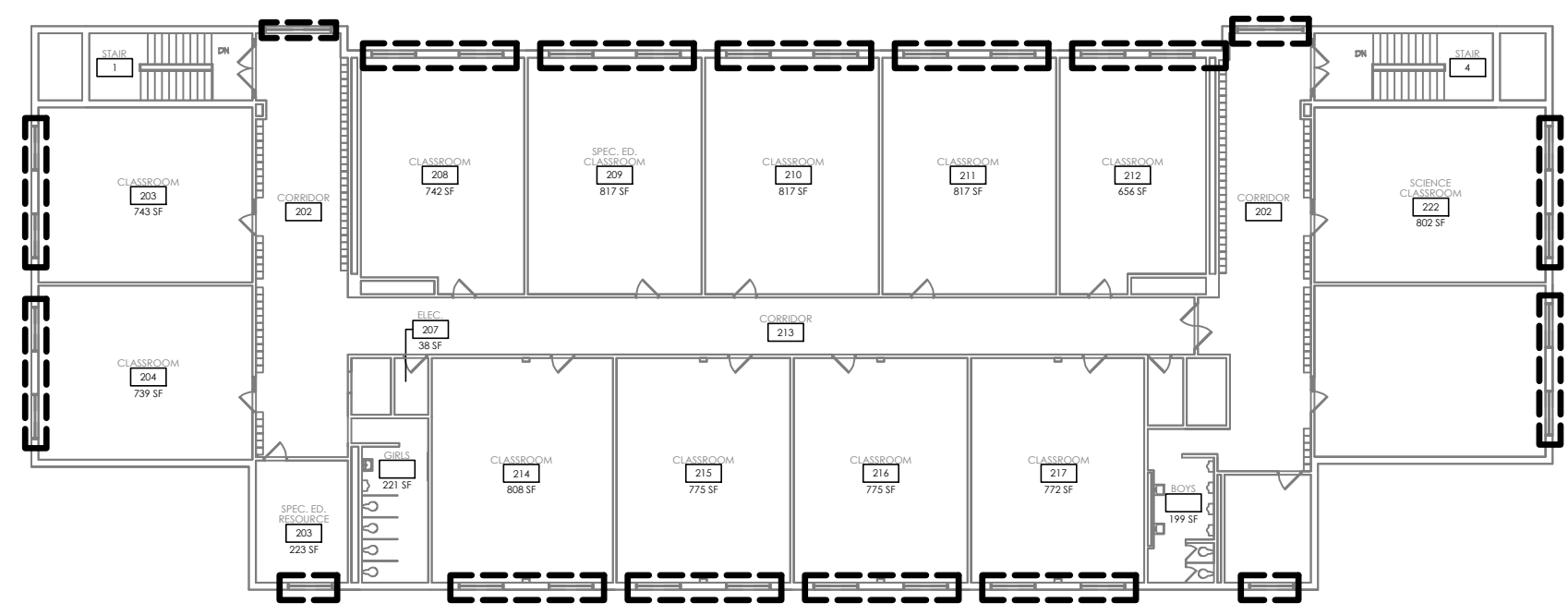
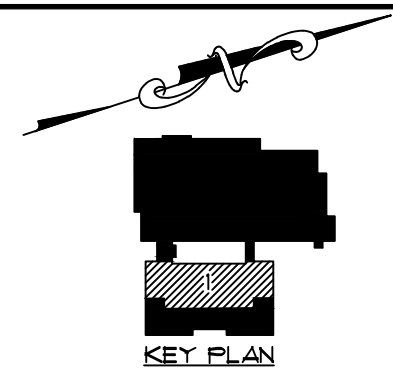


Asbestos & Environmental
Consulting Corporation

6308 Fly Road
East Syracuse, NY 13057

PROJECT NO. 20-146		Circleville Middle School 1951 New York State Route 302 Circleville, New York 10919 Partial First Floor Plan	FIGURE 2
DRAWN: SEPT. 2020			
DRAWN BY: NP		Limited Hazardous Material Pre-Renovation Survey	
CHECKED BY: BB			






IMPORTANT SURVEY NOTE:

THIS SURVEY WAS LIMITED IN NATURE. ONLY SPECIFIC BUILDING MATERIALS WITHIN THE DASHED BOUNDARIES WERE INVESTIGATED/SAMPLED, AS PER THE DIRECTION OF THE PROJECT ARCHITECT. ANY BUILDING MATERIALS NOT SPECIFICALLY SAMPLED WITHIN THE DASHED BOUNDARIES AND ALL BUILDING MATERIALS LOCATED OUTSIDE THE DASHED BOUNDARIES SHALL NEED TO BE TREATED AS POTENTIALLY HAZARDOUS MATERIALS, UNTIL EXAMINED BY AN ENVIRONMENTAL CONSULTANT AND LABORATORY RESULTS PROVE OTHERWISE.

THE INFORMATION INCLUDED ON THIS GRAPHIC REPRESENTATION HAS BEEN COMPILED FROM A VARIETY OF SOURCES AND IS SUBJECT TO CHANGE WITHOUT NOTICE. AECC MAKES NO REPRESENTATIONS OR WARRANTIES, EXPRESS OR IMPLIED, AS TO ACCURACY, COMPLETENESS, TIMELINESS, OR RIGHTS TO THE USE OF SUCH INFORMATION. THIS DOCUMENT IS NOT INTENDED FOR USE AS A LAND SURVEY PRODUCT NOR IS IT DESIGNED OR INTENDED AS A CONSTRUCTION DESIGN DOCUMENT. THE USE OR MISUSE OF THE INFORMATION CONTAINED ON THIS GRAPHIC REPRESENTATION IS AT THE SOLE RISK OF THE PARTY USING OR MISUSING THE INFORMATION.

 Asbestos & Environmental Consulting Corporation 6308 Fly Road East Syracuse, NY 13057	PROJECT NO.	20-146	Circleville Middle School 1951 New York State Route 302 Circleville, New York 10919 Second Floor Plan	FIGURE 4
	DRAWN:	SEPT. 2020		
	DRAWN BY:	NP	Limited Hazardous Material Pre-Renovation Survey	
	CHECKED BY:	BB		



Limited Hazardous Material Pre-Renovation Survey Report Pine Bush Central School District – 2019 CIP, Phase 2 Activities

Pakanasink Elementary School
1953 NYS Route 302
Circleville, New York 10919

Prepared for:

Mr. Christopher M. Ladanyi, AIS
Clark Patterson Lee, Architecture, Engineering & Planning, P.C.
50 Front Street, Suite 202
Newburgh, New York 12550

Prepared by:

Asbestos & Environmental Consulting Corporation (AECC)
6308 Fly Road
East Syracuse, New York 13057



September 14, 2020

Mr. Christopher M. Ladanyi, AIS
Clark Patterson Lee, Architecture, Engineering & Planning, P.C.
50 Front Street, Suite 202
Newburgh, New York 12550

**RE: Limited Hazardous Material Pre-Renovation Survey Report
Pine Bush Central School District – 2019 CIP, Phase 2 Activities
Pakanasink Elementary School – 1953 NYS Route 302, Circleville, New York 10919
AECC Project Number: 20-146**

Dear Mr. Ladanyi:

The Asbestos & Environmental Consulting Corporation (AECC) conducted a limited hazardous material pre-renovation survey at Pakanasink Elementary School, located at 1953 New York State Route 302, in Circleville, New York. The survey was limited nature. Only specific areas anticipated to be impacted by proposed Phase II activities of the Pine Bush 2019 Capital Improvement Project were included, as per the direction of the Project Architect (CPL). The following sections summarize the results:

ASBESTOS PRE-RENOVATION SURVEY

The asbestos bulk samples were collected by Mr. Bruce Osterman, Mr. Nicholas Coulombe, Mr. Hayden Haas and Mr. Steven Martinez, New York State Department of Labor (NYSDOL)-certified Asbestos Building Inspectors. The following building materials were collected, labeled, and shipped to AmeriSci New York for laboratory analysis:

Table 1: Asbestos Bulk Sampling Summary

SAMPLE NUMBER	MATERIAL DESCRIPTION	SAMPLE LOCATION(S)	ASBESTOS CONTENT
ACT-001A,B	2'x4' Acoustical Ceiling Tile (White, Pinholes/Fissures)	1 st Floor - Lobby 1	NAD
CB-002A,B	4" Cove Base (Black)	1 st Floor - Lobby 1	NAD
CBM-003A,B	Cove Base Mastic (Brown)	1 st Floor - Lobby 1	NAD
TRZO-004A,B	Terrazzo Flooring (White)	1 st Floor - Lobby 1	NAD
CLK-005A,B	Door Caulk (Gray)	1 st Floor - Lobby 1	TRACE

Mr. Christopher M. Ladanyi, AIS
 Clark Patterson Lee, Architecture, Engineering & Planning, P.C.
Limited Hazardous Material Pre-Renovation Survey Report
Pakanasink Elementary School – 1953 NYS Route 302, Circleville, New York 10919

Table 1: Asbestos Bulk Sampling Summary

SAMPLE NUMBER	MATERIAL DESCRIPTION	SAMPLE LOCATION(S)	ASBESTOS CONTENT
SR-006A,B	Sheetrock (Gray)	1 st Floor - General Office 136A, Transom Panel	NAD
JC-007A,B	Joint Compound (White)	1st Floor - General Office 136A, Transom Panel	1.5% Chrysotile
CLK-008A,B	Interior Door Caulk (Tan)	1st Floor - General Office 136A & Girls Locker 109A	1.9% Chrysotile
ACT-009A,B	1'x1' Acoustical Ceiling Tile (White)	1 st Floor – Lobby 1	NAD
CTG-010A,B	Ceramic Floor Tile Grout (Gray)	1 st Floor - Boys Bathroom 137 & Men's Bathroom 141	NAD
CTT-011A,B	Ceramic Floor Tile Thin Set (Gray)	1 st Floor - Boys Bathroom 137 & Men's Bathroom 141	NAD
ACT-012A,B	2'x2' Acoustical Ceiling Tile (White, Pinholes/Fissures)	1 st Floor - Boys Bathroom 137 & Men's Bathroom 141	NAD
FD-013A,B	Fire Door Insulation (Gray)	1 st Floor - Boys Bathroom 137	NAD
CTG-014A,B	Ceramic Floor Tile Grout (Gray)	1 st Floor - Boys Locker 102A & Girls Locker 109A	NAD
CTT-015A,B	Ceramic Floor Tile Thin Set (Gray)	1 st Floor - Boys Locker 102A & Girls Locker 109A	NAD
ACT-016A,B	2'x4' Acoustical Ceiling Tile (White, Smooth)	1 st Floor - Boys Locker 102A & Girls Locker 109A	NAD
CTG-017A,B	Ceramic Wall Tile Grout (White)	1 st Floor - Boys Locker 102A & Girls Locker 109A	NAD
CTT-018A,B	Ceramic Wall Tile Thin Set (Gray)	1 st Floor - Boys Locker 102A & Girls Locker 109A	NAD
CTM-019A,B	Ceramic Wall Tile Mastic (Brown)	1 st Floor - Boys Locker 102A	NAD
SR-020A,B	Sheetrock (Gray)	1 st Floor - Boys Locker 102A, Around Skylight	NAD
JC-021A,B	Joint Compound (White)	1st Floor - Boys Locker 102A, Around Skylight	1.5% Chrysotile
CLK-022A,B	Window Caulk (Gray)	1 st Floor - Classroom 107 & Classroom 101	NAD
CLK-023A,B	Window Caulk (Gray)	1 st Floor - Stair 3 & Pool 102B	TRACE

Mr. Christopher M. Ladanyi, AIS
 Clark Patterson Lee, Architecture, Engineering & Planning, P.C.
Limited Hazardous Material Pre-Renovation Survey Report
Pakanasink Elementary School – 1953 NYS Route 302, Circleville, New York 10919

Table 1: Asbestos Bulk Sampling Summary

SAMPLE NUMBER	MATERIAL DESCRIPTION	SAMPLE LOCATION(S)	ASBESTOS CONTENT
CLK-024A,B	Window Caulk (Brown)	1 st Floor – Remedial 124 & Reading Recovery 112	NAD
GLZ-025A,B	Window Glazing Compound (Black)	1 st Floor – Remedial 124 & Reading Recovery 112	NAD
GLZ-026A,B	Window Glazing Compound (Black)	1 st Floor - Pool 102B & Classroom 101	NAD
CLK-027A,B	Window Caulk (Olive Green)	1 st Floor - Pool 102B	NAD
CLK-028A,B	Window Caulk (Olive Green)	1 st Floor - Classroom 222 & Classroom 167	NAD
SR-029A,B	Sheetrock (Gray)	1 st Floor - 5 th Grade Wing, Exterior Soffit	NAD
JC-030A,B	Joint Compound (White)	1 st Floor - 5 th Grade Wing, Exterior Soffit	NAD

Table Notes:

NAD = No Asbestos Detected

TRACE = Less than 1.0% Asbestos

The following asbestos-containing materials (ACMs) were identified within the renovation areas during the completion of this survey:

Table 2: Approximate Quantities of ACMs

ACM DESCRIPTION	ACM LOCATION(S)	ESTIMATED QUANTITY	MATERIAL CONDITION
White Joint Compound (JC-007)	1 st Floor - Boys Locker 102A, Girls Locker 109A, General Office 136A & Corridor 5A, Transom Panels	96 SF	F, Intact
Tan Interior Door Caulk (CLK-008)	1 st Floor – Boys Locker 102A, Girl's Locker 109A, General Office 136A, Corridor 5A, Girls Bathroom 136, Boys Bathroom 137, Men's Room 141 & Women's Room 143	20 SF	NF, Intact
White Joint Compound (JC-021)	1 st Floor - Boys Locker 102A & Girls Locker 109A, Around Skylights	192 SF	F, Intact

Table Notes:

SF = Square Feet

F= Friable

NF = Non-Friable

Asbestos Bulk Sampling Summary – By regulatory definition, a building material must be greater than one percent (1%) asbestos to be considered an asbestos-containing material (ACM). During this survey, two (2) white joint compound applications and tan interior door caulk were determined to be ACMs by laboratory analysis. According to state and federal laws, ACMs and presumed asbestos-containing materials (PACMs) must be handled and disposed of by a licensed abatement contractor prior to any renovation or demolition-related activities. The associated laboratory analysis reports have been included in Attachment B of this report.

OSHA Compliance – It should be noted that the Occupational Safety & Health Administration (OSHA) Asbestos Standard (29 CFR 1926.1101) has a definition for both "asbestos" and "asbestos-containing material." Under OSHA Asbestos Standard, the definition of asbestos covers all building materials containing any detectable concentration of asbestos, including those with concentrations less than or equal to one percent asbestos (i.e. the gray door caulk and gray window caulk tested during this survey). Although work operations conducted in areas where a material contains less than or equal to one percent asbestos is an "unclassified" operation, the employer still must follow the requirements of 29 CFR 1926.1101(g)(1) [except (g)(1)(i)], (g)(2) and (g)(3) that describe engineering and work practice controls operations to prevent unnecessary asbestos exposures to their employees (i.e. worker protection regulations).

Transmittal of Building / Structure Asbestos Survey Information – As required by New York State Industrial Code Rule 56, copies of this report shall be immediately transmitted by the building / structure owner (prior to any renovation-related activities), as follows:

- (1) One (1) copy of the completed asbestos survey shall be sent by the owner or their agent to the local entity charged with issuing a permit for such demolition, renovation, remodeling or repair work under state or local laws.
- (2) One (1) copy of completed asbestos survey shall be kept on the construction site with the asbestos notification and variance, if required, for the duration of the asbestos project and any associated demolition, renovation, remodeling or repair project.

LEAD-BASED PAINT INSPECTION

AECC's subcontractor, EcoSpect, Inc. (EcoSpect), performed a representative lead-based paint (LBP) inspection of the proposed renovation areas on August 31, 2020. During this inspection, LBP was identified on the following building substrates (number of positive readings in parentheses):

- Steel Lockers (2)
- Steel Window Moldings (7)
- Ceramic Walls (2)

Please reference EcoSpect's *XRF Lead Inspection* report (report dated September 10, 2020), found in Attachment C of this report, for additional details pertaining to the investigation techniques, sampling methodologies, and results from the lead-based paint inspection.

CAULK SAMPLING FOR PCBs

AECC collected representative building caulk applications from the proposed renovation areas and shipped them to Schneider Laboratories Global, Inc. for polychlorinated biphenyls (PCB) analysis. The following table summarizes the results:

Table 3: PCB Bulk Sampling Summary

SAMPLE NUMBER	CAULK DESCRIPTION	SAMPLE LOCATION	PCB CONTENT
CLK-005P	Door Caulk (Gray)	1 st Floor – Lobby 1	BRL
CLK-008P	Interior Door Caulk (Tan)	1 st Floor – General Office 136A	BRL
CLK-022P	Window Caulk (Gray)	1 st Floor – Classroom 107	BRL
CLK-023P	Window Caulk (Gray)	1 st Floor - Stair 3	BRL
CLK-024P	Window Caulk (Brown)	1 st Floor – Remedial 124	BRL
CLK-027P	Window Caulk (Olive Green)	1 st Floor - Pool 102B	BRL
CLK-028P	Window Caulk (Olive Green)	1 st Floor - Classroom 222	BRL

Table Notes:

BRL = Below Reporting Limit

PCB Bulk Sampling Summary – By regulatory definition, a PCB-containing bulk material is defined as any building material containing at least 50 parts per million (ppm) of PCBs. The caulk applications collected during this survey are not PCB-containing bulk materials, as determined by laboratory analysis. The associated laboratory analysis report has been included in Attachment D of this report.

MISCELLANEOUS HAZARDOUS / SPECIAL WASTE INVENTORY

The following items were observed during AECC's survey of the proposed renovation areas and presumed to contain the specified hazardous / special wastes in the table below:

Table 4: Miscellaneous Hazardous / Special Waste Inventory

ITEM DESCRIPTION	ITEM LOCATION(S)	ESTIMATED COUNT	PRESUMED HAZ MATERIAL	ITEM CONDITION
Exit Sign (Bulbs & Batteries)	1 st Floor – Lobby 1	1	Mercury, Lead	Intact

Mr. Christopher M. Ladanyi, AIS
Clark Patterson Lee, Architecture, Engineering & Planning, P.C.
Limited Hazardous Material Pre-Renovation Survey Report
Pakanasink Elementary School – 1953 NYS Route 302, Circleville, New York 10919

Table 4: Miscellaneous Hazardous / Special Waste Inventory

ITEM DESCRIPTION	ITEM LOCATION(S)	ESTIMATED COUNT	PRESUMED HAZ MATERIAL	ITEM CONDITION
Fluorescent Light Tubes / Bulbs	1 st Floor – Boys Locker 102A, Girls Locker 109A, Girls Bathroom 136, Boys Bathroom 137, Men's Room 141 & Women's Room 143	40	Mercury	Intact
Light Ballasts		20	PCBs	Intact

Miscellaneous Hazardous / Special Wastes Summary – Additional investigation into the status of these materials / items may be performed to prove that hazardous materials are not present. However, without conducting this additional investigation, these materials must be presumed to contain potentially hazardous materials and handled / disposed of in accordance with all applicable state, federal, and local regulations.

Report Note – In the event that other building materials (materials not specifically identified in this report) are identified prior to or during the course of the renovation activities, the materials shall be presumed to be hazardous until examined by an appropriately certified individual and laboratory analysis proves otherwise.

If you have any questions pertaining to this report, please do not hesitate to contact me directly at AECC's corporate office (315-432-9400).

Sincerely,
Asbestos & Environmental Consulting Corporation



Bryan Bowers
President / Owner

Attachment A: AECC Company License & Personnel Certifications
Attachment B: Asbestos Bulk Sampling Laboratory Results
Attachment C: EcoSpect's *XRF Lead Inspection* Report
Attachment D: PCB Bulk Sampling Laboratory Results
Attachment E: Figures 1, 2, 3 & 4

ATTACHMENT A

AECC Company License & Personnel Certifications

New York State – Department of Labor

Division of Safety and Health
License and Certificate Unit
State Campus, Building 12
Albany, NY 12240

ASBESTOS HANDLING LICENSE

Asbestos & Environmental Consulting Corporation
6308 Fly Road
E. Syracuse, NY 13057

FILE NUMBER: 09-42909
LICENSE NUMBER: 42909
LICENSE CLASS: RESTRICTED
DATE OF ISSUE: 02/14/2020
EXPIRATION DATE: 02/28/2021

Duly Authorized Representative – Bryan Bowers:

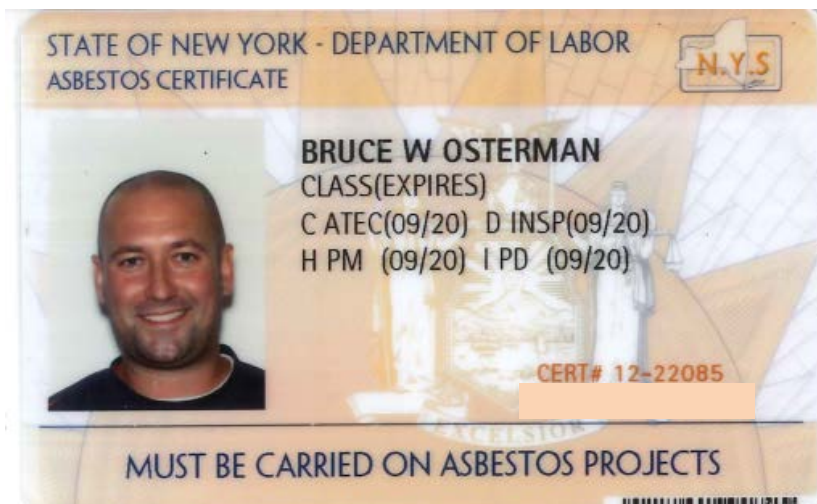
This license has been issued in accordance with applicable provisions of Article 30 of the Labor Law of New York State and of the New York State Codes, Rules and Regulations (12 NYCRR Part 56). It is subject to suspension or revocation for a (1) serious violation of state, federal or local laws with regard to the conduct of an asbestos project, or (2) demonstrated lack of responsibility in the conduct of any job involving asbestos or asbestos material.

This license is valid only for the contractor named above and this license or a photocopy must be prominently displayed at the asbestos project worksite. This license verifies that all persons employed by the licensee on an asbestos project in New York State have been issued an Asbestos Certificate, appropriate for the type of work they perform, by the New York State Department of Labor.



Eileen M. Franko, Director
For the Commissioner of Labor

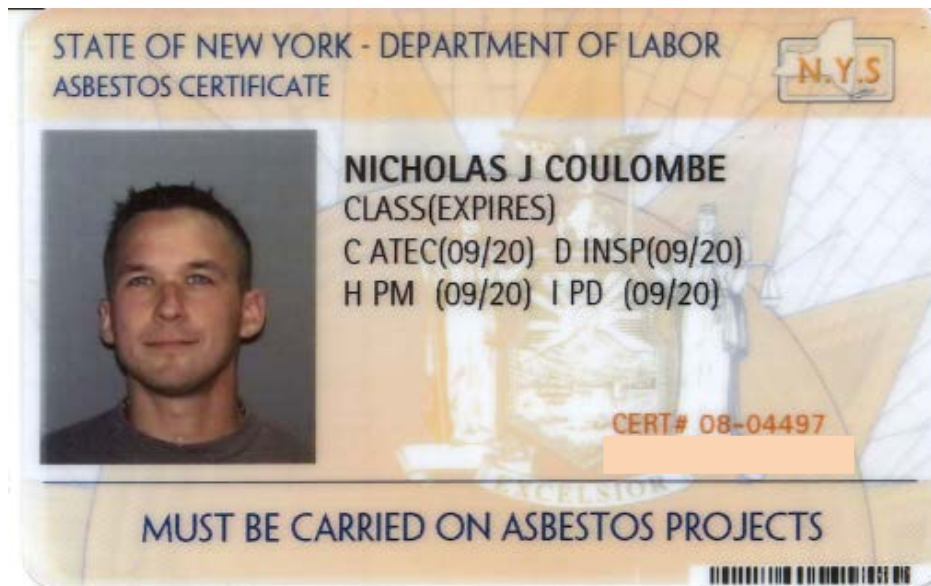
ASBESTOS CERTIFICATION



The following letter codes (as shown on the handling certificate) represent the corresponding asbestos classifications.

A – Asbestos Handler	D – Asbestos Inspector	G – Asbestos Supervisor
B – Allied Trades	E – Management Planner	H – Asbestos Project Monitor
C – Air sampling Technician	F – Operations & Maintenance	I – Asbestos Project Designer

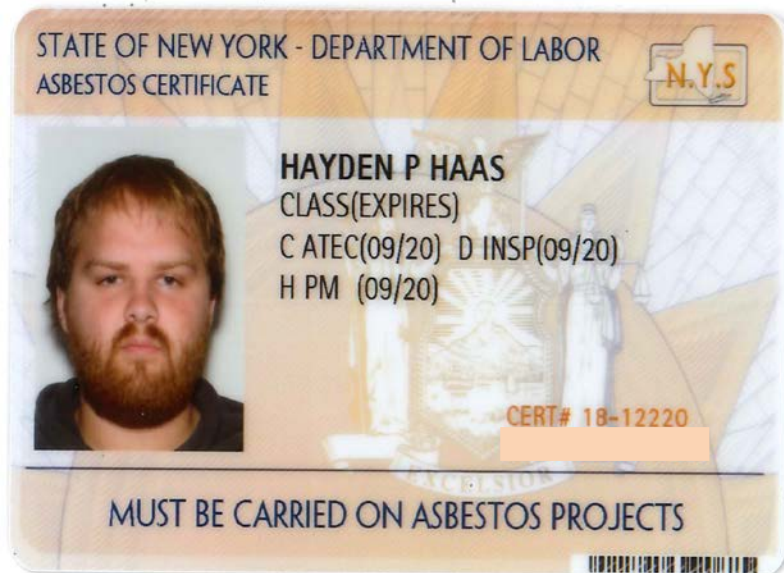
ASBESTOS CERTIFICATION



The following letter codes (as shown on the handling certificate) represent the corresponding asbestos classifications.

A – Asbestos Handler	D – Asbestos Inspector	G – Asbestos Supervisor
B – Allied Trades	E – Management Planner	H – Asbestos Project Monitor
C – Air sampling Technician	F – Operations & Maintenance	I – Asbestos Project Designer

ASBESTOS CERTIFICATION



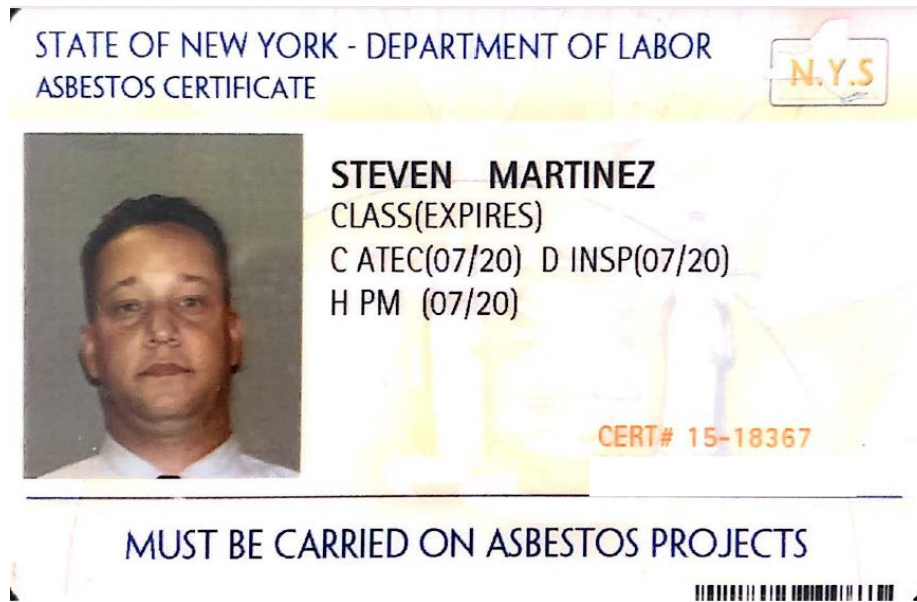
The following letter codes (as shown on the handling certificate) represent the corresponding asbestos classifications.

A – Asbestos Handler
B – Allied Trades
C – Air sampling Technician

D – Asbestos Inspector
E – Management Planner
F – Operations & Maintenance

G – Asbestos Supervisor
H – Asbestos Project Monitor
I – Asbestos Project Designer

ASBESTOS CERTIFICATION



The following letter codes (as shown on the handling certificate) represent the corresponding asbestos classifications.

A – Asbestos Handler	D – Asbestos Inspector	G – Asbestos Supervisor
B – Allied Trades	E – Management Planner	H – Asbestos Project Monitor
C – Air sampling Technician	F – Operations & Maintenance	I – Asbestos Project Designer

ATTACHMENT B

Asbestos Bulk Sampling Laboratory Results

**AmeriSci New York**

117 EAST 30TH ST.
NEW YORK, NY 10016
TEL: (212) 679-8600 • FAX: (212) 679-3114

PLM Bulk Asbestos Report

Asbestos & Environmental Consulting C
Attn: Bryan Bowers
6308 Fly Road

East Syracuse, NY 13057

Date Received 08/22/20 **AmeriSci Job #** 220083316
Date Examined 08/24/20 **P.O. #**
ELAP # 11480 **Page** 1 **of** 8
RE: 20-146; Clark Patterson Lee Architects; Pakanasink
Elementary, 1953 NY-302, Circleville, New York, 10919

Client No. / HGA	Lab No.	Asbestos Present	Total % Asbestos
ACT-001A 1	220083316-01 Location: Main Entry - 2' x 4' Pinhole/Fissured Ceiling Tile (White)	No	NAD ¹ (by NYS ELAP 198.6) by Valeriu Voicu on 08/24/20
Analyst Description: White/Beige, Homogeneous, Non-Fibrous, Bulk Material Asbestos Types: Other Material: Non-fibrous 37.4 %			
ACT-001B 1	220083316-02 Location: Main Entry - 2' x 4' Pinhole/Fissured Ceiling Tile (White)	No	NAD (by NYS ELAP 198.6) by Valeriu Voicu on 08/24/20
Analyst Description: White/Beige, Homogeneous, Non-Fibrous, Bulk Material Asbestos Types: Other Material: Non-fibrous 41.9 %			
CB-002A 2	220083316-03 Location: Main Entry - 4" Cove Base (Black)	No	NAD (by NYS ELAP 198.6) by Valeriu Voicu on 08/24/20
Analyst Description: Black, Homogeneous, Non-Fibrous, Bulk Material Asbestos Types: Other Material: Non-fibrous 3.7 %			
CB-002B 2	220083316-04 Location: Main Entry - 4" Cove Base (Black)	No	NAD (by NYS ELAP 198.6) by Valeriu Voicu on 08/24/20
Analyst Description: Black, Homogeneous, Non-Fibrous, Bulk Material Asbestos Types: Other Material: Non-fibrous 2.6 %			
CBM-003A 3	220083316-05 Location: Main Entry - Cove Base Mastic (Brown)	No	NAD (by NYS ELAP 198.6) by Valeriu Voicu on 08/24/20
Analyst Description: Brown, Homogeneous, Non-Fibrous, Bulk Material Asbestos Types: Other Material: Non-fibrous 29.2 %			

Client Name: Asbestos & Environmental Consulting Corp.

PLM Bulk Asbestos Report20-146; Clark Patterson Lee Architects; Pakanasink
Elementary, 1953 NY-302, Circleville, New York, 10919

Client No. / HGA	Lab No.	Asbestos Present	Total % Asbestos
CBM-003B 3 Location: Main Entry - Cove Base Mastic (Brown)	220083316-06	No	NAD (by NYS ELAP 198.6) by Valeriu Voicu on 08/24/20
Analyst Description: Brown, Homogeneous, Non-Fibrous, Bulk Material Asbestos Types: Other Material: Non-fibrous 28.1 %			
TRZO-004A 4 Location: Main Entry - Terrazzo Flooring (White)	220083316-07	No	NAD (by NYS ELAP 198.1) by Valeriu Voicu on 08/24/20
Analyst Description: White/Grey, Homogeneous, Non-Fibrous, Cementitious, Bulk Material Asbestos Types: Other Material: Cellulose Trace, Non-fibrous 100 %			
TRZO-004B 4 Location: Main Entry - Terrazzo Flooring (White)	220083316-08	No	NAD (by NYS ELAP 198.1) by Valeriu Voicu on 08/24/20
Analyst Description: White/Beige, Homogeneous, Non-Fibrous, Cementitious, Bulk Material Asbestos Types: Other Material: Cellulose Trace, Non-fibrous 100 %			
CLK-005A 5 Location: Main Entry - Door - Door Caulk (Gray)	220083316-09	Yes	Trace (<0.25 % pc) ² (EPA 400 PC) by Valeriu Voicu on 08/24/20
Analyst Description: Dark Brown, Homogeneous, Non-Fibrous, Bulk Material Asbestos Types: Chrysotile <0.25 % pc Other Material: Non-fibrous 4.5 %			
CLK-005B 5 Location: Main Entry - Door - Door Caulk (Gray)	220083316-10	Yes	Trace (<0.25 % pc) ² (EPA 400 PC) by Valeriu Voicu on 08/24/20
Analyst Description: Dark Brown, Homogeneous, Non-Fibrous, Bulk Material Asbestos Types: Chrysotile <0.25 % pc Other Material: Non-fibrous 5.7 %			
SR-006A 6 Location: Main Entry - Door Blank - Sheetrock (Gray)	220083316-11	No	NAD (by NYS ELAP 198.1) by Valeriu Voicu on 08/24/20
Analyst Description: OffWhite/Brown, Heterogeneous, Fibrous, Bulk Material Asbestos Types: Other Material: Cellulose 25 %, Non-fibrous 75 %			

Client Name: Asbestos & Environmental Consulting Corp.

PLM Bulk Asbestos Report20-146; Clark Patterson Lee Architects; Pakanasink
Elementary, 1953 NY-302, Circleville, New York, 10919

Client No. / HGA	Lab No.	Asbestos Present	Total % Asbestos
SR-006B 6	220083316-12 Location: Main Entry - Door Blank - Sheetrock (Gray)	No	NAD (by NYS ELAP 198.1) by Valeriu Voicu on 08/24/20
Analyst Description: OffWhite/Brown, Heterogeneous, Fibrous, Bulk Material Asbestos Types: Other Material: Cellulose 10 %, Non-fibrous 90 %			
JC-007A 7	220083316-13 Location: Main Entry - Door Blank - Joint Compound (White)	Yes	1.5 % (EPA 400 PC) by Valeriu Voicu on 08/24/20
Analyst Description: OffWhite, Homogeneous, Fibrous, Bulk Material Asbestos Types: Chrysotile 1.5 % Other Material: Non-fibrous 98.5 %			
JC-007B 7	220083316-14 Location: Main Entry - Door Blank - Joint Compound (White)		NA/PS
Analyst Description: Bulk Material Asbestos Types: Other Material:			
CLK-008A 8	220083316-15 Location: Main Entry - Door - Interior Door Caulk (Tan)	Yes	1.9 % ² (EPA 400 PC) by Valeriu Voicu on 08/24/20
Analyst Description: Tan, Homogeneous, Fibrous, Bulk Material Asbestos Types: Chrysotile 1.9 % Other Material: Non-fibrous 31.1 %			
CLK-008B 8	220083316-16 Location: Main Entry - Door - Interior Door Caulk (Tan)		NA/PS
Analyst Description: Bulk Material Asbestos Types: Other Material:			
ACT-009A 9	220083316-17 Location: Main Entry - 1' x 1' Ceiling Tile (White)	No	NAD (by NYS ELAP 198.6) by Valeriu Voicu on 08/24/20
Analyst Description: White/Grey, Homogeneous, Non-Fibrous, Bulk Material Asbestos Types: Other Material: Non-fibrous 50.1 %			

Client Name: Asbestos & Environmental Consulting Corp.

PLM Bulk Asbestos Report20-146; Clark Patterson Lee Architects; Pakanasink
Elementary, 1953 NY-302, Circleville, New York, 10919

Client No. / HGA	Lab No.	Asbestos Present	Total % Asbestos
ACT-009B 9	220083316-18 Location: Main Entry - 1' x 1' Ceiling Tile (White)	No	NAD (by NYS ELAP 198.6) by Valeriu Voicu on 08/24/20
Analyst Description: White/Grey, Homogeneous, Non-Fibrous, Bulk Material Asbestos Types: Other Material: Non-fibrous 42.4 %			
CTG-010A 10	220083316-19 Location: Boy's Bathroom 137 & Men's Bathroom 141 - Ceramic Floor Tile Grout (Gray)	No	NAD (by NYS ELAP 198.1) by Valeriu Voicu on 08/24/20
Analyst Description: Grey, Homogeneous, Non-Fibrous, Cementitious, Bulk Material Asbestos Types: Other Material: Cellulose Trace, Non-fibrous 100 %			
CTG-010B 10	220083316-20 Location: Boy's Bathroom 137 & Men's Bathroom 141 - Ceramic Floor Tile Grout (Gray)	No	NAD (by NYS ELAP 198.1) by Valeriu Voicu on 08/24/20
Analyst Description: Grey, Homogeneous, Non-Fibrous, Cementitious, Bulk Material Asbestos Types: Other Material: Cellulose Trace, Non-fibrous 100 %			
CTT-011A 11	220083316-21 Location: Boy's Bathroom 137 & Men's Bathroom 141 - Ceramic Floor Tile Thinset (Gray)	No	NAD (by NYS ELAP 198.1) by Valeriu Voicu on 08/24/20
Analyst Description: Grey, Homogeneous, Non-Fibrous, Cementitious, Bulk Material Asbestos Types: Other Material: Cellulose Trace, Non-fibrous 100 %			
CTT-011B 11	220083316-22 Location: Boy's Bathroom 137 & Men's Bathroom 141 - Ceramic Floor Tile Thinset (Gray)	No	NAD (by NYS ELAP 198.1) by Valeriu Voicu on 08/24/20
Analyst Description: Grey, Homogeneous, Non-Fibrous, Cementitious, Bulk Material Asbestos Types: Other Material: Cellulose Trace, Non-fibrous 100 %			
ACT-012A 12	220083316-23 Location: Boy's Bathroom 137 & Men's Bathroom 141 - 2' x 2' Pinhole/Fissured Ceiling Tile (White)	No	NAD (by NYS ELAP 198.6) by Valeriu Voicu on 08/24/20
Analyst Description: White/Beige, Homogeneous, Non-Fibrous, Bulk Material Asbestos Types: Other Material: Non-fibrous 37.4 %			

Client Name: Asbestos & Environmental Consulting Corp.

PLM Bulk Asbestos Report20-146; Clark Patterson Lee Architects; Pakanasink
Elementary, 1953 NY-302, Circleville, New York, 10919

Client No. / HGA	Lab No.	Asbestos Present	Total % Asbestos
ACT-012B 12	220083316-24 Location: Boy's Bathroom 137 & Men's Bathroom 141 - 2' x 2' Pinhole/Fissured Ceiling Tile (White)	No	NAD (by NYS ELAP 198.6) by Valeriu Voicu on 08/24/20
Analyst Description: White/Beige, Homogeneous, Non-Fibrous, Bulk Material Asbestos Types: Other Material: Non-fibrous 34 %			
FD-013A 13	220083316-25 Location: Boy's Bathroom 137 - Fire Door Insulation (Gray)	No	NAD (by NYS ELAP 198.1) by Valeriu Voicu on 08/24/20
Analyst Description: Light Grey, Homogeneous, Fibrous, Bulk Material Asbestos Types: Other Material: Cellulose 30 %, Non-fibrous 70 %			
FD-013B 13	220083316-26 Location: Boy's Bathroom 137 - Fire Door Insulation (Gray)	No	NAD (by NYS ELAP 198.1) by Valeriu Voicu on 08/24/20
Analyst Description: Light Grey, Homogeneous, Fibrous, Bulk Material Asbestos Types: Other Material: Cellulose 35 %, Non-fibrous 65 %			
CTG-014A 14	220083316-27 Location: Boy's Locker Room & Girl's Locker Room - Ceramic Floor Tile Grout (Gray)	No	NAD (by NYS ELAP 198.1) by Valeriu Voicu on 08/24/20
Analyst Description: Grey, Homogeneous, Non-Fibrous, Cementitious, Bulk Material Asbestos Types: Other Material: Cellulose Trace, Non-fibrous 100 %			
CTG-014B 14	220083316-28 Location: Boy's Locker Room & Girl's Locker Room - Ceramic Floor Tile Grout (Gray)	No	NAD (by NYS ELAP 198.1) by Valeriu Voicu on 08/24/20
Analyst Description: Grey, Homogeneous, Non-Fibrous, Cementitious, Bulk Material Asbestos Types: Other Material: Cellulose Trace, Non-fibrous 100 %			
CTT-015A 15	220083316-29 Location: Boy's Locker Room & Girl's Locker Room - Ceramic Floor Tile Thinset (Gray)	No	NAD (by NYS ELAP 198.1) by Valeriu Voicu on 08/24/20
Analyst Description: Light Grey/Grey, Heterogeneous, Non-Fibrous, Cementitious, Bulk Material Asbestos Types: Other Material: Cellulose Trace, Non-fibrous 100 %			

Client Name: Asbestos & Environmental Consulting Corp.

PLM Bulk Asbestos Report

20-146; Clark Patterson Lee Architects; Pakanasink
Elementary, 1953 NY-302, Circleville, New York, 10919

Client No. / HGA	Lab No.	Asbestos Present	Total % Asbestos
CTT-015B 15	220083316-30 Location: Boy's Locker Room & Girl's Locker Room - Ceramic Floor Tile Thinset (Gray)	No	NAD (by NYS ELAP 198.1) by Valeriu Voicu on 08/24/20
Analyst Description: Light Grey/Grey, Heterogeneous, Non-Fibrous, Cementitious, Bulk Material Asbestos Types: Other Material: Cellulose Trace, Non-fibrous 100 %			
ACT-016A 16	220083316-31 Location: Boy's Locker Room & Girl's Locker Room - 2' x 4' Smooth Ceiling Tile (White)	No	NAD (by NYS ELAP 198.6) by Valeriu Voicu on 08/24/20
Analyst Description: White/Grey, Homogeneous, Non-Fibrous, Bulk Material Asbestos Types: Other Material: Non-fibrous 53.4 %			
ACT-016B 16	220083316-32 Location: Boy's Locker Room & Girl's Locker Room - 2' x 4' Smooth Ceiling Tile (White)	No	NAD (by NYS ELAP 198.6) by Valeriu Voicu on 08/24/20
Analyst Description: White/Grey, Homogeneous, Non-Fibrous, Bulk Material Asbestos Types: Other Material: Non-fibrous 57.1 %			
CTG-017A 17	220083316-33 Location: Boy's Locker Room & Girl's Locker Room - Ceramic Wall Tile Grout (White)	No	NAD (by NYS ELAP 198.1) by Valeriu Voicu on 08/24/20
Analyst Description: White, Homogeneous, Non-Fibrous, Bulk Material Asbestos Types: Other Material: Cellulose Trace, Non-fibrous 100 %			
CTG-017B 17	220083316-34 Location: Boy's Locker Room & Girl's Locker Room - Ceramic Wall Tile Grout (White)	No	NAD (by NYS ELAP 198.1) by Valeriu Voicu on 08/24/20
Analyst Description: White, Homogeneous, Non-Fibrous, Bulk Material Asbestos Types: Other Material: Cellulose Trace, Non-fibrous 100 %			
CTT-018A 18	220083316-35 Location: Boy's Locker Room & Girl's Locker Room - Ceramic Wall Tile Thinset (Gray)	No	NAD (by NYS ELAP 198.1) by Valeriu Voicu on 08/24/20
Analyst Description: Grey, Homogeneous, Non-Fibrous, Bulk Material Asbestos Types: Other Material: Cellulose Trace, Non-fibrous 100 %			

Client Name: Asbestos & Environmental Consulting Corp.

PLM Bulk Asbestos Report20-146; Clark Patterson Lee Architects; Pakanasink
Elementary, 1953 NY-302, Circleville, New York, 10919

Client No. / HGA	Lab No.	Asbestos Present	Total % Asbestos
CTT-018B 18	220083316-36	No	NAD
Location: Boy's Locker Room & Girl's Locker Room - Ceramic Wall Tile Thinset (Gray)			(by NYS ELAP 198.1) by Valeriu Voicu on 08/24/20
Analyst Description: Grey, Homogeneous, Non-Fibrous, Bulk Material			
Asbestos Types:			
Other Material: Cellulose Trace, Non-fibrous 100 %			
CTM-019A 19	220083316-37	No	NAD
Location: Boy's Locker Room & Girl's Locker Room - Ceramic Wall Tile Mastic (Brown)			(by NYS ELAP 198.6) by Valeriu Voicu on 08/24/20
Analyst Description: Brown/White, Heterogeneous, Non-Fibrous, Bulk Material			
Asbestos Types:			
Other Material: Non-fibrous 40.3 %			
CTM-019B 19	220083316-38	No	NAD
Location: Boy's Locker Room & Girl's Locker Room - Ceramic Wall Tile Mastic (Brown)			(by NYS ELAP 198.6) by Valeriu Voicu on 08/24/20
Analyst Description: Brown/White, Heterogeneous, Non-Fibrous, Bulk Material			
Asbestos Types:			
Other Material: Non-fibrous 35.8 %			
SR-020A 20	220083316-39	No	NAD
Location: Boy's Locker Room - Skylight - Sheetrock (Gray)			(by NYS ELAP 198.1) by Valeriu Voicu on 08/24/20
Analyst Description: Grey, Homogeneous, Fibrous, Bulk Material			
Asbestos Types:			
Other Material: Cellulose 2 %, Non-fibrous 98 %			
SR-020B 20	220083316-40	No	NAD
Location: Boy's Locker Room - Skylight - Sheetrock (Gray)			(by NYS ELAP 198.1) by Valeriu Voicu on 08/24/20
Analyst Description: Grey/Brown, Heterogeneous, Fibrous, Bulk Material			
Asbestos Types:			
Other Material: Cellulose 7 %, Non-fibrous 93 %			

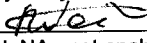
Client Name: Asbestos & Environmental Consulting Corp.

PLM Bulk Asbestos Report

20-146; Clark Patterson Lee Architects; Pakanasink
Elementary, 1953 NY-302, Circleville, New York, 10919

Reporting Notes:

- (1) This PLM job was analyzed using Olympus BH-2 Pol Scope S/N 229915
- (2) Sample prepared for analysis by ELAP 198.6 method

Analyzed by: Valeriu Voicu 

*NAD/NSD =no asbestos detected; NA =not analyzed; NA/PS=not analyzed/positive stop, (SOF-V) = Sprayed On Fireproofing containing Vermiculite; (SM-V) = Surfacing Material containing Vermiculite; PLM Bulk Asbestos Analysis by Appd E to Subpt E, 40 CFR 763 (NVLAP 200546-0), ELAP PLM Method 198.1 for NY friable samples, which includes the identification and quantitation of vermiculite or ELAP 198.6 for NOB samples or EPA 400 pt ct by EPA 600-M4-82-020 (NY ELAP Lab 11480); Note:PLM is not consistently reliable in detecting asbestos in floor coverings and similar non-friable organically bound materials. NAD or Trace results by PLM are inconclusive, TEM is currently the only method that can be used to determine if this material can be considered or treated as non asbestos-containing in NY State (also see EPA Advisory for floor tile, FR 59,146,38970,8/1/94) National Institute of Standards and Technology Accreditation requirements mandate that this report must not be reproduced except in full without the approval of the lab. This PLM report relates ONLY to the items tested. AIHA-LAP, LLC Lab ID 102843, RI Cert AAL-094, CT Cert PH-0186, Mass Cert AA000054.

Reviewed By: 

END OF REPORT

Client Name: Asbestos & Environmental Consulting Corp.

Table I
Summary of Bulk Asbestos Analysis Results

20-146; Clark Patterson Lee Architects; Pakanasink Elementary, 1953 NY-302, Circleville, New York, 10919

AmeriSci Sample #	Client Sample#	HG Area	Sample Weight (gram)	Heat Sensitive Organic %	Acid Soluble Inorganic %	Insoluble Non-Asbestos Inorganic %	** Asbestos % by PLM/DS	** Asbestos % by TEM
01	ACT-001A	1	0.149	15.3	47.3	37.4	NAD	NAD
Location: Main Entry - 2' x 4' Pinhole/Fissured Ceiling Tile (White)								
02	ACT-001B	1	0.203	15.1	43.0	41.9	NAD	NAD
Location: Main Entry - 2' x 4' Pinhole/Fissured Ceiling Tile (White)								
03	CB-002A	2	0.136	26.0	70.3	3.7	NAD	NAD
Location: Main Entry - 4" Cove Base (Black)								
04	CB-002B	2	0.155	26.7	70.6	2.6	NAD	NAD
Location: Main Entry - 4" Cove Base (Black)								
05	CBM-003A	3	0.274	66.3	4.5	29.2	NAD	NAD
Location: Main Entry - Cove Base Mastic (Brown)								
06	CBM-003B	3	0.195	66.6	5.3	28.1	NAD	NAD
Location: Main Entry - Cove Base Mastic (Brown)								
07	TRZO-004A	4	----	----	----	----	NAD	NA
Location: Main Entry - Terrazzo Flooring (White)								
08	TRZO-004B	4	----	----	----	----	NAD	NA
Location: Main Entry - Terrazzo Flooring (White)								
09	CLK-005A	5	0.201	45.5	50.0	4.4	Chrysotile <0.25	Chrysotile Trace
Location: Main Entry - Door - Door Caulk (Gray)								
10	CLK-005B	5	0.272	45.0	49.2	5.6	Chrysotile <0.25	Chrysotile Trace
Location: Main Entry - Door - Door Caulk (Gray)								
11	SR-006A	6	----	----	----	----	NAD	NA
Location: Main Entry - Door Blank - Sheetrock (Gray)								
12	SR-006B	6	----	----	----	----	NAD	NA
Location: Main Entry - Door Blank - Sheetrock (Gray)								
13	JC-007A	7	----	----	----	----	Chrysotile 1.5	NA
Location: Main Entry - Door Blank - Joint Compound (White)								
14	JC-007B	7	----	----	----	----	NA/PS	NA
Location: Main Entry - Door Blank - Joint Compound (White)								
15	CLK-008A	8	0.185	41.9	25.1	31.1	Chrysotile 1.9	NA
Location: Main Entry - Door - Interior Door Caulk (Tan)								
16	CLK-008B	8	0.417	30.1	53.7	16.2	NA/PS	NA
Location: Main Entry - Door - Interior Door Caulk (Tan)								

See Reporting notes on last page

Table I
Summary of Bulk Asbestos Analysis Results

20-146; Clark Patterson Lee Architects; Pakanasink Elementary, 1953 NY-302, Circleville, New York, 10919

AmeriSci Sample #	Client Sample#	HG Area	Sample Weight (gram)	Heat Sensitive Organic %	Acid Soluble Inorganic %	Insoluble Non-Asbestos Inorganic %	** Asbestos % by PLM/DS	** Asbestos % by TEM
17	ACT-009A	9	0.163	2.0	47.9	50.1	NAD	NAD
Location: Main Entry - 1' x 1' Ceiling Tile (White)								
18	ACT-009B	9	0.118	4.2	53.4	42.4	NAD	NAD
Location: Main Entry - 1' x 1' Ceiling Tile (White)								
19	CTG-010A	10	----	----	----	----	NAD	NA
Location: Boy's Bathroom 137 & Men's Bathroom 141 - Ceramic Floor Tile Grout (Gray)								
20	CTG-010B	10	----	----	----	----	NAD	NA
Location: Boy's Bathroom 137 & Men's Bathroom 141 - Ceramic Floor Tile Grout (Gray)								
21	CTT-011A	11	----	----	----	----	NAD	NA
Location: Boy's Bathroom 137 & Men's Bathroom 141 - Ceramic Floor Tile Thinset (Gray)								
22	CTT-011B	11	----	----	----	----	NAD	NA
Location: Boy's Bathroom 137 & Men's Bathroom 141 - Ceramic Floor Tile Thinset (Gray)								
23	ACT-012A	12	0.100	54.0	8.7	37.4	NAD	NAD
Location: Boy's Bathroom 137 & Men's Bathroom 141 - 2' x 2' Pinhole/Fissured Ceiling Tile (White)								
24	ACT-012B	12	0.084	30.1	35.8	34.0	NAD	NAD
Location: Boy's Bathroom 137 & Men's Bathroom 141 - 2' x 2' Pinhole/Fissured Ceiling Tile (White)								
25	FD-013A	13	----	----	----	----	NAD	NA
Location: Boy's Bathroom 137 - Fire Door Insulation (Gray)								
26	FD-013B	13	----	----	----	----	NAD	NA
Location: Boy's Bathroom 137 - Fire Door Insulation (Gray)								
27	CTG-014A	14	----	----	----	----	NAD	NA
Location: Boy's Locker Room & Girl's Locker Room - Ceramic Floor Tile Grout (Gray)								
28	CTG-014B	14	----	----	----	----	NAD	NA
Location: Boy's Locker Room & Girl's Locker Room - Ceramic Floor Tile Grout (Gray)								
29	CTT-015A	15	----	----	----	----	NAD	NA
Location: Boy's Locker Room & Girl's Locker Room - Ceramic Floor Tile Thinset (Gray)								
30	CTT-015B	15	----	----	----	----	NAD	NA
Location: Boy's Locker Room & Girl's Locker Room - Ceramic Floor Tile Thinset (Gray)								
31	ACT-016A	16	0.155	1.3	45.3	53.4	NAD	NAD
Location: Boy's Locker Room & Girl's Locker Room - 2' x 4' Smooth Ceiling Tile (White)								
32	ACT-016B	16	0.160	1.3	41.6	57.1	NAD	NAD
Location: Boy's Locker Room & Girl's Locker Room - 2' x 4' Smooth Ceiling Tile (White)								

Client Name: Asbestos & Environmental Consulting Corp.

Table I
Summary of Bulk Asbestos Analysis Results

20-146; Clark Patterson Lee Architects; Pakanasink Elementary, 1953 NY-302, Circleville, New York, 10919

AmeriSci Sample #	Client Sample#	HG Area	Sample Weight (gram)	Heat Sensitive Organic %	Acid Soluble Inorganic %	Insoluble Non-Asbestos Inorganic %	** Asbestos % by PLM/DS	** Asbestos % by TEM
33	CTG-017A	17	----	----	----	----	NAD	NA
Location: Boy's Locker Room & Girl's Locker Room - Ceramic Wall Tile Grout (White)								
34	CTG-017B	17	----	----	----	----	NAD	NA
Location: Boy's Locker Room & Girl's Locker Room - Ceramic Wall Tile Grout (White)								
35	CTT-018A	18	----	----	----	----	NAD	NA
Location: Boy's Locker Room & Girl's Locker Room - Ceramic Wall Tile Thinset (Gray)								
36	CTT-018B	18	----	----	----	----	NAD	NA
Location: Boy's Locker Room & Girl's Locker Room - Ceramic Wall Tile Thinset (Gray)								
37	CTM-019A	19	0.327	39.7	20.1	40.3	NAD	NAD
Location: Boy's Locker Room & Girl's Locker Room - Ceramic Wall Tile Mastix (Brown)								
38	CTM-019B	19	0.313	55.3	8.9	35.8	NAD	NAD
Location: Boy's Locker Room & Girl's Locker Room - Ceramic Wall Tile Mastix (Brown)								
39	SR-020A	20	----	----	----	----	NAD	NA
Location: Boy's Locker Room - Skylight - Sheetrock (Gray)								
40	SR-020B	20	----	----	----	----	NAD	NA
Location: Boy's Locker Room - Skylight - Sheetrock (Gray)								

Analyzed by: A Barengolts-Hitachi#542/Noran, Date Analyzed 8/26/2020

**Quantitative Analysis (Semi/Full); Bulk Asbestos Analysis - PLM by Appd E to Subpt E, 40 CFR 763 or NYSDOH ELAP 198.1 for New York friable samples or NYSDOH ELAP 198.6 for New York NOB samples; TEM (Semi/Full) by EPA 600/R-93/116 (or NYSDOH ELAP 198.4; for New York samples); NAD = no asbestos detected during a quantitative analysis; NA = not analyzed; Trace = <1%; (SOF-V) = Sprayed On Fireproofing containing Vermiculite; (SM-V) = Surfacing Material containing Vermiculite; Quantitation for beginning weights of <0.1 grams should be considered as qualitative only; Qualitative Analysis: Asbestos analysis results of "Present" or "NVA = No Visible Asbestos" represents results for Qualitative PLM or TEM Analysis only (no accreditation coverage available from any regulatory agency for qualitative analyses); NVLAP (PLM) 200546-0, NYSDOH ELAP Lab 11480, AIHA-LAP, LLC (PLM) Lab ID 102843.

Warning Note: PLM limitation, only TEM will resolve fibers <0.25 micrometers in diameter. TEM bulk analysis is representative of the fine grained matrix material and may not be representative of non-uniformly dispersed debris for which PLM evaluation is recommended (i.e. soils and other heterogenous materials).

Reviewed By: _____



#220083316

Asbestos Bulk Sample Chain of Custody

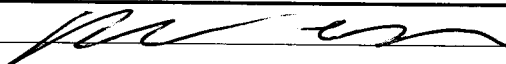

Project No. 20-146
Client Clark Patterson Lee Architects
Address **Pakanasink Elementary**
1953 NY-302, Circleville, New York 10919

AECC Contact: Bryan Bowers
Office Phone: 315-432-9400
Office Fax: 315-432-9405
E-mail: labdata@aeccgroup.com

Sample ID	Material Description	Sample Location
ACT-001A,B	2'X4' Pinhole/Fissured Ceiling Tile (White)	Main Entry
CB-002A,B	4" Cove Base (Black)	Main Entry
CBM-003A,B	Cove Base Mastic (Brown)	Main Entry
TRZO-004A,B	Terrazzo Flooring (White)	Main Entry
CLK-005A,B	Door Caulk (Gray)	Main Entry – Door
SR-006A,B	Sheetrock (Gray)	Main Office – Door Blank
JC-007A,B	Joint Compound (White)	Main Office – Door Blank
CLK-008A,B	Interior Door Caulk (Tan)	Main Office – Door
ACT-009A,B	1'x1' Ceiling Tile (White)	Main Entry
CTG-010A,B	Ceramic Floor Tile Grout (Gray)	Boy's Bathroom 137 & Men's Bathroom 141
CTT-011A,B	Ceramic Floor Tile Thinset (Gray)	Boy's Bathroom 137 & Men's Bathroom 141
ACT-012A,B	2'x2' Pinhole/Fissured Ceiling Tile (White)	Boy's Bathroom 137 & Men's Bathroom 141
FD-013A,B	Fire Door Insulation (Gray)	Boy's Bathroom 137
CTG-014A,B	Ceramic Floor Tile Grout (Gray)	Boy's Locker Room & Girl's Locker Room
CTT-015A,B	Ceramic Floor Tile Thinset (Gray)	Boy's Locker Room & Girl's Locker Room
ACT-016A,B	2'x4' Smooth Ceiling Tile (White)	Boy's Locker Room & Girl's Locker Room
CTG-017A,B	Ceramic Wall Tile Grout (White)	Boy's Locker Room & Girl's Locker Room
CTT-018A,B	Ceramic Wall Tile Thinset (Gray)	Boy's Locker Room & Girl's Locker Room
CTM-019A,B	Ceramic Wall Tile Mastic (Brown)	Boy's Locker Room & Girl's Locker Room
SR-020A,B	Sheetrock (Gray)	Boy's Locker Room – Skylight

Analyzing Sequence: 1 - Separate layers/mastics for individual analysis, if applicable.
2 - Determine method of analysis for PLM (198.1 or 198.6).
3 - If the PLM NOB result is equal to or greater than 1% asbestos, testing of material is complete.
If the PLM NOB result is less than 1% asbestos, please analyze utilizing TEM.
4 - If submitted in series (A, B, C), please stop at first positive.
5 - Report results as % Asbestos via e-mail.

Sample Turnaround Time: ~~10~~ 5 DAY Verbal To: _____ Phone: _____

Sampled By: 	Date: 8/20/20
Shipped By: _____	Date: _____
Received By Lab: 	Date: 8/22/2020 1150
Results e-mailed By: _____	Date: _____

**AmeriSci New York**

117 EAST 30TH ST.
NEW YORK, NY 10016
TEL: (212) 679-8600 • FAX: (212) 679-3114

PLM Bulk Asbestos Report

Asbestos & Environmental Consulting C
Attn: Bryan Bowers
6308 Fly Road

East Syracuse, NY 13057

Date Received 08/22/20 **AmeriSci Job #** 220083315
Date Examined 08/24/20 **P.O. #**
ELAP # 11480 **Page** 1 of 4
RE: 20-146; Clark Patterson Lee Architects; Pakanasink
Elementary, 1953 NY-302, Circleville, New York, 10919

Client No. / HGA	Lab No.	Asbestos Present	Total % Asbestos
JC-021A 21	220083315-01 Location: Boy's Locker Room - Skylight - Joint Compound (White)	Yes	1.5 % ¹ (EPA 400 PC) by Valeriu Voicu on 08/24/20
Analyst Description: White, Homogeneous, Fibrous, Bulk Material Asbestos Types: Chrysotile 1.5 % Other Material: Cellulose Trace, Non-fibrous 98.5 %			
JC-021B 21	220083315-02 Location: Boy's Locker Room - Skylight - Joint Compound (White)		N/A/PS
Analyst Description: Bulk Material Asbestos Types: Other Material:			
CLK-022A 22	220083315-03 Location: Classroom 124 & 101 - Window - Window Caulk (Gray)	No	NAD (by NYS ELAP 198.6) by Valeriu Voicu on 08/26/20
Analyst Description: Grey, Homogeneous, Non-Fibrous, Bulk Material Asbestos Types: Other Material: Non-fibrous 1.4 %			
CLK-022B 22	220083315-04 Location: Classroom 124 & 101 - Window - Window Caulk (Gray)	No	NAD (by NYS ELAP 198.6) by Valeriu Voicu on 08/26/20
Analyst Description: Grey, Homogeneous, Non-Fibrous, Bulk Material Asbestos Types: Other Material: Non-fibrous 1.1 %			
CLK-023A 23	220083315-05 Location: Classroom 124 & Pool Area - Window - Window Caulk (Gray)	Yes	Trace (<0.25 % pc) ² (EPA 400 PC) by Valeriu Voicu on 08/26/20
Analyst Description: Dark Brown, Homogeneous, Non-Fibrous, Bulk Material Asbestos Types: Chrysotile <0.25 % pc Other Material: Non-fibrous 3.6 %			

Client Name: Asbestos & Environmental Consulting Corp.

PLM Bulk Asbestos Report20-146; Clark Patterson Lee Architects; Pakanasink
Elementary, 1953 NY-302, Circleville, New York, 10919

Client No. / HGA	Lab No.	Asbestos Present	Total % Asbestos
CLK-023B 23	220083315-06 Location: Classroom 124 & Pool Area - Window - Window Caulk (Gray)	Yes	Trace (<0.25 % pc) ² (EPA 400 PC) by Valeriu Voicu on 08/26/20
Analyst Description: Dark Brown, Homogeneous, Non-Fibrous, Bulk Material Asbestos Types: Chrysotile <0.25 % pc Other Material: Non-fibrous 1.7 %			
CLK-024A 24	220083315-07 Location: Classroom 124 & 112 - Window - Window Caulk (Brown)	No	NAD (by NYS ELAP 198.6) by Valeriu Voicu on 08/26/20
Analyst Description: Brown, Homogeneous, Non-Fibrous, Bulk Material Asbestos Types: Other Material: Non-fibrous 2 %			
CLK-024B 24	220083315-08 Location: Classroom 124 & 112 - Window - Window Caulk (Brown)	No	NAD (by NYS ELAP 198.6) by Valeriu Voicu on 08/26/20
Analyst Description: Brown, Homogeneous, Non-Fibrous, Bulk Material Asbestos Types: Other Material: Non-fibrous 2.1 %			
GLZ-025A 25	220083315-09 Location: Classroom 124 & 112 - Window - Window Glazing Compound (Black)	No	NAD (by NYS ELAP 198.6) by Valeriu Voicu on 08/26/20
Analyst Description: Black, Homogeneous, Non-Fibrous, Bulk Material Asbestos Types: Other Material: Non-fibrous 56.9 %			
GLZ-025B 25	220083315-10 Location: Classroom 124 & 112 - Window - Window Glazing Compound (Black)	No	NAD (by NYS ELAP 198.6) by Valeriu Voicu on 08/26/20
Analyst Description: Black, Homogeneous, Non-Fibrous, Bulk Material Asbestos Types: Other Material: Non-fibrous 49 %			
GLZ-026A 26	220083315-11 Location: Pool Area & Classroom 101 - Window Glazing Compound (Black)	No	NAD (by NYS ELAP 198.6) by Valeriu Voicu on 08/26/20
Analyst Description: Black, Homogeneous, Non-Fibrous, Bulk Material Asbestos Types: Other Material: Non-fibrous 43.1 %			

Client Name: Asbestos & Environmental Consulting Corp.

PLM Bulk Asbestos Report20-146; Clark Patterson Lee Architects; Pakanasink
Elementary, 1953 NY-302, Circleville, New York, 10919

Client No. / HGA	Lab No.	Asbestos Present	Total % Asbestos
GLZ-026B 26	220083315-12 Location: Pool Area & Classroom 101 - Window Glazing Compound (Black)	No	NAD (by NYS ELAP 198.6) by Valeriu Voicu on 08/26/20
Analyst Description: Black, Homogeneous, Non-Fibrous, Bulk Material Asbestos Types: Other Material: Non-fibrous 50 %			
CLK-027A 27	220083315-13 Location: Pool Area - Window - Window Caulk (Olive Green)	No	NAD (by NYS ELAP 198.6) by Valeriu Voicu on 08/26/20
Analyst Description: Olive, Homogeneous, Non-Fibrous, Bulk Material Asbestos Types: Other Material: Non-fibrous 2.1 %			
CLK-027B 27	220083315-14 Location: Pool Area - Window - Window Caulk (Olive Green)	No	NAD (by NYS ELAP 198.6) by Valeriu Voicu on 08/26/20
Analyst Description: Olive, Homogeneous, Non-Fibrous, Bulk Material Asbestos Types: Other Material: Non-fibrous 1.5 %			
CLK-028A 28	220083315-15 Location: Science Room 222 - Window - Window Caulk (Olive Green)	No	NAD (by NYS ELAP 198.6) by Valeriu Voicu on 08/26/20
Analyst Description: Olive, Homogeneous, Non-Fibrous, Bulk Material Asbestos Types: Other Material: Non-fibrous 6.7 %			
CLK-028B 28	220083315-16 Location: Science Room 222 - Window - Window Caulk (Olive Green)	No	NAD (by NYS ELAP 198.6) by Valeriu Voicu on 08/26/20
Analyst Description: Olive, Homogeneous, Non-Fibrous, Bulk Material Asbestos Types: Other Material: Non-fibrous 6.7 %			
SR-029A 29	220083315-17 Location: 5th Grade Wing - Exterior Soffit - Sheetrock (Gray)	No	NAD (by NYS ELAP 198.1) by Valeriu Voicu on 08/26/20
Analyst Description: White, Homogeneous, Fibrous, Bulk Material Asbestos Types: Other Material: Cellulose 1 %, Fibrous glass Trace, Non-fibrous 99 %			

Client Name: Asbestos & Environmental Consulting Corp.

PLM Bulk Asbestos Report20-146; Clark Patterson Lee Architects; Pakanasink
Elementary, 1953 NY-302, Circleville, New York, 10919

Client No. / HGA	Lab No.	Asbestos Present	Total % Asbestos
SR-029B 29	220083315-18 Location: 5th Grade Wing - Exterior Soffit - Sheetrock (Gray)	No	NAD (by NYS ELAP 198.1) by Valeriu Voicu on 08/26/20
Analyst Description: White, Homogeneous, Fibrous, Bulk Material Asbestos Types: Other Material: Cellulose 1 %, Fibrous glass Trace, Non-fibrous 99 %			
JC-030A 30	220083315-19 Location: 5th Grade Wing - Exterior Soffit - Joint Compound (White)	No	NAD (by NYS ELAP 198.1) by Valeriu Voicu on 08/26/20
Analyst Description: White, Homogeneous, Non-Fibrous, Bulk Material Asbestos Types: Other Material: Cellulose Trace, Non-fibrous 100 %			
JC-030B 30	220083315-20 Location: 5th Grade Wing - Exterior Soffit - Joint Compound (White)	No	NAD (by NYS ELAP 198.1) by Valeriu Voicu on 08/26/20
Analyst Description: White, Homogeneous, Non-Fibrous, Bulk Material Asbestos Types: Other Material: Cellulose Trace, Non-fibrous 100 %			

Reporting Notes:

- (1) This PLM job was analyzed using Olympus BH-2 Pol Scope S/N 229915
- (2) Sample prepared for analysis by ELAP 198.6 method

Analyzed by: Valeriu Voicu 

*NAD/NSD =no asbestos detected; NA =not analyzed; NA/PS=not analyzed/positive stop, (SOF-V) = Sprayed On Fireproofing containing Vermiculite; (SM-V) = Surfacing Material containing Vermiculite; PLM Bulk Asbestos Analysis by Appd E to Subpt E, 40 CFR 763 (NVLAP 200546-0), ELAP PLM Method 198.1 for NY friable samples, which includes the identification and quantitation of vermiculite or ELAP 198.6 for NOB samples or EPA 400 pt ct by EPA 600-M4-82-020 (NY ELAP Lab 11480); Note:PLM is not consistently reliable in detecting asbestos in floor coverings and similar non-friable organically bound materials. NAD or Trace results by PLM are inconclusive, TEM is currently the only method that can be used to determine if this material can be considered or treated as non asbestos-containing in NY State (also see EPA Advisory for floor tile, FR 59,146,38970,8/1/94) National Institute of Standards and Technology Accreditation requirements mandate that this report must not be reproduced except in full without the approval of the lab. This PLM report relates ONLY to the items tested. AIHA-LAP, LLC Lab ID 102843, RI Cert AAL-094, CT Cert PH-0186, Mass Cert AA000054.

Reviewed By:   END OF REPORT

Client Name: Asbestos & Environmental Consulting Corp.

Table I
Summary of Bulk Asbestos Analysis Results

20-146; Clark Patterson Lee Architects; Pakanasink Elementary, 1953 NY-302, Circleville, New York, 10919

AmeriSci Sample #	Client Sample#	HG Area	Sample Weight (gram)	Heat Sensitive Organic %	Acid Soluble Inorganic %	Insoluble Non-Asbestos Inorganic %	** Asbestos % by PLM/DS	** Asbestos % by TEM
01	JC-021A	21	----	----	----	----	Chrysotile 1.5	NA
Location: Boy's Locker Room - Skylight - Joint Compound (White)								
02	JC-021B	21	----	----	----	----	NA/PS	NA
Location: Boy's Locker Room - Skylight - Joint Compound (White)								
03	CLK-022A	22	0.202	62.1	36.5	1.4	NAD	NAD
Location: Classroom 124 & 101 - Window - Window Caulk (Gray)								
04	CLK-022B	22	0.105	20.3	78.6	1.1	NAD	NAD
Location: Classroom 124 & 101 - Window - Window Caulk (Gray)								
05	CLK-023A	23	0.114	47.9	48.5	3.5	Chrysotile <0.25	Chrysotile Trace
Location: Classroom 124 & Pool Area - Window - Window Caulk (Gray)								
06	CLK-023B	23	0.115	50.0	48.2	1.6	Chrysotile <0.25	Chrysotile Trace
Location: Classroom 124 & Pool Area - Window - Window Caulk (Gray)								
07	CLK-024A	24	0.204	20.2	77.8	2.0	NAD	NAD
Location: Classroom 124 & 112 - Window - Window Caulk (Brown)								
08	CLK-024B	24	0.223	19.2	78.7	2.1	NAD	NAD
Location: Classroom 124 & 112 - Window - Window Caulk (Brown)								
09	GLZ-025A	25	0.308	26.8	16.3	56.9	NAD	NAD
Location: Classroom 124 & 112 - Window - Window Glazing Compound (Black)								
10	GLZ-025B	25	0.151	30.1	20.9	49.0	NAD	NAD
Location: Classroom 124 & 112 - Window - Window Glazing Compound (Black)								
11	GLZ-026A	26	0.207	27.2	29.6	43.1	NAD	NAD
Location: Pool Area & Classroom 101 - Window Glazing Compound (Black)								
12	GLZ-026B	26	0.448	32.1	17.9	50.0	NAD	NAD
Location: Pool Area & Classroom 101 - Window Glazing Compound (Black)								
13	CLK-027A	27	0.161	42.7	55.2	2.1	NAD	NAD
Location: Pool Area - Window - Window Caulk (Olive Green)								
14	CLK-027B	27	0.130	45.5	53.0	1.5	NAD	NAD
Location: Pool Area - Window - Window Caulk (Olive Green)								
15	CLK-028A	28	0.126	62.3	30.9	6.7	NAD	NAD
Location: Science Room 222 - Window - Window Caulk (Olive Green)								
16	CLK-028B	28	0.203	62.3	31.0	6.7	NAD	NAD
Location: Science Room 222 - Window - Window Caulk (Olive Green)								

See Reporting notes on last page

Client Name: Asbestos & Environmental Consulting Corp.

Table I
Summary of Bulk Asbestos Analysis Results

20-146; Clark Patterson Lee Architects; Pakanasink Elementary, 1953 NY-302, Circleville, New York, 10919

AmeriSci Sample #	Client Sample#	HG Area	Sample Weight (gram)	Heat Sensitive Organic %	Acid Soluble Inorganic %	Insoluble Non-Asbestos Inorganic %	** Asbestos % by PLM/DS	** Asbestos % by TEM
17	SR-029A	29	----	----	----	----	NAD	NA
Location: 5th Grade Wing - Exterior Soffit - Sheetrock (Gray)								
18	SR-029B	29	----	----	----	----	NAD	NA
Location: 5th Grade Wing - Exterior Soffit - Sheetrock (Gray)								
19	JC-030A	30	----	----	----	----	NAD	NA
Location: 5th Grade Wing - Exterior Soffit - Joint Compound (White)								
20	JC-030B	30	----	----	----	----	NAD	NA
Location: 5th Grade Wing - Exterior Soffit - Joint Compound (White)								

Analyzed by: A Barengolts-Hitachi#542/Noran : Date Analyzed 8/26/2020

**Quantitative Analysis (Semi/Full); Bulk Asbestos Analysis - PLM by App E to Subpt E, 40 CFR 763 or NYSDOH ELAP 198.1 for New York friable samples or NYSDOH ELAP 198.6 for New York NOB samples; TEM (Semi/Full) by EPA 600/R-93/116 (or NYSDOH ELAP 198.4; for New York samples); NAD = no asbestos detected during a quantitative analysis; NA = not analyzed; Trace = <1%; (SOF-V) = Sprayed On Fireproofing containing Vermiculite; (SM-V) = Surfacing Material containing Vermiculite; Quantitation for beginning weights of <0.1 grams should be considered as qualitative only; Qualitative Analysis: Asbestos analysis results of "Present" or "NVA = No Visible Asbestos" represents results for Qualitative PLM or TEM Analysis only (no accreditation coverage available from any regulatory agency for qualitative analyses); NVLAP (PLM) 200546-0, NYSDOH ELAP Lab 11480, AIHA-LAP, LLC (PLM) Lab ID 102843.

Warning Note: PLM limitation, only TEM will resolve fibers <0.25 micrometers in diameter. TEM bulk analysis is representative of the fine grained matrix material and may not be representative of non-uniformly dispersed debris for which PLM evaluation is recommended (i.e. soils and other heterogenous materials).

Reviewed By: 

Asbestos Bulk Sample Chain of Custody

ATTACHMENT C

EcoSpect's XRF Lead Inspection Report



Healthy Basement. Healthy Home.

XRF Lead Inspection

Project:

Pakanasink Elementary
1953 NY-302
Circleville, NY 10919

Date Tested:

8/31/2020

Prepared by:

Daryl Heffron
Ecospect, Inc.
5785 State Route 96, PO Box 25,
Romulus, NY 14541

Prepared For:

AECC
East Syracuse, NY 13057
6308 Fly Road

9/10/2020



9/10/2020

To:

Nick Columbe

AECC

6308 Fly Road, East Syracuse, NY 13057

East Syracuse, NY 13057

RE: Pakansink Elementary

1953 NY-302

Circleville, NY 10919

Dear Nick :

On August 31, 2020, EcoSpect, Inc. conducted XRF testing for the presence of lead-based paint, as directed by AECC, at the above captioned location.

The instruments were operated with the guidance from the Performance Characteristics Sheets published by the US Department of HUD and the results classified as positive or negative based the HUD action level of 1.00 mg/cm². Results less than 1.00 mg/cm² are considered negative and results greater than 1.00 mg/cm² are considered positive. For renovation purposes, as well as OSHA implications, it should be noted the lead present in levels less than 1.00 mg/cm² could generate dust that exceeds acceptable levels depending on the renovation or demolition being performed. For OSHA purposes, there are no accepted standards other than "zero" for lead content in surfaces that are affected so as to release lead in the form of dust. XRF readings at the lower end of the range (close to zero) are less likely to create toxic situations. XRF readings with negative prefixes correlate to very low lead levels in that particular surface. For conclusive, task-oriented results, contractors should follow all applicable OSHA requirements found in regulation 1926.62.

The walls in each space oriented in a clockwise fashion, with wall #1 oriented to the front of the building. Please refer to the building plans for clarification. An "NA" indicates that the room was not accessible during testing, and "NP" indicates that there were no painted surfaces within that space. During the testing procedures, EcoSpect personnel were able to gain access to the designated spaces and tested all of the selected rooms that were requested.

Summary of Positive Findings

LOCATION ADDRESS: 156 NY-302, Pine Bush, NY 12566

Positive test results for the presence of lead-based paint in concentrations equal to or greater than 1.00 mg/cm² are:

Positive components by substrate:

Steel: Locker (2) Window Molding (7)

Cermic: Walls(2)

If you have any questions regarding this report, please feel free to give us a call at any time.

Sincerely Yours,

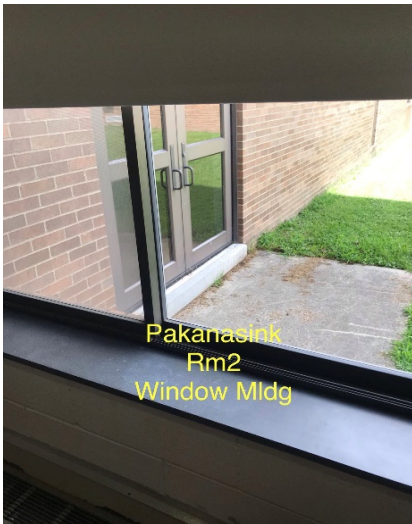
A handwritten signature in black ink, appearing to read 'D. Heffron', with a long horizontal flourish extending to the right.

Daryl Heffron EcoSpect, Inc.

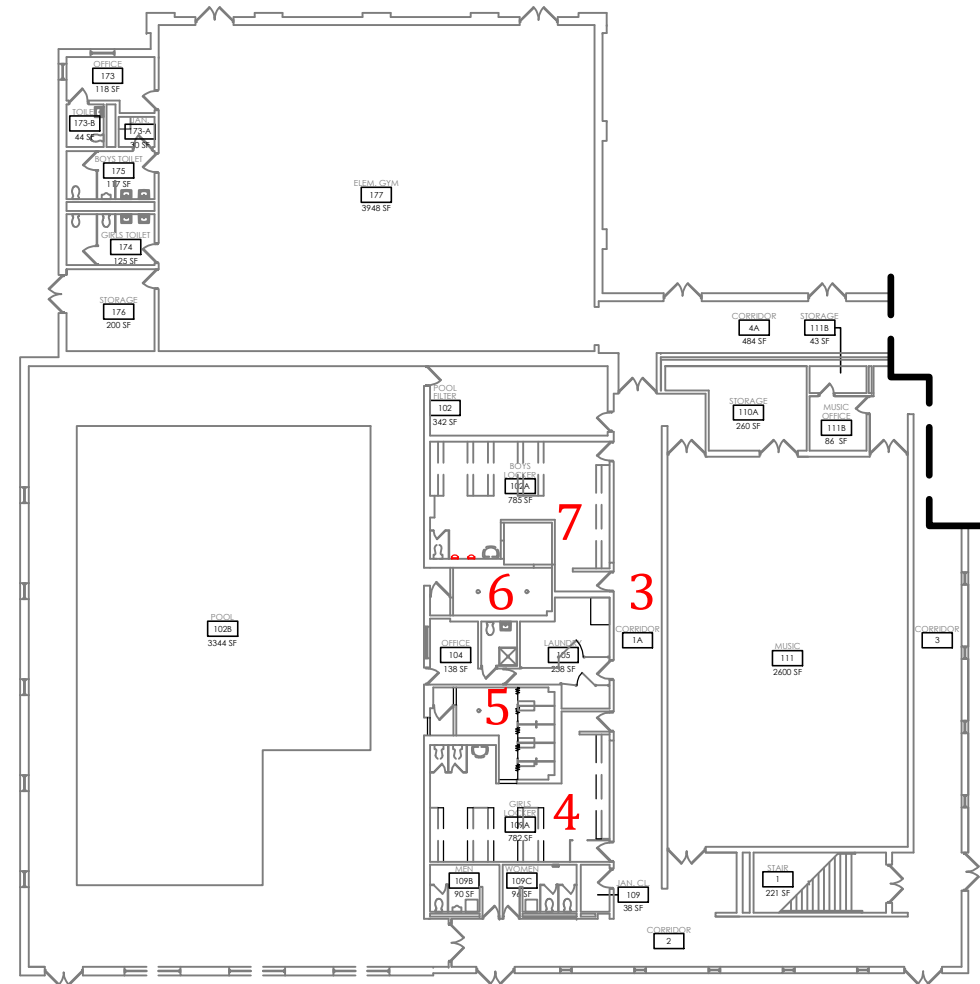
Summary

Summary Analysis							
#	Component	# Tested Negative	% Negative	# Tested Positive	% Positive	Total Tested	Total %
1	Bar Joist	1	100.00%	0	0.00%	1	100.00%
2	Baseboard	2	100.00%	0	0.00%	2	100.00%
3	Door	1	100.00%	0	0.00%	1	100.00%
4	Door Molding	9	100.00%	0	0.00%	9	100.00%
5	I-Beam Ceiling	2	100.00%	0	0.00%	2	100.00%
6	Locker	3	60.00%	2	40.00%	5	100.00%
7	Radiator	2	100.00%	0	0.00%	2	100.00%
8	Stall	1	100.00%	0	0.00%	1	100.00%
9	Wall	15	88.24%	2	11.76%	17	100.00%
10	Window Mldg	11	61.11%	7	38.89%	18	100.00%

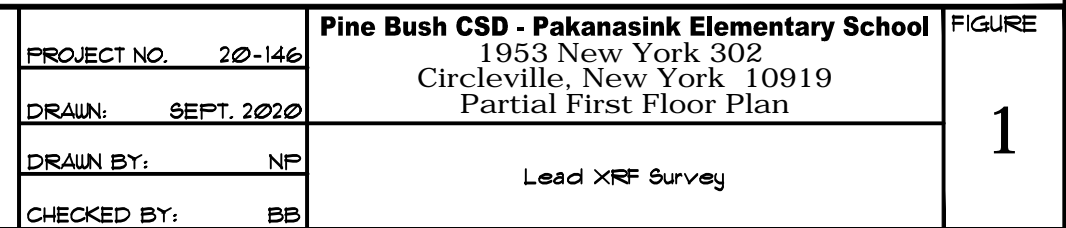
Confirmed Positive Component Types

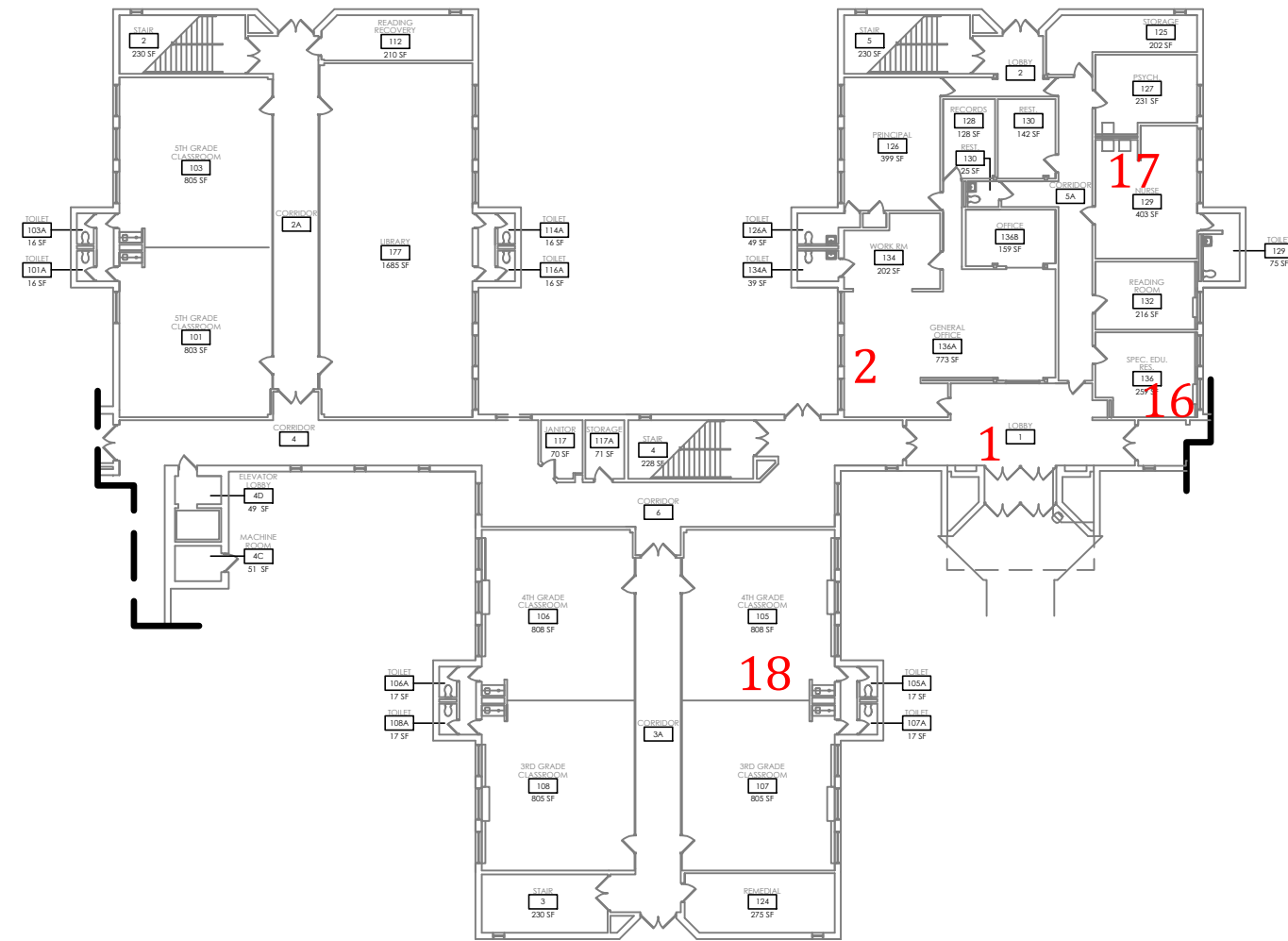
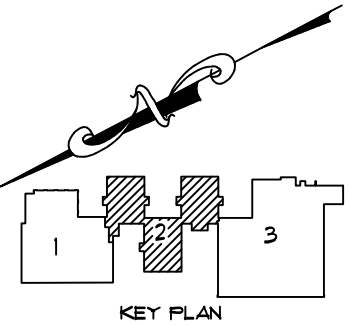


Floor Plans



THE INFORMATION INCLUDED ON THIS GRAPHIC REPRESENTATION HAS BEEN COMPILED FROM A VARIETY OF SOURCES AND IS SUBJECT TO CHANGE WITHOUT NOTICE. AECC MAKES NO REPRESENTATIONS OR WARRANTIES, EXPRESS OR IMPLIED, AS TO ACCURACY, COMPLETENESS, TIMENESS, OR RIGHTS TO THE USE OF SUCH INFORMATION. THIS DOCUMENT IS NOT INTENDED FOR USE AS A BASIS FOR REASONED JUDGMENT BY ANY PERSON, NOR IS IT A CONSTRUCTION DESIGN DOCUMENT. THE USE OR MISUSE OF THE INFORMATION CONTAINED ON THIS GRAPHIC REPRESENTATION IS AT THE SOLE RISK OF THE PARTY USING OR MISUSING THE INFORMATION.

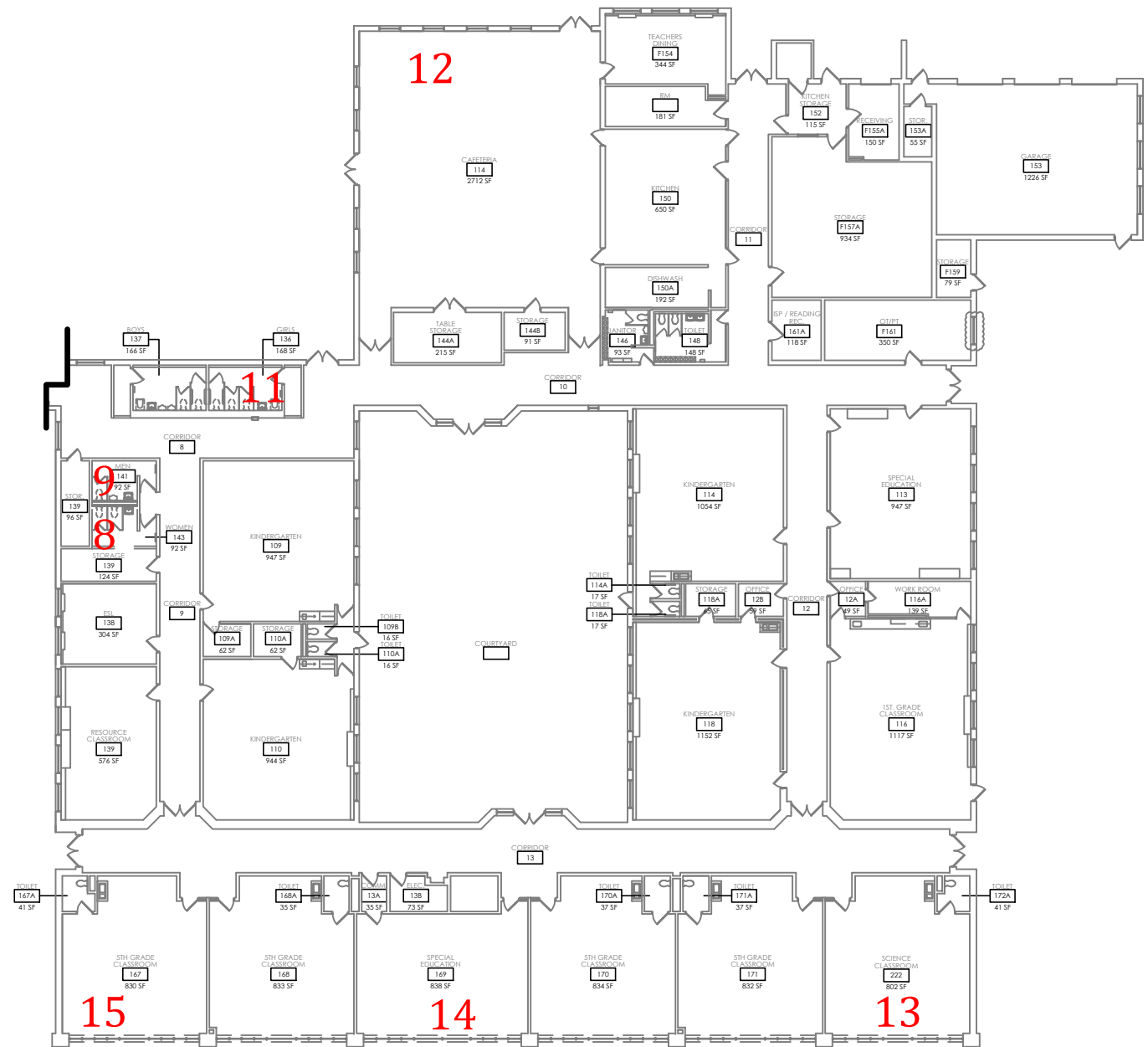
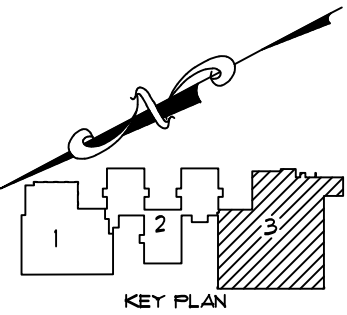




THE INFORMATION INCLUDED ON THIS GRAPHIC REPRESENTATION HAS BEEN COMPILED FROM A VARIETY OF SOURCES AND IS SUBJECT TO CHANGE WITHOUT NOTICE. AECC MAKES NO REPRESENTATIONS OR WARRANTIES, EXPRESS OR IMPLIED, AS TO ACCURACY, COMPLETENESS, TIMELINESS, OR RIGHTS TO THE USE OF SUCH INFORMATION. THIS DOCUMENT IS NOT INTENDED FOR USE AS A LAND SURVEY PRODUCT NOR IS IT DESIGNED OR INTENDED AS A CONSTRUCTION DESIGN DOCUMENT. THE USE OR MISUSE OF THE INFORMATION CONTAINED ON THIS GRAPHIC REPRESENTATION IS AT THE SOLE RISK OF THE PARTY USING OR MISUSING THE INFORMATION.

AECC
ENVIRONMENTAL CONSULTING
Asbestos & Environmental
Consulting Corporation
6308 Fly Road
East Syracuse, NY 13057

		Pine Bush CSD - Pakanasink Elementary School 1953 New York 302 Circleville, New York 10919 Partial First Floor Plan
PROJECT NO.	20-146	
DRAWN:	SEPT. 2020	Lead XRF Survey
DRAWN BY:	NP	
CHECKED BY:	BB	

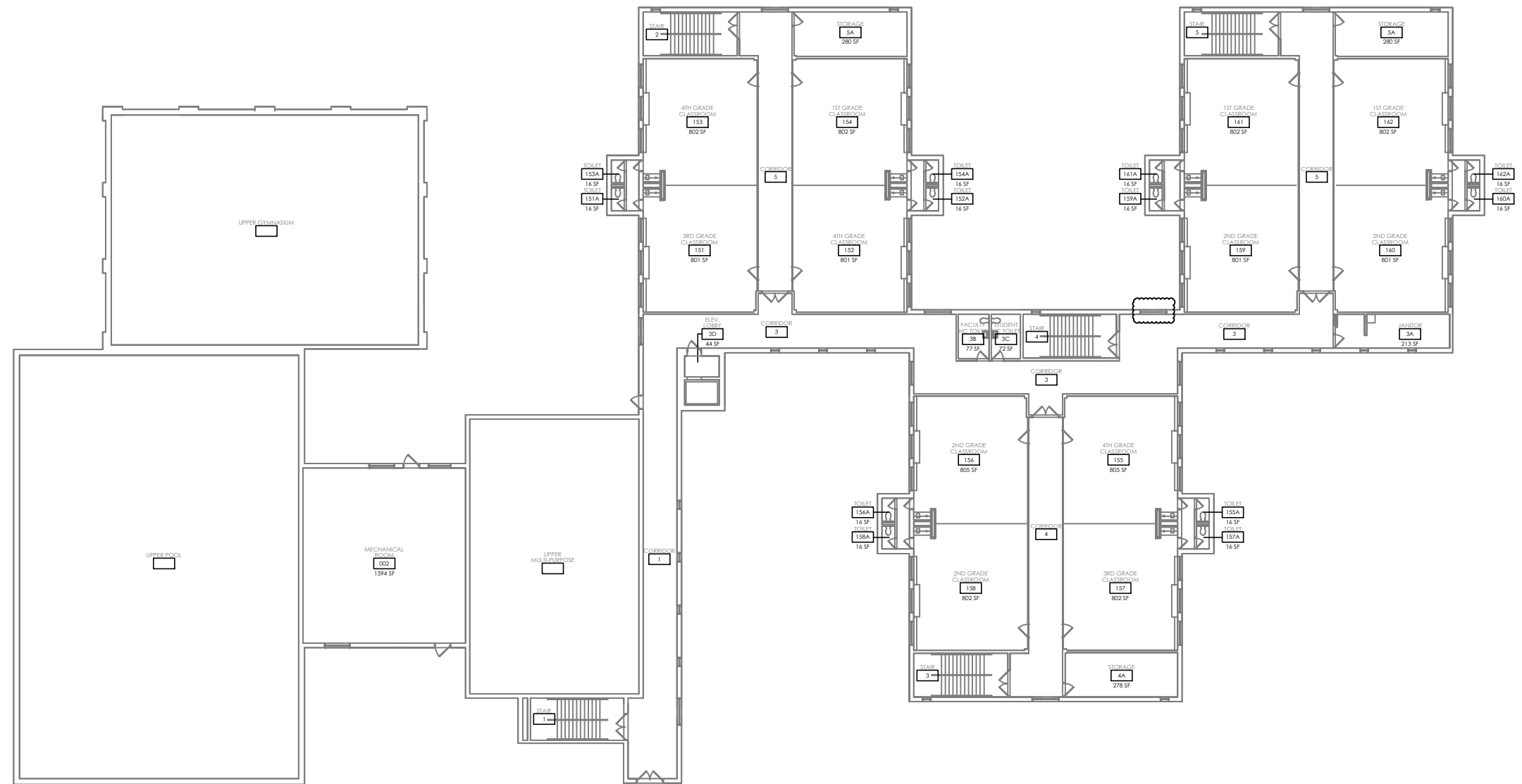
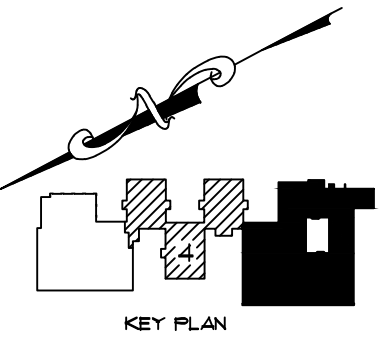


THE INFORMATION INCLUDED ON THIS GRAPHIC REPRESENTATION HAS BEEN COMPILED FROM A VARIETY OF SOURCES AND IS SUBJECT TO CHANGE WITHOUT NOTICE. AECC MAKES NO REPRESENTATIONS OR WARRANTIES, EXPRESS OR IMPLIED, AS TO ACCURACY, COMPLETENESS, TIMELINESS, OR RIGHTS TO THE USE OF SUCH INFORMATION. THIS DOCUMENT IS NOT INTENDED FOR USE AS A LAND SURVEY PRODUCT NOR IS IT DESIGNED OR INTENDED AS A CONSTRUCTION DESIGN DOCUMENT. THE USE OR MISUSE OF THE INFORMATION CONTAINED ON THIS GRAPHIC REPRESENTATION IS AT THE SOLE RISK OF THE PARTY USING OR MISUSING THE INFORMATION.



AECC
ENVIRONMENTAL CONSULTING
Asbestos & Environmental
Consulting Corporation
6308 Fly Road
East Syracuse, NY 13057

PROJECT NO.	20-146	Pine Bush CSD - Pakanasink Elementary School 1953 New York 302 Circleville, New York 10919 Partial First Floor Plan
DRAWN:	SEPT. 2020	
DRAWN BY:	NP	Lead XRF Survey
CHECKED BY:	BB	



THE INFORMATION INCLUDED ON THIS GRAPHIC REPRESENTATION HAS BEEN COMPILED FROM A VARIETY OF SOURCES AND IS SUBJECT TO CHANGE WITHOUT NOTICE. AECC MAKES NO REPRESENTATIONS OR WARRANTIES, EXPRESS OR IMPLIED, AS TO ACCURACY, COMPLETENESS, TIMELINESS, OR RIGHTS TO THE USE OF SUCH INFORMATION. THIS DOCUMENT IS NOT INTENDED FOR USE AS A LAND SURVEY PRODUCT NOR IS IT DESIGNED OR INTENDED AS A CONSTRUCTION DESIGN DOCUMENT. THE USE OR MISUSE OF THE INFORMATION CONTAINED ON THIS GRAPHIC REPRESENTATION IS AT THE SOLE RISK OF THE PARTY USING OR MISUSING THE INFORMATION.



AECC
ENVIRONMENTAL CONSULTING

Asbestos & Environmental
Consulting Corporation

6308 Fly Road
East Syracuse, NY 13057

PROJECT NO. 20-146		Pine Bush CSD - Pakanasink Elementary School 1953 New York 302 Circleville, New York 10919 Second Floor Plan
DRAWN: SEPT. 2020		
DRAWN BY: NP		Lead XRF Survey
CHECKED BY: BB		

Daily Calibrations

Calibrations					
#	Date	Time	Type	Nom Secs	mg/cm2
1	8/31/2020	13:36:50	Calibration	5	1
2	8/31/2020	13:37:04	Calibration	5	1
3	8/31/2020	13:37:17	Calibration	5	1
137	8/31/2020	15:11:57	Calibration	5	1
138	8/31/2020	15:44:00	Calibration	5	0.9
197	8/31/2020	16:21:37	Calibration	5	0.9
198	8/31/2020	16:26:58	Calibration	5	0.9
276	8/31/2020	17:27:29	Calibration	5	1
277	8/31/2020	17:30:47	Calibration	5	0.9
336	8/31/2020	18:14:49	Calibration	5	1

Confirmed Positives

Confirmed Positives								
Reading #	Room	#	Wall	Component	Substrate	Condition	Results	mg/cm2
284	2		Wall 2	Window Mldg	Steel	Brown	Positive	2
295	5		Wall 3	Wall	Ceramic	White	Positive	2.4
296	6		Wall 3	Wall	Ceramic	White	Positive	2.2
300	7		Wall 4	Locker	Steel	Blue	Positive	1.8
301	7		Wall 4	Locker	Steel	Blue	Positive	2.5
319	12		Wall 2	Window Mldg	Steel	Brown	Positive	1.5
320	12		Wall 3	Window Mldg	Steel	Brown	Positive	1
324	16		Wall 4	Window Mldg	Steel	Brown	Positive	2.4
325	17		Wall 4	Window Mldg	Steel	Brown	Positive	1.7
326	18		Wall 4	Window Mldg	Steel	Brown	Positive	1
329	19		Wall 4	Window Mldg	Steel	Brown	Positive	1.1

XRF Results

XRF & Labs								
Reading #	Room	#	Wall	Component	Substrate	Condition	Results	mg/cm2
278	1	1	Wall 1	Wall	Masonry	Blue	Negative	-0.4
279	1	1	Wall 1	Door Molding	Steel	Black	Negative	0.2
280	1	1	Wall 1	Door	Steel	Black	Negative	-0.3
281	1	1	Wall 2	Door Molding	Steel	Blue	Negative	0.2
282	1	1	Wall 2	Wall	Masonry	Blue	Negative	-0.4
283	1	1	Wall 2	I-Beam Ceiling	Steel	Brown	Negative	0
284	2	2	Wall 2	Window Mldg	Steel	Brown	Positive	2
285	3	3	Wall 2	Door Molding	Steel	Blue	Negative	0.4
286	3	3	Wall 2	Door Molding	Steel	Blue	Negative	0.4
287	3	3	Wall 2	Door Molding	Steel	Blue	Negative	0.4
288	4	4	Wall 1	Wall	Masonry	Blue	Negative	-0.2
289	4	4	Wall 1	Locker	Steel	Blue	Negative	0.1
290	4	4	Wall 1	Baseboard	Ceramic	Gray	Negative	0
291	4	4	Wall 2	Wall	Masonry	Blue	Negative	-0.3
292	4	4	Wall 2	Stall	Steel	Blue	Negative	-0.2
293	4	4	Wall 4	Wall	Masonry	Blue	Negative	-0.2
294	4	4	Wall 4	I-Beam Ceiling	Steel	Brown	Negative	-0.2
295	5	5	Wall 3	Wall	Ceramic	White	Positive	2.4
296	6	6	Wall 3	Wall	Ceramic	White	Positive	2.2
297	7	7	Wall 3	Wall	Masonry	Blue	Negative	-0.1
298	7	7	Wall 4	Wall	Masonry	Blue	Negative	-0.4
299	7	7	Wall 4	Baseboard	Steel	Gray	Negative	-0.2
300	7	7	Wall 4	Locker	Steel	Blue	Positive	1.8
301	7	7	Wall 4	Locker	Steel	Blue	Positive	2.5
302	8	8	Wall 1	Wall	Masonry	White	Negative	-0.2
303	8	8	Wall 3	Wall	Masonry	White	Negative	-0.2
304	8	8	Wall 3	Locker	Steel	Blue	Negative	0.1
305	8	8	Wall 3	Door Molding	Steel	Blue	Negative	0.5
306	8	8	Wall 3	Bar Joist	Steel	Brown	Negative	0.2
307	9	9	Wall 1	Door Molding	Steel	Brown	Negative	0.3
308	9	9	Wall 1	Wall	Masonry	White	Negative	-0.5
309	9	9	Wall 1	Locker	Steel	Blue	Negative	-0.2
310	9	9	Wall 3	Wall	Masonry	White	Negative	-0.4
311	10	10	Wall 2	Wall	Masonry	Blue	Negative	-0.4
312	10	10	Wall 2	Door Molding	Steel	Brown	Negative	0.4
313	10	10	Wall 3	Wall	Masonry	Blue	Negative	-0.3
314	10	10	Wall 3	Radiator	Steel	Brown	Negative	-0.1
315	11	11	Wall 3	Radiator	Steel	Brown	Negative	0
316	11	11	Wall 3	Wall	Masonry	Blue	Negative	-0.4
317	11	11	Wall 4	Wall	Masonry	Blue	Negative	-0.1
318	11	11	Wall 4	Door Molding	Steel	Brown	Negative	0.6
319	12	12	Wall 2	Window Mldg	Steel	Brown	Positive	1.5
320	12	12	Wall 3	Window Mldg	Steel	Brown	Positive	1
321	13	13	Wall 1	Window Mldg	Steel	Brown	Negative	0.1
322	14	14	Wall 1	Window Mldg	Steel	Brown	Negative	0.2

XRF & Labs								
Reading #	Room	#	Wall	Component	Substrate	Condition	Results	mg/cm2
323	15		Wall 1	Window Mldg	Steel	Brown	Negative	-0.3
324	16		Wall 4	Window Mldg	Steel	Brown	Positive	2.4
325	17		Wall 4	Window Mldg	Steel	Brown	Positive	1.7
326	18		Wall 4	Window Mldg	Steel	Brown	Positive	1
327	19		Wall 4	Window Mldg	Steel	Brown	Negative	0.1
328	19		Wall 4	Window Mldg	Steel	Brown	Negative	0.3
329	19		Wall 4	Window Mldg	Steel	Brown	Positive	1.1
330	19		Wall 2	Window Mldg	Steel	Brown	Negative	0.3
331	19		Wall 2	Window Mldg	Steel	Brown	Negative	0.9
332	19		Wall 2	Window Mldg	Steel	Brown	Negative	0.9
333	19		Wall 3	Window Mldg	Steel	Brown	Negative	0.9
334	19		Wall 1	Window Mldg	Steel	Brown	Negative	-0.5
335	19		Wall 1	Window Mldg	Steel	Brown	Negative	0.4

Performance Characteristic Sheet

EFFECTIVE DATE: December 1, 2015

MANUFACTURER AND MODEL:

Make: *Heuresis*
Models: *Model Pb200i*
Source: *⁵⁷Co, 5 mCi (nominal – new source)*

FIELD OPERATION GUIDANCE

OPERATING PARAMETERS:

Action Level mode

XRF CALIBRATION CHECK LIMITS:

0.8 to 1.2 mg/cm ² (inclusive)

SUBSTRATE CORRECTION:

Not applicable

INCONCLUSIVE RANGE OR THRESHOLD:

ACTION LEVEL MODE READING DESCRIPTION	SUBSTRATE	THRESHOLD (mg/cm ²)
Results not corrected for substrate bias on any substrate	Brick	1.0
	Concrete	1.0
	Drywall	1.0
	Metal	1.0
	Plaster	1.0
	Wood	1.0

BACKGROUND INFORMATION

EVALUATION DATA SOURCE AND DATE:

This sheet is supplemental information to be used in conjunction with Chapter 7 of the HUD *Guidelines for the Evaluation and Control of Lead-Based Paint Hazards in Housing* ("HUD Guidelines"). Performance parameters shown on this sheet are calculated using test results on building components in the HUD archive. Testing was conducted on 146 test samples in November 2015, with two separate instruments running software version 2.1-2 in Action Level test mode. The actual source strength of each instrument on the day of testing was approximately 2.0 mCi; source ages were approximately one year.

OPERATING PARAMETERS

Performance parameters shown in this sheet are applicable only when properly operating the instrument using the manufacturer's instructions and procedures described in Chapter 7 of the HUD Guidelines.

XRF CALIBRATION CHECK:

The calibration of the XRF instrument should be checked using the paint film nearest 1.0 mg/cm² in the NIST Standard Reference Material (SRM) used (e.g., for NIST SRM 2579, use the 1.02 mg/cm² film).

If the average (rounded to 1 decimal place) of three readings is outside the acceptable calibration check range, follow the manufacturer's instructions to bring the instrument into control before XRF testing proceeds.

SUBSTRATE CORRECTION VALUE COMPUTATION:

Chapter 7 of the HUD Guidelines provides guidance on correcting XRF results for substrate bias. Supplemental guidance for using the paint film nearest 1.0 mg/cm² for substrate correction is provided:

XRF results are corrected for substrate bias by subtracting from each XRF result a correction value determined separately in each house for single-family housing or in each development for multifamily housing, for each substrate. The correction value is an average of XRF readings taken over the NIST SRM paint film nearest to 1.0 mg/cm² at test locations that have been scraped bare of their paint covering. Compute the correction values as follows:

Using the same XRF instrument, take three readings on a bare substrate area covered with the NIST SRM paint film nearest 1 mg/cm². Repeat this procedure by taking three more readings on a second bare substrate area of the same substrate covered with the NIST SRM.

Compute the correction value for each substrate type where XRF readings indicate substrate correction is needed by computing the average of all six readings as shown below.

For each substrate type (the 1.02 mg/cm² NIST SRM is shown in this example; use the actual lead loading of the NIST SRM used for substrate correction):

$$\text{Correction value} = (1\text{st} + 2\text{nd} + 3\text{rd} + 4\text{th} + 5\text{th} + 6\text{th Reading})/6 - 1.02 \text{ mg/cm}^2$$

Repeat this procedure for each substrate requiring substrate correction in the house or housing development.

EVALUATING THE QUALITY OF XRF TESTING:

Randomly select ten testing combinations for retesting from each house or from two randomly selected units in multifamily housing.

Conduct XRF re-testing at the ten testing combinations selected for retesting.

Determine if the XRF testing in the units or house passed or failed the test by applying the steps below.

Compute the Retest Tolerance Limit by the following steps:

Determine XRF results for the original and retest XRF readings. Do not correct the original or retest results for substrate bias. In single-family and multi-family housing, a result is defined as a single reading. Therefore, there will be ten original and ten retest XRF results for each house or for the two selected units.

Calculate the average of the original XRF result and the retest XRF result for each testing combination.

Square the average for each testing combination.

Add the ten squared averages together. Call this quantity C.

Multiply the number C by 0.0072. Call this quantity D.

Add the number 0.032 to D. Call this quantity E.

Take the square root of E. Call this quantity F.

Multiply F by 1.645. The result is the Retest Tolerance Limit.

Compute the average of all ten original XRF readings.

Compute the average of all ten re-test XRF readings.

Find the absolute difference of the two averages.

If the difference is less than the Retest Tolerance Limit, the inspection has passed the retest. If the difference of the overall averages equals or exceeds the Retest Tolerance Limit, this procedure should be repeated with ten new testing combinations. If the difference of the overall averages is equal to or greater than the Retest Tolerance Limit a second time, then the inspection should be considered deficient.

Use of this procedure is estimated to produce a spurious result approximately 1% of the time. That is, results of this procedure will call for further examination when no examination is warranted in approximately 1 out of 100 dwelling units tested.

TESTING TIMES:

In the Action Level paint test mode, the instrument takes the longest time to complete readings close to the Federal standard of 1.0 mg/cm². The table below shows the mean and standard deviation of actual reading times by reading level for paint samples during the November 2015 archive testing. The tested instruments reported readings to one decimal place. No significant differences in reading times by substrate were observed. These times apply only to instruments with the same source strength as those tested (2.0 mCi). Instruments with stronger sources will have shorter reading times and those with weaker sources, longer reading times, than those in the table.

Mean and Standard Deviation of Reading Times in Action Level Mode by Reading Level		
Reading (mg/cm ²)	Mean Reading Time (seconds)	Standard Deviation (seconds)
< 0.7	3.48	0.47
0.7	7.29	1.92
0.8	13.95	1.78
0.9 – 1.2	15.25	0.66
1.3 – 1.4	6.08	2.50
≥ 1.5	3.32	0.05

CLASSIFICATION OF RESULTS:

XRF results are classified as **positive** if they are **greater than or equal** to the stated threshold for the instrument (1.0 mg/cm²), and *negative* if they are *less than* the threshold.

DOCUMENTATION:

A report titled *Methodology for XRF Performance Characteristic Sheets* (EPA 747-R-95-008) provides an explanation of the statistical methodology used to construct the data in the sheets, and provides empirical results from using the recommended inconclusive ranges or thresholds for specific XRF instruments. The report may be downloaded at <http://www2.epa.gov/lead/methodology-xrf-performance-characteristic-sheets-epa-747-r-95-008-september-1997>.

This XRF Performance Characteristic Sheet (PCS) was developed by QuanTech, Inc., under a contract with the XRF manufacturer.

ATTACHMENT D

PCB Bulk Sampling Laboratory Results



Analysis Report

Schneider Laboratories Global, Inc

2512 W. Cary Street • Richmond, Virginia • 23220-5117
804-353-6778 • 800-785-LABS (5227) • Fax 804-359-1475

Customer: Asbestos & Environmental Consulting Corp. (4307)
Address: 6308 Fly Road
East Syracuse, NY 13057

Order #: 382643

Matrix Bulk
Received 08/24/20
Reported 08/25/20

Attn:

Project: Pakanasink Elementary
Location: 1953 NY-302, Circleville
Number: 20-146

PO Number:

Sample ID	Cust. Sample ID	Location	Result	RL*	Units	Analysis Date	Analyst
Parameter		Method					
382643-001	CLK-005P	Main Entry-Door					
Semi-volatile Organic Compounds							
Aroclor - 1016		SW846 8082A	<697	697	µg/kg	08/24/20	THN
Aroclor - 1221		SW846 8082A	<697	697	µg/kg	08/24/20	THN
Aroclor - 1232		SW846 8082A	<697	697	µg/kg	08/24/20	THN
Aroclor - 1242		SW846 8082A	<697	697	µg/kg	08/24/20	THN
Aroclor - 1248		SW846 8082A	<697	697	µg/kg	08/24/20	THN
Aroclor - 1254		SW846 8082A	<697	697	µg/kg	08/24/20	THN
Aroclor - 1260		SW846 8082A	<697	697	µg/kg	08/24/20	THN
Aroclor - 1262		SW846 8082A	<697	697	µg/kg	08/24/20	THN
Aroclor - 1268		SW846 8082A	<697	697	µg/kg	08/24/20	THN
PCB - Surrogate Recoveries							
DCB		66%					
TCMX		84%					
382643-002	CLK-008P	Main Office-Door					
Semi-volatile Organic Compounds							
Aroclor - 1016		SW846 8082A	<492	492	µg/kg	08/24/20	THN
Aroclor - 1221		SW846 8082A	<492	492	µg/kg	08/24/20	THN
Aroclor - 1232		SW846 8082A	<492	492	µg/kg	08/24/20	THN
Aroclor - 1242		SW846 8082A	<492	492	µg/kg	08/24/20	THN
Aroclor - 1248		SW846 8082A	<492	492	µg/kg	08/24/20	THN
Aroclor - 1254		SW846 8082A	<492	492	µg/kg	08/24/20	THN
Aroclor - 1260		SW846 8082A	<492	492	µg/kg	08/24/20	THN
Aroclor - 1262		SW846 8082A	<492	492	µg/kg	08/24/20	THN
Aroclor - 1268		SW846 8082A	<492	492	µg/kg	08/24/20	THN
PCB - Surrogate Recoveries							
DCB		130%					
TCMX		69%					

All internal QC parameters were met. Unusual sample conditions, if any, are described. Surrogate Spike results designated with "D" indicate that the analyte was diluted out. "MI" indicates matrix interference. Concentration and *Reporting Limit (RL) based on areas provided by client. Values are reported to three significant figures. Solid PPM = mg/kg | PPB = µg/kg and Water PPM = mg/L | PPB = µg/L. The test results reported relate only to the samples submitted.



Analysis Report

Schneider Laboratories Global, Inc

2512 W. Cary Street • Richmond, Virginia • 23220-5117
804-353-6778 • 800-785-LABS (5227) • Fax 804-359-1475

Customer: Asbestos & Environmental Consulting Corp. (4307)
Address: 6308 Fly Road
East Syracuse, NY 13057

Order #: 382643

Matrix Bulk
Received 08/24/20
Reported 08/25/20

Attn:

Project: Pakanasink Elementary
Location: 1953 NY-302, Circleville
Number: 20-146

PO Number:

Sample ID	Cust. Sample ID	Location	Result	RL*	Units	Analysis Date	Analyst
Parameter		Method					
382643-003	CLK-022P	Classroom 124-Window					
Semi-volatile Organic Compounds							
Aroclor - 1016		SW846 8082A	<549	548	µg/kg	08/24/20	THN
Aroclor - 1221		SW846 8082A	<549	548	µg/kg	08/24/20	THN
Aroclor - 1232		SW846 8082A	<549	548	µg/kg	08/24/20	THN
Aroclor - 1242		SW846 8082A	<549	548	µg/kg	08/24/20	THN
Aroclor - 1248		SW846 8082A	<549	548	µg/kg	08/24/20	THN
Aroclor - 1254		SW846 8082A	<549	548	µg/kg	08/24/20	THN
Aroclor - 1260		SW846 8082A	<549	548	µg/kg	08/24/20	THN
Aroclor - 1262		SW846 8082A	<549	548	µg/kg	08/24/20	THN
Aroclor - 1268		SW846 8082A	<549	548	µg/kg	08/24/20	THN
PCB - Surrogate Recoveries							
DCB		73%					
TCMX		94%					
382643-004	CLK-023P	Classroom 124-Window					
Semi-volatile Organic Compounds							
Aroclor - 1016		SW846 8082A	<472	472	µg/kg	08/24/20	THN
Aroclor - 1221		SW846 8082A	<472	472	µg/kg	08/24/20	THN
Aroclor - 1232		SW846 8082A	<472	472	µg/kg	08/24/20	THN
Aroclor - 1242		SW846 8082A	<472	472	µg/kg	08/24/20	THN
Aroclor - 1248		SW846 8082A	<472	472	µg/kg	08/24/20	THN
Aroclor - 1254		SW846 8082A	<472	472	µg/kg	08/24/20	THN
Aroclor - 1260		SW846 8082A	<472	472	µg/kg	08/24/20	THN
Aroclor - 1262		SW846 8082A	<472	472	µg/kg	08/24/20	THN
Aroclor - 1268		SW846 8082A	<472	472	µg/kg	08/24/20	THN
PCB - Surrogate Recoveries							
DCB		105%					
TCMX		80%					

All internal QC parameters were met. Unusual sample conditions, if any, are described. Surrogate Spike results designated with "D" indicate that the analyte was diluted out. "MI" indicates matrix interference. Concentration and *Reporting Limit (RL) based on areas provided by client. Values are reported to three significant figures. Solid PPM = mg/kg | PPB = µg/kg and Water PPM = mg/L | PPB = µg/L. The test results reported relate only to the samples submitted.



Analysis Report

Schneider Laboratories Global, Inc

2512 W. Cary Street • Richmond, Virginia • 23220-5117
804-353-6778 • 800-785-LABS (5227) • Fax 804-359-1475

Customer: Asbestos & Environmental Consulting Corp. (4307)
Address: 6308 Fly Road
East Syracuse, NY 13057

Order #: 382643

Matrix Bulk
Received 08/24/20
Reported 08/25/20

Attn:

Project: Pakanasink Elementary
Location: 1953 NY-302, Circleville
Number: 20-146

PO Number:

Sample ID	Cust. Sample ID	Location	Result	RL*	Units	Analysis Date	Analyst
Parameter		Method					
382643-005	CLK-024P	Classroom 124-Window					
Semi-volatile Organic Compounds							
Aroclor - 1016		SW846 8082A	<452	452	µg/kg	08/24/20	THN
Aroclor - 1221		SW846 8082A	<452	452	µg/kg	08/24/20	THN
Aroclor - 1232		SW846 8082A	<452	452	µg/kg	08/24/20	THN
Aroclor - 1242		SW846 8082A	<452	452	µg/kg	08/24/20	THN
Aroclor - 1248		SW846 8082A	<452	452	µg/kg	08/24/20	THN
Aroclor - 1254		SW846 8082A	<452	452	µg/kg	08/24/20	THN
Aroclor - 1260		SW846 8082A	<452	452	µg/kg	08/24/20	THN
Aroclor - 1262		SW846 8082A	<452	452	µg/kg	08/24/20	THN
Aroclor - 1268		SW846 8082A	<452	452	µg/kg	08/24/20	THN
PCB - Surrogate Recoveries							
DCB		81%					
TCMX		72%					
382643-006	CLK-027P	Pool Area-Window					
Semi-volatile Organic Compounds							
Aroclor - 1016		SW846 8082A	<475	475	µg/kg	08/24/20	THN
Aroclor - 1221		SW846 8082A	<475	475	µg/kg	08/24/20	THN
Aroclor - 1232		SW846 8082A	<475	475	µg/kg	08/24/20	THN
Aroclor - 1242		SW846 8082A	<475	475	µg/kg	08/24/20	THN
Aroclor - 1248		SW846 8082A	<475	475	µg/kg	08/24/20	THN
Aroclor - 1254		SW846 8082A	<475	475	µg/kg	08/24/20	THN
Aroclor - 1260		SW846 8082A	<475	475	µg/kg	08/24/20	THN
Aroclor - 1262		SW846 8082A	<475	475	µg/kg	08/24/20	THN
Aroclor - 1268		SW846 8082A	<475	475	µg/kg	08/24/20	THN
PCB - Surrogate Recoveries							
DCB		MI					
TCMX		MI					

All internal QC parameters were met. Unusual sample conditions, if any, are described. Surrogate Spike results designated with "D" indicate that the analyte was diluted out. "MI" indicates matrix interference. Concentration and *Reporting Limit (RL) based on areas provided by client. Values are reported to three significant figures. Solid PPM = mg/kg | PPB = µg/kg and Water PPM = mg/L | PPB = µg/L. The test results reported relate only to the samples submitted.



Analysis Report

Schneider Laboratories Global, Inc

2512 W. Cary Street • Richmond, Virginia • 23220-5117
804-353-6778 • 800-785-LABS (5227) • Fax 804-359-1475

Customer: Asbestos & Environmental Consulting Corp. (4307)
Address: 6308 Fly Road
East Syracuse, NY 13057

Order #: 382643

Matrix Bulk
Received 08/24/20
Reported 08/25/20

Attn:

Project: Pakanasink Elementary
Location: 1953 NY-302, Circleville
Number: 20-146

PO Number:

Sample ID	Cust. Sample ID	Location	Result	RL*	Units	Analysis Date	Analyst
Parameter		Method					
382643-007	CLK-028P	Science Room 222-Window					
Semi-volatile Organic Compounds							
Aroclor - 1016		SW846 8082A	<897	897	µg/kg	08/24/20	THN
Aroclor - 1221		SW846 8082A	<897	897	µg/kg	08/24/20	THN
Aroclor - 1232		SW846 8082A	<897	897	µg/kg	08/24/20	THN
Aroclor - 1242		SW846 8082A	<897	897	µg/kg	08/24/20	THN
Aroclor - 1248		SW846 8082A	<897	897	µg/kg	08/24/20	THN
Aroclor - 1254		SW846 8082A	<897	897	µg/kg	08/24/20	THN
Aroclor - 1260		SW846 8082A	<897	897	µg/kg	08/24/20	THN
Aroclor - 1262		SW846 8082A	<897	897	µg/kg	08/24/20	THN
Aroclor - 1268		SW846 8082A	<897	897	µg/kg	08/24/20	THN
PCB - Surrogate Recoveries							
DCB		MI					
TCMX		MI					

382643-08/25/20 05:31 PM

Reviewed By: **Jennifer Lee**
Manager

All internal QC parameters were met. Unusual sample conditions, if any, are described. Surrogate Spike results designated with "D" indicate that the analyte was diluted out. "MI" indicates matrix interference. Concentration and *Reporting Limit (RL) based on areas provided by client. Values are reported to three significant figures. Solid PPM = mg/kg | PPB = µg/kg and Water PPM = mg/L | PPB = µg/L. The test results reported relate only to the samples submitted.



Analysis Report

Schneider Laboratories Global, Inc

2512 W. Cary Street • Richmond, Virginia • 23220-5117
804-353-6778 • 800-785-LABS (5227) • Fax 804-359-1475

Customer: Asbestos & Environmental Consulting Corp. (4307)
Address: 6308 Fly Road
East Syracuse, NY 13057

Order #: 382643

Matrix Bulk
Received 08/24/20
Reported 08/25/20

Attn:

Project: Pakanasink Elementary
Location: 1953 NY-302, Circleville
Number: 20-146

PO Number:

Sample ID	Cust. Sample ID	Location	Result	RL*	Units	Analysis Date	Analyst
Parameter		Method					

State Certifications

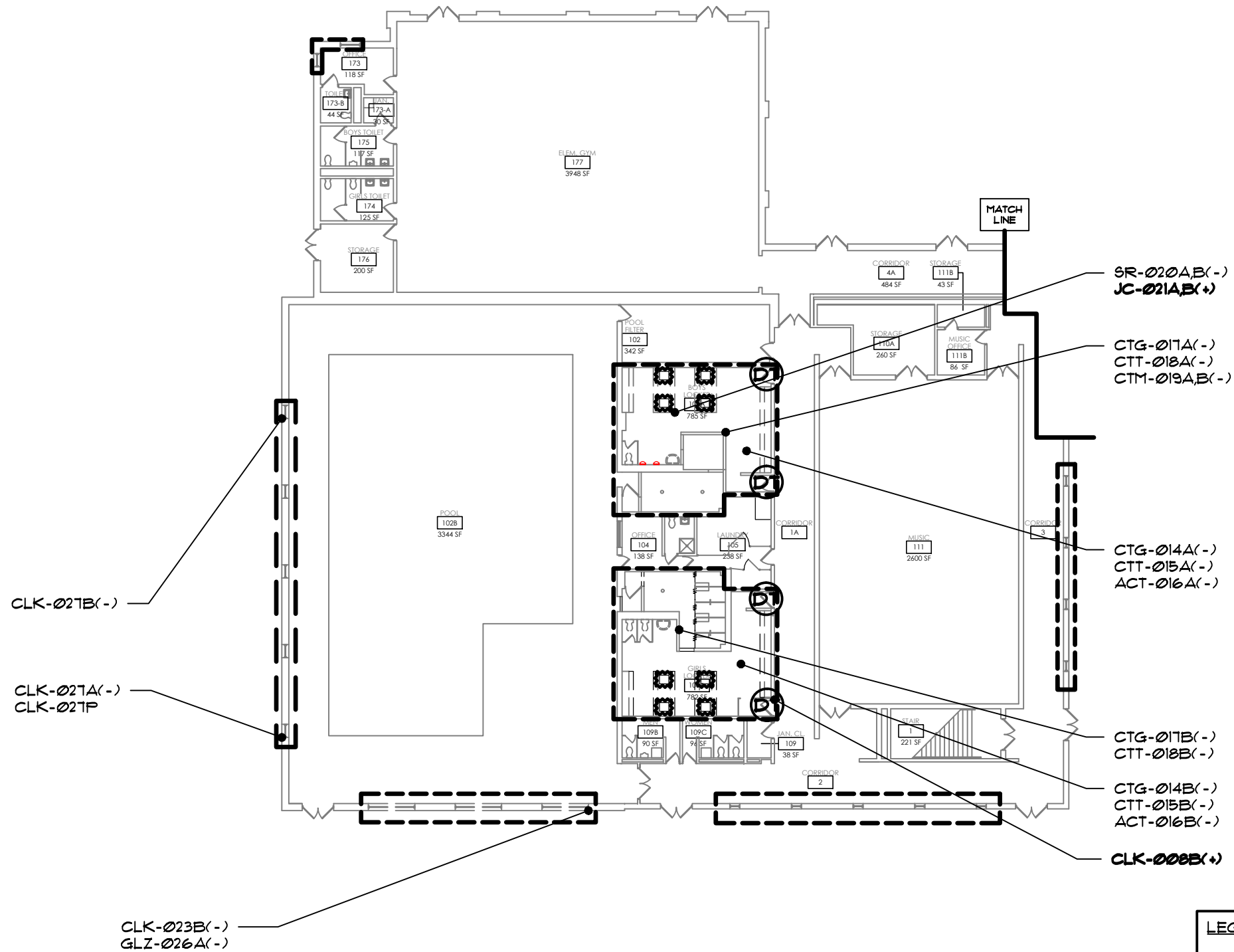
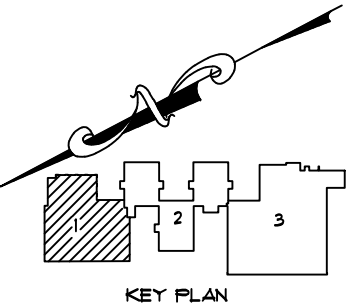
Method	Parameter	New York	Virginia
SW846 8082A	Aroclor - 1016	ELAP Certified	VELAP Certified
SW846 8082A	Aroclor - 1221	ELAP Certified	VELAP Certified
SW846 8082A	Aroclor - 1232	ELAP Certified	VELAP Certified
SW846 8082A	Aroclor - 1242	ELAP Certified	VELAP Certified
SW846 8082A	Aroclor - 1248	ELAP Certified	VELAP Certified
SW846 8082A	Aroclor - 1254	ELAP Certified	VELAP Certified
SW846 8082A	Aroclor - 1260	ELAP Certified	VELAP Certified
SW846 8082A	Aroclor - 1262	ELAP Certified	VELAP Certified
SW846 8082A	Aroclor - 1268	ELAP Certified	VELAP Certified

State	Certificate Number
New York	ELAP 61372
Virginia	VELAP 10779

All internal QC parameters were met. Unusual sample conditions, if any, are described. Surrogate Spike results designated with "D" indicate that the analyte was diluted out. "MI" indicates matrix interference. Concentration and *Reporting Limit (RL) based on areas provided by client. Values are reported to three significant figures. Solid PPM = mg/kg | PPB = µg/kg and Water PPM = mg/L | PPB = µg/L. The test results reported relate only to the samples submitted.

ATTACHMENT E

Figures 1, 2, 3, & 4



IMPORTANT SURVEY NOTE:

THIS SURVEY WAS LIMITED IN NATURE. ONLY SPECIFIC BUILDING MATERIALS WITHIN THE DASHED BOUNDARIES WERE INVESTIGATED/SAMPLED, AS PER THE DIRECTION OF THE PROJECT ARCHITECT. ANY BUILDING MATERIALS NOT SPECIFICALLY SAMPLED WITHIN THE DASHED BOUNDARIES AND ALL BUILDING MATERIALS LOCATED OUTSIDE THE DASHED BOUNDARIES SHALL NEED TO BE TREATED AS POTENTIALLY HAZARDOUS MATERIALS, UNTIL EXAMINED BY AN ENVIRONMENTAL CONSULTANT AND LABORATORY RESULTS PROVE OTHERWISE.

LEGEND:



ASBESTOS-CONTAINING DOOR CAULK AND ASBESTOS-CONTAINING JOINT COMPOUND (ON SHEETROCK TRANSOM PANEL)



ASBESTOS-CONTAINING JOINT COMPOUND AND ASSOCIATED SHEETROCK

THE INFORMATION INCLUDED ON THIS GRAPHIC REPRESENTATION HAS BEEN COMPILED FROM A VARIETY OF SOURCES AND IS SUBJECT TO CHANGE WITHOUT NOTICE. AECC MAKES NO REPRESENTATIONS OR WARRANTIES, EXPRESS OR IMPLIED, AS TO ACCURACY, COMPLETENESS, TIMELINESS, OR RIGHTS TO THE USE OF SUCH INFORMATION. THIS DOCUMENT IS NOT INTENDED FOR USE AS A LAND SURVEY PRODUCT NOR IS IT DESIGNED OR INTENDED AS A CONSTRUCTION DESIGN DOCUMENT. THE USE OR MISUSE OF THE INFORMATION CONTAINED ON THIS GRAPHIC REPRESENTATION IS AT THE SOLE RISK OF THE PARTY USING OR MISUSING THE INFORMATION.

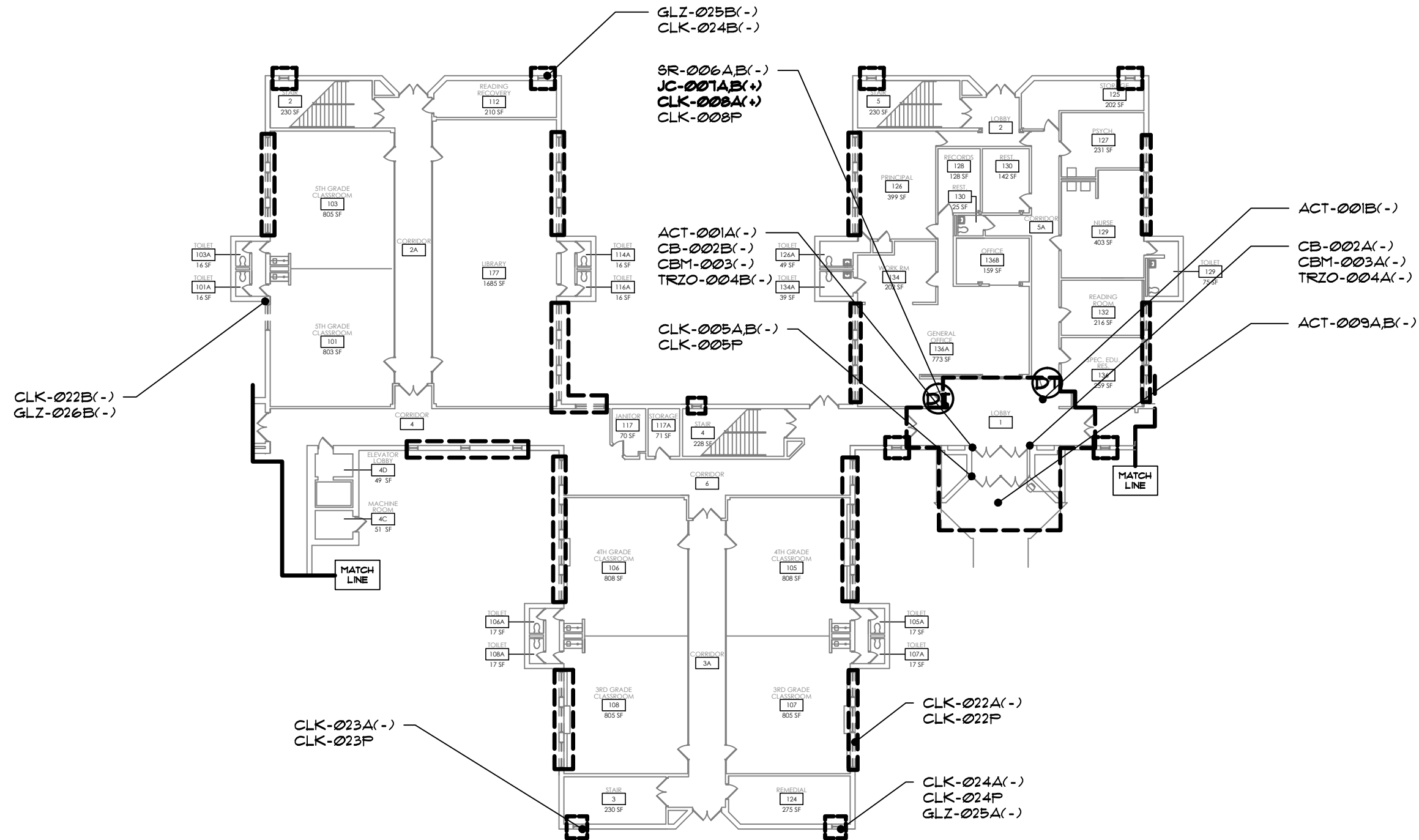
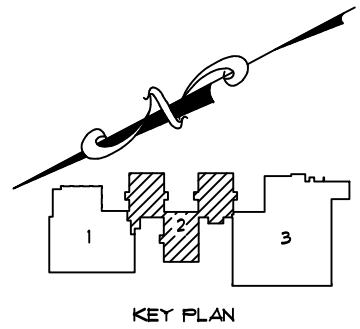
AECC
ENVIRONMENTAL CONSULTING
Asbestos & Environmental
Consulting Corporation
6308 Fly Road
East Syracuse, NY 13057

PROJECT NO. 20-146
DRAWN: SEPT. 2020
DRAWN BY: NP
CHECKED BY: BB

Pakanasink Elementary School
1953 New York State Route 302
Circleville, New York 10919
Partial First Floor Plan

Limited Hazardous Material Pre-Renovation Survey

FIGURE
1



IMPORTANT SURVEY NOTE:

THIS SURVEY WAS LIMITED IN NATURE. ONLY SPECIFIC BUILDING MATERIALS WITHIN THE DASHED BOUNDARIES WERE INVESTIGATED/SAMPLED, AS PER THE DIRECTION OF THE PROJECT ARCHITECT. ANY BUILDING MATERIALS NOT SPECIFICALLY SAMPLED WITHIN THE DASHED BOUNDARIES AND ALL BUILDING MATERIALS LOCATED OUTSIDE THE DASHED BOUNDARIES SHALL NEED TO BE TREATED AS POTENTIALLY HAZARDOUS MATERIALS, UNTIL EXAMINED BY AN ENVIRONMENTAL CONSULTANT AND LABORATORY RESULTS PROVE OTHERWISE.



LEGEND:	
	ASBESTOS-CONTAINING DOOR CAULK AND ASBESTOS-CONTAINING JOINT COMPOUND (ON SHEETROCK TRANSOM PANEL)
Pakanasink Elementary School 1953 New York State Route 302 Circleville, New York 10919 Partial First Floor Plan	
Limited Hazardous Material Pre-Renovation Survey	

FIGURE
2



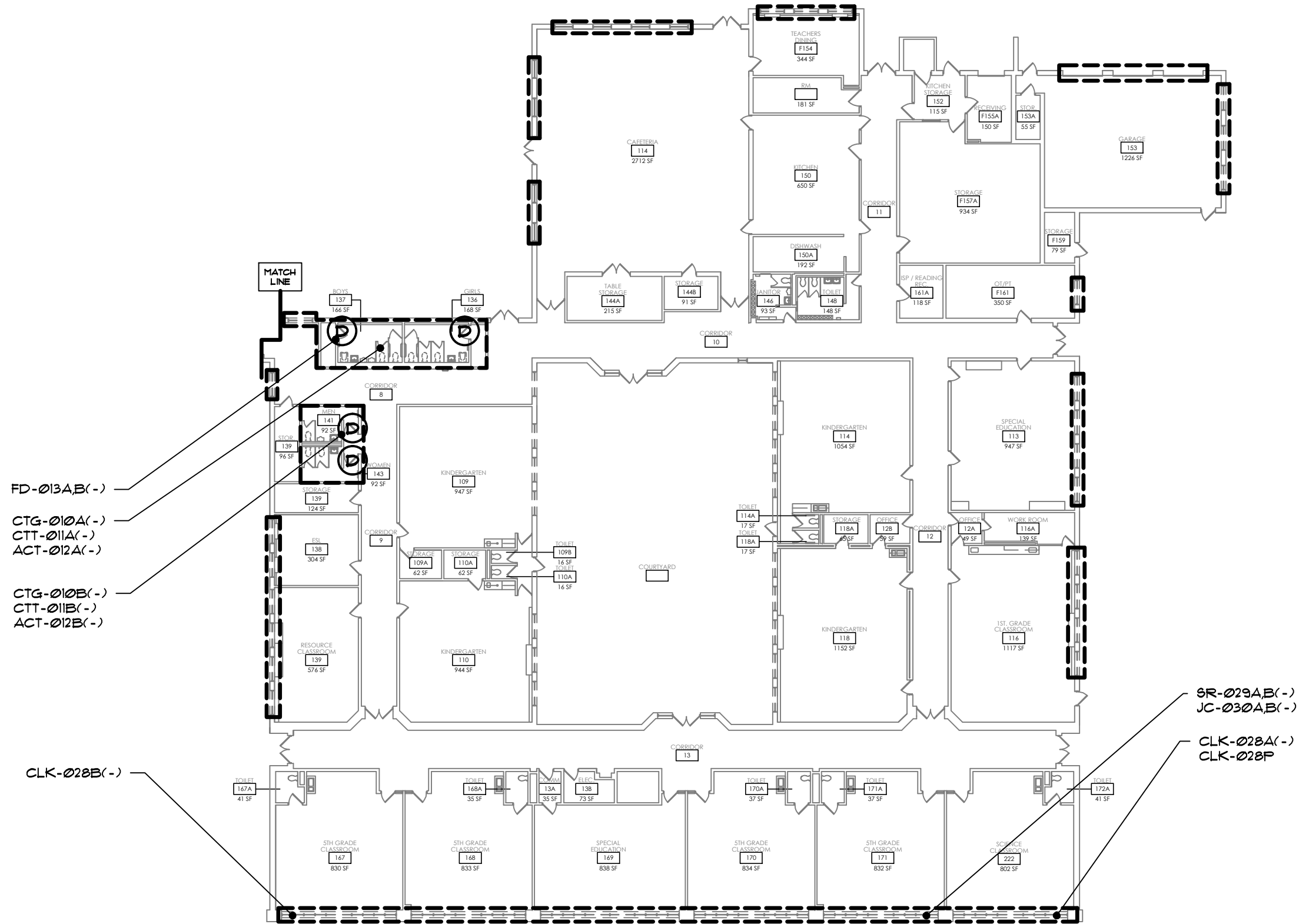
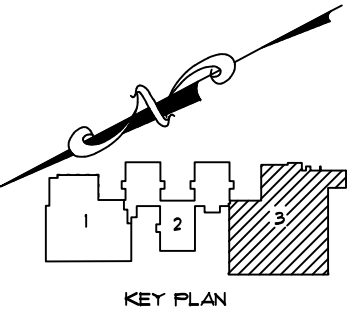
AECC
ENVIRONMENTAL CONSULTING

Asbestos & Environmental
Consulting Corporation

6308 Fly Road
East Syracuse, NY 13057

PROJECT NO.	20-146
DRAWN:	SEPT. 2020
DRAWN BY:	NP
CHECKED BY:	BB

THE INFORMATION INCLUDED ON THIS GRAPHIC REPRESENTATION HAS BEEN COMPILED FROM A VARIETY OF SOURCES AND IS SUBJECT TO CHANGE WITHOUT NOTICE. AECC MAKES NO REPRESENTATIONS OR WARRANTIES, EXPRESS OR IMPLIED, AS TO ACCURACY, COMPLETENESS, TIMELINESS, OR RIGHTS TO THE USE OF SUCH INFORMATION. THIS DOCUMENT IS NOT INTENDED FOR USE AS A LAND SURVEY PRODUCT NOR IS IT DESIGNED OR INTENDED AS A CONSTRUCTION DESIGN DOCUMENT. THE USE OR MISUSE OF THE INFORMATION CONTAINED ON THIS GRAPHIC REPRESENTATION IS AT THE SOLE RISK OF THE PARTY USING OR MISUSING THE INFORMATION.




IMPORTANT SURVEY NOTE:

THIS SURVEY WAS LIMITED IN NATURE. ONLY SPECIFIC BUILDING MATERIALS WITHIN THE DASHED BOUNDARIES WERE INVESTIGATED/SAMPLED, AS PER THE DIRECTION OF THE PROJECT ARCHITECT. ANY BUILDING MATERIALS NOT SPECIFICALLY SAMPLED WITHIN THE DASHED BOUNDARIES AND ALL BUILDING MATERIALS LOCATED OUTSIDE THE DASHED BOUNDARIES SHALL NEED TO BE TREATED AS POTENTIALLY HAZARDOUS MATERIALS, UNTIL EXAMINED BY AN ENVIRONMENTAL CONSULTANT AND LABORATORY RESULTS PROVE OTHERWISE.

LEGEND:

Ⓟ ASBESTOS-CONTAINING DOOR CAULK

THE INFORMATION INCLUDED ON THIS GRAPHIC REPRESENTATION HAS BEEN COMPILED FROM A VARIETY OF SOURCES AND IS SUBJECT TO CHANGE WITHOUT NOTICE. AECC MAKES NO REPRESENTATIONS OR WARRANTIES, EXPRESS OR IMPLIED, AS TO ACCURACY, COMPLETENESS, TIMELINESS, OR RIGHTS TO THE USE OF SUCH INFORMATION. THIS DOCUMENT IS NOT INTENDED FOR USE AS A LAND SURVEY PRODUCT NOR IS IT DESIGNED OR INTENDED AS A CONSTRUCTION DESIGN DOCUMENT. THE USE OR MISUSE OF THE INFORMATION CONTAINED ON THIS GRAPHIC REPRESENTATION IS AT THE SOLE RISK OF THE PARTY USING OR MISUSING THE INFORMATION.

 Asbestos & Environmental Consulting Corporation 6308 Fly Road East Syracuse, NY 13057	PROJECT NO.	20-146	Pakanasink Elementary School 1953 New York State Route 302 Circleville, New York 10919 Partial First Floor Plan	FIGURE 3
	DRAWN:	SEPT. 2020		
	DRAWN BY:	NP	Limited Hazardous Material Pre-Renovation Survey	
	CHECKED BY:	BB		



Limited Hazardous Material Pre-Renovation Survey Report

Pine Bush Central School District – 2019 CIP, Phase 2 Activities

Pine Bush High School
156 NYS Route 302
Pine Bush, New York 12566

Prepared for:

Mr. Christopher M. Ladanyi, AIS
Clark Patterson Lee, Architecture, Engineering & Planning, P.C.
50 Front Street, Suite 202
Newburgh, New York 12550

Prepared by:

Asbestos & Environmental Consulting Corporation (AECC)
6308 Fly Road
East Syracuse, New York 13057



September 14, 2020

Mr. Christopher M. Ladanyi, AIS
Clark Patterson Lee, Architecture, Engineering & Planning, P.C.
50 Front Street, Suite 202
Newburgh, New York 12550

**RE: Limited Hazardous Material Pre-Renovation Survey Report
Pine Bush Central School District – 2019 CIP, Phase 2 Activities
Pine Bush High School – 156 NYS Route 302, Pine Bush, New York 12566
AECC Project Number: 20-146**

Dear Mr. Ladanyi:

The Asbestos & Environmental Consulting Corporation (AECC) conducted a limited hazardous material pre-renovation survey at Pine Bush High School, located at 156 New York State Route 302, in Pine Bush, New York. The survey was limited nature. Only specific areas anticipated to be impacted by proposed Phase II activities of the Pine Bush 2019 Capital Improvement Project were included, as per the direction of the Project Architect (CPL). The following sections summarize the results:

ASBESTOS PRE-RENOVATION SURVEY

The asbestos bulk samples were collected by Mr. Bruce Osterman, Mr. Nicholas Coulombe, Mr. Hayden Haas and Mr. Steven Martinez, New York State Department of Labor (NYSDOL)-certified Asbestos Building Inspectors. The following building materials were collected, labeled, and shipped to AmeriSci New York for laboratory analysis:

Table 1: Asbestos Bulk Sampling Summary

SAMPLE NUMBER	MATERIAL DESCRIPTION	SAMPLE LOCATION(S)	ASBESTOS CONTENT
CLK-001A,B	Window Caulk (Red)	1 st Floor - Classroom 104 & Classroom 97	NAD
GLZ-002A,B	Window Glazing Compound (Black)	1 st Floor - Classroom 104 & Classroom 162	NAD
GLZ-003A,B	Window Glazing Compound (Black)	Basement - Classroom 15 & Classroom 14	NAD
CLK-004A,B	Window Sill Caulk (Black)	1st Floor - Courtyard C	2.4% Chrysotile
CLK-005A,B	Window Caulk (Black)	1 st Floor - Classroom 135 & Resource Room 168	NAD
ACT-006A,B	2'x2' Acoustical Ceiling Tile (White, Pinholes)	1 st Floor - Classroom 104 & Classroom 107	NAD

Mr. Christopher M. Ladanyi, AIS
 Clark Patterson Lee, Architecture, Engineering & Planning, P.C.
Limited Hazardous Material Pre-Renovation Survey Report
Pine Bush High School – 156 NYS Route 302, Pine Bush, New York 12566

Table 1: Asbestos Bulk Sampling Summary

SAMPLE NUMBER	MATERIAL DESCRIPTION	SAMPLE LOCATION(S)	ASBESTOS CONTENT
CB-007A,B	4" Cove Base (Gray)	1 st Floor - Classroom 104 & Classroom 106	NAD
CBM-008A,B	Cove Base Mastic (Tan/Brown)	1 st Floor - Classroom 104 & Classroom 106	NAD
FT-009A,B	12"x12" Floor Tile (Blue, Mottled)	1 st Floor - Classroom 104 & Classroom 107	NAD
FTM-010A,B	Floor Tile Mastic (Yellow)	1 st Floor - Classroom 104 & Classroom 107	NAD
FLFR-011A,B	Floor Filler Compound (White)	1 st Floor - Classroom 104 & Classroom 107	NAD
CLK-012A,B	Interior Door Caulk (White)	1 st Floor - Classroom 104 & Classroom 106	NAD
GLZ-013A,B	Door Vision Panel Glazing Compound (White)	1 st Floor - Classroom 104	NAD
FD-014A,B	Fire Door Insulation (Gray)	1 st Floor - Classroom 104 & Classroom 107	NAD
CKM-015A,B	Chalkboard Mastic (Tan)	1 st Floor - Classroom 104 & Classroom 107	NAD
ACT-016A,B	2'x2' Acoustical Ceiling Tile (White, Rough Texture)	1 st Floor - Classroom 105 & Classroom 106	NAD
CLK-017A,B	Interior Door Caulk (White)	1 st Floor – Gymnasium 103	NAD
PLS-018A,B,C	Plaster - Skim Coat (White)	1 st Floor - Corridor C110	NAD
PLB-019A,B,C	Plaster - Base Coat (Gray)	1 st Floor - Corridor C110	NAD
SR-020A,B	Sheetrock (Gray)	1 st Floor - Corridor C110	NAD
ACT-021A,B	2'x4' Acoustical Ceiling Tile (White, Square Pattern)	1 st Floor - Corridor C110	NAD
CKM-022A,B	Chalkboard Mastic (Brown)	1 st Floor - Classroom 107	NAD
CB-023A,B	4" Cove Base (Blue)	1 st Floor - Corridor C110	NAD
TRZO-024A,B	12"x12" Terrazzo Tile (Blue/Gray)	1 st Floor - Corridor C110	NAD

Mr. Christopher M. Ladanyi, AIS
 Clark Patterson Lee, Architecture, Engineering & Planning, P.C.
Limited Hazardous Material Pre-Renovation Survey Report
Pine Bush High School – 156 NYS Route 302, Pine Bush, New York 12566

Table 1: Asbestos Bulk Sampling Summary

SAMPLE NUMBER	MATERIAL DESCRIPTION	SAMPLE LOCATION(S)	ASBESTOS CONTENT
TMAS-025A,B	Terrazzo Tile Mastic (Yellow)	1 st Floor - Corridor C110	NAD
TRZO-026A,B	Terrazzo Flooring (Red)	1 st Floor - Corridor C110	NAD
FIT-027A,B,C	Storm Sewer Pipe Fitting (Gray)	1 st Floor - Corridor C110	NAD
fTECT-028A,B	Tectum Ceiling Tile (White)	1 st Floor - Boys Locker 110	NAD
SEAL-029A,B	Roof Drain Sealant (White)	1 st Floor - Boys Locker 110 & Girls Locker 111	NAD
CTG-030A,B	Ceramic Floor Tile Grout (Gray)	1 st Floor - Boys Locker 110, Office Toilet & Shower	NAD
CTT-031A,B	Ceramic Floor Tile Thin Set (Gray)	1 st Floor - Boys Locker 110, Office Toilet & Shower	NAD
PMAS-032A,B	Pipe Mastic (Black)	1 st Floor - Boys Locker 100, Office	NAD
CTG-033A,B	Ceramic Wall Tile Grout (White)	1 st Floor - Boys Locker 110, Office Toilet & Shower	NAD
CTT-034A,B	Ceramic Wall Tile Thin Set (Gray)	1 st Floor - Boys Locker 110, Office Toilet & Shower	NAD
ACT-035A,B	2'x2' Acoustical Ceiling Tile (White, Pinholes/Fissures)	1 st Floor - Boys Locker 110, Office Toilet	NAD
TRZO-036A,B	Terrazzo Flooring (Green)	1 st Floor - Boys Locker 110, Under Floor Tile	NAD
CB-037A,B	6" Cove Base (Gray)	Basement - Girls Locker 002	NAD
CBM-038A,B	Cove Base Mastic (Brown)	Basement - Girls Locker 002	NAD
FT-039A,B	12"x12" Floor Tile (Gray)	Basement - Girls Locker 002	NAD
FTM-040A,B	Floor Tile Mastic (Yellow)	Basement - Girls Locker 002	NAD
FIT-041A,B,C	2" Pipe Fitting Insulation (Gray)	Basement – Girls Locker 002 & Boys Locker 001	NAD
FIT-042A,B,C	4" Pipe Fitting Insulation (Gray)	Basement - Boys Locker 001	NAD

Mr. Christopher M. Ladanyi, AIS
 Clark Patterson Lee, Architecture, Engineering & Planning, P.C.
Limited Hazardous Material Pre-Renovation Survey Report
Pine Bush High School – 156 NYS Route 302, Pine Bush, New York 12566

Table 1: Asbestos Bulk Sampling Summary

SAMPLE NUMBER	MATERIAL DESCRIPTION	SAMPLE LOCATION(S)	ASBESTOS CONTENT
CLK-043A,B	Residual Window Caulk (White)	1 st Floor - Courtyard A	4.5% Chrysotile
FLR-044A,B	Vinyl Sheet Flooring (Gray, 2'x2' Pattern)	Basement - Boys Locker 004	NAD
FMAS-045A,B	Flooring Mastic (Yellow)	Basement - Boys Locker 004	NAD
FIT-046A,B,C	2" Pipe Fitting Insulation (Gray)	Basement - Girls Locker 006 & Boys Locker 004	NAD
PLB-047A,B,C	Plaster - Base Coat (Gray)	Basement - Boys Locker 004 & Girls Locker 006	NAD

Table Notes:

NAD = No Asbestos Detected

The following asbestos-containing materials (ACMs) were identified within the renovation areas during the completion of this survey:

Table 2: Approximate Quantities of ACMs

ACM DESCRIPTION	ACM LOCATION(S)	ESTIMATED QUANTITY	MATERIAL CONDITION
Black Window Sill Caulk (CLK-004)	Basement, 1 st Floor & 2 nd Floor - Assumed Under Metal Window Sills	140 SF	NF, Intact
White Residual Window Caulk (CLK-043)	Basement, 1 st Floor & 2 nd Floor - Various Windows	50 SF	NF, Intact

Table Notes:

SF = Square Feet

NF = Non-Friable

Asbestos Bulk Sampling Summary – By regulatory definition, a building material must be greater than one percent (1%) asbestos to be considered an asbestos-containing material (ACM). During this survey, black window sill caulk and white residual window caulk were determined to be ACMs by laboratory analysis. According to state and federal laws, ACMs and presumed asbestos-containing materials (PACMs) must be handled and disposed of by a licensed abatement contractor prior to any renovation or demolition-related activities. The associated laboratory analysis reports have been included in Attachment B of this report.

Transmittal of Building / Structure Asbestos Survey Information – As required by New York State Industrial Code Rule 56, copies of this report shall be immediately transmitted by the building / structure owner (prior to any renovation-related activities), as follows:

Mr. Christopher M. Ladanyi, AIS
Clark Patterson Lee, Architecture, Engineering & Planning, P.C.
Limited Hazardous Material Pre-Renovation Survey Report
Pine Bush High School – 156 NYS Route 302, Pine Bush, New York 12566

- (1) One (1) copy of the completed asbestos survey shall be sent by the owner or their agent to the local entity charged with issuing a permit for such demolition, renovation, remodeling or repair work under state or local laws.
- (2) One (1) copy of completed asbestos survey shall be kept on the construction site with the asbestos notification and variance, if required, for the duration of the asbestos project and any associated demolition, renovation, remodeling or repair project.

LEAD-BASED PAINT INSPECTION

AECC's subcontractor, EcoSpect, Inc. (EcoSpect), performed a representative lead-based paint (LBP) inspection of the proposed renovation areas on August 31, 2020. During this inspection, LBP was identified on the following building substrates (number of positive readings in parentheses):

- Ceramic Walls (7)

Please reference EcoSpect's *XRF Lead Inspection* report (report dated September 10, 2020), found in Attachment C of this report, for additional details pertaining to the investigation techniques, sampling methodologies, and results from the lead-based paint inspection.

CAULK SAMPLING FOR PCBs

AECC collected representative building caulk applications from the proposed renovation areas and shipped them to Schneider Laboratories Global, Inc. for polychlorinated biphenyls (PCB) analysis. The following table summarizes the results:

Table 3: PCB Bulk Sampling Summary

SAMPLE NUMBER	CAULK DESCRIPTION	SAMPLE LOCATION	PCB CONTENT
CLK-001P	Window Caulk (Red)	1 st Floor - Classroom 104	BRL
CLK-004P	Window Sill Caulk (Black)	1 st Floor - Courtyard C	BRL
CLK-005P	Window Caulk (Black)	1 st Floor - Classroom 158	BRL
CLK-012P	Interior Door Caulk (White)	1 st Floor - Classroom 104	BRL
CLK-017P	Interior Door Caulk (White)	1 st Floor – Gymnasium 103	BRL
CLK-043P	Window Caulk (White)	1 st Floor - Courtyard A	BRL

Table Notes:

BRL = Below Reporting Limit

PCB Bulk Sampling Summary – By regulatory definition, a PCB-containing bulk material is defined as any building material containing at least 50 parts per million (ppm) of PCBs. The caulk applications collected during this survey are not PCB-containing bulk materials, as determined by laboratory analysis. The associated laboratory analysis report has been included in Attachment D of this report.

MISCELLANEOUS HAZARDOUS / SPECIAL WASTE INVENTORY

The following items were observed during AECC's survey of the proposed renovation areas and presumed to contain the specified hazardous / special wastes in the table below:

Table 4: Miscellaneous Hazardous / Special Waste Inventory

ITEM DESCRIPTION	ITEM LOCATION(S)	ESTIMATED COUNT	PRESUMED HAZ MATERIAL	ITEM CONDITION
Fluorescent Light Tubes / Bulbs	Basement - Boys Locker 001, Girls Locker 002, Boys Locker 004 & Girls Locker 006	390	Mercury	Intact
Light Ballasts	1 st Floor - Boys Locker 110, Girls Locker 111, Corridor C110, Classroom 104, Classroom 105, Classroom 106 & Classroom 107	195	PCBs	Intact
Exit Signs (Bulbs & Batteries)	Basement - Boys Locker 001, Girls Locker 002, Boys Locker 004 & Girls Locker 006 1 st Floor - Boys Locker 110, Girls Locker 111 & Corridor C110	14	Mercury and Lead	Intact
Thermostats	Basement - Boys Locker 001, Girls Locker 002, Boys Locker 004 & Girls Locker 006 1 st Floor - Boys Locker 110 & Girls Locker 111	6	Mercury	Intact

Miscellaneous Hazardous / Special Wastes Summary – Additional investigation into the status of these materials / items may be performed to prove that hazardous materials are not present. However, without conducting this additional investigation, these materials must be presumed to contain potentially hazardous materials and handled / disposed of in accordance with all applicable state, federal, and local regulations.

Mr. Christopher M. Ladanyi, AIS
Clark Patterson Lee, Architecture, Engineering & Planning, P.C.
Limited Hazardous Material Pre-Renovation Survey Report
Pine Bush High School – 156 NYS Route 302, Pine Bush, New York 12566

Report Note – In the event that other building materials (materials not specifically identified in this report) are identified prior to or during the course of the renovation activities, the materials shall be presumed to be hazardous until examined by an appropriately certified individual and laboratory analysis proves otherwise.

If you have any questions pertaining to this report, please do not hesitate to contact me directly at AECC's corporate office (315-432-9400).

Sincerely,
Asbestos & Environmental Consulting Corporation



Bryan Bowers
President / Owner

Attachment A: AECC Company License & Personnel Certifications
Attachment B: Asbestos Bulk Sampling Laboratory Results
Attachment C: EcoSpect's *XRF Lead Inspection* Report
Attachment D: PCB Bulk Sampling Laboratory Results
Attachment E: Figures 1, 2, 3, 4, 5, 6, 7, 8 & 9

ATTACHMENT A

AECC Company License & Personnel Certifications

New York State – Department of Labor

Division of Safety and Health
License and Certificate Unit
State Campus, Building 12
Albany, NY 12240

ASBESTOS HANDLING LICENSE

Asbestos & Environmental Consulting Corporation
6308 Fly Road
E. Syracuse, NY 13057

FILE NUMBER: 09-42909
LICENSE NUMBER: 42909
LICENSE CLASS: RESTRICTED
DATE OF ISSUE: 02/14/2020
EXPIRATION DATE: 02/28/2021

Duly Authorized Representative – Bryan Bowers:

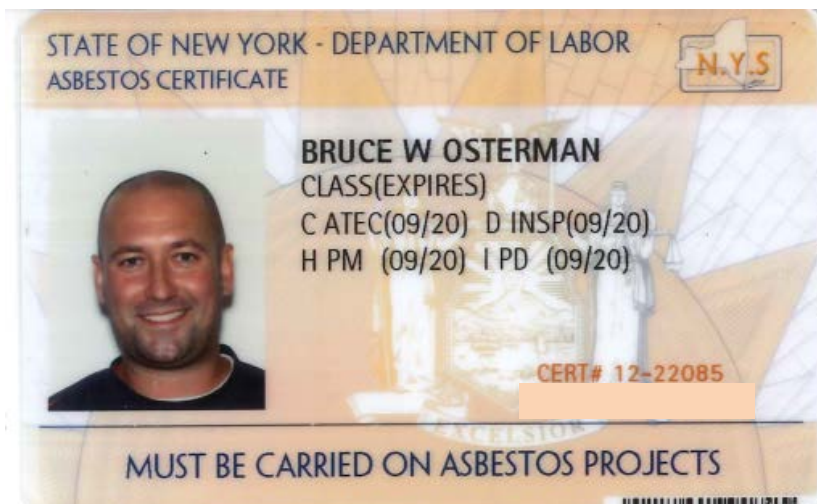
This license has been issued in accordance with applicable provisions of Article 30 of the Labor Law of New York State and of the New York State Codes, Rules and Regulations (12 NYCRR Part 56). It is subject to suspension or revocation for a (1) serious violation of state, federal or local laws with regard to the conduct of an asbestos project, or (2) demonstrated lack of responsibility in the conduct of any job involving asbestos or asbestos material.

This license is valid only for the contractor named above and this license or a photocopy must be prominently displayed at the asbestos project worksite. This license verifies that all persons employed by the licensee on an asbestos project in New York State have been issued an Asbestos Certificate, appropriate for the type of work they perform, by the New York State Department of Labor.



Eileen M. Franko, Director
For the Commissioner of Labor

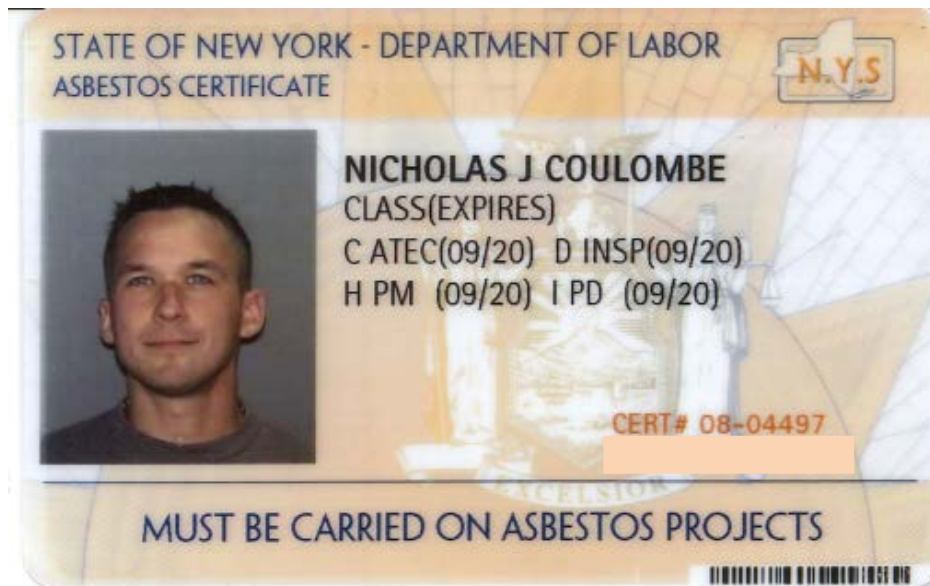
ASBESTOS CERTIFICATION



The following letter codes (as shown on the handling certificate) represent the corresponding asbestos classifications.

A – Asbestos Handler	D – Asbestos Inspector	G – Asbestos Supervisor
B – Allied Trades	E – Management Planner	H – Asbestos Project Monitor
C – Air sampling Technician	F – Operations & Maintenance	I – Asbestos Project Designer

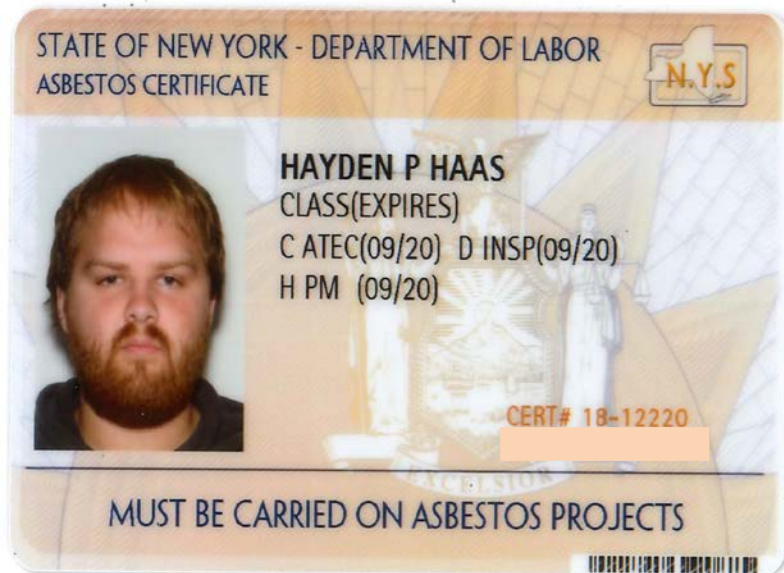
ASBESTOS CERTIFICATION



The following letter codes (as shown on the handling certificate) represent the corresponding asbestos classifications.

A – Asbestos Handler	D – Asbestos Inspector	G – Asbestos Supervisor
B – Allied Trades	E – Management Planner	H – Asbestos Project Monitor
C – Air sampling Technician	F – Operations & Maintenance	I – Asbestos Project Designer

ASBESTOS CERTIFICATION



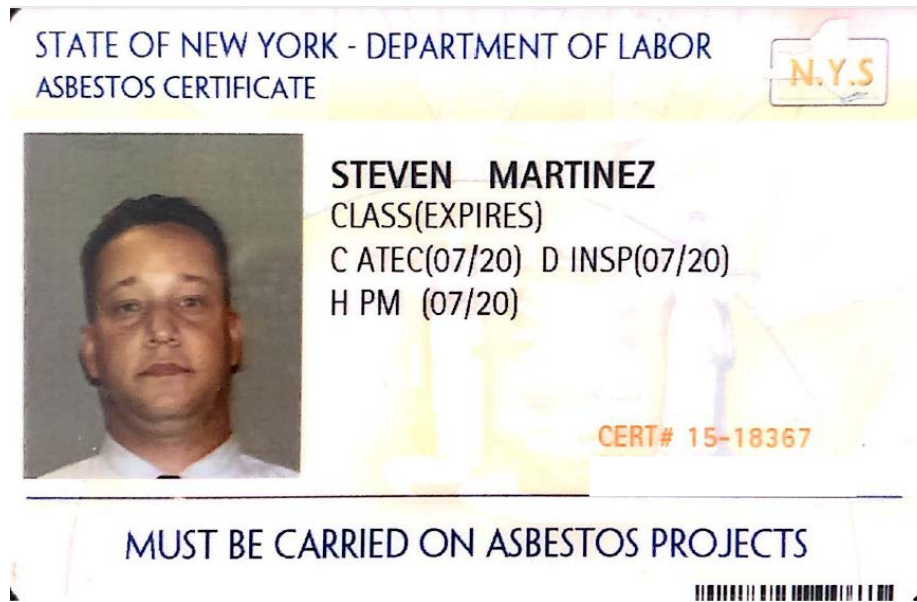
The following letter codes (as shown on the handling certificate) represent the corresponding asbestos classifications.

A – Asbestos Handler
B – Allied Trades
C – Air sampling Technician

D – Asbestos Inspector
E – Management Planner
F – Operations & Maintenance

G – Asbestos Supervisor
H – Asbestos Project Monitor
I – Asbestos Project Designer

ASBESTOS CERTIFICATION



The following letter codes (as shown on the handling certificate) represent the corresponding asbestos classifications.

A – Asbestos Handler	D – Asbestos Inspector	G – Asbestos Supervisor
B – Allied Trades	E – Management Planner	H – Asbestos Project Monitor
C – Air sampling Technician	F – Operations & Maintenance	I – Asbestos Project Designer

ATTACHMENT B

Asbestos Bulk Sampling Laboratory Results

**AmeriSci New York**

117 EAST 30TH ST.
NEW YORK, NY 10016
TEL: (212) 679-8600 • FAX: (212) 679-3114

PLM Bulk Asbestos Report

Asbestos & Environmental Consulting C
Attn: Bryan Bowers
6308 Fly Road

East Syracuse, NY 13057

Date Received 08/22/20 **AmeriSci Job #** 220083326
Date Examined 08/24/20 **P.O. #**
ELAP # 11480 **Page** 1 **of** 8
RE: 20-146; Clark Patterson Lee Architects; Pine Bush High
School, 156 NY-302, Pine Bush, New York, NY, 12566

Client No. / HGA	Lab No.	Asbestos Present	Total % Asbestos
CLK-001A 1 Location: Main Entrance - Window - Window Caulk (Red)	220083326-01	No	NAD ¹ (by NYS ELAP 198.6) by Valeriu Voicu on 08/24/20
Analyst Description: Brown, Homogeneous, Non-Fibrous, Bulk Material Asbestos Types: Other Material: Non-fibrous 4.8 %			
CLK-001B 1 Location: Main Entrance - Window - Window Caulk (Red)	220083326-02	No	NAD (by NYS ELAP 198.6) by Valeriu Voicu on 08/24/20
Analyst Description: Brown/Red, Homogeneous, Non-Fibrous, Bulk Material Asbestos Types: Other Material: Non-fibrous 1.9 %			
GLZ-002A 2 Location: Main Entrance - Window - Window Glazing Compound (Black)	220083326-03	No	NAD (by NYS ELAP 198.6) by Valeriu Voicu on 08/24/20
Analyst Description: Dark Grey, Homogeneous, Non-Fibrous, Bulk Material Asbestos Types: Other Material: Non-fibrous 5.1 %			
GLZ-002B 2 Location: Main Entrance - Window - Window Glazing Compound (Black)	220083326-04	No	NAD (by NYS ELAP 198.6) by Valeriu Voicu on 08/24/20
Analyst Description: Black/Grey, Homogeneous, Non-Fibrous, Bulk Material Asbestos Types: Other Material: Non-fibrous 27.2 %			
GLZ-003A 3 Location: Main Entrance - Small Window - Window Glazing Compound (Black)	220083326-05	No	NAD (by NYS ELAP 198.6) by Valeriu Voicu on 08/24/20
Analyst Description: Black, Homogeneous, Non-Fibrous, Bulk Material Asbestos Types: Other Material: Non-fibrous 1.4 %			

Client Name: Asbestos & Environmental Consulting Corp.

PLM Bulk Asbestos Report20-146; Clark Patterson Lee Architects; Pine Bush High
School, 156 NY-302, Pine Bush, New York, NY, 12566

Client No. / HGA	Lab No.	Asbestos Present	Total % Asbestos
GLZ-003B 3	220083326-06 Location: Main Entrance - Small Window - Window Glazing Compound (Black)	No	NAD (by NYS ELAP 198.6) by Valeriu Voicu on 08/24/20
Analyst Description: Black, Homogeneous, Non-Fibrous, Bulk Material Asbestos Types: Other Material: Cellulose 39.5 %			
CLK-004A 4	220083326-07 Location: Courtyard C - Window - Window Sill Caulk (Black)	Yes	2.4 % (by NYS ELAP 198.6) by Valeriu Voicu on 08/24/20
Analyst Description: Dark Brown/Black, Homogeneous, Fibrous, Bulk Material Asbestos Types: Chrysotile 2.4 % Other Material: Non-fibrous 15.7 %			
CLK-004B 4	220083326-08 Location: Courtyard C - Window - Window Sill Caulk (Black)		NA/PS
Analyst Description: Bulk Material Asbestos Types: Other Material:			
CLK-005A 5	220083326-09 Location: Corridor B - Window - Window Caulk (Black)	No	NAD (by NYS ELAP 198.6) by Valeriu Voicu on 08/24/20
Analyst Description: Black, Homogeneous, Non-Fibrous, Bulk Material Asbestos Types: Other Material: Non-fibrous 13.7 %			
CLK-005B 5	220083326-10 Location: Corridor B - Window - Window Caulk (Black)	No	NAD (by NYS ELAP 198.6) by Valeriu Voicu on 08/24/20
Analyst Description: Black, Homogeneous, Non-Fibrous, Bulk Material Asbestos Types: Other Material: Non-fibrous 11.4 %			
ACT-006A 6	220083326-11 Location: Classroom 104 & 107 - 2' x 2' Pinhole Ceiling Tile (White)	No	NAD (by NYS ELAP 198.6) by Valeriu Voicu on 08/24/20
Analyst Description: White/Beige, Homogeneous, Non-Fibrous, Bulk Material Asbestos Types: Other Material: Non-fibrous 39.9 %			

Client Name: Asbestos & Environmental Consulting Corp.

PLM Bulk Asbestos Report

20-146; Clark Patterson Lee Architects; Pine Bush High School, 156 NY-302, Pine Bush, New York, NY, 12566

Client No. / HGA	Lab No.	Asbestos Present	Total % Asbestos
ACT-006B 6	220083326-12 Location: Classroom 104 & 107 - 2' x 2' Pinhole Ceiling Tile (White)	No	NAD (by NYS ELAP 198.6) by Valeriu Voicu on 08/24/20
Analyst Description: White/Beige, Homogeneous, Non-Fibrous, Bulk Material Asbestos Types: Other Material: Non-fibrous 35.7 %			
CB-007A 7	220083326-13 Location: Classroom 104 & 106 - 4" Cove Base (Gray)	No	NAD (by NYS ELAP 198.6) by Valeriu Voicu on 08/24/20
Analyst Description: Grey, Homogeneous, Non-Fibrous, Bulk Material Asbestos Types: Other Material: Non-fibrous 41.3 %			
CB-007B 7	220083326-14 Location: Classroom 104 & 106 - 4" Cove Base (Gray)	No	NAD (by NYS ELAP 198.6) by Valeriu Voicu on 08/24/20
Analyst Description: Grey, Homogeneous, Non-Fibrous, Bulk Material Asbestos Types: Other Material: Non-fibrous 41.2 %			
CBM-008A 8	220083326-15 Location: Classroom 104 & 106 - Cove Base Mastic (Tan/Brown)	No	NAD (by NYS ELAP 198.6) by Valeriu Voicu on 08/24/20
Analyst Description: Beige, Homogeneous, Non-Fibrous, Bulk Material Asbestos Types: Other Material: Non-fibrous 34.2 %			
CBM-008B 8	220083326-16 Location: Classroom 104 & 106 - Cove Base Mastic (Tan/Brown)	No	NAD (by NYS ELAP 198.6) by Valeriu Voicu on 08/24/20
Analyst Description: Beige, Homogeneous, Non-Fibrous, Bulk Material Asbestos Types: Other Material: Non-fibrous 36.8 %			
FT-009A 9	220083326-17 Location: Classroom 104 & 107 - 12" Floor Tile "Mottled" (Blue)	No	NAD (by NYS ELAP 198.6) by Valeriu Voicu on 08/24/20
Analyst Description: Grey, Homogeneous, Non-Fibrous, Bulk Material Asbestos Types: Other Material: Non-fibrous 4.8 %			

Client Name: Asbestos & Environmental Consulting Corp.

PLM Bulk Asbestos Report20-146; Clark Patterson Lee Architects; Pine Bush High
School, 156 NY-302, Pine Bush, New York, NY, 12566

Client No. / HGA	Lab No.	Asbestos Present	Total % Asbestos
FTM-009B 9	220083326-18 Location: Classroom 104 & 107 - 12" Floor Tile "Mottled" (Blue)	No	NAD (by NYS ELAP 198.6) by Valeriu Voicu on 08/24/20
Analyst Description: Grey, Homogeneous, Non-Fibrous, Bulk Material Asbestos Types: Other Material: Non-fibrous 3.7 %			
FTM-010A 10	220083326-19 Location: Classroom 104 & 107 - Floor Tile Mastic (Yellow)	No	NAD (by NYS ELAP 198.6) by Valeriu Voicu on 08/24/20
Analyst Description: Yellow, Homogeneous, Non-Fibrous, Bulk Material Asbestos Types: Other Material: Non-fibrous 25.6 %			
FTM-010B 10	220083326-20 Location: Classroom 104 & 107 - Floor Tile Mastic (Yellow)	No	NAD (by NYS ELAP 198.6) by Valeriu Voicu on 08/24/20
Analyst Description: Yellow, Homogeneous, Non-Fibrous, Bulk Material Asbestos Types: Other Material: Non-fibrous 27.6 %			
FLFR-011A 11	220083326-21 Location: Classroom 104 & 107 - Floor Filler Compound (White)	No	NAD (by NYS ELAP 198.1) by Valeriu Voicu on 08/24/20
Analyst Description: Light Grey, Homogeneous, Non-Fibrous, Cementitious, Bulk Material Asbestos Types: Other Material: Cellulose Trace, Non-fibrous 100 %			
FLFR-011B 11	220083326-22 Location: Classroom 104 & 107 - Floor Filler Compound (White)	No	NAD (by NYS ELAP 198.1) by Valeriu Voicu on 08/24/20
Analyst Description: Light Grey, Homogeneous, Non-Fibrous, Cementitious, Bulk Material Asbestos Types: Other Material: Cellulose Trace, Non-fibrous 100 %			
CLK-012A 12	220083326-23 Location: Classroom 104 & 106 - Interior Door Caulk (White)	No	NAD (by NYS ELAP 198.6) by Valeriu Voicu on 08/24/20
Analyst Description: White, Homogeneous, Non-Fibrous, Bulk Material Asbestos Types: Other Material: Non-fibrous 18.6 %			

Client Name: Asbestos & Environmental Consulting Corp.

PLM Bulk Asbestos Report

20-146; Clark Patterson Lee Architects; Pine Bush High School, 156 NY-302, Pine Bush, New York, NY, 12566

Client No. / HGA	Lab No.	Asbestos Present	Total % Asbestos
CLK-012B 12	220083326-24 Location: Classroom 104 & 106 - Interior Door Caulk (White)	No	NAD (by NYS ELAP 198.6) by Valeriu Voicu on 08/24/20
Analyst Description: White, Homogeneous, Non-Fibrous, Bulk Material Asbestos Types: Other Material: Non-fibrous 13.1 %			
GLZ-013A 13	220083326-25 Location: Classroom 104 - Door Vision Glazing (White)	No	NAD (by NYS ELAP 198.6) by Valeriu Voicu on 08/24/20
Analyst Description: White, Homogeneous, Non-Fibrous, Bulk Material Asbestos Types: Other Material: Non-fibrous 3.7 %			
GLZ-013B 13	220083326-26 Location: Classroom 104 - Door Vision Glazing (White)	No	NAD (by NYS ELAP 198.6) by Valeriu Voicu on 08/24/20
Analyst Description: White, Homogeneous, Non-Fibrous, Bulk Material Asbestos Types: Other Material: Non-fibrous 16.2 %			
FD-014A 14	220083326-27 Location: Classroom 104 & 107 - Fire Door Insulation (Gray)	No	NAD (by NYS ELAP 198.1) by Valeriu Voicu on 08/24/20
Analyst Description: OffWhite, Homogeneous, Fibrous, Bulk Material Asbestos Types: Other Material: Cellulose 30 %, Non-fibrous 70 %			
FD-014B 14	220083326-28 Location: Classroom 104 & 107 - Fire Door Insulation (Gray)	No	NAD (by NYS ELAP 198.1) by Valeriu Voicu on 08/24/20
Analyst Description: OffWhite, Homogeneous, Fibrous, Bulk Material Asbestos Types: Other Material: Cellulose 35 %, Non-fibrous 65 %			
CKM-015A 15	220083326-29 Location: Classroom 104 & 107 - Chalk Board Mastic (Tan)	No	NAD (by NYS ELAP 198.6) by Valeriu Voicu on 08/24/20
Analyst Description: Tan, Homogeneous, Non-Fibrous, Bulk Material Asbestos Types: Other Material: Non-fibrous 8.9 %			

Client Name: Asbestos & Environmental Consulting Corp.

PLM Bulk Asbestos Report

20-146; Clark Patterson Lee Architects; Pine Bush High School, 156 NY-302, Pine Bush, New York, NY, 12566

Client No. / HGA	Lab No.	Asbestos Present	Total % Asbestos
CKM-015B 15	220083326-30 Location: Classroom 104 & 107 - Chalk Board Mastic (Tan)	No	NAD (by NYS ELAP 198.6) by Valeriu Voicu on 08/24/20
Analyst Description: Tan, Homogeneous, Non-Fibrous, Bulk Material Asbestos Types: Other Material: Non-fibrous 7.7 %			
ACT-016A 16	220083326-31 Location: Classroom 105 & 106 - 2' x 2' Rough Textured Ceiling Tile (White)	No	NAD (by NYS ELAP 198.6) by Valeriu Voicu on 08/24/20
Analyst Description: White/Beige, Homogeneous, Non-Fibrous, Bulk Material Asbestos Types: Other Material: Non-fibrous 27.9 %			
ACT-016B 16	220083326-32 Location: Classroom 105 & 106 - 2' x 2' Rough Textured Ceiling Tile (White)	No	NAD (by NYS ELAP 198.6) by Valeriu Voicu on 08/24/20
Analyst Description: White/Beige, Homogeneous, Non-Fibrous, Bulk Material Asbestos Types: Other Material: Non-fibrous 53.1 %			
CLK-017A 17	220083326-33 Location: Gym Doors - Interior Door Caulk (White)	No	NAD (by NYS ELAP 198.6) by Valeriu Voicu on 08/24/20
Analyst Description: White, Homogeneous, Non-Fibrous, Bulk Material Asbestos Types: Other Material: Non-fibrous 18.5 %			
CLK-017B 17	220083326-34 Location: Gym Doors - Interior Door Caulk (White)	No	NAD (by NYS ELAP 198.6) by Valeriu Voicu on 08/24/20
Analyst Description: White, Homogeneous, Non-Fibrous, Bulk Material Asbestos Types: Other Material: Non-fibrous 17.9 %			
PLS-018A 18	220083326-35 Location: Corridor C110 - Plaster Skim Coat (White)	No	NAD (by NYS ELAP 198.1) by Valeriu Voicu on 08/24/20
Analyst Description: White, Homogeneous, Non-Fibrous, Bulk Material Asbestos Types: Other Material: Non-fibrous 100 %			

Client Name: Asbestos & Environmental Consulting Corp.

PLM Bulk Asbestos Report20-146; Clark Patterson Lee Architects; Pine Bush High
School, 156 NY-302, Pine Bush, New York, NY, 12566

Client No. / HGA	Lab No.	Asbestos Present	Total % Asbestos
PLS-018B 18	220083326-36 Location: Corridor C110 - Plaster Skim Coat (White)	No	NAD (by NYS ELAP 198.1) by Valeriu Voicu on 08/24/20
Analyst Description: White, Homogeneous, Non-Fibrous, Bulk Material Asbestos Types: Other Material: Cellulose Trace, Non-fibrous 100 %			
PLS-018C 18	220083326-37 Location: Corridor C110 - Plaster Skim Coat (White)	No	NAD (by NYS ELAP 198.1) by Valeriu Voicu on 08/24/20
Analyst Description: White, Homogeneous, Non-Fibrous, Bulk Material Asbestos Types: Other Material: Cellulose Trace, Non-fibrous 100 %			
PLB-019A 19	220083326-38 Location: Corridor C110 - Plaster Base Coat (Gray)	No	NAD (by NYS ELAP 198.1) by Valeriu Voicu on 08/24/20
Analyst Description: Light Grey, Homogeneous, Non-Fibrous, Cementitious, Bulk Material Asbestos Types: Other Material: Cellulose Trace, Non-fibrous 100 %			
PLB-019B 19	220083326-39 Location: Corridor C110 - Plaster Base Coat (Gray)	No	NAD (by NYS ELAP 198.1) by Valeriu Voicu on 08/24/20
Analyst Description: Light Grey, Homogeneous, Non-Fibrous, Cementitious, Bulk Material Asbestos Types: Other Material: Cellulose Trace, Non-fibrous 100 %			
PLB-019C 19	220083326-40 Location: Corridor C110 - Plaster Base Coat (Gray)	No	NAD (by NYS ELAP 198.1) by Valeriu Voicu on 08/24/20
Analyst Description: Light Grey, Homogeneous, Non-Fibrous, Cementitious, Bulk Material Asbestos Types: Other Material: Cellulose Trace, Non-fibrous 100 %			
SR-020A 20	220083326-41 Location: Corridor C110 - Sheetrock (Gray)	No	NAD (by NYS ELAP 198.1) by Valeriu Voicu on 08/24/20
Analyst Description: Brown/Grey, Heterogeneous, Fibrous, Bulk Material Asbestos Types: Other Material: Cellulose 7 %, Non-fibrous 93 %			

Client Name: Asbestos & Environmental Consulting Corp.

PLM Bulk Asbestos Report

20-146; Clark Patterson Lee Architects; Pine Bush High
School, 156 NY-302, Pine Bush, New York, NY, 12566

Client No. / HGA	Lab No.	Asbestos Present	Total % Asbestos
SR-020B 20	220083326-42 Location: Corridor C110 - Sheetrock (Gray)	No	NAD (by NYS ELAP 198.1) by Valeriu Voicu on 08/24/20
Analyst Description: Brown/White, Heterogeneous, Fibrous, Bulk Material			
Asbestos Types:			
Other Material: Cellulose 8 %, Non-fibrous 92 %			

Reporting Notes:

(1) This PLM job was analyzed using Olympus BH-2 Pol Scope S/N 229915

Analyzed by: Valeriu Voicu 

*NAD/NSD =no asbestos detected; NA =not analyzed; NA/PS=not analyzed/positive stop, (SOF-V) = Sprayed On Fireproofing containing Vermiculite; (SM-V) = Surfacing Material containing Vermiculite; PLM Bulk Asbestos Analysis by Appd E to Subpt E, 40 CFR 763 (NVLAP 200546-0), ELAP PLM Method 198.1 for NY friable samples, which includes the identification and quantitation of vermiculite or ELAP 198.6 for NOB samples or EPA 400 pt ct by EPA 600-M4-82-020 (NY ELAP Lab 11480); Note:PLM is not consistently reliable in detecting asbestos in floor coverings and similar non-friable organically bound materials. NAD or Trace results by PLM are inconclusive, TEM is currently the only method that can be used to determine if this material can be considered or treated as non asbestos-containing in NY State (also see EPA Advisory for floor tile, FR 59,146,38970,8/1/94) National Institute of Standards and Technology Accreditation requirements mandate that this report must not be reproduced except in full without the approval of the lab. This PLM report relates ONLY to the items tested. AIHA-LAP, LLC Lab ID 102843, RI Cert AAL-094, CT Cert PH-0186, Mass Cert AA000054.

Reviewed By: 

END OF REPORT

Client Name: Asbestos & Environmental Consulting Corp.

Table I
Summary of Bulk Asbestos Analysis Results

20-146; Clark Patterson Lee Architects; Pine Bush High School, 156 NY-302, Pine Bush, New York, NY, 12566

AmeriSci Sample #	Client Sample#	HG Area	Sample Weight (gram)	Heat Sensitive Organic %	Acid Soluble Inorganic %	Insoluble Non-Asbestos Inorganic %	** Asbestos % by PLM/DS	** Asbestos % by TEM
01	CLK-001A	1	0.273	50.6	44.6	4.8	NAD	NAD
Location: Main Entrance - Window - Window Caulk (Red)								
02	CLK-001B	1	0.104	79.8	18.3	1.9	NAD	NAD
Location: Main Entrance - Window - Window Caulk (Red)								
03	GLZ-002A	2	0.109	93.1	1.7	5.1	NAD	NAD
Location: Main Entrance - Window - Window Glazing Compound (Black)								
04	GLZ-002B	2	0.346	22.7	50.1	27.2	NAD	NAD
Location: Main Entrance - Window - Window Glazing Compound (Black)								
05	GLZ-003A	3	0.184	41.5	57.2	1.4	NAD	NAD
Location: Main Entrance - Small Window - Window Glazing Compound (Black)								
06	GLZ-003B	3	0.119	44.7	15.8	39.5	NAD	NAD
Location: Main Entrance - Small Window - Window Glazing Compound (Black)								
07	CLK-004A	4	0.150	64.7	17.2	15.7	Chrysotile 2.4	NA
Location: Courtyard C - Window - Window Sill Caulk (Black)								
08	CLK-004B	4	0.307	67.9	14.9	17.2	NA/PS	NA
Location: Courtyard C - Window - Window Sill Caulk (Black)								
09	CLK-005A	5	0.314	85.7	0.6	13.7	NAD	NAD
Location: Corridor B - Window - Window Caulk (Black)								
10	CLK-005B	5	0.185	83.9	4.7	11.4	NAD	NAD
Location: Corridor B - Window - Window Caulk (Black)								
11	ACT-006A	6	0.177	19.8	40.3	39.9	NAD	NAD
Location: Classroom 104 & 107 - 2' x 2' Pinhole Ceiling Tile (White)								
12	ACT-006B	6	0.191	22.9	41.4	35.7	NAD	NAD
Location: Classroom 104 & 107 - 2' x 2' Pinhole Ceiling Tile (White)								
13	CB-007A	7	0.134	55.0	3.7	41.3	NAD	NAD
Location: Classroom 104 & 106 - 4" Cove Base (Gray)								
14	CB-007B	7	0.188	55.3	3.5	41.2	NAD	NAD
Location: Classroom 104 & 106 - 4" Cove Base (Gray)								
15	CBM-008A	8	0.179	39.0	26.8	34.2	NAD	NAD
Location: Classroom 104 & 106 - Cove Base Mastic (Tan/Brown)								
16	CBM-008B	8	0.388	37.4	25.8	36.8	NAD	NAD
Location: Classroom 104 & 106 - Cove Base Mastic (Tan/Brown)								

See Reporting notes on last page

Client Name: Asbestos & Environmental Consulting Corp.

Table I
Summary of Bulk Asbestos Analysis Results

20-146; Clark Patterson Lee Architects; Pine Bush High School, 156 NY-302, Pine Bush, New York, NY, 12566

AmeriSci Sample #	Client Sample#	HG Area	Sample Weight (gram)	Heat Sensitive Organic %	Acid Soluble Inorganic %	Insoluble Non-Asbestos Inorganic %	** Asbestos % by PLM/DS	** Asbestos % by TEM
17	FT-009A	9	0.176	14.4	80.8	4.8	NAD	NAD
Location: Classroom 104 & 107 - 12" Floor Tile "Mottled" (Blue)								
18	FT-009B	9	0.173	15.9	80.4	3.7	NAD	NAD
Location: Classroom 104 & 107 - 12" Floor Tile "Mottled" (Blue)								
19	FTM-010A	10	0.088	40.9	33.5	25.6	NAD	NAD
Location: Classroom 104 & 107 - Floor Tile Mastic (Yellow)								
20	FTM-010B	10	0.092	43.0	29.4	27.6	NAD	NAD
Location: Classroom 104 & 107 - Floor Tile Mastic (Yellow)								
21	FLFR-011A	11	----	----	----	----	NAD	NA
Location: Classroom 104 & 107 - Floor Filler Compound (White)								
22	FLFR-011B	11	----	----	----	----	NAD	NA
Location: Classroom 104 & 107 - Floor Filler Compound (White)								
23	CLK-012A	12	0.169	27.0	54.3	18.6	NAD	NAD
Location: Classroom 104 & 106 - Interior Door Caulk (White)								
24	CLK-012B	12	0.221	27.5	59.4	13.1	NAD	NAD
Location: Classroom 104 & 106 - Interior Door Caulk (White)								
25	GLZ-013A	13	0.051	74.4	21.9	3.7	NAD	NAD
Location: Classroom 104 - Door Vision Glazing (White)								
26	GLZ-013B	13	0.091	22.0	61.7	16.2	NAD	NAD
Location: Classroom 104 - Door Vision Glazing (White)								
27	FD-014A	14	----	----	----	----	NAD	NA
Location: Classroom 104 & 107 - Fire Door Insulation (Gray)								
28	FD-014B	14	----	----	----	----	NAD	NA
Location: Classroom 104 & 107 - Fire Door Insulation (Gray)								
29	CKM-015A	15	0.253	49.2	41.8	8.9	NAD	NAD
Location: Classroom 104 & 107 - Chalk Board Mastic (Tan)								
30	CKM-015B	15	0.201	53.1	39.3	7.7	NAD	NAD
Location: Classroom 104 & 107 - Chalk Board Mastic (Tan)								
31	ACT-016A	16	0.119	26.1	46.0	27.9	NAD	NAD
Location: Classroom 105 & 106 - 2' x 2' Rough Textured Ceiling Tile (White)								
32	ACT-016B	16	0.136	18.0	28.9	53.1	NAD	NAD
Location: Classroom 105 & 106 - 2' x 2' Rough Textured Ceiling Tile (White)								

See Reporting notes on last page

Client Name: Asbestos & Environmental Consulting Corp.

Table I
Summary of Bulk Asbestos Analysis Results

20-146; Clark Patterson Lee Architects; Pine Bush High School, 156 NY-302, Pine Bush, New York, NY, 12566

AmeriSci Sample #	Client Sample#	HG Area	Sample Weight (gram)	Heat Sensitive Organic %	Acid Soluble Inorganic %	Insoluble Non-Asbestos Inorganic %	** Asbestos % by PLM/DS	** Asbestos % by TEM
33	CLK-017A	17	0.096	30.5	51.0	18.5	NAD	NAD
Location: Gym Doors - Interior Door Caulk (White)								
34	CLK-017B	17	0.115	30.0	52.1	17.9	NAD	NAD
Location: Gym Doors - Interior Door Caulk (White)								
35	PLS-018A	18	----	----	----	----	NAD	NA
Location: Corridor C110 - Plaster Skim Coat (White)								
36	PLS-018B	18	----	----	----	----	NAD	NA
Location: Corridor C110 - Plaster Skim Coat (White)								
37	PLS-018C	18	----	----	----	----	NAD	NA
Location: Corridor C110 - Plaster Skim Coat (White)								
38	PLB-019A	19	----	----	----	----	NAD	NA
Location: Corridor C110 - Plaster Base Coat (Gray)								
39	PLB-019B	19	----	----	----	----	NAD	NA
Location: Corridor C110 - Plaster Base Coat (Gray)								
40	PLB-019C	19	----	----	----	----	NAD	NA
Location: Corridor C110 - Plaster Base Coat (Gray)								
41	SR-020A	20	----	----	----	----	NAD	NA
Location: Corridor C110 - Sheetrock (Gray)								
42	SR-020B	20	----	----	----	----	NAD	NA
Location: Corridor C110 - Sheetrock (Gray)								

Analyzed by: A Barengolts-Hitachi#542/Noran  Date Analyzed 8/26/2020

**Quantitative Analysis (Semi/Full); Bulk Asbestos Analysis - PLM by Appd E to Subpt E, 40 CFR 763 or NYSDOH ELAP 198.1 for New York friable samples or NYSDOH ELAP 198.6 for New York NOB samples; TEM (Semi/Full) by EPA 600/R-93/116 or NYSDOH ELAP 198.4 for New York samples; NAD = no asbestos detected during a quantitative analysis; NA = not analyzed; Trace = <1%; (SOF-V) = Sprayed On Fireproofing containing Vermiculite; (SM-V) = Surfacing Material containing Vermiculite; Quantitation for beginning weights of <0.1 grams should be considered as qualitative only; Qualitative Analysis: Asbestos analysis results of "Present" or "NVA = No Visible Asbestos" represents results for Qualitative PLM or TEM Analysis only (no accreditation coverage available from any regulatory agency for qualitative analyses); NVLAP (PLM) 200546-0, NYSDOH ELAP Lab 11480, AIHA-LAP, LLC (PLM) Lab ID 102843.

Warning Note: PLM limitation, only TEM will resolve fibers <0.25 micrometers in diameter. TEM bulk analysis is representative of the fine grained matrix material and may not be representative of non-uniformly dispersed debris for which PLM evaluation is recommended (i.e. soils and other heterogenous materials).

Reviewed By: 



#220083326

Asbestos Bulk Sample Chain of Custody

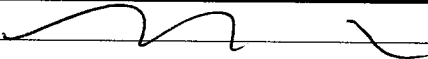

Project No. 20-146
Client Clark Patterson Lee Architects
Address **Pine Bush High School**
156 NY-302, Pine Bush, New York 12566

AECC Contact: Bryan Bowers
Office Phone: 315-432-9400
Office Fax: 315-432-9405
E-mail: labdata@aeccgroup.com

Sample ID	Material Description	Sample Location
CLK-001A,B	Window Caulk (Red)	Main Entrance – Window
GLZ-002A,B	Window Glazing Compound (Black)	Main Entrance – Window
GLZ-003A,B	Window Glazing Compound (Black)	Main Entrance – Small Window
CLK-004A,B	Window Sill Caulk (Black)	Courtyard C – Window
CLK-005A,B	Window Caulk (Black)	Corridor B – Window
ACT-006A,B	2'X2' Pinhole Ceiling Tile (White)	Classroom 104 & 107
CB-007A,B	4" Cove Base (Gray)	Classroom 104 & 106
CBM-008A,B	Cove Base Mastic (Tan/Brown)	Classroom 104 & 106
FT-009A,B	12" Floor Tile "Mottled" (Blue)	Classroom 104 & 107
FTM-010A,B	Floor Tile Mastic (Yellow)	Classroom 104 & 107
FLFR-011A,B	Floor Filler Compound (White)	Classroom 104 & 107
CLK-012A,B	Interior Door Caulk (White)	Classroom 104 & 106
GLZ-013A,B	Door Vision Glazing (White)	Classroom 104
FD-014A,B	Fire Door Insulation (Gray)	Classroom 104 & 107
CKM-015A,B	Chalk Board Mastic (Tan)	Classroom 104 & 107
ACT-016A,B	2'x2' Rough Textured Ceiling Tile (White)	Classroom 105 & 106
CLK-017A,B	Interior Door Caulk (White)	Gym Doors
PLS-018A,B,C	Plaster Skim Coat (White)	Corridor C110
PLB-019A,B,C	Plaster Base Coat (Gray)	Corridor C110
SR-020A,B	Sheetrock (Gray)	Corridor C110

Analyzing Sequence: 1 - Separate layers/mastics for individual analysis, if applicable.
2 - Determine method of analysis for PLM (198.1 or 198.6).
3 - If the PLM NOB result is equal to or greater than 1% asbestos, testing of material is complete.
If the PLM NOB result is less than 1% asbestos, please analyze utilizing TEM.
4 - If submitted in series (A, B, C), please stop at first positive.
5 - Report results as % Asbestos via e-mail.

Sample Turnaround Time: 14h 5 DAY Verbal To: Phone:

Sampled By: 	Date: <u>8/20/20</u>
Shipped By: 	Date: <u>8/22/2020</u> 113C
Received By Lab:	Date:
Results e-mailed By:	Date:

**AmeriSci New York**117 EAST 30TH ST.
NEW YORK, NY 10016

TEL: (212) 679-8600 • FAX: (212) 679-3114

PLM Bulk Asbestos Report

Asbestos & Environmental Consulting C
Attn: Bryan Bowers
6308 Fly Road

East Syracuse, NY 13057

Date Received 08/22/20 **AmeriSci Job #** 220083327
Date Examined 08/24/20 **P.O. #**
ELAP # 11480 **Page** 1 **of** 8
RE: 20-146; Clark Patterson Lee Architects; Pine Bush High
School, 156 NY-302, Pine Bush, New York, NY, 12566

Client No. / HGA	Lab No.	Asbestos Present	Total % Asbestos
ACT-021A 21	220083327-01 Location: Corridor C110 - 2' x 4' Square Pattern Ceiling Tile (White)	No	NAD ¹ (by NYS ELAP 198.6) by Valeriu Voicu on 08/24/20
Analyst Description: White/Beige, Homogeneous, Non-Fibrous, Bulk Material Asbestos Types: Other Material: Non-fibrous 35.3 %			
ACT-021B 21	220083327-02 Location: Corridor C110 - 2' x 4' Square Pattern Ceiling Tile (White)	No	NAD (by NYS ELAP 198.6) by Valeriu Voicu on 08/24/20
Analyst Description: White/Beige, Homogeneous, Non-Fibrous, Bulk Material Asbestos Types: Other Material: Non-fibrous 34.7 %			
CKM-022A 22	220083327-03 Location: Classroom 107 - Chalk Board Mastic (Brown)	No	NAD (by NYS ELAP 198.6) by Valeriu Voicu on 08/24/20
Analyst Description: Brown, Homogeneous, Non-Fibrous, Bulk Material Asbestos Types: Other Material: Non-fibrous 44.7 %			
CKM-022B 22	220083327-04 Location: Classroom 107 - Chalk Board Mastic (Brown)	No	NAD (by NYS ELAP 198.6) by Valeriu Voicu on 08/24/20
Analyst Description: Brown, Homogeneous, Non-Fibrous, Bulk Material Asbestos Types: Other Material: Non-fibrous 62.1 %			
CB-023A 23	220083327-05 Location: Corridor C110 - 4" Cove Base (Blue)	No	NAD (by NYS ELAP 198.6) by Valeriu Voicu on 08/24/20
Analyst Description: Blue, Homogeneous, Non-Fibrous, Bulk Material Asbestos Types: Other Material: Non-fibrous 4.7 %			

Client Name: Asbestos & Environmental Consulting Corp.

PLM Bulk Asbestos Report20-146; Clark Patterson Lee Architects; Pine Bush High School,
156 NY-302, Pine Bush, New York, NY, 12566

Client No. / HGA	Lab No.	Asbestos Present	Total % Asbestos
CB-023B 23	220083327-06 Location: Corridor C110 - 4" Cove Base (Blue)	No	NAD (by NYS ELAP 198.6) by Valeriu Voicu on 08/24/20
Analyst Description: Blue, Homogeneous, Non-Fibrous, Bulk Material Asbestos Types: Other Material: Non-fibrous 1.7 %			
TRZO-024A 24	220083327-07 Location: Corridor C110 - Terrazzo Flooring (Blue/Gray)	No	NAD (by NYS ELAP 198.1) by Valeriu Voicu on 08/24/20
Analyst Description: Grey, Homogeneous, Non-Fibrous, Bulk Material Asbestos Types: Other Material: Cellulose Trace, Non-fibrous 100 %			
TRZO-024B 24	220083327-08 Location: Corridor C110 - Terrazzo Flooring (Blue/Gray)	No	NAD (by NYS ELAP 198.1) by Valeriu Voicu on 08/24/20
Analyst Description: Grey, Homogeneous, Non-Fibrous, Bulk Material Asbestos Types: Other Material: Non-fibrous 100 %			
TMAS-025A 25	220083327-09 Location: Corridor C110 - Terrazzo Mastic (Yellow)	No	NAD (by NYS ELAP 198.6) by Valeriu Voicu on 08/24/20
Analyst Description: Yellow/Grey, Heterogeneous, Non-Fibrous, Bulk Material Asbestos Types: Other Material: Non-fibrous 27.7 %			
TMAS-025B 25	220083327-10 Location: Corridor C110 - Terrazzo Mastic (Yellow)	No	NAD (by NYS ELAP 198.6) by Valeriu Voicu on 08/24/20
Analyst Description: Yellow, Homogeneous, Non-Fibrous, Bulk Material Asbestos Types: Other Material: Non-fibrous 28.7 %			
TRZO-026A 26	220083327-11 Location: Corridor C110 - Terrazzo Flooring (Red)	No	NAD (by NYS ELAP 198.1) by Valeriu Voicu on 08/24/20
Analyst Description: Grey/Red, Homogeneous, Non-Fibrous, Cementitious, Bulk Material Asbestos Types: Other Material: Cellulose Trace, Non-fibrous 100 %			

Client Name: Asbestos & Environmental Consulting Corp.

PLM Bulk Asbestos Report20-146; Clark Patterson Lee Architects; Pine Bush High School,
156 NY-302, Pine Bush, New York, NY, 12566

Client No. / HGA	Lab No.	Asbestos Present	Total % Asbestos
TRZO-026B 26	220083327-12 Location: Corridor C110 - Terrazzo Flooring (Red)	No	NAD (by NYS ELAP 198.1) by Valeriu Voicu on 08/24/20
Analyst Description: Grey/Red, Homogeneous, Non-Fibrous, Cementitious, Bulk Material Asbestos Types: Other Material: Cellulose Trace, Non-fibrous 100 %			
FIT-027A 27	220083327-13 Location: Corridor C110 - Storm Sewer Fitting (Gray)	No	NAD (by NYS ELAP 198.1) by Valeriu Voicu on 08/24/20
Analyst Description: Grey, Homogeneous, Fibrous, Bulk Material Asbestos Types: Other Material: Cellulose Trace, Fibrous glass 5 %, Non-fibrous 95 %			
FIT-027B 27	220083327-14 Location: Corridor C110 - Storm Sewer Fitting (Gray)	No	NAD (by NYS ELAP 198.1) by Valeriu Voicu on 08/24/20
Analyst Description: Grey, Homogeneous, Fibrous, Bulk Material Asbestos Types: Other Material: Cellulose Trace, Fibrous glass 10 %, Non-fibrous 90 %			
FIT-027C 27	220083327-15 Location: Corridor C110 - Storm Sewer Fitting (Gray)	No	NAD (by NYS ELAP 198.1) by Valeriu Voicu on 08/24/20
Analyst Description: Grey, Homogeneous, Fibrous, Bulk Material Asbestos Types: Other Material: Cellulose Trace, Fibrous glass 5 %, Non-fibrous 95 %			
TECT-028A 28	220083327-16 Location: Boy's Locker Room 110 - Tectum Ceiling Tile (White)	No	NAD (by NYS ELAP 198.6) by Valeriu Voicu on 08/24/20
Analyst Description: Grey/Tan, Homogeneous, Non-Fibrous, Bulk Material Asbestos Types: Other Material: Non-fibrous 5.9 %			
TECT-028B 28	220083327-17 Location: Boy's Locker Room 110 - Tectum Ceiling Tile (White)	No	NAD (by NYS ELAP 198.6) by Valeriu Voicu on 08/24/20
Analyst Description: Grey/Tan, Homogeneous, Non-Fibrous, Bulk Material Asbestos Types: Other Material: Non-fibrous 7.4 %			

Client Name: Asbestos & Environmental Consulting Corp.

PLM Bulk Asbestos Report20-146; Clark Patterson Lee Architects; Pine Bush High School,
156 NY-302, Pine Bush, New York, NY, 12566

Client No. / HGA	Lab No.	Asbestos Present	Total % Asbestos
SEAL-029A 29	220083327-18 Location: Boy's Locker Room 110 - Roof Drain Sealant (White)	No	NAD (by NYS ELAP 198.6) by Valeriu Voicu on 08/24/20
Analyst Description: White/Silver, Heterogeneous, Fibrous, Bulk Material Asbestos Types: Other Material: Fibrous glass 4 %, Non-fibrous 8.8 %			
SEAL-029B 29	220083327-19 Location: Boy's Locker Room 110 - Roof Drain Sealant (White)	No	NAD (by NYS ELAP 198.6) by Valeriu Voicu on 08/24/20
Analyst Description: White/Silver, Heterogeneous, Fibrous, Bulk Material Asbestos Types: Other Material: Fibrous glass 15 %, Non-fibrous 14.9 %			
CTG-030A 30	220083327-20 Location: Boy's Office Toilet Room 141A & Shower Area - Ceramic Floor Tile Grout (Gray)	No	NAD (by NYS ELAP 198.1) by Valeriu Voicu on 08/24/20
Analyst Description: Grey, Homogeneous, Non-Fibrous, Cementitious, Bulk Material Asbestos Types: Other Material: Cellulose Trace, Non-fibrous 100 %			
CTG-030B 30	220083327-21 Location: Boy's Office Toilet Room 141A & Shower Area - Ceramic Floor Tile Grout (Gray)	No	NAD (by NYS ELAP 198.1) by Valeriu Voicu on 08/24/20
Analyst Description: Grey, Homogeneous, Non-Fibrous, Cementitious, Bulk Material Asbestos Types: Other Material: Cellulose Trace, Non-fibrous 100 %			
CTT-031A 31	220083327-22 Location: Boy's Office Toilet Room 141A & Shower Area - Ceramic Floor Tile Thinset (Gray)	No	NAD (by NYS ELAP 198.1) by Valeriu Voicu on 08/24/20
Analyst Description: Grey, Homogeneous, Non-Fibrous, Cementitious, Bulk Material Asbestos Types: Other Material: Cellulose Trace, Non-fibrous 100 %			
CTT-031B 31	220083327-23 Location: Boy's Office Toilet Room 141A & Shower Area - Ceramic Floor Tile Thinset (Gray)	No	NAD (by NYS ELAP 198.1) by Valeriu Voicu on 08/24/20
Analyst Description: Grey, Homogeneous, Non-Fibrous, Cementitious, Bulk Material Asbestos Types: Other Material: Cellulose Trace, Non-fibrous 100 %			

Client Name: Asbestos & Environmental Consulting Corp.

PLM Bulk Asbestos Report20-146; Clark Patterson Lee Architects; Pine Bush High School,
156 NY-302, Pine Bush, New York, NY, 12566

Client No. / HGA	Lab No.	Asbestos Present	Total % Asbestos
PMAS-032A 32	220083327-24 Location: Boy's Office 141 - Pipe Mastic (Black)	No	NAD (by NYS ELAP 198.6) by Valeriu Voicu on 08/24/20
Analyst Description: Black, Homogeneous, Non-Fibrous, Bulk Material Asbestos Types: Other Material: Non-fibrous 62.6 %			
PMAS-032B 32	220083327-25 Location: Boy's Office 141 - Pipe Mastic (Black)	No	NAD (by NYS ELAP 198.6) by Valeriu Voicu on 08/24/20
Analyst Description: Black, Homogeneous, Non-Fibrous, Bulk Material Asbestos Types: Other Material: Non-fibrous 48.6 %			
CTG-033A 33	220083327-26 Location: Boy's Office Toilet Room 141A & Shower Area - Ceramic Wall Tile Grout (White)	No	NAD (by NYS ELAP 198.1) by Valeriu Voicu on 08/24/20
Analyst Description: White, Homogeneous, Non-Fibrous, Bulk Material Asbestos Types: Other Material: Cellulose Trace, Non-fibrous 100 %			
CTG-033B 33	220083327-27 Location: Boy's Office Toilet Room 141A & Shower Area - Ceramic Wall Tile Grout (White)	No	NAD (by NYS ELAP 198.1) by Valeriu Voicu on 08/24/20
Analyst Description: White, Homogeneous, Non-Fibrous, Bulk Material Asbestos Types: Other Material: Cellulose Trace, Non-fibrous 100 %			
CTT-034A 34	220083327-28 Location: Boy's Office Toilet Room 141A & Shower Area - Ceramic Wall Tile Thinset (White)	No	NAD (by NYS ELAP 198.1) by Valeriu Voicu on 08/24/20
Analyst Description: Light Grey, Homogeneous, Non-Fibrous, Cementitious, Bulk Material Asbestos Types: Other Material: Cellulose Trace, Non-fibrous 100 %			
CTT-034B 34	220083327-29 Location: Boy's Office Toilet Room 141A & Shower Area - Ceramic Wall Tile Thinset (White)	No	NAD (by NYS ELAP 198.1) by Valeriu Voicu on 08/24/20
Analyst Description: Light Grey, Homogeneous, Non-Fibrous, Cementitious, Bulk Material Asbestos Types: Other Material: Cellulose Trace, Non-fibrous 100 %			

Client Name: Asbestos & Environmental Consulting Corp.

PLM Bulk Asbestos Report20-146; Clark Patterson Lee Architects; Pine Bush High School,
156 NY-302, Pine Bush, New York, NY, 12566

Client No. / HGA	Lab No.	Asbestos Present	Total % Asbestos
ACT-035A 35	220083327-30 Location: Boy's Office Toilet Room 141A - 2' x 2' Fissured/Pinhole Ceiling Tile (White)	No	NAD (by NYS ELAP 198.6) by Valeriu Voicu on 08/24/20
Analyst Description: White/Grey, Homogeneous, Non-Fibrous, Bulk Material Asbestos Types: Other Material: Non-fibrous 45.1 %			
ACT-035B 35	220083327-31 Location: Boy's Office Toilet Room 141A - 2' x 2' Fissured/Pinhole Ceiling Tile (White)	No	NAD (by NYS ELAP 198.6) by Valeriu Voicu on 08/24/20
Analyst Description: White/Grey, Homogeneous, Non-Fibrous, Bulk Material Asbestos Types: Other Material: Non-fibrous 52 %			
TRZO-036A 36	220083327-32 Location: Boy's Locker Room 110 - Under Floor Tile - Terrazzo Flooring (Green)	No	NAD (by NYS ELAP 198.1) by Valeriu Voicu on 08/24/20
Analyst Description: Grey/Green, Homogeneous, Non-Fibrous, Cementitious, Bulk Material Asbestos Types: Other Material: Cellulose Trace, Non-fibrous 100 %			
TRZO-036B 36	220083327-33 Location: Boy's Locker Room 110 - Under Floor Tile - Terrazzo Flooring (Green)	No	NAD (by NYS ELAP 198.1) by Valeriu Voicu on 08/24/20
Analyst Description: Grey/Green, Homogeneous, Non-Fibrous, Bulk Material Asbestos Types: Other Material: Cellulose Trace, Non-fibrous 100 %			
CB-037A 37	220083327-34 Location: Girl's Locker Room 002 - 6" Cove Base (Gray)	No	NAD (by NYS ELAP 198.6) by Valeriu Voicu on 08/24/20
Analyst Description: Grey, Homogeneous, Non-Fibrous, Bulk Material Asbestos Types: Other Material: Non-fibrous 39.8 %			
CB-037B 37	220083327-35 Location: Girl's Locker Room 002 - 6" Cove Base (Gray)	No	NAD (by NYS ELAP 198.6) by Valeriu Voicu on 08/24/20
Analyst Description: Grey, Homogeneous, Non-Fibrous, Bulk Material Asbestos Types: Other Material: Non-fibrous 40.1 %			

Client Name: Asbestos & Environmental Consulting Corp.

PLM Bulk Asbestos Report20-146; Clark Patterson Lee Architects; Pine Bush High School,
156 NY-302, Pine Bush, New York, NY, 12566

Client No. / HGA	Lab No.	Asbestos Present	Total % Asbestos
CBM-038A 38	220083327-36 Location: Girl's Locker Room 002 - Cove Base Mastic (Brown)	No	NAD (by NYS ELAP 198.6) by Valeriu Voicu on 08/24/20
Analyst Description: Dark Brown, Homogeneous, Non-Fibrous, Bulk Material Asbestos Types: Other Material: Non-fibrous 39.9 %			
CBM-038B 38	220083327-37 Location: Girl's Locker Room 002 - Cove Base Mastic (Brown)	No	NAD (by NYS ELAP 198.6) by Valeriu Voicu on 08/24/20
Analyst Description: Dark Brown, Homogeneous, Non-Fibrous, Bulk Material Asbestos Types: Other Material: Non-fibrous 38.5 %			
FT-039A 39	220083327-38 Location: Girl's Locker Room 002 - 12" Floor Tile (Gray)	No	NAD (by NYS ELAP 198.6) by Valeriu Voicu on 08/24/20
Analyst Description: Grey/Beige, Homogeneous, Non-Fibrous, Bulk Material Asbestos Types: Other Material: Non-fibrous 0.9 %			
FT-039B 39	220083327-39 Location: Girl's Locker Room 002 - 12" Floor Tile (Gray)	No	NAD (by NYS ELAP 198.6) by Valeriu Voicu on 08/24/20
Analyst Description: Grey/Beige, Homogeneous, Non-Fibrous, Bulk Material Asbestos Types: Other Material: Non-fibrous 0.9 %			
FTM-040A 40	220083327-40 Location: Girl's Locker Room 002 - Floor Tile Mastic (Yellow)	No	NAD (by NYS ELAP 198.6) by Valeriu Voicu on 08/24/20
Analyst Description: Tan, Homogeneous, Non-Fibrous, Bulk Material Asbestos Types: Other Material: Non-fibrous 29.4 %			
FTM-040B 40	220083327-41 Location: Girl's Locker Room 002 - Floor Tile Mastic (Yellow)	No	NAD (by NYS ELAP 198.6) by Valeriu Voicu on 08/24/20
Analyst Description: Tan, Homogeneous, Non-Fibrous, Bulk Material Asbestos Types: Other Material: Non-fibrous 35.6 %			

Client Name: Asbestos & Environmental Consulting Corp.

PLM Bulk Asbestos Report

20-146; Clark Patterson Lee Architects; Pine Bush High School,
156 NY-302, Pine Bush, New York, NY, 12566

Reporting Notes:

(1) This PLM job was analyzed using Olympus BH-2 Pol Scope S/N 229915

Analyzed by: Valeriu Voicu 

*NAD/NSD =no asbestos detected; NA =not analyzed; NA/PS=not analyzed/positive stop, (SOF-V) = Sprayed On Fireproofing containing Vermiculite; (SM-V) = Surfacing Material containing Vermiculite; PLM Bulk Asbestos Analysis by Appd E to Subpt E, 40 CFR 763 (NVLAP 200546-0), ELAP PLM Method 198.1 for NY friable samples, which includes the identification and quantitation of vermiculite or ELAP 198.6 for NOB samples or EPA 400 pt ct by EPA 600-M4-82-020 (NY ELAP Lab 11480); Note:PLM is not consistently reliable in detecting asbestos in floor coverings and similar non-friable organically bound materials. NAD or Trace results by PLM are inconclusive, TEM is currently the only method that can be used to determine if this material can be considered or treated as non asbestos-containing in NY State (also see EPA Advisory for floor tile, FR 59,146,38970,8/1/94) National Institute of Standards and Technology Accreditation requirements mandate that this report must not be reproduced except in full without the approval of the lab.This PLM report relates ONLY to the items tested. AIHA-LAP, LLC Lab ID 102843, RI Cert AAL-094, CT Cert PH-0186, Mass Cert AA000054.

Reviewed By: 

END OF REPORT

Client Name: Asbestos & Environmental Consulting Corp.

Table I
Summary of Bulk Asbestos Analysis Results

20-146; Clark Patterson Lee Architects; Pine Bush High School, 156 NY-302, Pine Bush, New York, NY, 12566

AmeriSci Sample #	Client Sample#	HG Area	Sample Weight (gram)	Heat Sensitive Organic %	Acid Soluble Inorganic %	Insoluble Non-Asbestos Inorganic %	** Asbestos % by PLM/DS	** Asbestos % by TEM
01	ACT-021A	21	0.069	28.5	36.2	35.3	NAD	NAD
Location: Corridor C110 - 2' x 4' Square Pattern Ceiling Tile (White)								
02	ACT-021B	21	0.134	28.4	36.9	34.7	NAD	NAD
Location: Corridor C110 - 2' x 4' Square Pattern Ceiling Tile (White)								
03	CKM-022A	22	0.187	35.7	19.7	44.7	NAD	NAD
Location: Classroom 107 - Chalk Board Mastic (Brown)								
04	CKM-022B	22	0.068	19.8	18.0	62.1	NAD	NAD
Location: Classroom 107 - Chalk Board Mastic (Brown)								
05	CB-023A	23	0.206	46.7	48.6	4.7	NAD	NAD
Location: Corridor C110 - 4" Cove Base (Blue)								
06	CB-023B	23	0.206	51.9	46.3	1.7	NAD	NAD
Location: Corridor C110 - 4" Cove Base (Blue)								
07	TRZO-024A	24	----	----	----	----	NAD	NA
Location: Corridor C110 - Terrazzo Flooring (Blue/Gray)								
08	TRZO-024B	24	----	----	----	----	NAD	NA
Location: Corridor C110 - Terrazzo Flooring (Blue/Gray)								
09	TMAS-025A	25	0.289	24.0	48.2	27.7	NAD	NAD
Location: Corridor C110 - Terrazzo Mastic (Yellow)								
10	TMAS-025B	25	0.125	54.9	16.4	28.7	NAD	NAD
Location: Corridor C110 - Terrazzo Mastic (Yellow)								
11	TRZO-026A	26	----	----	----	----	NAD	NA
Location: Corridor C110 - Terrazzo Flooring (Red)								
12	TRZO-026B	26	----	----	----	----	NAD	NA
Location: Corridor C110 - Terrazzo Flooring (Red)								
13	FIT-027A	27	----	----	----	----	NAD	NA
Location: Corridor C110 - Storm Sewer Fitting (Gray)								
14	FIT-027B	27	----	----	----	----	NAD	NA
Location: Corridor C110 - Storm Sewer Fitting (Gray)								
15	FIT-027C	27	----	----	----	----	NAD	NA
Location: Corridor C110 - Storm Sewer Fitting (Gray)								
16	TECT-028A	28	0.307	26.5	67.6	5.9	NAD	NAD
Location: Boy's Locker Room 110 - Tectum Ceiling Tile (White)								

See Reporting notes on last page

Client Name: Asbestos & Environmental Consulting Corp.

Table I
Summary of Bulk Asbestos Analysis Results

20-146; Clark Patterson Lee Architects; Pine Bush High School, 156 NY-302, Pine Bush, New York, NY, 12566

AmeriSci Sample #	Client Sample#	HG Area	Sample Weight (gram)	Heat Sensitive Organic %	Acid Soluble Inorganic %	Insoluble Non-Asbestos Inorganic %	** Asbestos % by PLM/DS	** Asbestos % by TEM
17	TECT-028B	28	0.348	18.8	73.8	7.4	NAD	NAD
Location: Boy's Locker Room 110 - Tectum Ceiling Tile (White)								
18	SEAL-029A	29	0.140	51.4	35.8	12.8	NAD	NAD
Location: Boy's Locker Room 110 - Roof Drain Sealant (White)								
19	SEAL-029B	29	0.217	38.0	32.2	29.9	NAD	NAD
Location: Boy's Locker Room 110 - Roof Drain Sealant (White)								
20	CTG-030A	30	---	---	---	---	NAD	NA
Location: Boy's Office Toilet Room 141A & Shower Area - Ceramic Floor Tile Grout (Gray)								
21	CTG-030B	30	---	---	---	---	NAD	NA
Location: Boy's Office Toilet Room 141A & Shower Area - Ceramic Floor Tile Grout (Gray)								
22	CTT-031A	31	---	---	---	---	NAD	NA
Location: Boy's Office Toilet Room 141A & Shower Area - Ceramic Floor Tile Thinset (Gray)								
23	CTT-031B	31	---	---	---	---	NAD	NA
Location: Boy's Office Toilet Room 141A & Shower Area - Ceramic Floor Tile Thinset (Gray)								
24	PMAS-032A	32	0.228	14.8	22.6	62.6	NAD	NAD
Location: Boy's Office 141 - Pipe Mastic (Black)								
25	PMAS-032B	32	0.078	43.0	8.4	48.6	NAD	NAD
Location: Boy's Office 141 - Pipe Mastic (Black)								
26	CTG-033A	33	---	---	---	---	NAD	NA
Location: Boy's Office Toilet Room 141A & Shower Area - Ceramic Wall Tile Grout (White)								
27	CTG-033B	33	---	---	---	---	NAD	NA
Location: Boy's Office Toilet Room 141A & Shower Area - Ceramic Wall Tile Grout (White)								
28	CTT-034A	34	---	---	---	---	NAD	NA
Location: Boy's Office Toilet Room 141A & Shower Area - Ceramic Wall Tile Thinset (White)								
29	CTT-034B	34	---	---	---	---	NAD	NA
Location: Boy's Office Toilet Room 141A & Shower Area - Ceramic Wall Tile Thinset (White)								
30	ACT-035A	35	0.119	22.4	32.5	45.1	NAD	NAD
Location: Boy's Office Toilet Room 141A - 2' x 2' Fissured/Pinhole Ceiling Tile (White)								
31	ACT-035B	35	0.120	19.6	28.5	52.0	NAD	NAD
Location: Boy's Office Toilet Room 141A - 2' x 2' Fissured/Pinhole Ceiling Tile (White)								
32	TRZO-036A	36	---	---	---	---	NAD	NA
Location: Boy's Locker Room 110 - Under Floor Tile - Terrazzo Flooring (Green)								

See Reporting notes on last page

Client Name: Asbestos & Environmental Consulting Corp.

Table I
Summary of Bulk Asbestos Analysis Results

20-146; Clark Patterson Lee Architects; Pine Bush High School, 156 NY-302, Pine Bush, New York, NY, 12566

AmeriSci Sample #	Client Sample#	HG Area	Sample Weight (gram)	Heat Sensitive Organic %	Acid Soluble Inorganic %	Insoluble Non-Asbestos Inorganic %	** Asbestos % by PLM/DS	** Asbestos % by TEM
33	TRZO-036B	36	----	----	----	----	NAD	NA
Location: Boy's Locker Room 110 - Under Floor Tile - Terrazzo Flooring (Green)								
34	CB-037A	37	0.191	54.7	5.4	39.8	NAD	NAD
Location: Girl's Locker Room 002 - 6" Cove Base (Gray)								
35	CB-037B	37	0.136	54.8	5.1	40.1	NAD	NAD
Location: Girl's Locker Room 002 - 6" Cove Base (Gray)								
36	CBM-038A	38	0.442	54.0	6.1	39.9	NAD	NAD
Location: Girl's Locker Room 002 - Cove Base Mastic (Brown)								
37	CBM-038B	38	0.153	54.0	7.5	38.5	NAD	NAD
Location: Girl's Locker Room 002 - Cove Base Mastic (Brown)								
38	FT-039A	39	0.201	14.2	84.8	0.9	NAD	NAD
Location: Girl's Locker Room 002 - 12" Floor Tile (Gray)								
39	FT-039B	39	0.189	13.4	85.7	0.9	NAD	NAD
Location: Girl's Locker Room 002 - 12" Floor Tile (Gray)								
40	FTM-040A	40	0.192	51.0	19.6	29.4	NAD	NAD
Location: Girl's Locker Room 002 - Floor Tile Mastic (Yellow)								
41	FTM-040B	40	0.183	58.2	6.2	35.6	NAD	NAD
Location: Girl's Locker Room 002 - Floor Tile Mastic (Yellow)								

Analyzed by: A Barengolts-Hitachi#542/Noran ; Date Analyzed 8/26/2020

**Quantitative Analysis (Semi/Full); Bulk Asbestos Analysis - PLM by Appendix E to Subpart E, 40 CFR 763 or NYSDOH ELAP 198.1 for New York friable samples or NYSDOH ELAP 198.6 for New York NOB samples; TEM (Semi/Full) by EPA 600/R-93/116 or NYSDOH ELAP 198.4; for New York samples); NAD = no asbestos detected during a quantitative analysis; NA = not analyzed; Trace = <1%; (SOF-V) = Sprayed On Fireproofing containing Vermiculite; (SM-V) = Surfacing Material containing Vermiculite; Quantitation for beginning weights of <0.1 grams should be considered as qualitative only; Qualitative Analysis: Asbestos analysis results of "Present" or "NVA = No Visible Asbestos" represents results for Qualitative PLM or TEM Analysis only (no accreditation coverage available from any regulatory agency for qualitative analyses); NVLAP (PLM) 200546-0, NYSDOH ELAP Lab 11480, AIHA-LAP, LLC (PLM) Lab ID 102843.

Warning Note: PLM limitation, only TEM will resolve fibers <0.25 micrometers in diameter. TEM bulk analysis is representative of the fine grained matrix material and may not be representative of non-uniformly dispersed debris for which PLM evaluation is recommended (i.e. soils and other heterogeneous materials).

Reviewed By: 



#220083327

Asbestos Bulk Sample Chain of Custody

Project No. 20-146
Client Clark Patterson Lee Architects
Address **Pine Bush High School**
156 NY-302, Pine Bush, New York 12566

AECC Contact: Bryan Bowers
Office Phone: 315-432-9400
Office Fax: 315-432-9405
E-mail: labdata@aeccgroup.com

Sample ID	Material Description	Sample Location
ACT-021A,B	2'x4' Square Pattern Ceiling Tile (White)	Corridor C110
CKM-022A,B	Chalk Board Mastic (Brown)	Classroom 107
CB-023A,B	4" Cove Base (Blue)	Corridor C110
TRZO-024A,B	Terrazzo Flooring (Blue/Gray)	Corridor C110
TMAS-025A,B	Terrazzo Mastic (Yellow)	Corridor C110
TRZO-026A,B	Terrazzo Flooring (Red)	Corridor C110
FIT-027A,B,C	Storm Sewer Fitting (Gray)	Corridor C110
TECT-028A,B	Tectum Ceiling Tile (White)	Boy's Locker Room 110
SEAL-029A,B	Roof Drain Sealant (White)	Boy's Locker Room 110
CTG-030A,B	Ceramic Floor Tile Grout (Gray)	Boy's Office Toilet Room 141A & Shower Area
CTT-031A,B	Ceramic Floor Tile Thinset (Gray)	Boy's Office Toilet Room 141A & Shower Area
PMAS-032A,B	Pipe Mastic (Black)	Boy's Office 141
CTG-033A,B	Ceramic Wall Tile Grout (White)	Boy's Office Toilet Room 141A & Shower Area
CTT-034A,B	Ceramic Wall Tile Thinset (Gray)	Boy's Office Toilet Room 141A & Shower Area
ACT-035A,B	2'x2' Fissured/Pinhole Ceiling Tile (White)	Boy's Office Toilet Room 141A
TRZO-036A,B	Terrazzo Flooring (Green)	Boy's Locker Room 110 – Under Floor Tile
CB-037A,B	6" Cove Base (Gray)	Girl's Locker Room 002
CBM-038A,B	Cove Base Mastic (Brown)	Girl's Locker Room 002
FT-039A,B	12" Floor Tile (Gray)	Girl's Locker Room 002
FTM-040A,B	Floor Tile Mastic (Yellow)	Girl's Locker Room 002

Analyzing Sequence: 1 - Separate layers/mastics for individual analysis, if applicable.
2 - Determine method of analysis for PLM (198.1 or 198.6).
3 - If the PLM NOB result is equal to or greater than 1% asbestos, testing of material is complete.
If the PLM NOB result is less than 1% asbestos, please analyze utilizing TEM.
4 - If submitted in series (A, B, C), please stop at first positive.
5 - Report results as % Asbestos via e-mail.

Sample Turnaround Time: 5 Day Verbal To: Phone:

Sampled By:	Date: 8/20/20
Shipped By:	Date:
Received By Lab:	Date: 8/22/2020 1130
Results e-mailed By:	Date:

**AmeriSci New York**

117 EAST 30TH ST.
NEW YORK, NY 10016
TEL: (212) 679-8600 • FAX: (212) 679-3114

PLM Bulk Asbestos Report

Asbestos & Environmental Consulting C
Attn: Bryan Bowers
6308 Fly Road
East Syracuse, NY 13057

Date Received 08/22/20 **AmeriSci Job #** 220083325
Date Examined 08/26/20 **P.O. #**
ELAP # 11480 **Page** 1 **of** 4
RE: 20-146; Clark Patterson Lee Architects; Pine Bush High
School, 156 NY-302, Pine Bush, New York, 12566

Client No. / HGA	Lab No.	Asbestos Present	Total % Asbestos
FIT-041A 41	220083325-01	No	NAD ¹
Location: Boy's Locker Room 001 & Girl's Locker Room 002 - 2" Pipe Fitting Insulation (Gray)			(by NYS ELAP 198.1) by Bo Sun on 08/26/20
Analyst Description: Grey, Homogeneous, Non-Fibrous, Bulk Material			
Asbestos Types:			
Other Material: Fibrous glass 15 %, Non-fibrous 85 %			
FIT-041B 41	220083325-02	No	NAD
Location: Boy's Locker Room 001 & Girl's Locker Room 002 - 2" Pipe Fitting Insulation (Gray)			(by NYS ELAP 198.1) by Bo Sun on 08/26/20
Analyst Description: Grey, Homogeneous, Non-Fibrous, Bulk Material			
Asbestos Types:			
Other Material: Fibrous glass 10 %, Non-fibrous 90 %			
FIT-041C 41	220083325-03	No	NAD
Location: Boy's Locker Room 001 & Girl's Locker Room 002 - 2" Pipe Fitting Insulation (Gray)			(by NYS ELAP 198.1) by Bo Sun on 08/26/20
Analyst Description: Grey, Homogeneous, Non-Fibrous, Bulk Material			
Asbestos Types:			
Other Material: Fibrous glass 15 %, Non-fibrous 85 %			
FIT-042A 42	220083325-04	No	NAD
Location: Boy's Locker Room 001 - 4" Pipe Fitting Insulation (Gray)			(by NYS ELAP 198.1) by Bo Sun on 08/26/20
Analyst Description: Grey, Homogeneous, Non-Fibrous, Bulk Material			
Asbestos Types:			
Other Material: Fibrous glass 10 %, Non-fibrous 90 %			

PLM Bulk Asbestos Report

20-146; Clark Patterson Lee Architects; Pine Bush High School, 156 NY-302, Pine Bush, New York, 12566

Client No. / HGA	Lab No.	Asbestos Present	Total % Asbestos
FIT-042B 42	220083325-05 Location: Boy's Locker Room 001 - 4" Pipe Fitting Insulation (Gray)	No	NAD (by NYS ELAP 198.1) by Bo Sun on 08/26/20
Analyst Description: Grey, Homogeneous, Non-Fibrous, Bulk Material Asbestos Types: Other Material: Fibrous glass 15 %, Non-fibrous 85 %			
FIT-042C 42	220083325-06 Location: Boy's Locker Room 001 - 4" Pipe Fitting Insulation (Gray)	No	NAD (by NYS ELAP 198.1) by Bo Sun on 08/26/20
Analyst Description: Grey, Homogeneous, Fibrous, Bulk Material Asbestos Types: Other Material: Fibrous glass 10 %, Non-fibrous 90 %			
CLK-043A 43	220083325-07 Location: Courtyard A - Window Caulk (White)	Yes	4.5 % (by NYS ELAP 198.6) by Bo Sun on 08/26/20
Analyst Description: White, Homogeneous, Non-Fibrous, Bulk Material Asbestos Types: Chrysotile 4.5 % Other Material: Non-fibrous 13.3 %			
CLK-043B 43	220083325-08 Location: Courtyard A - Window Caulk (White)		NA/PS
Analyst Description: Bulk Material Asbestos Types: Other Material:			
FLR-044A 44	220083325-09 Location: Boy's Locker Room 004 - 2' x 2' Sheet Flooring (Gray)	No	NAD (by NYS ELAP 198.6) by Bo Sun on 08/26/20
Analyst Description: Grey, Homogeneous, Non-Fibrous, Bulk Material Asbestos Types: Other Material: Non-fibrous 44.9 %			

PLM Bulk Asbestos Report

20-146; Clark Patterson Lee Architects; Pine Bush High
School, 156 NY-302, Pine Bush, New York, 12566

Client No. / HGA	Lab No.	Asbestos Present	Total % Asbestos
FLR-044B 44	220083325-10	No	NAD
Location: Boy's Locker Room 004 - 2' x 2' Sheet Flooring (Gray)			(by NYS ELAP 198.6) by Bo Sun on 08/26/20
Analyst Description: Grey, Homogeneous, Non-Fibrous, Bulk Material			
Asbestos Types:			
Other Material: Non-fibrous 41.5 %			
FMAS-045A 45	220083325-11	No	NAD
Location: Boy's Locker Room 004 - Flooring Mastic (Yellow)			(by NYS ELAP 198.6) by Bo Sun on 08/26/20
Analyst Description: Yellow, Homogeneous, Non-Fibrous, Bulk Material			
Asbestos Types:			
Other Material: Fibrous Talc 3 %, Non-fibrous 24.7 %			
FMAS-045B 45	220083325-12	No	NAD
Location: Boy's Locker Room 004 - Flooring Mastic (Yellow)			(by NYS ELAP 198.6) by Bo Sun on 08/26/20
Analyst Description: Yellow, Homogeneous, Non-Fibrous, Bulk Material			
Asbestos Types:			
Other Material: Fibrous Talc 2 %, Non-fibrous 19.4 %			
FIT-046A 46	220083325-13	No	NAD
Location: Boy's Locker Room 004 & Girl's Locker Room 006 - 2" Pipe Fitting Insulation (Gray)			(by NYS ELAP 198.1) by Bo Sun on 08/26/20
Analyst Description: Grey, Homogeneous, Non-Fibrous, Bulk Material			
Asbestos Types:			
Other Material: Fibrous glass 15 %, Non-fibrous 85 %			
FIT-046B 46	220083325-14	No	NAD
Location: Boy's Locker Room 004 & Girl's Locker Room 006 - 2" Pipe Fitting Insulation (Gray)			(by NYS ELAP 198.1) by Bo Sun on 08/26/20
Analyst Description: Grey, Homogeneous, Non-Fibrous, Bulk Material			
Asbestos Types:			
Other Material: Fibrous glass 15 %, Non-fibrous 85 %			

PLM Bulk Asbestos Report

20-146; Clark Patterson Lee Architects; Pine Bush High School, 156 NY-302, Pine Bush, New York, 12566

Client No. / HGA	Lab No.	Asbestos Present	Total % Asbestos
FIT-046C 46	220083325-15	No	NAD
Location: Boy's Locker Room 004 & Girl's Locker Room 006 - 2" Pipe Fitting Insulation (Gray)			(by NYS ELAP 198.1) by Bo Sun on 08/26/20
Analyst Description: Grey, Homogeneous, Non-Fibrous, Bulk Material			
Asbestos Types:			
Other Material: Fibrous glass 10 %, Non-fibrous 90 %			
PLB-047A 47	220083325-16	No	NAD
Location: Boy's Locker Room 004 & Girl's Locker Room 006 - Plaster Base Coat (Gray)			(by NYS ELAP 198.1) by Bo Sun on 08/26/20
Analyst Description: Grey, Homogeneous, Non-Fibrous, Cementitious, Bulk Material			
Asbestos Types:			
Other Material: Non-fibrous 100 %			
PLB-047B 47	220083325-17	No	NAD
Location: Boy's Locker Room 004 & Girl's Locker Room 006 - Plaster Base Coat (Gray)			(by NYS ELAP 198.1) by Bo Sun on 08/26/20
Analyst Description: Grey, Homogeneous, Non-Fibrous, Cementitious, Bulk Material			
Asbestos Types:			
Other Material: Non-fibrous 100 %			
PLB-047C 47	220083325-18	No	NAD
Location: Boy's Locker Room 004 & Girl's Locker Room 006 - Plaster Base Coat (Gray)			(by NYS ELAP 198.1) by Bo Sun on 08/26/20
Analyst Description: Grey, Homogeneous, Non-Fibrous, Cementitious, Bulk Material			
Asbestos Types:			
Other Material: Non-fibrous 100 %			

Reporting Notes:

(1) This PLM job was analyzed using Nikon Labophot Pol Scope S/N 954314

Analyzed by: Bo Sun

*NAD/NSD =no asbestos detected; NA =not analyzed; NA/PS=not analyzed/positive stop, (SOF-V) = Sprayed On Fireproofing containing Vermiculite; (SM-V) = Surfacing Material containing Vermiculite; PLM Bulk Asbestos Analysis by Appd E to Subpt E, 40 CFR 763 (NVLAP 200546-0), ELAP PLM Method 198.1 for NY friable samples, which includes the identification and quantitation of vermiculite or ELAP 198.6 for NOB samples or EPA 400 pt ct by EPA 600-M4-82-020 (NY ELAP Lab 11480); Note:PLM is not consistently reliable in detecting asbestos in floor coverings and similar non-friable organically bound materials. NAD or Trace results by PLM are inconclusive, TEM is currently the only method that can be used to determine if this material can be considered or treated as non asbestos-containing in NY State (also see EPA Advisory for floor tile, FR 59,146,38970,8/1/94) National Institute of Standards and Technology Accreditation requirements mandate that this report must not be reproduced except in full without the approval of the lab. This PLM report relates ONLY to the items tested. AIHA-LAP, LLC Lab ID 102843, RI Cert AAL-094, CT Cert PH-0186, Mass Cert AA000054.

Reviewed By: 

END OF REPORT

Client Name: Asbestos & Environmental Consulting Corp.

Table I
Summary of Bulk Asbestos Analysis Results

20-146; Clark Patterson Lee Architects; Pine Bush High School, 156 NY-302, Pine Bush, New York, 12566

AmeriSci Sample #	Client Sample#	HG Area	Sample Weight (gram)	Heat Sensitive Organic %	Acid Soluble Inorganic %	Insoluble Non-Asbestos Inorganic %	** Asbestos % by PLM/DS	** Asbestos % by TEM
01	FIT-041A	41	----	----	----	----	NAD	NA
Location: Boy's Locker Room 001 & Girl's Locker Room 002 - 2" Pipe Fitting Insulation (Gray)								
02	FIT-041B	41	----	----	----	----	NAD	NA
Location: Boy's Locker Room 001 & Girl's Locker Room 002 - 2" Pipe Fitting Insulation (Gray)								
03	FIT-041C	41	----	----	----	----	NAD	NA
Location: Boy's Locker Room 001 & Girl's Locker Room 002 - 2" Pipe Fitting Insulation (Gray)								
04	FIT-042A	42	----	----	----	----	NAD	NA
Location: Boy's Locker Room 001 - 4" Pipe Fitting Insulation (Gray)								
05	FIT-042B	42	----	----	----	----	NAD	NA
Location: Boy's Locker Room 001 - 4" Pipe Fitting Insulation (Gray)								
06	FIT-042C	42	----	----	----	----	NAD	NA
Location: Boy's Locker Room 001 - 4" Pipe Fitting Insulation (Gray)								
07	CLK-043A	43	0.221	67.4	14.8	13.4	Chrysotile 4.5	NA
Location: Courtyard A - Window Caulk (White)								
08	CLK-043B	43	0.167	61.4	19.3	19.2	NA/PS	NA
Location: Courtyard A - Window Caulk (White)								
09	FLR-044A	44	0.210	38.7	16.5	44.9	NAD	NAD
Location: Boy's Locker Room 004 - 2' x 2' Sheet Flooring (Gray)								
10	FLR-044B	44	0.134	36.1	22.3	41.5	NAD	NAD
Location: Boy's Locker Room 004 - 2' x 2' Sheet Flooring (Gray)								
11	FMA-045A	45	0.241	59.2	13.1	27.7	NAD	NAD
Location: Boy's Locker Room 004 - Flooring Mastic (Yellow)								
12	FMA-045B	45	0.160	64.6	14.0	21.4	NAD	NAD
Location: Boy's Locker Room 004 - Flooring Mastic (Yellow)								
13	FIT-046A	46	----	----	----	----	NAD	NA
Location: Boy's Locker Room 004 & Girl's Locker Room 006 - 2" Pipe Fitting Insulation (Gray)								
14	FIT-046B	46	----	----	----	----	NAD	NA
Location: Boy's Locker Room 004 & Girl's Locker Room 006 - 2" Pipe Fitting Insulation (Gray)								
15	FIT-046C	46	----	----	----	----	NAD	NA
Location: Boy's Locker Room 004 & Girl's Locker Room 006 - 2" Pipe Fitting Insulation (Gray)								
16	PLB-047A	47	----	----	----	----	NAD	NA
Location: Boy's Locker Room 004 & Girl's Locker Room 006 - Plaster Base Coat (Gray)								

See Reporting notes on last page

Client Name: Asbestos & Environmental Consulting Corp.

Table I
Summary of Bulk Asbestos Analysis Results

20-146; Clark Patterson Lee Architects; Pine Bush High School, 156 NY-302, Pine Bush, New York, 12566

AmeriSci Sample #	Client Sample#	HG Area	Sample Weight (gram)	Heat Sensitive Organic %	Acid Soluble Inorganic %	Insoluble Non-Asbestos Inorganic %	** Asbestos % by PLM/DS	** Asbestos % by TEM
17	PLB-047B	47	----	----	----	----	NAD	NA
Location: Boy's Locker Room 004 & Girl's Locker Room 006 - Plaster Base Coat (Gray)								
18	PLB-047C	47	----	----	----	----	NAD	NA
Location: Boy's Locker Room 004 & Girl's Locker Room 006 - Plaster Base Coat (Gray)								

Analyzed by: Khaalid W. Perine

Date Analyzed 8/26/2020

Hitachi #217/Norm

**Quantitative Analysis (Semi/Full) Bulk Asbestos Analysis - PLM by Appd E to Subpt E, 40 CFR 763 or NYSDOH ELAP 198.1 for New York friable samples or NYSDOH ELAP 198.6 for New York NOB samples; TEM (Semi/Full) by EPA 600/R-93/116 (or NYSDOH ELAP 198.4; for New York samples); NAD = no asbestos detected during a quantitative analysis; NA = not analyzed; Trace = <1%; (SOF-V) = Sprayed On Fireproofing containing Vermiculite; (SM-V) = Surfacing Material containing Vermiculite; Quantitation for beginning weights of <0.1 grams should be considered as qualitative only; Qualitative Analysis: Asbestos analysis results of "Present" or "NVA = No Visible Asbestos" represents results for Qualitative PLM or TEM Analysis only (no accreditation coverage available from any regulatory agency for qualitative analyses); NVLAP (PLM) 200546-0, NYSDOH ELAP Lab 11480, AIHA-LAP, LLC (PLM) Lab ID 102843.

Warning Note: PLM limitation, only TEM will resolve fibers <0.25 micrometers in diameter. TEM bulk analysis is representative of the fine grained matrix material and may not be representative of non-uniformly dispersed debris for which PLM evaluation is recommended (i.e. soils and other heterogenous materials).

Reviewed By:

for PM

ATTACHMENT C

EcoSpect's XRF Lead Inspection Report



Healthy Basement. Healthy Home.

XRF Lead Inspection

Project:

Pine Bush Highschool
156 NY-302
Pine Bush, NY 12566

Date Tested:

8/31/2020

Prepared by:

Daryl Heffron
Ecospect, Inc.
5785 State Route 96, PO Box 25,
Romulus, NY 14541

Prepared For:

AECC
East Syracuse, NY 13057
6308 Fly Road

9/10/2020



9/10/2020

To:

Nick Columbe

AECC

6308 Fly Road, East Syracuse, NY 13057

East Syracuse, NY 13057

RE: Private Residence – Pine Bush High School

156 New York 302

Pine Bush, NY 12566

Dear Nick :

On August 31, 2020, EcoSpect, Inc. conducted XRF testing for the presence of lead-based paint, as directed by AECC, at the above captioned location.

The instruments were operated with the guidance from the Performance Characteristics Sheets published by the US Department of HUD and the results classified as positive or negative based the HUD action level of 1.00 mg/cm². Results less than 1.00 mg/cm² are considered negative and results greater than 1.00 mg/cm² are considered positive. For renovation purposes, as well as OSHA implications, it should be noted the lead present in levels less than 1.00 mg/cm² could generate dust that exceeds acceptable levels depending on the renovation or demolition being performed. For OSHA purposes, there are no accepted standards other than “zero” for lead content in surfaces that are affected so as to release lead in the form of dust. XRF readings at the lower end of the range (close to zero) are less likely to create toxic situations. XRF readings with negative prefixes correlate to very low lead levels in that particular surface. For conclusive, task-oriented results, contractors should follow all applicable OSHA requirements found in regulation 1926.62.

The walls in each space oriented in a clockwise fashion, with wall #1 oriented to the front of the building. Please refer to the building plans for clarification. An “NA” indicates that the room was not accessible during testing, and “NP” indicates that there were no painted surfaces within that space. During the testing procedures, EcoSpect personnel were able to gain access to the designated spaces and tested all of the selected rooms that were requested.

Summary of Positive Findings

LOCATION ADDRESS: 156 NY-302, Pine Bush, NY 12566

Positive test results for the presence of lead-based paint in concentrations equal to or greater than 1.00 mg/cm² are:

Positive components by substrate:

Ceramic: Walls (7)

If you have any questions regarding this report, please feel free to give us a call at any time.

Sincerely Yours,

A handwritten signature in black ink, appearing to read 'Daryl Heffron', with a long horizontal flourish extending to the right.

Daryl Heffron EcoSpect, Inc.

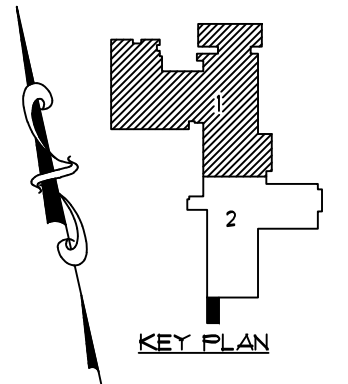
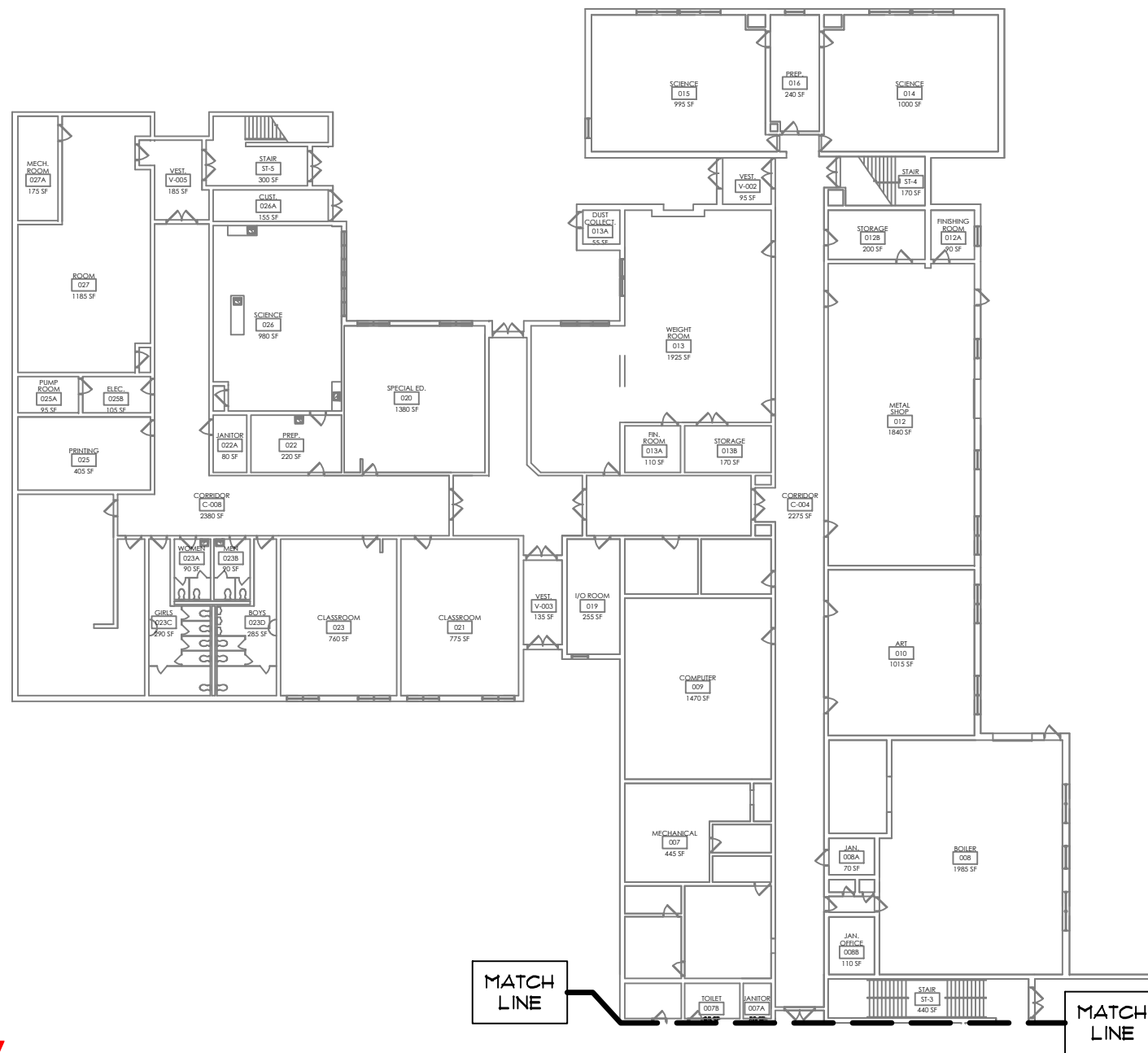
Summary

Summary Analysis							
#	Component	# Tested Negative	% Negative	# Tested Positive	% Positive	Total Tested	Total %
1	Access Door	1	100.00%	0	0.00%	1	100.00%
2	Baseboard	1	100.00%	0	0.00%	1	100.00%
3	Bench	2	100.00%	0	0.00%	2	100.00%
4	Ceiling	6	100.00%	0	0.00%	6	100.00%
5	Door	4	100.00%	0	0.00%	4	100.00%
6	Door Header	2	100.00%	0	0.00%	2	100.00%
7	Door Molding	18	100.00%	0	0.00%	18	100.00%
8	Drinking Fountain	1	100.00%	0	0.00%	1	100.00%
9	Duct	2	100.00%	0	0.00%	2	100.00%
10	Floor	2	100.00%	0	0.00%	2	100.00%
11	I-Beam Ceiling	8	100.00%	0	0.00%	8	100.00%
12	Locker	9	100.00%	0	0.00%	9	100.00%
13	Stall	2	100.00%	0	0.00%	2	100.00%
14	Structural Steel	2	100.00%	0	0.00%	2	100.00%
15	Support Post	2	100.00%	0	0.00%	2	100.00%
16	Unit Ventilator	5	100.00%	0	0.00%	5	100.00%
17	Wall	31	81.58%	7	18.42%	38	100.00%
18	Wall Molding	1	100.00%	0	0.00%	1	100.00%
19	Window Mldg	27	100.00%	0	0.00%	27	100.00%

Confirmed Positive Component Types



Floor Plans

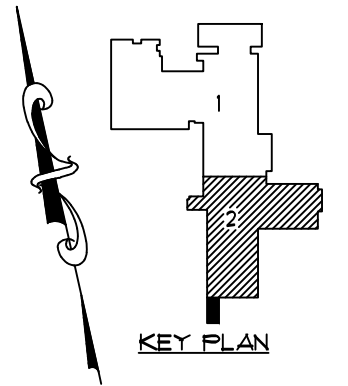


Exterior 17

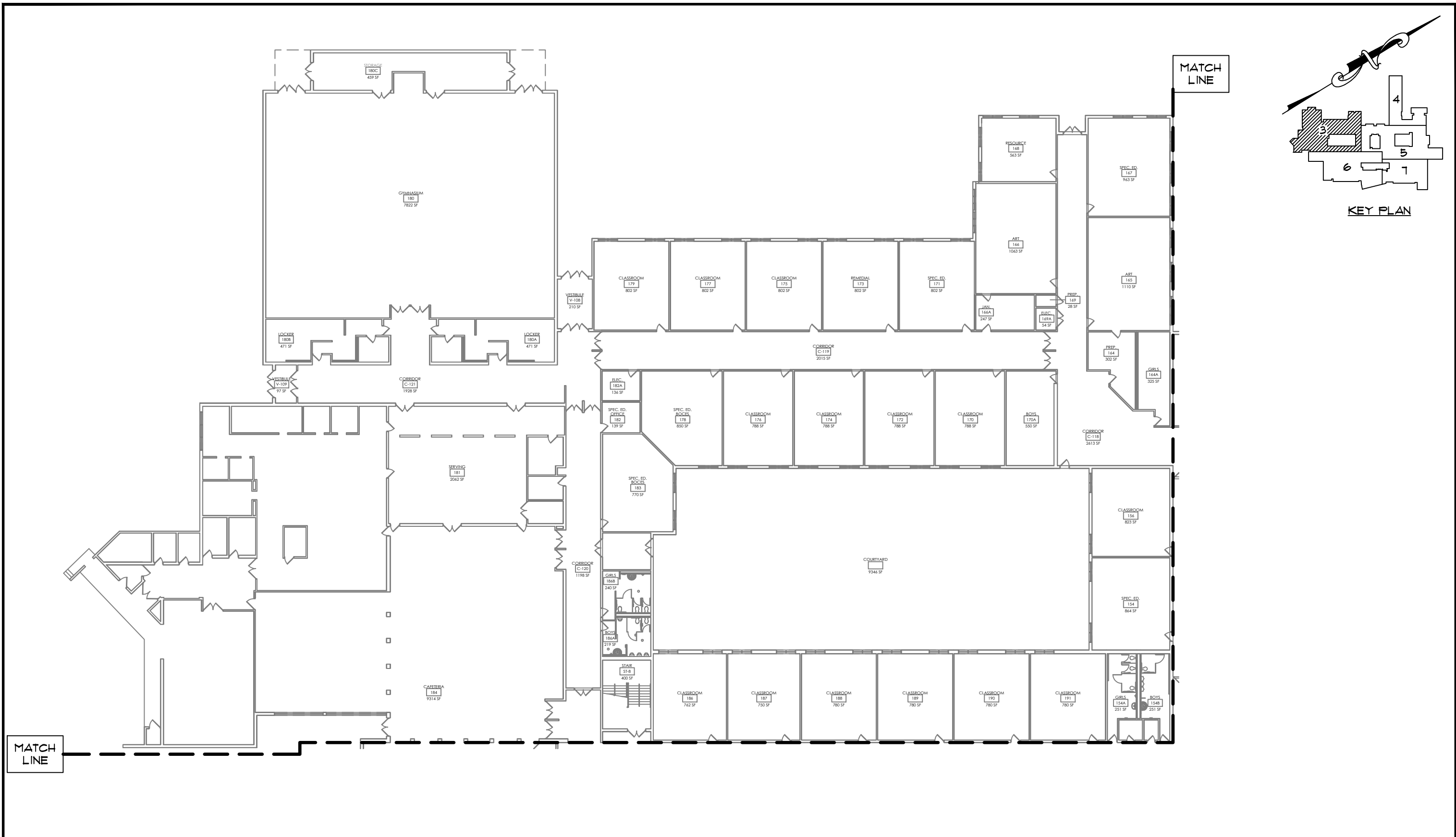
THE INFORMATION INCLUDED ON THIS GRAPHIC REPRESENTATION HAS BEEN COMPILED FROM A VARIETY OF SOURCES AND IS SUBJECT TO CHANGE WITHOUT NOTICE. AECC MAKES NO REPRESENTATIONS OR WARRANTIES, EXPRESS OR IMPLIED, AS TO ACCURACY, COMPLETENESS, TIMELINESS, OR RIGHTS TO THE USE OF SUCH INFORMATION. THIS DOCUMENT IS NOT INTENDED FOR USE AS A LAND SURVEY PRODUCT NOR IS IT DESIGNED OR INTENDED AS A CONSTRUCTION DESIGN DOCUMENT. THE USE OR MISUSE OF THE INFORMATION CONTAINED ON THIS GRAPHIC REPRESENTATION IS AT THE SOLE RISK OF THE PARTY USING OR MISUSING THE INFORMATION.

AECC
ENVIRONMENTAL CONSULTING
Asbestos & Environmental
Consulting Corporation
6308 Fly Road
East Syracuse, NY 13057


PROJECT NO. 20-146		Pine Bush CSD - Pine Bush High School 156 New York - 302 Pine Bush, New York 12566 Partial Basement Floor Plan	FIGURE 1
DRAWN: SEPT. 2020			
DRAWN BY: NP		Lead XRF Survey	
CHECKED BY: BB			

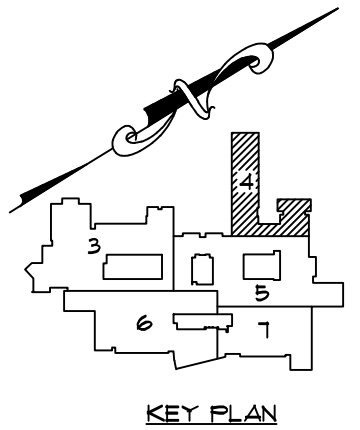


2



THE INFORMATION INCLUDED ON THIS GRAPHIC REPRESENTATION HAS BEEN COMPILED FROM A VARIETY OF SOURCES AND IS SUBJECT TO CHANGE WITHOUT NOTICE. AECC MAKES NO REPRESENTATIONS OR WARRANTIES, EXPRESS OR IMPLIED, AS TO ACCURACY, COMPLETENESS, TIMELINESS, OR RIGHTS TO THE USE OF SUCH INFORMATION. THIS DOCUMENT IS NOT INTENDED FOR USE AS A LAND SURVEY PRODUCT NOR IS IT DESIGNED OR INTENDED AS A CONSTRUCTION DESIGN DOCUMENT. THE USE OR MISUSE OF THE INFORMATION CONTAINED ON THIS GRAPHIC REPRESENTATION IS AT THE SOLE RISK OF THE PARTY USING OR MISUSING THE INFORMATION.

 <p>Asbestos & Environmental Consulting Corporation</p> <p>6308 Fly Road East Syracuse, NY 13057</p>	PROJECT NO. 20-146	Pine Bush CSD - Pine Bush High School 156 New York - 302 Pine Bush, New York 12566 Partial First Floor Plan	FIGURE 3
	DRAWN: SEPT. 2020		
	DRAWN BY: NP	Lead XRF Survey	
	CHECKED BY: BB		



THE INFORMATION INCLUDED ON THIS GRAPHIC REPRESENTATION HAS BEEN COMPILED FROM A VARIETY OF SOURCES AND IS SUBJECT TO CHANGE WITHOUT NOTICE. AECC MAKES NO REPRESENTATIONS OR WARRANTIES, EXPRESS OR IMPLIED, AS TO ACCURACY, COMPLETENESS, TIMELINESS, OR RIGHTS TO THE USE OF SUCH INFORMATION. THIS DOCUMENT IS NOT INTENDED FOR USE AS A LAND SURVEY PRODUCT NOR IS IT DESIGNED OR INTENDED AS A CONSTRUCTION DESIGN DOCUMENT. THE USE OR MISUSE OF THE INFORMATION CONTAINED ON THIS GRAPHIC REPRESENTATION IS AT THE SOLE RISK OF THE PARTY USING OR MISUSING THE INFORMATION.

AECC
ENVIRONMENTAL CONSULTING

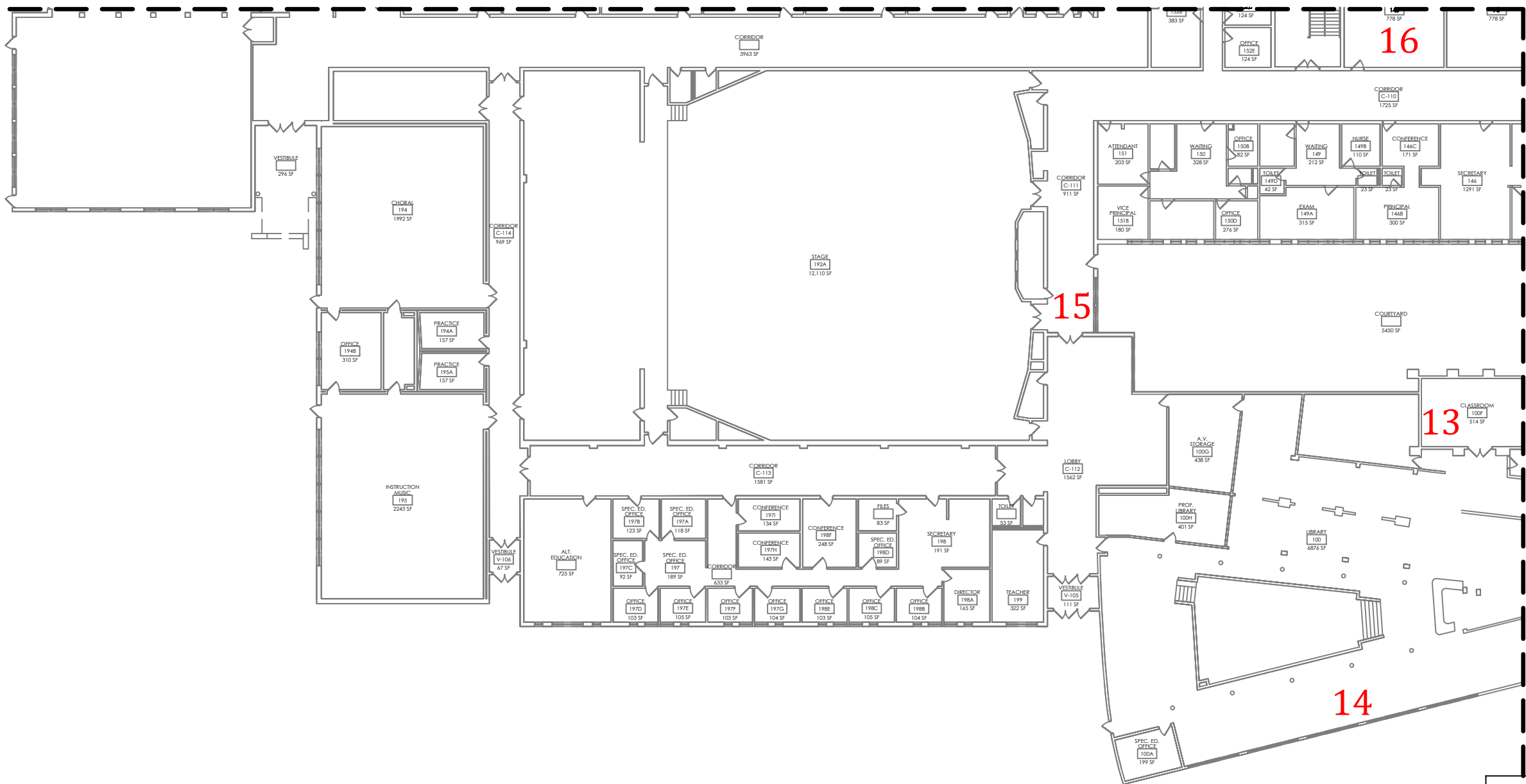
Asbestos & Environmental
Consulting Corporation

6308 Fly Road
East Syracuse, NY 13057

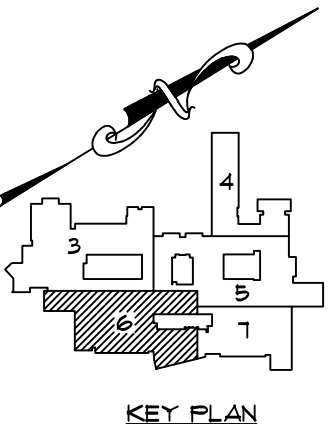
PROJECT NO.	20-146
DRAWN:	SEPT. 2020
DRAWN BY:	NP
CHECKED BY:	BB

Pine Bush CSD - Pine Bush High School 156 New York - 302 Pine Bush, New York 12566 Partial First Floor Plan	
Lead XRF Survey	

MATCH LINE



MATCH LINE



THE INFORMATION INCLUDED ON THIS GRAPHIC REPRESENTATION HAS BEEN COMPILED FROM A VARIETY OF SOURCES AND IS SUBJECT TO CHANGE WITHOUT NOTICE. AECC MAKES NO REPRESENTATIONS OR WARRANTIES, EXPRESS OR IMPLIED, AS TO ACCURACY, COMPLETENESS, TIMELINESS, OR RIGHTS TO THE USE OF SUCH INFORMATION. THIS DOCUMENT IS NOT INTENDED FOR USE AS A LAND SURVEY PRODUCT NOR IS IT DESIGNED OR INTENDED AS A CONSTRUCTION DESIGN DOCUMENT. THE USE OR MISUSE OF THE INFORMATION CONTAINED ON THIS GRAPHIC REPRESENTATION IS AT THE SOLE RISK OF THE PARTY USING OR MISUSING THE INFORMATION.

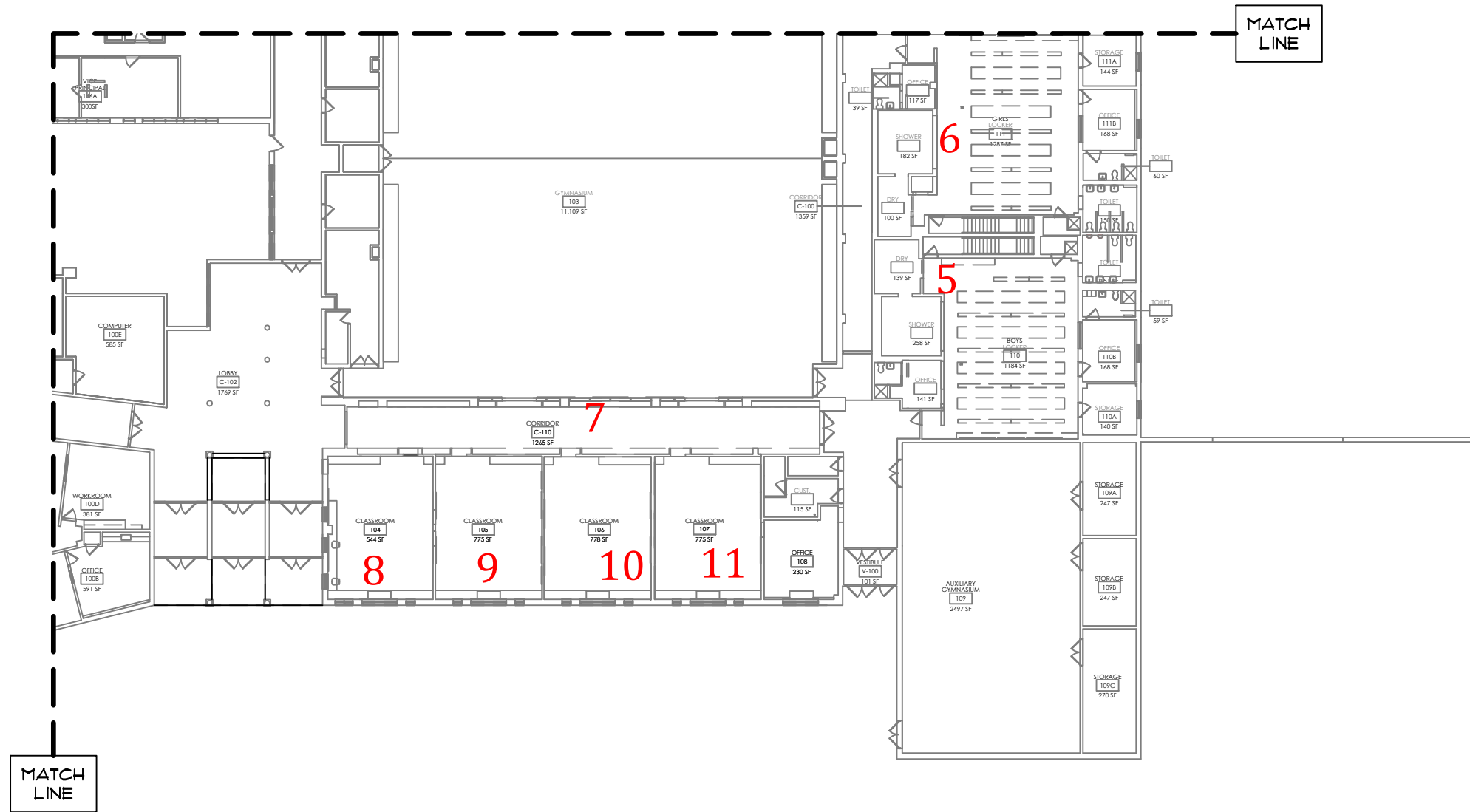
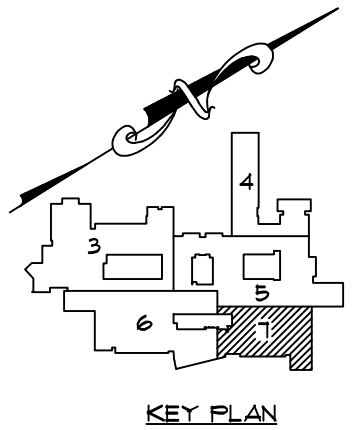
AECC
ENVIRONMENTAL CONSULTING
Asbestos & Environmental
Consulting Corporation
6308 Fly Road
East Syracuse, NY 13057

PROJECT NO. 20-146
DRAWN: SEPT. 2020
DRAWN BY: NP
CHECKED BY: BB

Pine Bush CSD - Pine Bush High School
156 New York - 302
Pine Bush, New York 12566
Partial First Floor Plan

Lead XRF Survey

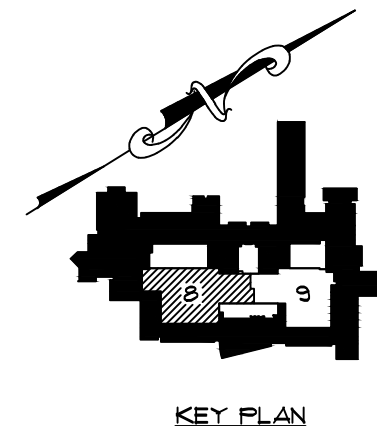
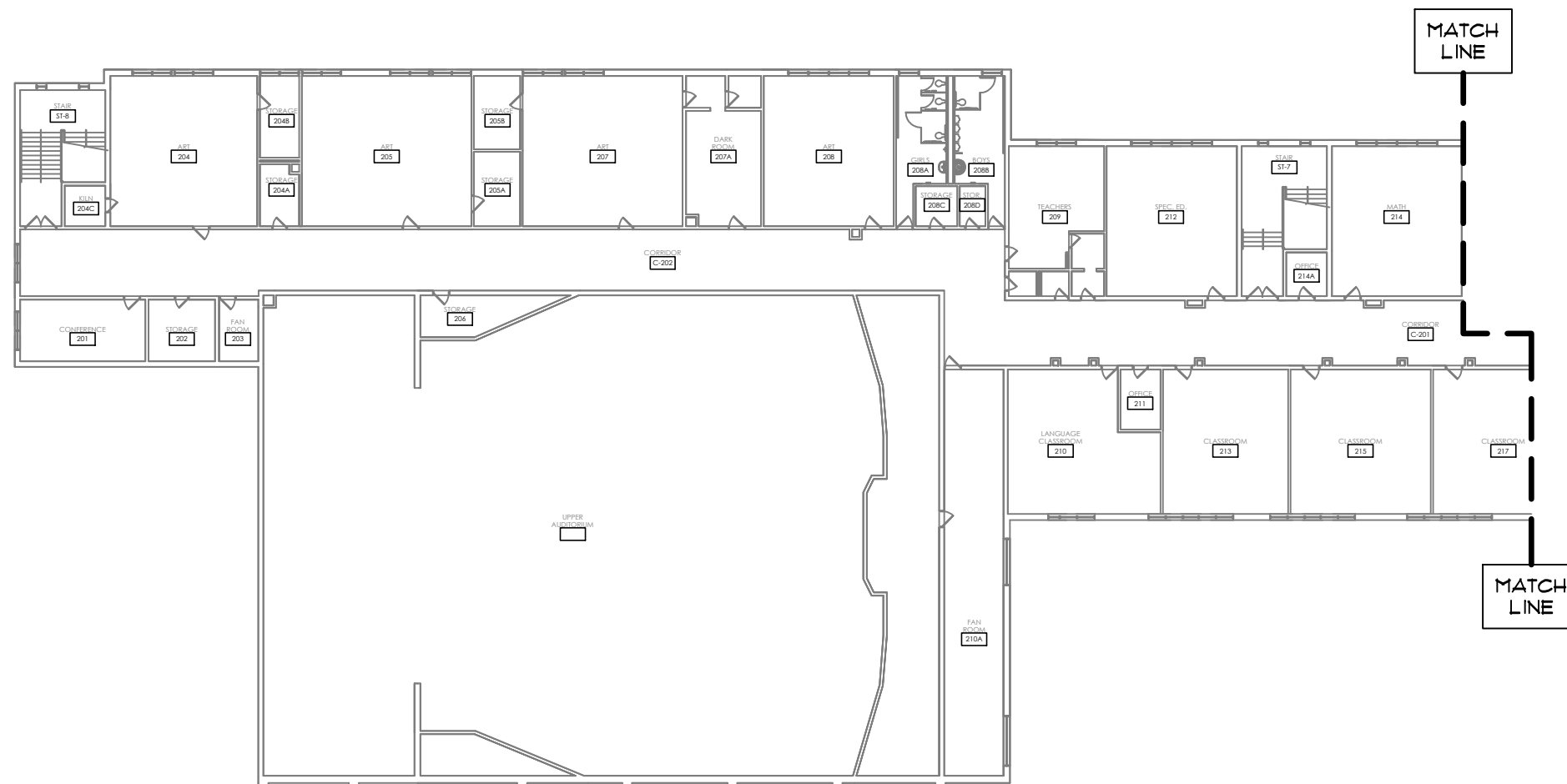
FIGURE
6



THE INFORMATION INCLUDED ON THIS GRAPHIC REPRESENTATION HAS BEEN COMPILED FROM A VARIETY OF SOURCES AND IS SUBJECT TO CHANGE WITHOUT NOTICE. AECC MAKES NO REPRESENTATIONS OR WARRANTIES, EXPRESS OR IMPLIED, AS TO ACCURACY, COMPLETENESS, TIMELINESS, OR RIGHTS TO THE USE OF SUCH INFORMATION. THIS DOCUMENT IS NOT INTENDED FOR USE AS A LAND SURVEY PRODUCT NOR IS IT DESIGNED OR INTENDED AS A CONSTRUCTION DESIGN DOCUMENT. THE USE OR MISUSE OF THE INFORMATION CONTAINED ON THIS GRAPHIC REPRESENTATION IS AT THE SOLE RISK OF THE PARTY USING OR MISUSING THE INFORMATION.

AECC
ENVIRONMENTAL CONSULTING
Asbestos & Environmental
Consulting Corporation
6308 Fly Road
East Syracuse, NY 13057

PROJECT NO.	20-146	Pine Bush CSD - Pine Bush High School 156 New York - 302 Pine Bush, New York 12566 Partial First Floor Plan	FIGURE 7
DRAWN:	SEPT. 2020		
DRAWN BY:	NP	Lead XRF Survey	
CHECKED BY:	BB		



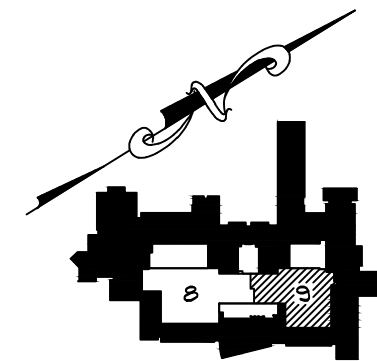
THE INFORMATION INCLUDED ON THIS GRAPHIC REPRESENTATION HAS BEEN COMPILED FROM A VARIETY OF SOURCES AND IS SUBJECT TO CHANGE WITHOUT NOTICE. AECC MAKES NO REPRESENTATIONS OR WARRANTIES, EXPRESS OR IMPLIED, AS TO ACCURACY, COMPLETENESS, TIMELINESS, OR RIGHTS TO THE USE OF SUCH INFORMATION. THIS DOCUMENT IS NOT INTENDED FOR USE AS A LAND SURVEY PRODUCT NOR IS IT DESIGNED OR INTENDED AS A CONSTRUCTION DESIGN DOCUMENT. THE USE OR MISUSE OF THE INFORMATION CONTAINED ON THIS GRAPHIC REPRESENTATION IS AT THE SOLE RISK OF THE PARTY USING OR MISUSING THE INFORMATION.

AECC
ENVIRONMENTAL CONSULTING
Asbestos & Environmental
Consulting Corporation
6308 Fly Road
East Syracuse, NY 13057

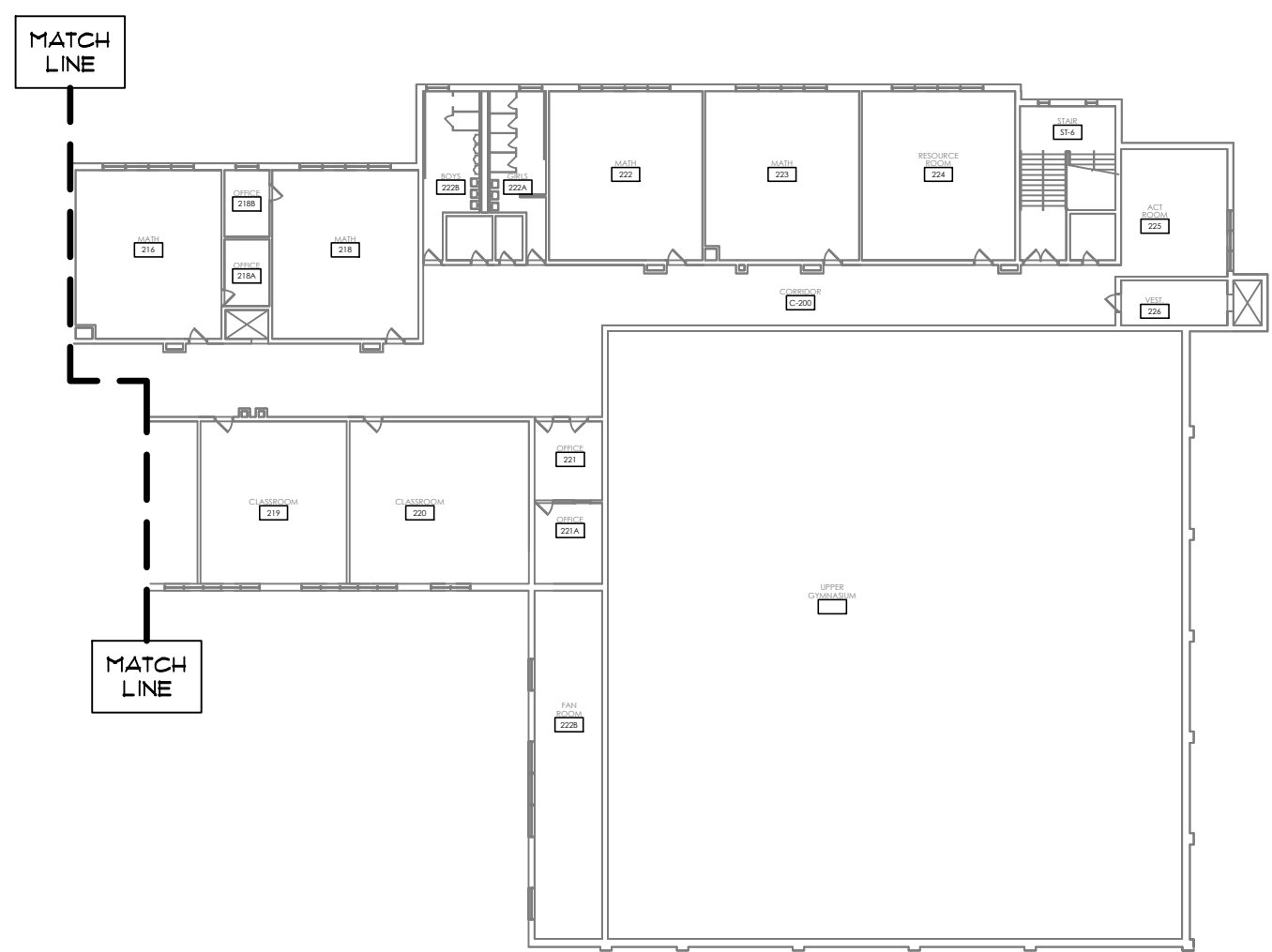
PROJECT NO.	20-146
DRAWN:	SEPT. 2020
DRAWN BY:	NP
CHECKED BY:	BB

Pine Bush CSD - Pine Bush High School
156 New York - 302
Pine Bush, New York 12566
Partial Second Floor Plan
Lead XRF Survey

FIGURE
8



KEY PLAN



THE INFORMATION INCLUDED ON THIS GRAPHIC REPRESENTATION HAS BEEN COMPILED FROM A VARIETY OF SOURCES AND IS SUBJECT TO CHANGE WITHOUT NOTICE. AECC MAKES NO REPRESENTATIONS OR WARRANTIES, EXPRESS OR IMPLIED, AS TO ACCURACY, COMPLETENESS, TIMELINESS, OR RIGHTS TO THE USE OF SUCH INFORMATION. THIS DOCUMENT IS NOT INTENDED FOR USE AS A LAND SURVEY PRODUCT NOR IS IT DESIGNED OR INTENDED AS A CONSTRUCTION DESIGN DOCUMENT. THE USE OR MISUSE OF THE INFORMATION CONTAINED ON THIS GRAPHIC REPRESENTATION IS AT THE SOLE RISK OF THE PARTY USING OR MISUSING THE INFORMATION.



AECC
ENVIRONMENTAL CONSULTING

Asbestos & Environmental
Consulting Corporation

6308 Fly Road
East Syracuse, NY 13057

PROJECT NO. 20-146		Pine Bush CSD - Pine Bush High School 156 New York - 302 Pine Bush, New York 12566 Partial Second Floor Plan	FIGURE 9
DRAWN: SEPT. 2020			
DRAWN BY: NP		Lead XRF Survey	
CHECKED BY: BB			

Daily Calibrations

Calibrations					
#	Date	Time	Type	Nom Secs	mg/cm2
1	8/31/2020	13:36:50	Calibration	5	1
2	8/31/2020	13:37:04	Calibration	5	1
3	8/31/2020	13:37:17	Calibration	5	1
137	8/31/2020	15:11:57	Calibration	5	1
138	8/31/2020	15:44:00	Calibration	5	0.9
197	8/31/2020	16:21:37	Calibration	5	0.9
198	8/31/2020	16:26:58	Calibration	5	0.9
276	8/31/2020	17:27:29	Calibration	5	1
277	8/31/2020	17:30:47	Calibration	5	0.9
336	8/31/2020	18:14:49	Calibration	5	1

Confirmed Positives

Confirmed Positives								
Reading #	Room	#	Wall	Component	Substrate	Condition	Results	mg/cm2
4	1		Wall 1	Wall	Ceramic	Blue	Positive	7.1
9	1		Wall 2	Wall	Ceramic	Blue	Positive	7.1
17	1		Wall 1	Wall	Ceramic	Pink	Positive	8
31	2		Wall 1	Wall	Ceramic	Pink	Positive	8.2
58	4		Wall 2	Wall	Ceramic	Blue	Positive	7.3
74	5		Wall 4	Wall	Ceramic	Brown	Positive	8
77	5		Wall 2	Wall	Ceramic	Brown	Positive	7.8

XRF Results

XRF & Labs								
Reading #	Room	#	Wall	Component	Substrate	Condition	Results	mg/cm2
4	1	1	Wall 1	Wall	Ceramic	Blue	Positive	7.1
5	1	1	Wall 1	Wall	Masonry	White	Negative	-0.3
6	1	1	Wall 1	Stall	Steel	Gray	Negative	0
7	1	1	Wall 1	Duct	Steel	Gray	Negative	-0.1
8	1	1	Wall 2	Wall	Masonry	White	Negative	-0.3
9	1	1	Wall 2	Wall	Ceramic	Blue	Positive	7.1
10	1	1	Wall 2	Door Molding	Steel	Blue	Negative	0.2
11	1	1	Wall 2	Locker	Steel	Blue	Negative	-0.1
12	1	1	Wall 4	Wall	Masonry	White	Negative	0
13	1	1	Wall 1	Ceiling	Steel	Gray	Negative	0.1
14	1	1	Wall 1	I-Beam Ceiling	Steel	Yellow	Negative	0
15	1	1	Wall 1	I-Beam Ceiling	Steel	Yellow	Negative	0
16	1	1	Wall 1	Ceiling	Masonry	White	Negative	-0.2
17	1	1	Wall 1	Wall	Ceramic	Pink	Positive	8
18	2	2	Wall 1	Wall	Masonry	White	Negative	0
19	2	2	Wall 1	Floor	Masonry	Gray	Negative	0.1
20	2	2	Wall 1	Locker	Steel	Blue	Negative	0
21	2	2	Wall 1	Locker	Steel	Blue	Negative	0
22	2	2	Wall 1	Baseboard	Masonry	Black	Negative	-0.1
23	2	2	Wall 1	Bench	Steel	Red	Negative	-0.3
24	2	2	Wall 4	Door Header	Steel	Black	Negative	0
25	2	2	Wall 4	Unit Ventilator	Steel	Brown	Negative	-0.2
26	2	2	Wall 4	Window Mldg	Steel	Black	Negative	-0.1
27	2	2	Wall 4	Door Molding	Steel	Black	Negative	0.4
28	2	2	Wall 2	Bench	Masonry	White	Negative	0
29	2	2	Wall 2	Wall	Masonry	White	Negative	-0.2
30	2	2	Wall 2	Drinking Fountain	Ceramic	Brown	Negative	-0.7
31	2	2	Wall 1	Wall	Ceramic	Pink	Positive	8.2
32	2	2	Wall 1	Ceiling	Steel	Gray	Negative	0
33	2	2	Wall 1	Access Door	Steel	Blue	Negative	0
34	2	2	Wall 3	Door Molding	Steel	Blue	Negative	0.3
35	2	2	Wall 3	Ceiling	Masonry	White	Negative	0
36	2	2	Wall 3	I-Beam Ceiling	Steel	Brown	Negative	-0.1
37	2	2	Wall 3	I-Beam Ceiling	Steel	Brown	Negative	0
38	3	3	Wall 1	Ceiling	Masonry	White	Negative	-0.4
39	3	3	Wall 1	Wall	Masonry	White	Negative	-0.3
40	3	3	Wall 1	Locker	Steel	Blue	Negative	0
41	3	3	Wall 2	Door Molding	Steel	Blue	Negative	0.1
42	3	3	Wall 2	Wall	Masonry	Blue	Negative	-0.2
43	3	3	Wall 2	I-Beam Ceiling	Steel	White	Negative	0.1
44	3	3	Wall 3	Door Molding	Wood	White	Negative	0
45	3	3	Wall 3	Door	Wood	White	Negative	-0.1
46	3	3	Wall 2	Door	Steel	Blue	Negative	0
47	3	3	Wall 3	Wall	Sheetrock	Blue	Negative	-0.2
48	3	3	Wall 4	Wall	Ceramic	Green	Negative	0.8

XRF & Labs								
Reading #	Room	#	Wall	Component	Substrate	Condition	Results	mg/cm2
49	3		Wall 4	Wall	Ceramic	Green	Negative	0.8
50	4		Wall 1	Wall	Sheetrock	Blue	Negative	0.2
51	4		Wall 1	Door Molding	Wood	Blue	Negative	0
52	4		Wall 1	Door	Wood	Blue	Negative	-0.1
53	4		Wall 2	Wall	Masonry	Blue	Negative	-0.3
54	4		Wall 2	Door Molding	Steel	Blue	Negative	0.5
55	4		Wall 2	Ceiling	Masonry	White	Negative	-0.1
56	4		Wall 2	I-Beam Ceiling	Steel	White	Negative	-0.1
57	4		Wall 2	Wall Molding	Steel	Blue	Negative	0.1
58	4		Wall 2	Wall	Ceramic	Blue	Positive	7.3
59	4		Wall 2	Wall	Ceramic	White	Negative	-0.2
60	5		Wall 1	Wall	Masonry	White	Negative	-0.2
61	5		Wall 1	Locker	Steel	Blue	Negative	0
62	5		Wall 1	Locker	Steel	Blue	Negative	0
63	5		Wall 1	Locker	Steel	Blue	Negative	0
64	5		Wall 2	Wall	Masonry	White	Negative	0
65	5		Wall 2	Floor	Masonry	Gray	Negative	0
66	5		Wall 2	Stall	Masonry	Blue	Negative	0.1
67	5		Wall 2	Window Mldg	Steel	Blue	Negative	-0.1
68	5		Wall 2	Window Mldg	Steel	Brown	Negative	0.2
69	5		Wall 3	Unit Ventilator	Steel	Brown	Negative	0.1
70	5		Wall 4	Support Post	Steel	Blue	Negative	0
71	5		Wall 4	I-Beam Ceiling	Steel	White	Negative	0
72	5		Wall 4	Structural Steel	Steel	White	Negative	-0.3
73	5		Wall 4	Duct	Steel	White	Negative	-0.1
74	5		Wall 4	Wall	Ceramic	Brown	Positive	8
75	5		Wall 1	Door Molding	Steel	Blue	Negative	0.4
76	5		Wall 1	Door	Steel	Blue	Negative	-0.1
77	5		Wall 2	Wall	Ceramic	Brown	Positive	7.8
78	5		Wall 2	Door Molding	Steel	Blue	Negative	0.3
79	6		Wall 1	Door Molding	Steel	Blue	Negative	0.1
80	6		Wall 1	Wall	Masonry	White	Negative	-0.4
81	6		Wall 1	Door Header	Steel	White	Negative	0.2
82	6		Wall 1	Door Molding	Steel	Blue	Negative	0.6
83	6		Wall 2	Wall	Ceramic	Yellow	Negative	0.7
84	6		Wall 3	Support Post	Steel	Blue	Negative	0.1
85	6		Wall 2	Door Molding	Steel	Blue	Negative	0.7
86	6		Wall 2	Structural Steel	Steel	White	Negative	0.3
87	6		Wall 2	I-Beam Ceiling	Steel	White	Negative	0
88	7		Wall 1	Wall	Masonry	White	Negative	0
89	7		Wall 1	Door Molding	Steel	Blue	Negative	0.5
90	7		Wall 1	Locker	Steel	Blue	Negative	0.2
91	7		Wall 1	Locker	Steel	Blue	Negative	-0.1
92	7		Wall 2	Door Molding	Steel	Blue	Negative	0.2
93	7		Wall 2	Wall	Masonry	White	Negative	-0.1

XRF & Labs								
Reading #	Room	#	Wall	Component	Substrate	Condition	Results	mg/cm2
94	7		Wall 3	Wall	Masonry	White	Negative	0
95	7		Wall 3	Wall	Sheetrock	White	Negative	0.3
96	8		Wall 1	Wall	Masonry	White	Negative	-0.3
97	8		Wall 1	Window Mldg	Steel	Brown	Negative	0.1
98	8		Wall 1	Unit Ventilator	Steel	Brown	Negative	-0.1
99	8		Wall 2	Wall	Masonry	White	Negative	-0.1
100	8		Wall 3	Wall	Masonry	White	Negative	-0.3
101	8		Wall 3	Door Molding	Steel	Brown	Negative	0.5
102	9		Wall 1	Window Mldg	Steel	Brown	Negative	0
103	9		Wall 1	Wall	Masonry	White	Negative	-0.3
104	9		Wall 1	Window Mldg	Steel	White	Negative	0.1
105	9		Wall 1	Unit Ventilator	Steel	Brown	Negative	0
106	9		Wall 2	Wall	Masonry	White	Negative	-0.1
107	9		Wall 3	Wall	Masonry	White	Negative	-0.1
108	9		Wall 3	Door Molding	Steel	Brown	Negative	0.6
109	9		Wall 4	Wall	Masonry	White	Negative	0
110	10		Wall 1	Wall	Masonry	Blue	Negative	-0.2
111	10		Wall 1	Window Mldg	Steel	Brown	Negative	0.1
112	10		Wall 1	Unit Ventilator	Steel	Brown	Negative	-0.2
113	10		Wall 2	Wall	Masonry	Blue	Negative	-0.1
114	10		Wall 3	Wall	Masonry	Blue	Negative	0
115	10		Wall 3	Door Molding	Steel	Brown	Negative	0.6
116	11		Wall 1	Window Mldg	Steel	Brown	Negative	0.1
117	11		Wall 3	Door Molding	Steel	Brown	Negative	0.1
118	12		Wall 2	Window Mldg	Steel	Brown	Negative	0.1
119	12		Wall 2	Window Mldg	Steel	Brown	Negative	0.2
120	13		Wall 3	Window Mldg	Steel	Brown	Negative	0
121	14		Wall 1	Window Mldg	Steel	Brown	Negative	0.2
122	15		Wall 4	Window Mldg	Steel	Brown	Negative	0.2
123	16		Wall 3	Window Mldg	Steel	Brown	Negative	0.1
124	17		Wall 2	Window Mldg	Steel	Brown	Negative	0.7
125	17		Wall 2	Window Mldg	Steel	Brown	Negative	0.3
126	17		Wall 2	Window Mldg	Steel	Brown	Negative	0.3
127	17		Wall 2	Window Mldg	Steel	Brown	Negative	0
128	17		Wall 2	Window Mldg	Steel	Brown	Negative	0.2
129	17		Wall 2	Window Mldg	Steel	Brown	Negative	0.5
130	17		Wall 2	Window Mldg	Steel	Brown	Negative	-0.1
131	17		Wall 2	Window Mldg	Steel	Brown	Negative	-0.1
132	17		Wall 2	Window Mldg	Steel	Brown	Negative	0.3
133	17		Wall 2	Window Mldg	Steel	Brown	Negative	0.5
134	17		Wall 3	Window Mldg	Steel	Brown	Negative	0.2
135	17		Wall 3	Window Mldg	Steel	Brown	Negative	0
136	17		Wall 3	Window Mldg	Steel	Brown	Negative	0.2

Performance Characteristic Sheet

EFFECTIVE DATE: December 1, 2015

MANUFACTURER AND MODEL:

Make: *Heuresis*
Models: *Model Pb200i*
Source: *⁵⁷Co, 5 mCi (nominal – new source)*

FIELD OPERATION GUIDANCE

OPERATING PARAMETERS:

Action Level mode

XRF CALIBRATION CHECK LIMITS:

0.8 to 1.2 mg/cm ² (inclusive)

SUBSTRATE CORRECTION:

Not applicable

INCONCLUSIVE RANGE OR THRESHOLD:

ACTION LEVEL MODE READING DESCRIPTION	SUBSTRATE	THRESHOLD (mg/cm ²)
Results not corrected for substrate bias on any substrate	Brick	1.0
	Concrete	1.0
	Drywall	1.0
	Metal	1.0
	Plaster	1.0
	Wood	1.0

BACKGROUND INFORMATION

EVALUATION DATA SOURCE AND DATE:

This sheet is supplemental information to be used in conjunction with Chapter 7 of the HUD *Guidelines for the Evaluation and Control of Lead-Based Paint Hazards in Housing* ("HUD Guidelines"). Performance parameters shown on this sheet are calculated using test results on building components in the HUD archive. Testing was conducted on 146 test samples in November 2015, with two separate instruments running software version 2.1-2 in Action Level test mode. The actual source strength of each instrument on the day of testing was approximately 2.0 mCi; source ages were approximately one year.

OPERATING PARAMETERS

Performance parameters shown in this sheet are applicable only when properly operating the instrument using the manufacturer's instructions and procedures described in Chapter 7 of the HUD Guidelines.

XRF CALIBRATION CHECK:

The calibration of the XRF instrument should be checked using the paint film nearest 1.0 mg/cm² in the NIST Standard Reference Material (SRM) used (e.g., for NIST SRM 2579, use the 1.02 mg/cm² film).

If the average (rounded to 1 decimal place) of three readings is outside the acceptable calibration check range, follow the manufacturer's instructions to bring the instrument into control before XRF testing proceeds.

SUBSTRATE CORRECTION VALUE COMPUTATION:

Chapter 7 of the HUD Guidelines provides guidance on correcting XRF results for substrate bias. Supplemental guidance for using the paint film nearest 1.0 mg/cm² for substrate correction is provided:

XRF results are corrected for substrate bias by subtracting from each XRF result a correction value determined separately in each house for single-family housing or in each development for multifamily housing, for each substrate. The correction value is an average of XRF readings taken over the NIST SRM paint film nearest to 1.0 mg/cm² at test locations that have been scraped bare of their paint covering. Compute the correction values as follows:

Using the same XRF instrument, take three readings on a bare substrate area covered with the NIST SRM paint film nearest 1 mg/cm². Repeat this procedure by taking three more readings on a second bare substrate area of the same substrate covered with the NIST SRM.

Compute the correction value for each substrate type where XRF readings indicate substrate correction is needed by computing the average of all six readings as shown below.

For each substrate type (the 1.02 mg/cm² NIST SRM is shown in this example; use the actual lead loading of the NIST SRM used for substrate correction):

$$\text{Correction value} = (1\text{st} + 2\text{nd} + 3\text{rd} + 4\text{th} + 5\text{th} + 6\text{th Reading})/6 - 1.02 \text{ mg/cm}^2$$

Repeat this procedure for each substrate requiring substrate correction in the house or housing development.

EVALUATING THE QUALITY OF XRF TESTING:

Randomly select ten testing combinations for retesting from each house or from two randomly selected units in multifamily housing.

Conduct XRF re-testing at the ten testing combinations selected for retesting.

Determine if the XRF testing in the units or house passed or failed the test by applying the steps below.

Compute the Retest Tolerance Limit by the following steps:

Determine XRF results for the original and retest XRF readings. Do not correct the original or retest results for substrate bias. In single-family and multi-family housing, a result is defined as a single reading. Therefore, there will be ten original and ten retest XRF results for each house or for the two selected units.

Calculate the average of the original XRF result and the retest XRF result for each testing combination.

Square the average for each testing combination.

Add the ten squared averages together. Call this quantity C.

Multiply the number C by 0.0072. Call this quantity D.

Add the number 0.032 to D. Call this quantity E.

Take the square root of E. Call this quantity F.

Multiply F by 1.645. The result is the Retest Tolerance Limit.

Compute the average of all ten original XRF readings.

Compute the average of all ten re-test XRF readings.

Find the absolute difference of the two averages.

If the difference is less than the Retest Tolerance Limit, the inspection has passed the retest. If the difference of the overall averages equals or exceeds the Retest Tolerance Limit, this procedure should be repeated with ten new testing combinations. If the difference of the overall averages is equal to or greater than the Retest Tolerance Limit a second time, then the inspection should be considered deficient.

Use of this procedure is estimated to produce a spurious result approximately 1% of the time. That is, results of this procedure will call for further examination when no examination is warranted in approximately 1 out of 100 dwelling units tested.

TESTING TIMES:

In the Action Level paint test mode, the instrument takes the longest time to complete readings close to the Federal standard of 1.0 mg/cm². The table below shows the mean and standard deviation of actual reading times by reading level for paint samples during the November 2015 archive testing. The tested instruments reported readings to one decimal place. No significant differences in reading times by substrate were observed. These times apply only to instruments with the same source strength as those tested (2.0 mCi). Instruments with stronger sources will have shorter reading times and those with weaker sources, longer reading times, than those in the table.

Mean and Standard Deviation of Reading Times in Action Level Mode by Reading Level		
Reading (mg/cm ²)	Mean Reading Time (seconds)	Standard Deviation (seconds)
< 0.7	3.48	0.47
0.7	7.29	1.92
0.8	13.95	1.78
0.9 – 1.2	15.25	0.66
1.3 – 1.4	6.08	2.50
≥ 1.5	3.32	0.05

CLASSIFICATION OF RESULTS:

XRF results are classified as **positive** if they are **greater than or equal** to the stated threshold for the instrument (1.0 mg/cm²), and *negative* if they are *less than* the threshold.

DOCUMENTATION:

A report titled *Methodology for XRF Performance Characteristic Sheets* (EPA 747-R-95-008) provides an explanation of the statistical methodology used to construct the data in the sheets, and provides empirical results from using the recommended inconclusive ranges or thresholds for specific XRF instruments. The report may be downloaded at <http://www2.epa.gov/lead/methodology-xrf-performance-characteristic-sheets-epa-747-r-95-008-september-1997>.

This XRF Performance Characteristic Sheet (PCS) was developed by QuanTech, Inc., under a contract with the XRF manufacturer.

ATTACHMENT D

PCB Bulk Sampling Laboratory Results



Analysis Report

Schneider Laboratories Global, Inc

2512 W. Cary Street • Richmond, Virginia • 23220-5117
804-353-6778 • 800-785-LABS (5227) • Fax 804-359-1475

Customer: Asbestos & Environmental Consulting Corp. (4307)
Address: 6308 Fly Road
East Syracuse, NY 13057

Order #: 382641

Matrix Bulk
Received 08/24/20
Reported 08/25/20

Attn:

Project: Pine Bush High School
Location: 156 NY-302 Pine Bush, NY 12566
Number: 20-146

PO Number:

Sample ID	Cust. Sample ID	Location	Result	RL*	Units	Analysis Date	Analyst
Parameter		Method					
382641-001	CLK-001P	Main Entrance-Window					
Semi-volatile Organic Compounds							
Aroclor - 1016		SW846 8082A	<733	733	µg/kg	08/24/20	THN
Aroclor - 1221		SW846 8082A	<733	733	µg/kg	08/24/20	THN
Aroclor - 1232		SW846 8082A	<733	733	µg/kg	08/24/20	THN
Aroclor - 1242		SW846 8082A	<733	733	µg/kg	08/24/20	THN
Aroclor - 1248		SW846 8082A	<733	733	µg/kg	08/24/20	THN
Aroclor - 1254		SW846 8082A	<733	733	µg/kg	08/24/20	THN
Aroclor - 1260		SW846 8082A	<733	733	µg/kg	08/24/20	THN
Aroclor - 1262		SW846 8082A	<733	733	µg/kg	08/24/20	THN
Aroclor - 1268		SW846 8082A	<733	733	µg/kg	08/24/20	THN
PCB - Surrogate Recoveries							
DCB		MI					
TCMX		106%					
382641-002	CLK-004P	Courtyard C-Window					
Semi-volatile Organic Compounds							
Aroclor - 1016		SW846 8082A	<483	483	µg/kg	08/24/20	THN
Aroclor - 1221		SW846 8082A	<483	483	µg/kg	08/24/20	THN
Aroclor - 1232		SW846 8082A	<483	483	µg/kg	08/24/20	THN
Aroclor - 1242		SW846 8082A	<483	483	µg/kg	08/24/20	THN
Aroclor - 1248		SW846 8082A	<483	483	µg/kg	08/24/20	THN
Aroclor - 1254		SW846 8082A	<483	483	µg/kg	08/24/20	THN
Aroclor - 1260		SW846 8082A	<483	483	µg/kg	08/24/20	THN
Aroclor - 1262		SW846 8082A	<483	483	µg/kg	08/24/20	THN
Aroclor - 1268		SW846 8082A	<483	483	µg/kg	08/24/20	THN
PCB - Surrogate Recoveries							
DCB		MI					
TCMX		70%					

All internal QC parameters were met. Unusual sample conditions, if any, are described. Surrogate Spike results designated with "D" indicate that the analyte was diluted out. "MI" indicates matrix interference. Concentration and *Reporting Limit (RL) based on areas provided by client. Values are reported to three significant figures. Solid PPM = mg/kg | PPB = µg/kg and Water PPM = mg/L | PPB = µg/L. The test results reported relate only to the samples submitted.



Analysis Report

Schneider Laboratories Global, Inc

2512 W. Cary Street • Richmond, Virginia • 23220-5117
804-353-6778 • 800-785-LABS (5227) • Fax 804-359-1475

Customer: Asbestos & Environmental Consulting Corp. (4307)
Address: 6308 Fly Road
East Syracuse, NY 13057

Order #: 382641

Matrix Bulk
Received 08/24/20
Reported 08/25/20

Attn:

Project: Pine Bush High School
Location: 156 NY-302 Pine Bush, NY 12566
Number: 20-146

PO Number:

Sample ID	Cust. Sample ID	Location	Result	RL*	Units	Analysis Date	Analyst
Parameter		Method					
382641-003	CLK-005P	Classroom 158-Window					
Semi-volatile Organic Compounds							
Aroclor - 1016		SW846 8082A	<1180	1180	µg/kg	08/24/20	THN
Aroclor - 1221		SW846 8082A	<1180	1180	µg/kg	08/24/20	THN
Aroclor - 1232		SW846 8082A	<1180	1180	µg/kg	08/24/20	THN
Aroclor - 1242		SW846 8082A	<1180	1180	µg/kg	08/24/20	THN
Aroclor - 1248		SW846 8082A	<1180	1180	µg/kg	08/24/20	THN
Aroclor - 1254		SW846 8082A	<1180	1180	µg/kg	08/24/20	THN
Aroclor - 1260		SW846 8082A	<1180	1180	µg/kg	08/24/20	THN
Aroclor - 1262		SW846 8082A	<1180	1180	µg/kg	08/24/20	THN
Aroclor - 1268		SW846 8082A	<1180	1180	µg/kg	08/24/20	THN
PCB - Surrogate Recoveries							
DCB		50%					
TCMX		MI					
382641-004	CLK-012P	Classroom 104					
Semi-volatile Organic Compounds							
Aroclor - 1016		SW846 8082A	<1230	1230	µg/kg	08/24/20	THN
Aroclor - 1221		SW846 8082A	<1230	1230	µg/kg	08/24/20	THN
Aroclor - 1232		SW846 8082A	<1230	1230	µg/kg	08/24/20	THN
Aroclor - 1242		SW846 8082A	<1230	1230	µg/kg	08/24/20	THN
Aroclor - 1248		SW846 8082A	<1230	1230	µg/kg	08/24/20	THN
Aroclor - 1254		SW846 8082A	<1230	1230	µg/kg	08/24/20	THN
Aroclor - 1260		SW846 8082A	<1230	1230	µg/kg	08/24/20	THN
Aroclor - 1262		SW846 8082A	<1230	1230	µg/kg	08/24/20	THN
Aroclor - 1268		SW846 8082A	<1230	1230	µg/kg	08/24/20	THN
PCB - Surrogate Recoveries							
DCB		MI					
TCMX		87%					

All internal QC parameters were met. Unusual sample conditions, if any, are described. Surrogate Spike results designated with "D" indicate that the analyte was diluted out. "MI" indicates matrix interference. Concentration and *Reporting Limit (RL) based on areas provided by client. Values are reported to three significant figures. Solid PPM = mg/kg | PPB = µg/kg and Water PPM = mg/L | PPB = µg/L. The test results reported relate only to the samples submitted.



Analysis Report

Schneider Laboratories Global, Inc

2512 W. Cary Street • Richmond, Virginia • 23220-5117
804-353-6778 • 800-785-LABS (5227) • Fax 804-359-1475

Customer: Asbestos & Environmental Consulting Corp. (4307)
Address: 6308 Fly Road
East Syracuse, NY 13057

Order #: 382641

Matrix Bulk
Received 08/24/20
Reported 08/25/20

Attn:

Project: Pine Bush High School
Location: 156 NY-302 Pine Bush, NY 12566
Number: 20-146

PO Number:

Sample ID	Cust. Sample ID	Location	Result	RL*	Units	Analysis Date	Analyst
Parameter		Method					
382641-005	CLK-017P	Gym Doors					
Semi-volatile Organic Compounds							
Aroclor - 1016		SW846 8082A	<1140	1130	µg/kg	08/24/20	THN
Aroclor - 1221		SW846 8082A	<1140	1130	µg/kg	08/24/20	THN
Aroclor - 1232		SW846 8082A	<1140	1130	µg/kg	08/24/20	THN
Aroclor - 1242		SW846 8082A	<1140	1130	µg/kg	08/24/20	THN
Aroclor - 1248		SW846 8082A	<1140	1130	µg/kg	08/24/20	THN
Aroclor - 1254		SW846 8082A	<1140	1130	µg/kg	08/24/20	THN
Aroclor - 1260		SW846 8082A	<1140	1130	µg/kg	08/24/20	THN
Aroclor - 1262		SW846 8082A	<1140	1130	µg/kg	08/24/20	THN
Aroclor - 1268		SW846 8082A	<1140	1130	µg/kg	08/24/20	THN
PCB - Surrogate Recoveries							
DCB		121%					
TCMX		MI					
382641-006	CLK-043P	Courtyard A-Window					
Semi-volatile Organic Compounds							
Aroclor - 1016		SW846 8082A	<648	648	µg/kg	08/24/20	THN
Aroclor - 1221		SW846 8082A	<648	648	µg/kg	08/24/20	THN
Aroclor - 1232		SW846 8082A	<648	648	µg/kg	08/24/20	THN
Aroclor - 1242		SW846 8082A	<648	648	µg/kg	08/24/20	THN
Aroclor - 1248		SW846 8082A	<648	648	µg/kg	08/24/20	THN
Aroclor - 1254		SW846 8082A	<648	648	µg/kg	08/24/20	THN
Aroclor - 1260		SW846 8082A	<648	648	µg/kg	08/24/20	THN
Aroclor - 1262		SW846 8082A	<648	648	µg/kg	08/24/20	THN
Aroclor - 1268		SW846 8082A	<648	648	µg/kg	08/24/20	THN
PCB - Surrogate Recoveries							
DCB		116%					
TCMX		77%					

All internal QC parameters were met. Unusual sample conditions, if any, are described. Surrogate Spike results designated with "D" indicate that the analyte was diluted out. "MI" indicates matrix interference. Concentration and *Reporting Limit (RL) based on areas provided by client. Values are reported to three significant figures. Solid PPM = mg/kg | PPB = µg/kg and Water PPM = mg/L | PPB = µg/L. The test results reported relate only to the samples submitted.



Analysis Report

Schneider Laboratories Global, Inc

2512 W. Cary Street • Richmond, Virginia • 23220-5117
804-353-6778 • 800-785-LABS (5227) • Fax 804-359-1475

Customer: Asbestos & Environmental Consulting Corp. (4307)
Address: 6308 Fly Road
East Syracuse, NY 13057

Order #: 382641

Matrix Bulk
Received 08/24/20
Reported 08/25/20

Attn:

Project: Pine Bush High School
Location: 156 NY-302 Pine Bush, NY 12566
Number: 20-146

PO Number:

Sample ID	Cust. Sample ID	Location	Result	RL*	Units	Analysis Date	Analyst
Parameter		Method					
382641-08/25/20 05:02 PM							

Reviewed By: **Jennifer Lee**
Manager

State Certifications

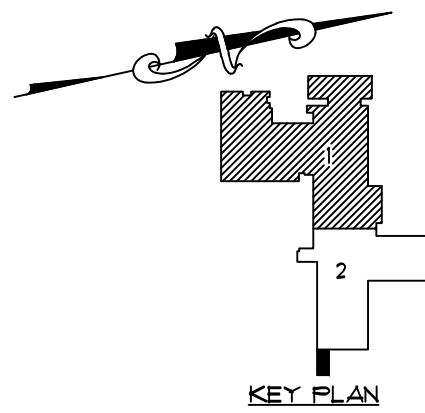
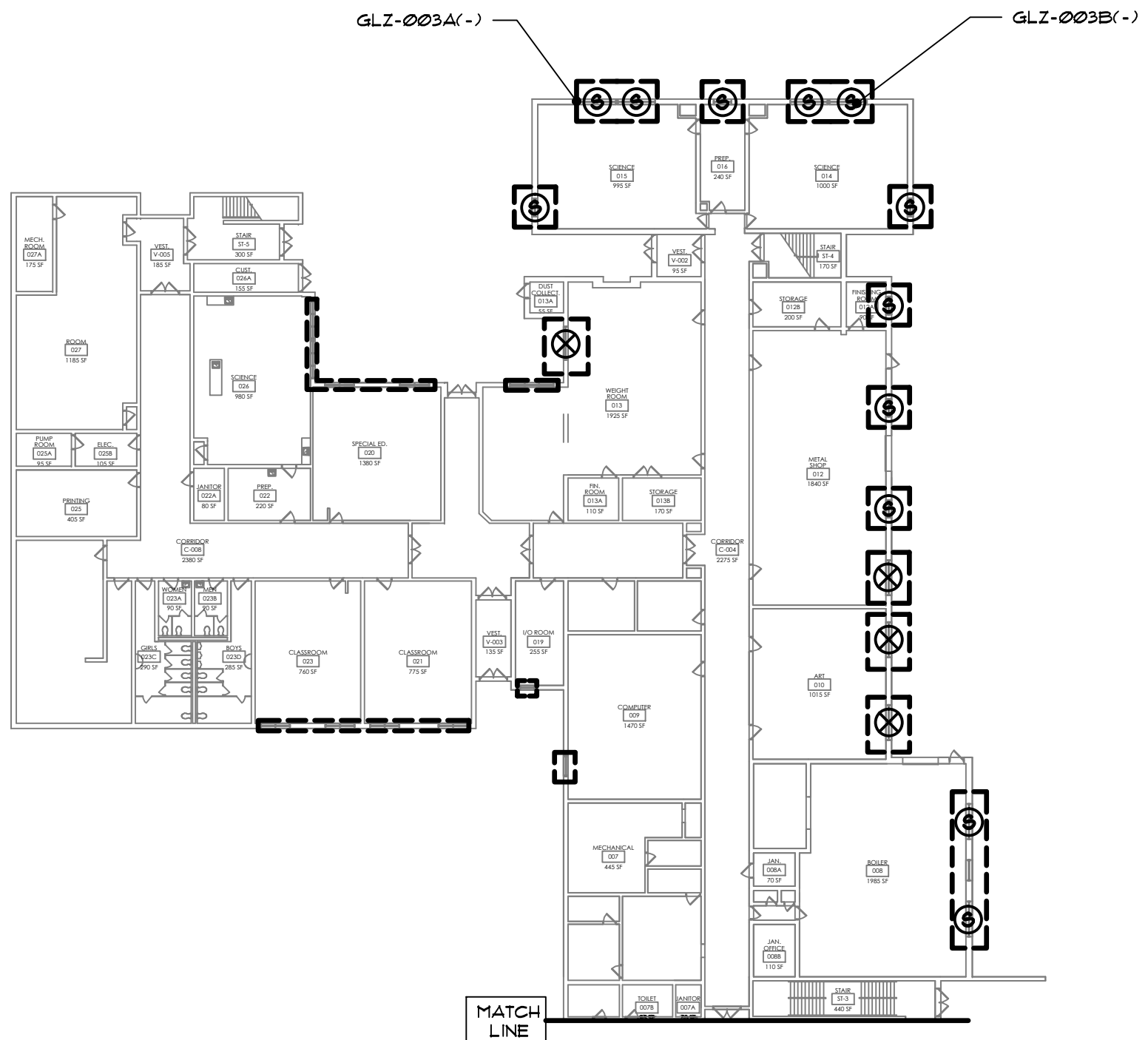
Method	Parameter	New York	Virginia
SW846 8082A	Aroclor - 1016	ELAP Certified	VELAP Certified
SW846 8082A	Aroclor - 1221	ELAP Certified	VELAP Certified
SW846 8082A	Aroclor - 1232	ELAP Certified	VELAP Certified
SW846 8082A	Aroclor - 1242	ELAP Certified	VELAP Certified
SW846 8082A	Aroclor - 1248	ELAP Certified	VELAP Certified
SW846 8082A	Aroclor - 1254	ELAP Certified	VELAP Certified
SW846 8082A	Aroclor - 1260	ELAP Certified	VELAP Certified
SW846 8082A	Aroclor - 1262	ELAP Certified	VELAP Certified
SW846 8082A	Aroclor - 1268	ELAP Certified	VELAP Certified

State	Certificate Number
New York	ELAP 61372
Virginia	VELAP 10779

All internal QC parameters were met. Unusual sample conditions, if any, are described. Surrogate Spike results designated with "D" indicate that the analyte was diluted out. "MI" indicates matrix interference. Concentration and *Reporting Limit (RL) based on areas provided by client. Values are reported to three significant figures. Solid PPM = mg/kg | PPB = µg/kg and Water PPM = mg/L | PPB = µg/L. The test results reported relate only to the samples submitted.

ATTACHMENT E

Figures 1, 2, 3, 4, 5, 6, 7, 8 & 9




LEGEND:

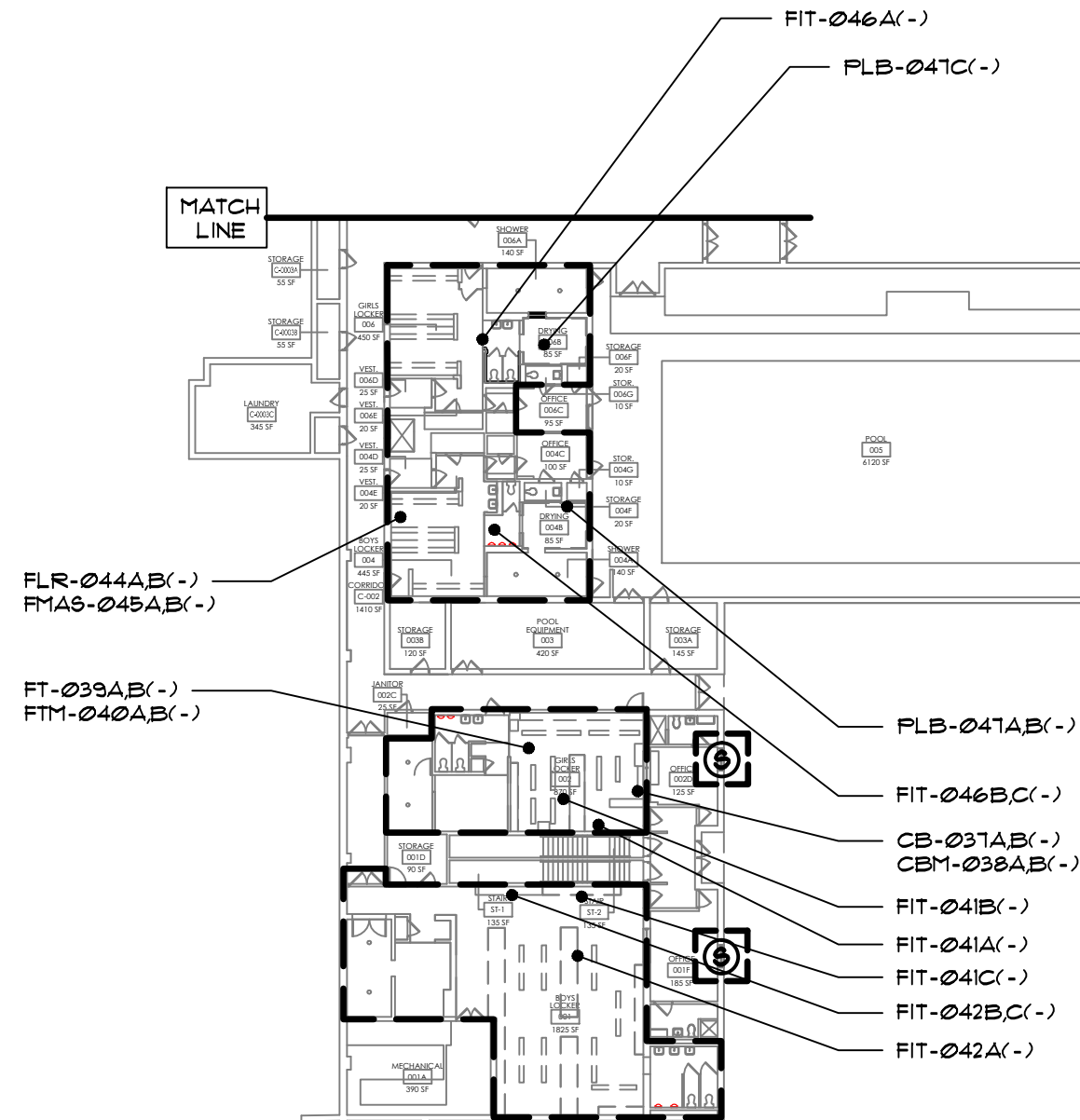
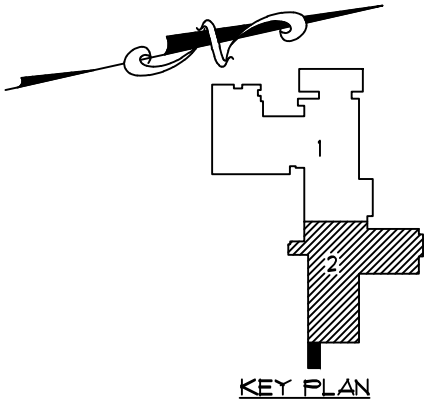
- ⊗ ASBESTOS-CONTAINING RESIDUAL WINDOW CAULK AND WINDOW SILL CAULK
- Ⓢ ASBESTOS-CONTAINING WINDOW SILL CAULK

IMPORTANT SURVEY NOTE:

THIS SURVEY WAS LIMITED IN NATURE. ONLY SPECIFIC BUILDING MATERIALS WITHIN THE DASHED BOUNDARIES WERE INVESTIGATED/SAMPLED, AS PER THE DIRECTION OF THE PROJECT ARCHITECT. ANY BUILDING MATERIALS NOT SPECIFICALLY SAMPLED WITHIN THE DASHED BOUNDARIES AND ALL BUILDING MATERIALS LOCATED OUTSIDE THE DASHED BOUNDARIES SHALL NEED TO BE TREATED AS POTENTIALLY HAZARDOUS MATERIALS, UNTIL EXAMINED BY AN ENVIRONMENTAL CONSULTANT AND LABORATORY RESULTS PROVE OTHERWISE.

THE INFORMATION INCLUDED ON THIS GRAPHIC REPRESENTATION HAS BEEN COMPILED FROM A VARIETY OF SOURCES AND IS SUBJECT TO CHANGE WITHOUT NOTICE. AECC MAKES NO REPRESENTATIONS OR WARRANTIES, EXPRESS OR IMPLIED, AS TO ACCURACY, COMPLETENESS, TIMELINESS, OR RIGHTS TO THE USE OF SUCH INFORMATION. THIS DOCUMENT IS NOT INTENDED FOR USE AS A LAND SURVEY PRODUCT NOR IS IT DESIGNED OR INTENDED AS A CONSTRUCTION DESIGN DOCUMENT. THE USE OR MISUSE OF THE INFORMATION CONTAINED ON THIS GRAPHIC REPRESENTATION IS AT THE SOLE RISK OF THE PARTY USING OR MISUSING THE INFORMATION.

<div><p>Asbestos & Environmental Consulting Corporation</p><p>6308 Fly Road East Syracuse, NY 13057</p></div>	PROJECT NO. 20-146	Pine Bush High School 156 New York State Route 302 Pine Bush, New York 12566 Partial Basement Floor Plan	FIGURE 1
	DRAWN: SEPT. 2020		
	DRAWN BY: NP	Limited Hazardous Material Pre-Renovation Survey	
	CHECKED BY: BB		




LEGEND:

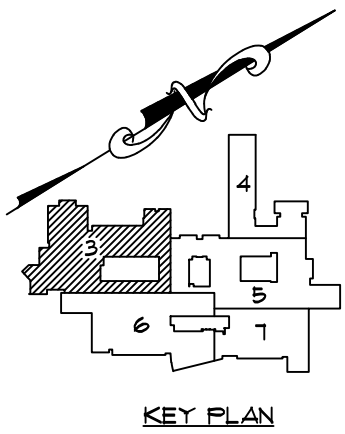
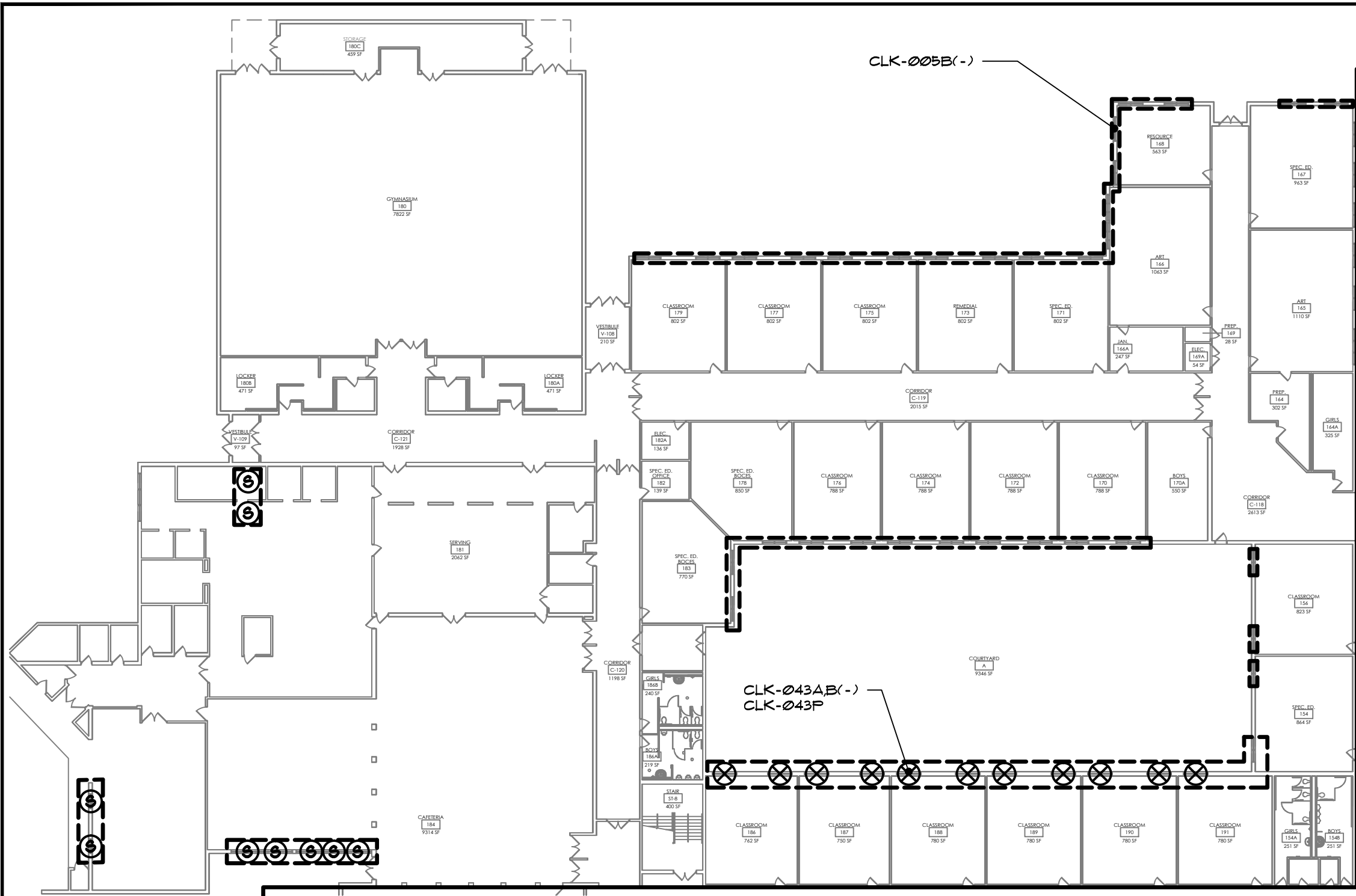
⑤ ASBESTOS-CONTAINING WINDOW SILL CAULK

IMPORTANT SURVEY NOTE:

THIS SURVEY WAS LIMITED IN NATURE. ONLY SPECIFIC BUILDING MATERIALS WITHIN THE DASHED BOUNDARIES WERE INVESTIGATED/SAMPLED, AS PER THE DIRECTION OF THE PROJECT ARCHITECT. ANY BUILDING MATERIALS NOT SPECIFICALLY SAMPLED WITHIN THE DASHED BOUNDARIES AND ALL BUILDING MATERIALS LOCATED OUTSIDE THE DASHED BOUNDARIES SHALL NEED TO BE TREATED AS POTENTIALLY HAZARDOUS MATERIALS, UNTIL EXAMINED BY AN ENVIRONMENTAL CONSULTANT AND LABORATORY RESULTS PROVE OTHERWISE.

THE INFORMATION INCLUDED ON THIS GRAPHIC REPRESENTATION HAS BEEN COMPILED FROM A VARIETY OF SOURCES AND IS SUBJECT TO CHANGE WITHOUT NOTICE. AECC MAKES NO REPRESENTATIONS OR WARRANTIES, EXPRESS OR IMPLIED, AS TO ACCURACY, COMPLETENESS, TIMELINESS, OR RIGHTS TO THE USE OF SUCH INFORMATION. THIS DOCUMENT IS NOT INTENDED FOR USE AS A LAND SURVEY PRODUCT NOR IS IT DESIGNED OR INTENDED AS A CONSTRUCTION DESIGN DOCUMENT. THE USE OR MISUSE OF THE INFORMATION CONTAINED ON THIS GRAPHIC REPRESENTATION IS AT THE SOLE RISK OF THE PARTY USING OR MISUSING THE INFORMATION.

<div> Asbestos & Environmental Consulting Corporation 6308 Fly Road East Syracuse, NY 13057</div>	PROJECT NO. 20-146	Pine Bush High School 156 New York State Route 302 Pine Bush, New York 12566 Partial Basement Floor Plan	FIGURE 2
	DRAWN: SEPT. 2020		
	DRAWN BY: NP	Limited Hazardous Material Pre-Renovation Survey	
	CHECKED BY: BB		




LEGEND:

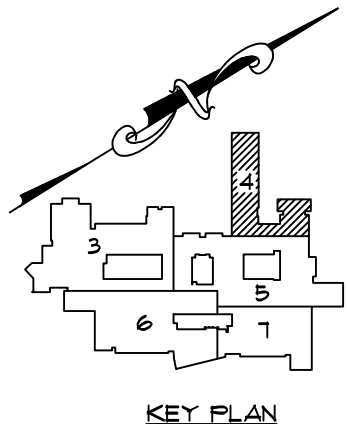
- ⊗ ASBESTOS-CONTAINING RESIDUAL WINDOW CAULK AND WINDOW SILL CAULK
- Ⓢ ASBESTOS-CONTAINING WINDOW SILL CAULK

IMPORTANT SURVEY NOTE:

THIS SURVEY WAS LIMITED IN NATURE. ONLY SPECIFIC BUILDING MATERIALS WITHIN THE DASHED BOUNDARIES WERE INVESTIGATED/SAMPLED, AS PER THE DIRECTION OF THE PROJECT ARCHITECT. ANY BUILDING MATERIALS NOT SPECIFICALLY SAMPLED WITHIN THE DASHED BOUNDARIES AND ALL BUILDING MATERIALS LOCATED OUTSIDE THE DASHED BOUNDARIES SHALL NEED TO BE TREATED AS POTENTIALLY HAZARDOUS MATERIALS, UNTIL EXAMINED BY AN ENVIRONMENTAL CONSULTANT AND LABORATORY RESULTS PROVE OTHERWISE.

THE INFORMATION INCLUDED ON THIS GRAPHIC REPRESENTATION HAS BEEN COMPILED FROM A VARIETY OF SOURCES AND IS SUBJECT TO CHANGE WITHOUT NOTICE. AECC MAKES NO REPRESENTATIONS OR WARRANTIES, EXPRESS OR IMPLIED, AS TO ACCURACY, COMPLETENESS, TIMELINESS, OR RIGHTS TO THE USE OF SUCH INFORMATION. THIS DOCUMENT IS NOT INTENDED FOR USE AS A LAND SURVEY PRODUCT NOR IS IT DESIGNED OR INTENDED AS A CONSTRUCTION DESIGN DOCUMENT. THE USE OR MISUSE OF THE INFORMATION CONTAINED ON THIS GRAPHIC REPRESENTATION IS AT THE SOLE RISK OF THE PARTY USING OR MISUSING THE INFORMATION.

 Asbestos & Environmental Consulting Corporation 6308 Fly Road East Syracuse, NY 13057	PROJECT NO.	20-146	Pine Bush High School 156 New York State Route 302 Pine Bush, New York 12566 Partial First Floor Plan	FIGURE
	DRAWN:	SEPT. 2020		
	DRAWN BY:	NP	Limited Hazardous Material Pre-Renovation Survey	3
	CHECKED BY:	BB		



CLK-001B(-)

CLK-005A(-)

MATCH
LINE

LEGEND:

- ⊗ ASBESTOS-CONTAINING RESIDUAL WINDOW CAULK AND WINDOW SILL CAULK
- Ⓢ ASBESTOS-CONTAINING WINDOW SILL CAULK

IMPORTANT SURVEY NOTE:

THIS SURVEY WAS LIMITED IN NATURE. ONLY SPECIFIC BUILDING MATERIALS WITHIN THE DASHED BOUNDARIES WERE INVESTIGATED/SAMPLED, AS PER THE DIRECTION OF THE PROJECT ARCHITECT. ANY BUILDING MATERIALS NOT SPECIFICALLY SAMPLED WITHIN THE DASHED BOUNDARIES AND ALL BUILDING MATERIALS LOCATED OUTSIDE THE DASHED BOUNDARIES SHALL NEED TO BE TREATED AS POTENTIALLY HAZARDOUS MATERIALS, UNTIL EXAMINED BY AN ENVIRONMENTAL CONSULTANT AND LABORATORY RESULTS PROVE OTHERWISE.

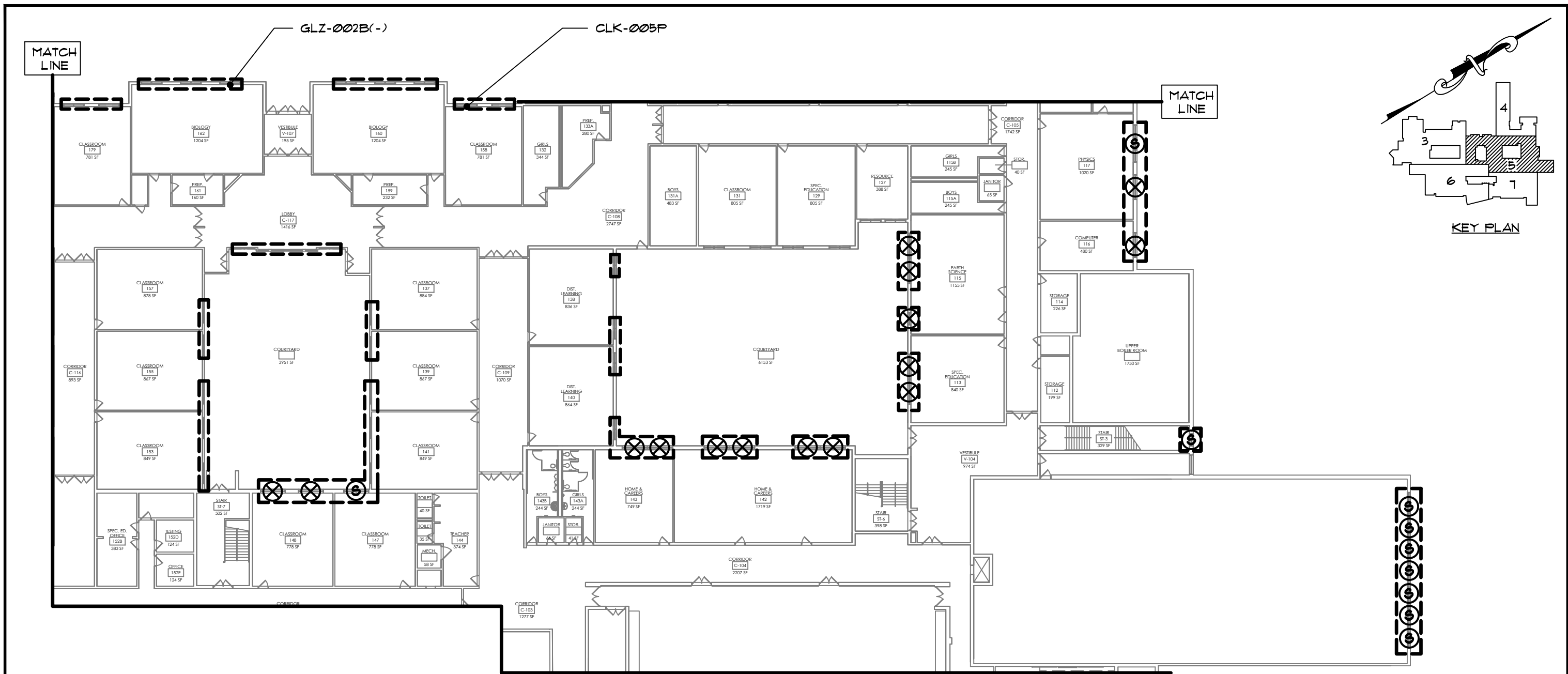
THE INFORMATION INCLUDED ON THIS GRAPHIC REPRESENTATION HAS BEEN COMPILED FROM A VARIETY OF SOURCES AND IS SUBJECT TO CHANGE WITHOUT NOTICE. AECC MAKES NO REPRESENTATIONS OR WARRANTIES, EXPRESS OR IMPLIED, AS TO ACCURACY, COMPLETENESS, TIMELINESS, OR RIGHTS TO THE USE OF SUCH INFORMATION. THIS DOCUMENT IS NOT INTENDED FOR USE AS A LAND SURVEY PRODUCT NOR IS IT DESIGNED OR INTENDED AS A CONSTRUCTION DESIGN DOCUMENT. THE USE OR MISUSE OF THE INFORMATION CONTAINED ON THIS GRAPHIC REPRESENTATION IS AT THE SOLE RISK OF THE PARTY USING OR MISUSING THE INFORMATION.

AECC
ENVIRONMENTAL CONSULTING
Asbestos & Environmental
Consulting Corporation
6308 Fly Road
East Syracuse, NY 13057

PROJECT NO. 20-146
DRAWN: SEPT. 2020
DRAWN BY: NP
CHECKED BY: BB

Pine Bush High School
156 New York State Route 302
Pine Bush, New York 12566
Partial First Floor Plan
Limited Hazardous Material Pre-Renovation Survey

FIGURE
4



THE INFORMATION INCLUDED ON THIS GRAPHIC REPRESENTATION HAS BEEN COMPILED FROM A VARIETY OF SOURCES AND IS SUBJECT TO CHANGE WITHOUT NOTICE. AECC MAKES NO REPRESENTATIONS OR WARRANTIES, EXPRESS OR IMPLIED, AS TO ACCURACY, COMPLETENESS, TIMELINESS, OR RIGHTS TO THE USE OF SUCH INFORMATION. THIS DOCUMENT IS NOT INTENDED FOR USE AS A LAND SURVEY PRODUCT NOR IS IT DESIGNED OR INTENDED AS A CONSTRUCTION DESIGN DOCUMENT. THE USE OR MISUSE OF THE INFORMATION CONTAINED ON THIS GRAPHIC REPRESENTATION IS AT THE SOLE RISK OF THE PARTY USING OR MISUSING THE INFORMATION.

IMPORTANT SURVEY NOTE:

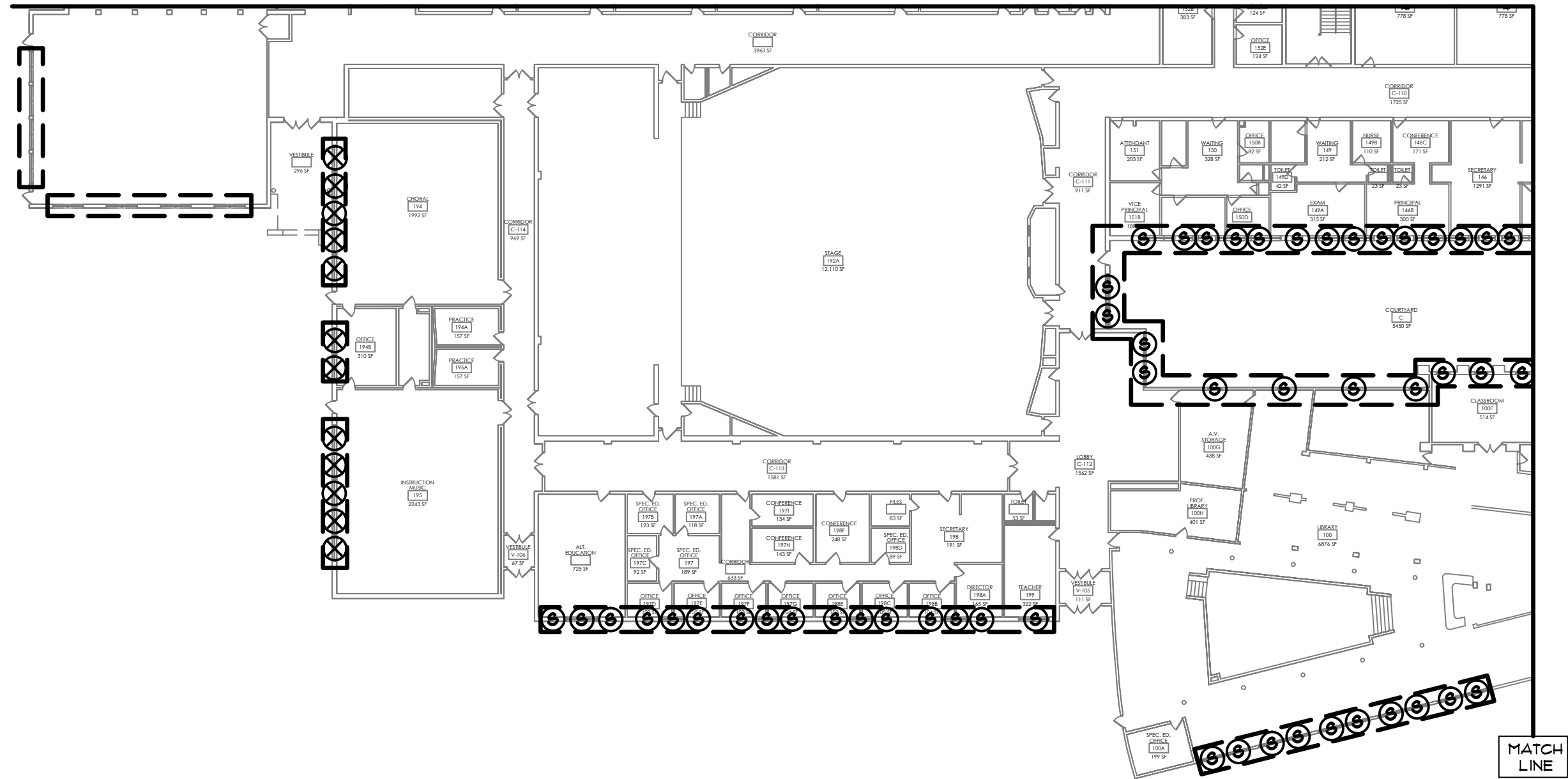
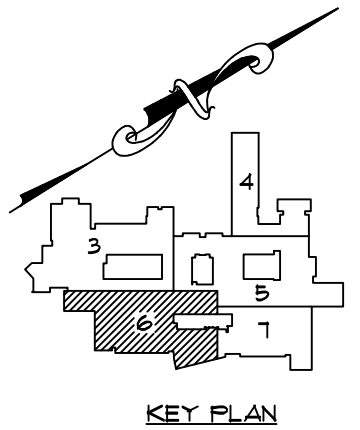
THIS SURVEY WAS LIMITED IN NATURE. ONLY SPECIFIC BUILDING MATERIALS WITHIN THE DASHED BOUNDARIES WERE INVESTIGATED/SAMPLED, AS PER THE DIRECTION OF THE PROJECT ARCHITECT. ANY BUILDING MATERIALS NOT SPECIFICALLY SAMPLED WITHIN THE DASHED BOUNDARIES AND ALL BUILDING MATERIALS LOCATED OUTSIDE THE DASHED BOUNDARIES SHALL NEED TO BE TREATED AS POTENTIALLY HAZARDOUS MATERIALS, UNTIL EXAMINED BY AN ENVIRONMENTAL CONSULTANT AND LABORATORY RESULTS PROVE OTHERWISE.

<p>Asbestos & Environmental Consulting Corporation</p> <p>6308 Fly Road East Syracuse, NY 13057</p>	PROJECT NO. 20-146	Pine Bush High School 156 New York State Route 302 Pine Bush, New York 12566 Partial First Floor Plan	FIGURE 5
	DRAWN: SEPT. 2020		
	DRAWN BY: NP	Limited Hazardous Material Pre-Renovation Survey	
	CHECKED BY: BB		

LEGEND:

⊗ ASBESTOS-CONTAINING RESIDUAL WINDOW CAULK AND WINDOW SILL CAULK

Ⓢ ASBESTOS-CONTAINING WINDOW SILL CAULK




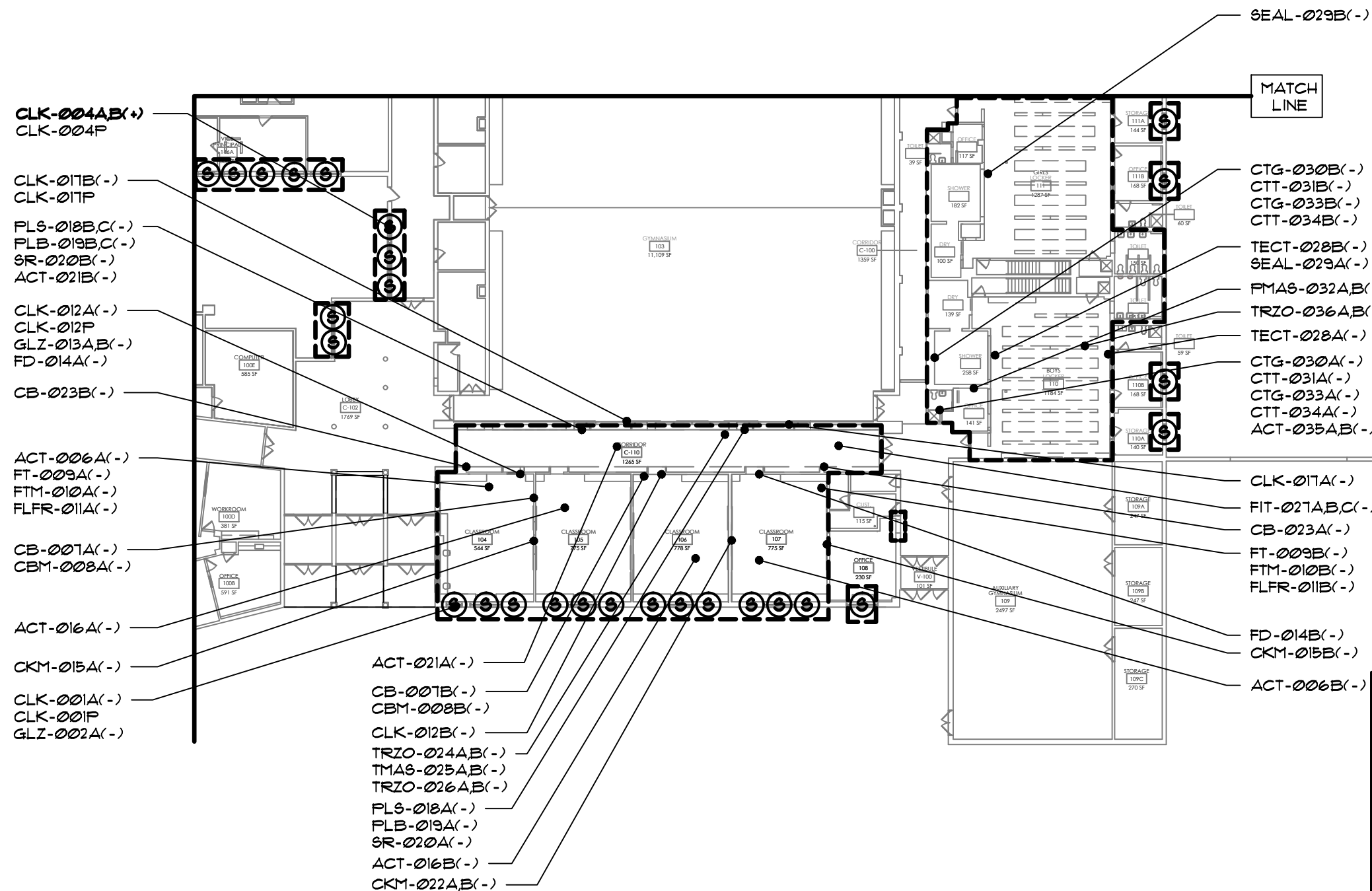
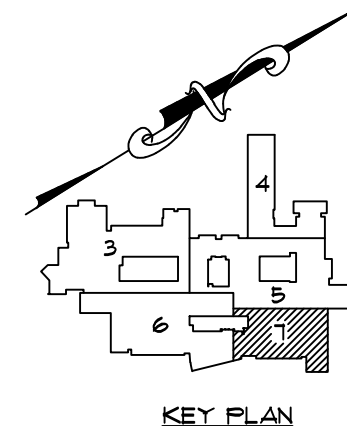
IMPORTANT SURVEY NOTE:

THIS SURVEY WAS LIMITED IN NATURE. ONLY SPECIFIC BUILDING MATERIALS WITHIN THE DASHED BOUNDARIES WERE INVESTIGATED/SAMPLED, AS PER THE DIRECTION OF THE PROJECT ARCHITECT. ANY BUILDING MATERIALS NOT SPECIFICALLY SAMPLED WITHIN THE DASHED BOUNDARIES AND ALL BUILDING MATERIALS LOCATED OUTSIDE THE DASHED BOUNDARIES SHALL NEED TO BE TREATED AS POTENTIALLY HAZARDOUS MATERIALS, UNTIL EXAMINED BY AN ENVIRONMENTAL CONSULTANT AND LABORATORY RESULTS PROVE OTHERWISE.

LEGEND:	
⊗	ASBESTOS-CONTAINING RESIDUAL WINDOW CAULK AND WINDOW SILL CAULK
Ⓢ	ASBESTOS-CONTAINING WINDOW SILL CAULK

THE INFORMATION INCLUDED ON THIS GRAPHIC REPRESENTATION HAS BEEN COMPILED FROM A VARIETY OF SOURCES AND IS SUBJECT TO CHANGE WITHOUT NOTICE. AECC MAKES NO REPRESENTATIONS OR WARRANTIES, EXPRESS OR IMPLIED, AS TO ACCURACY, COMPLETENESS, TIMELINESS, OR RIGHTS TO THE USE OF SUCH INFORMATION. THIS DOCUMENT IS NOT INTENDED FOR USE AS A LAND SURVEY PRODUCT NOR IS IT DESIGNED OR INTENDED AS A CONSTRUCTION DESIGN DOCUMENT. THE USE OR MISUSE OF THE INFORMATION CONTAINED ON THIS GRAPHIC REPRESENTATION IS AT THE SOLE RISK OF THE PARTY USING OR MISUSING THE INFORMATION.

<div><p>Asbestos & Environmental Consulting Corporation</p><p>6308 Fly Road East Syracuse, NY 13057</p></div>	PROJECT NO. 20-146	Pine Bush High School 156 New York State Route 302 Pine Bush, New York 12566 Partial First Floor Plan	FIGURE 6
	DRAWN: SEPT. 2020		
	DRAWN BY: NP	Limited Hazardous Material Pre-Renovation Survey	
	CHECKED BY: BB		



LEGEND:



ASBESTOS-CONTAINING WINDOW SILL CAULK

IMPORTANT SURVEY NOTE:

THIS SURVEY WAS LIMITED IN NATURE. ONLY SPECIFIC BUILDING MATERIALS WITHIN THE DASHED BOUNDARIES WERE INVESTIGATED/SAMPLED, AS PER THE DIRECTION OF THE PROJECT ARCHITECT. ANY BUILDING MATERIALS NOT SPECIFICALLY SAMPLED WITHIN THE DASHED BOUNDARIES AND ALL BUILDING MATERIALS LOCATED OUTSIDE THE DASHED BOUNDARIES SHALL NEED TO BE TREATED AS POTENTIALLY HAZARDOUS MATERIALS, UNTIL EXAMINED BY AN ENVIRONMENTAL CONSULTANT AND LABORATORY RESULTS PROVE OTHERWISE.

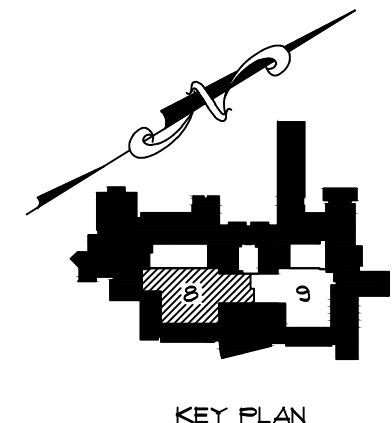
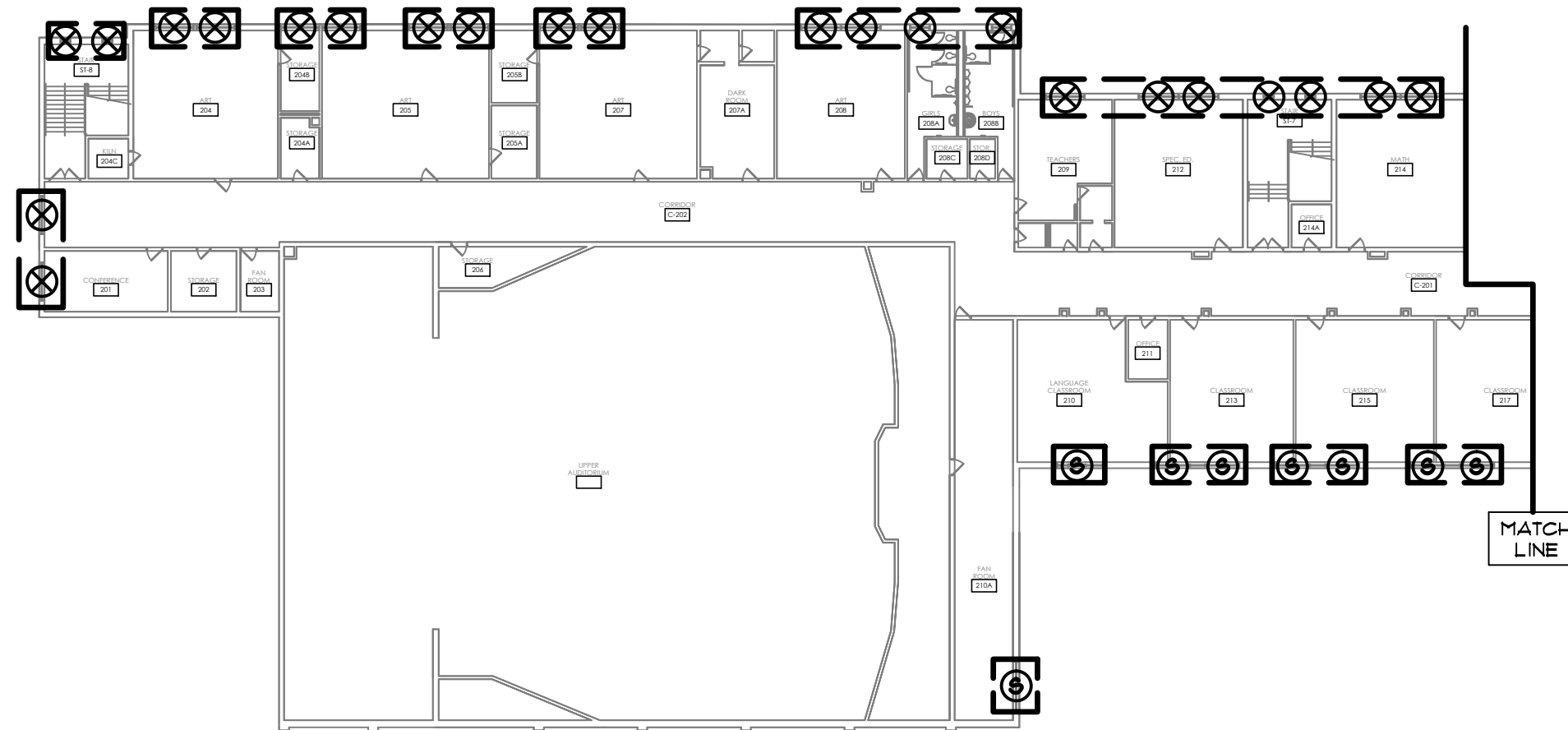
THE INFORMATION INCLUDED ON THIS GRAPHIC REPRESENTATION HAS BEEN COMPILED FROM A VARIETY OF SOURCES AND IS SUBJECT TO CHANGE WITHOUT NOTICE. AECC MAKES NO REPRESENTATIONS OR WARRANTIES, EXPRESS OR IMPLIED, AS TO ACCURACY, COMPLETENESS, TIMELINESS, OR RIGHTS TO THE USE OF SUCH INFORMATION. THIS DOCUMENT IS NOT INTENDED FOR USE AS A LAND SURVEY PRODUCT NOR IS IT DESIGNED OR INTENDED AS A CONSTRUCTION DESIGN DOCUMENT. THE USE OR MISUSE OF THE INFORMATION CONTAINED ON THIS GRAPHIC REPRESENTATION IS AT THE SOLE RISK OF THE PARTY USING OR MISUSING THE INFORMATION.

AECC
ENVIRONMENTAL CONSULTING
Asbestos & Environmental
Consulting Corporation
6308 Fly Road
East Syracuse, NY 13057

PROJECT NO. 20-146
DRAWN: SEPT. 2020
DRAWN BY: NP
CHECKED BY: BB

Pine Bush High School
156 New York State Route 302
Pine Bush, New York 12566
Partial First Floor Plan
Limited Hazardous Material Pre-Renovation Survey

FIGURE
7




LEGEND:

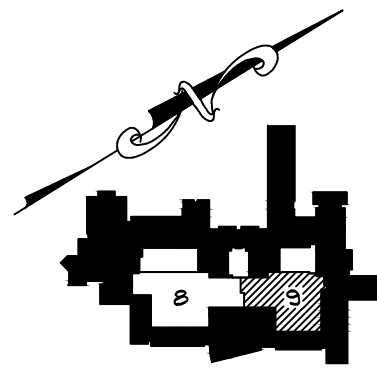
- ⊗ ASBESTOS-CONTAINING RESIDUAL WINDOW CAULK AND WINDOW SILL CAULK
- Ⓢ ASBESTOS-CONTAINING WINDOW SILL CAULK

IMPORTANT SURVEY NOTE:

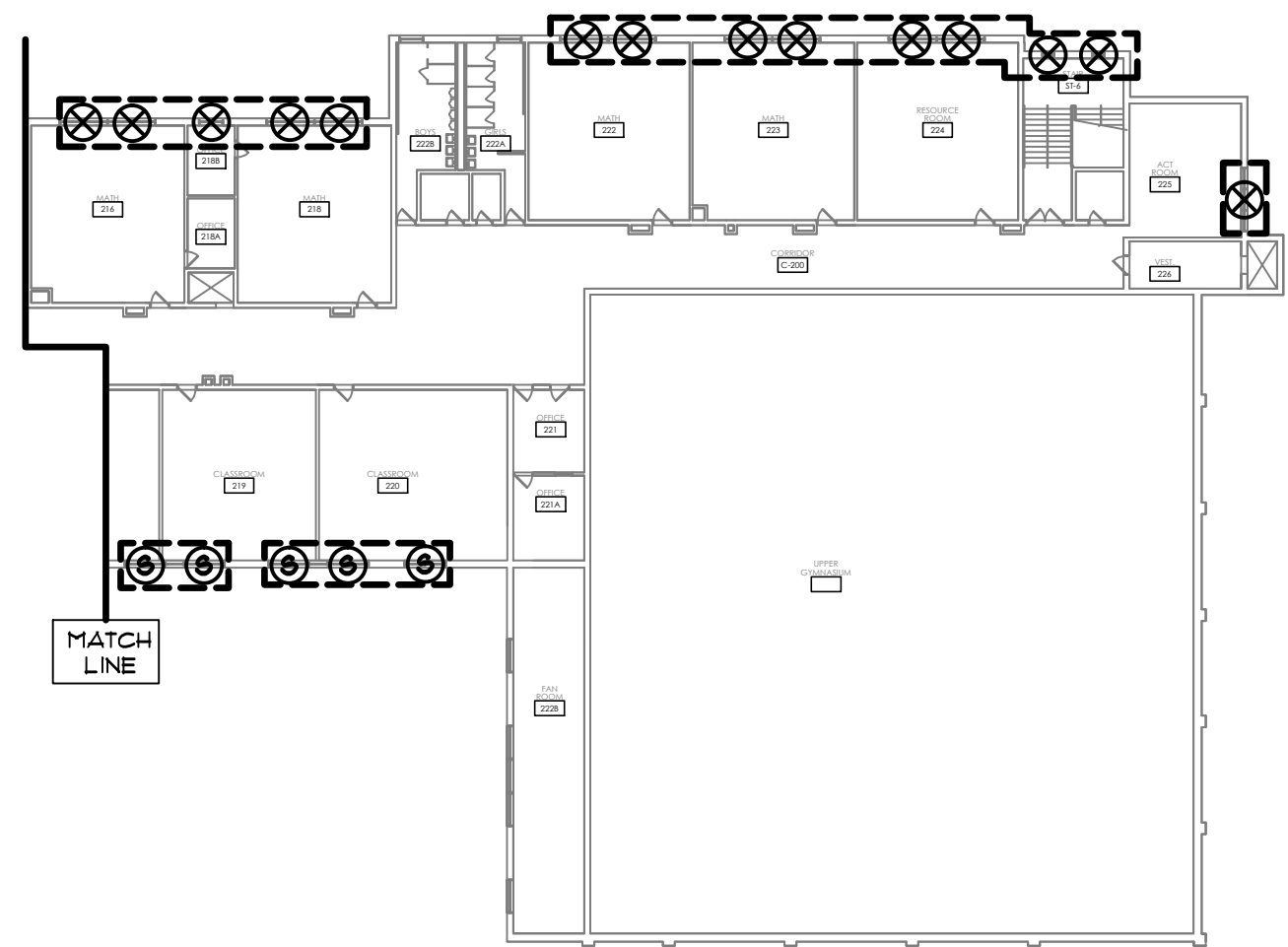
THIS SURVEY WAS LIMITED IN NATURE. ONLY SPECIFIC BUILDING MATERIALS WITHIN THE DASHED BOUNDARIES WERE INVESTIGATED/SAMPLED, AS PER THE DIRECTION OF THE PROJECT ARCHITECT. ANY BUILDING MATERIALS NOT SPECIFICALLY SAMPLED WITHIN THE DASHED BOUNDARIES AND ALL BUILDING MATERIALS LOCATED OUTSIDE THE DASHED BOUNDARIES SHALL NEED TO BE TREATED AS POTENTIALLY HAZARDOUS MATERIALS, UNTIL EXAMINED BY AN ENVIRONMENTAL CONSULTANT AND LABORATORY RESULTS PROVE OTHERWISE.

THE INFORMATION INCLUDED ON THIS GRAPHIC REPRESENTATION HAS BEEN COMPILED FROM A VARIETY OF SOURCES AND IS SUBJECT TO CHANGE WITHOUT NOTICE. AECC MAKES NO REPRESENTATIONS OR WARRANTIES, EXPRESS OR IMPLIED, AS TO ACCURACY, COMPLETENESS, TIMELINESS, OR RIGHTS TO THE USE OF SUCH INFORMATION. THIS DOCUMENT IS NOT INTENDED FOR USE AS A LAND SURVEY PRODUCT NOR IS IT DESIGNED OR INTENDED AS A CONSTRUCTION DESIGN DOCUMENT. THE USE OR MISUSE OF THE INFORMATION CONTAINED ON THIS GRAPHIC REPRESENTATION IS AT THE SOLE RISK OF THE PARTY USING OR MISUSING THE INFORMATION.

 Asbestos & Environmental Consulting Corporation 6308 Fly Road East Syracuse, NY 13057	PROJECT NO.	20-146	Pine Bush High School 156 New York State Route 302 Pine Bush, New York 12566 Partial Second Floor Plan	FIGURE 8
	DRAWN:	SEPT. 2020		
	DRAWN BY:	NP	Limited Hazardous Material Pre-Renovation Survey	
	CHECKED BY:	BB		



KEY PLAN



LEGEND:


⊗ ASBESTOS-CONTAINING RESIDUAL WINDOW CAULK AND WINDOW SILL CAULK

Ⓢ ASBESTOS-CONTAINING WINDOW SILL CAULK

IMPORTANT SURVEY NOTE:

THIS SURVEY WAS LIMITED IN NATURE. ONLY SPECIFIC BUILDING MATERIALS WITHIN THE DASHED BOUNDARIES WERE INVESTIGATED/SAMPLED, AS PER THE DIRECTION OF THE PROJECT ARCHITECT. ANY BUILDING MATERIALS NOT SPECIFICALLY SAMPLED WITHIN THE DASHED BOUNDARIES AND ALL BUILDING MATERIALS LOCATED OUTSIDE THE DASHED BOUNDARIES SHALL NEED TO BE TREATED AS POTENTIALLY HAZARDOUS MATERIALS, UNTIL EXAMINED BY AN ENVIRONMENTAL CONSULTANT AND LABORATORY RESULTS PROVE OTHERWISE.

THE INFORMATION INCLUDED ON THIS GRAPHIC REPRESENTATION HAS BEEN COMPILED FROM A VARIETY OF SOURCES AND IS SUBJECT TO CHANGE WITHOUT NOTICE. AECC MAKES NO REPRESENTATIONS OR WARRANTIES, EXPRESS OR IMPLIED, AS TO ACCURACY, COMPLETENESS, TIMELINESS, OR RIGHTS TO THE USE OF SUCH INFORMATION. THIS DOCUMENT IS NOT INTENDED FOR USE AS A LAND SURVEY PRODUCT NOR IS IT DESIGNED OR INTENDED AS A CONSTRUCTION DESIGN DOCUMENT. THE USE OR MISUSE OF THE INFORMATION CONTAINED ON THIS GRAPHIC REPRESENTATION IS AT THE SOLE RISK OF THE PARTY USING OR MISUSING THE INFORMATION.

<div> Asbestos & Environmental Consulting Corporation 6308 Fly Road East Syracuse, NY 13057</div>	PROJECT NO. 20-146	Pine Bush High School 156 New York State Route 302 Pine Bush, New York 12566 Partial Second Floor Plan	FIGURE 9
	DRAWN: SEPT. 2020		
	DRAWN BY: NP	Limited Hazardous Material Pre-Renovation Survey	
	CHECKED BY: BB		

SECTION 00 3310 – PROJECT FORMS

PART 1 - GENERAL

1.1 SUMMARY

- A. This Section lists the project forms to be used for administration of the project.

1.2 FORMS

- A. The following forms are attached to this Section:
1. GENERAL CONDITIONS SUBMITTAL LOG
 2. REQUEST FOR INFORMATION (RFI)
 3. SUBMITTAL COVER SHEET
 4. SUBCONTRACTOR LIST
 5. SUBSTITUTION REQUEST
 6. AIA FORMS (Forms provided are samples. Original AIA Documents shall be used):
 - a. Contractor's Qualification Statement (AIA Document A305).
 - b. Bid Bond (AIA Document A310).
 - c. Performance / Payment Bond (AIA Document A312).
 - d. Change Order (AIA Document G701).
 - e. Application and Certificate for Payment (AIA Document G702) and Continuation Sheet (AIA Document G703).
 - f. Certification of Substantial Completion (AIA Document G704).
 - g. Contractor's Affidavit of Payment of Debts and Claims (AIA Document G706).
 - h. Contractor's Affidavit of Release of Liens (AIA Document G706A).
 - i. Consent of Surety to Final Payment (AIA Document G707).
 - j. Work Changes Proposal Request (AIA Document G709).
 - k. Architect's Supplemental Instructions (AIA Document G710).
 - l. Construction Change Directive (AIA Document G714).
 - m. Supplemental Attachment for ACORD Certificate of Insurance 25-S (AIA Document G715).

PART 2 - PRODUCTS (Not Used)

PART 3 - EXECUTION

3.1 PROCEDURES

- A. GENERAL CONDITIONS SUBMITTAL LOG: This document is a checklist of the required submissions required. Refer to Division 0, Section entitled "INSTRUCTIONS TO BIDDERS" and Division 1, Section entitled "SUBMITTAL PROCEDURES" for submission procedures.
- B. REQUEST FOR INFORMATION (RFI): This form is to be used for information requests. The forms are filled out by any party to the contract and sent to the Architect/Engineer. The Architect/Engineer shall number RFI before processing.
- C. SUBMITTAL COVER SHEET: This document is to be used for submittal submissions. The forms shall be filled out by each Prime Contractor and sent to the Architect/Engineer in accordance with. Division 1, Section entitled "SUBMITTAL PROCEDURES". One copy of the form shall be attached to each copy of each submittal. The number assigned to the submittal by the Architect/Engineer shall be the submittal's 'official' number.

- D. SUBCONTRACTOR LIST: This document is to be used identify subcontractors. The form shall filled out by each Prime Contractor for all proposed subcontractors and sent to the Architect/Engineer in accordance with. Division 1, Section entitled "SUBMITTAL PROCEDURES".
- E. SUBSTITUTION REQUEST: This document is to be used by a Contractor to propose substitutions. The form shall be filled out by each Prime Contractor and sent to the Architect/Engineer in accordance with. Division 1, Section entitled "SUBMITTAL PROCEDURES" and "PRODUCT REQUIREMENTS".
- F. AIA Forms: Use of forms shall be as indicated in the Contract Documents and as noted on the individual forms.

END OF SECTION 00 3310

GENERAL CONDITIONS SUBMITTAL LOG

PINE BUSH CENTRAL SCHOOL DISTRICT
2019 CAPITAL IMPROVEMENT PROJECT – PHASE 2

Contract: _____

Contractor: _____

Submittal	Date		Remarks
	Submitted	Approved	
Contract:			
Schedule of Values:			
Bonds:			
Insurance:			
Workers Compensation:			
Automobile Insurance:			
Safety Program:			
Schedule:			
Submittal Schedule:			
Emergency Contact:			
Substitution List:			
Subcontractor List:			
Project Manager:			
Superintendent:			

This log is to be used by the Contractor to monitor and complete the required General Condition submittals.

REQUEST FOR INFORMATION	RFI No:
	Date:

PINE BUSH CENTRAL SCHOOL DISTRICT
2019 CAPITAL IMPROVEMENT PROJECT – PHASE 2

Contract: _____

To: _____

From: _____

Copies to: _____

WE REQUEST YOUR ATTENTION (OR CONFIRMATION) REGARDING THE FOLLOWING:

(Fully describe the question or type of information requested)

(List specific documents researched when seeking the information requested.)

Specifications: _____ Drawings: _____

Other: _____

Sender's Recommendation: _____

Receiver's Reply: _____

Note: This reply is not an authorization to proceed with work involving additional cost, time or both. If any reply requires a change to the Contract Documents, a Change Order or a Construction Change Directive must be executed in accordance with the Contract Documents.

By: _____ Date: _____

SUBMITTAL COVER SHEET

(Attach to each copy of each submittal)

CPL

50 Front Street, Suite 202
Newburgh, New York 12550
Phone: (800) 274 – 9000

Submittal No. _____

Contractor: _____
Address: _____

Phone / Email: _____

Architect Project No: 14533.05
Contractor's Number: _____
Project Name:
Pine Bush Central School District
2019 Capital Improvement Project –
Phase 2

TYPE OF SUBMITTAL

(Check one)

- ☐ Product Data ☐ Color Samples ☐ O&M Manual
☐ Shop Drawings ☐ Product Samples ☐ Record Document
☐ Other

SUBSTITUTION

See General Conditions

☐ YES

☐ NO

**DATE RECEIVED BY
ARCHITECT:** _____

**DATE RETURNED TO
CONTRACTOR:** _____

PRODUCT IDENTIFICATION

Specification Page No: _____
Paragraph: _____
Contract Dwg. Number: _____
Detail Reference: _____
Product: _____
Manufacturer: _____

CONTRACTOR'S APPROVAL

This submittal has been reviewed and approved by the Contractor in accordance with the General Conditions.

By: _____ **Date:** _____

DEVIATION FROM CONTRACT DOCUMENTS:

CONTRACTOR COMMENTS:

FOR USE BY CPL

ARCHITECT/ENGINEER'S STAMP

- ☐ No Exception Taken ☐ Revise & Resubmit
☐ Furnish as Corrected ☐ Rejected

Corrections or comments made on the submittal during this review do not relieve the Contractor from compliance with the requirements of the Contract Documents. This review is only for the limited purpose of checking for conformance with information given and the design concept expressed in the Contract Documents. The Contractor is responsible for: confirming and correlating all quantities and dimensions; selecting fabrication processes and techniques of construction; coordinating his work with that of all other trades; and performing his work in a safe and satisfactory manner.

CPL

Date: _____ By: _____

ARCHITECT/ENGINEER'S COMMENTS:

SUBCONTRACTOR LIST

PINE BUSH CENTRAL SCHOOL DISTRICT

2019 CAPITAL IMPROVEMENT PROJECT – PHASE 2

To: **CPL** From:
50 Front Street, Suite 202 (Contractor) _____
Newburgh, New York 12550 _____

Contractors No.: _____

Contract For: _____

List Subcontractors proposed for use on this Project as required by the Construction Documents.
Attach supplemental sheets if necessary.

Section No.: _____ Section Title: _____
Firm Name: _____ Contact: _____
Address: _____

Section No.: _____ Section Title: _____
Firm Name: _____ Contact: _____
Address: _____

Section No.: _____ Section Title: _____
Firm Name: _____ Contact: _____
Address: _____

Section No.: _____ Section Title: _____
Firm Name: _____ Contact: _____
Address: _____

Section No.: _____ Section Title: _____
Firm Name: _____ Contact: _____
Address: _____

Section No.: _____ Section Title: _____
Firm Name: _____ Contact: _____
Address: _____

Section No.: _____ Section Title: _____
Firm Name: _____ Contact: _____
Address: _____

☐ Attachment(s)

Signed by: _____ Date: _____

Copies: ☐ Owner ☐ Consultants ☐ File
☐ ☐ ☐

SUBSTITUTION REQUEST

PINE BUSH CENTRAL SCHOOL DISTRICT

2019 IMPROVEMENT PROJECT – PHASE 2

To: **CPL**
50 Front Street, Suite 202
Newburgh, New York 12550

From: _____
(Contractor) _____

Re: _____ Substitution Request Number: _____

Contract For: _____

Specification Title: _____ Description: _____

Section Number: _____ Page: _____ Part/Paragraph: _____

Proposed Substitution: _____

Manufacturer: _____ Address: _____ Phone: _____

Trade Name: _____ Model No.: _____

Installer: _____ Address: _____ Phone: _____

History: ☐ New product ☐ 2-5 years old ☐ 5-10 yrs old ☐ More than 10 years old

Differences between proposed substitution and specified product: _____

☐ Point-by-point comparative data attached

Reason for not providing specified item: _____

Similar Installation:

Project: _____ Architect/Engineer: _____

Contractor: _____ Owner: _____

_____ Date Installed: _____

Proposed substitution affects other parts of Work: ☐ No

☐ Yes, explain _____

Savings to Owner for accepting substitution: _____ (\$ _____)

Proposed substitution changes Contract Time: ☐ No ☐ Yes [Add] [Deduct] _____ days

Supporting Data Attached: ☐ Drawings ☐ Product Data ☐ Samples ☐ Tests ☐ Reports ☐ _____

The Undersigned certifies that (the):

- Proposed substitution has been fully investigated and determined to be equivalent or superior in all respects to specified product.
- Same warranty will be furnished for proposed substitution as for specified product.
- Same maintenance service and source of replacement parts, as applicable, is available.
- Proposed substitution will have no adverse effect on other trades and will not affect or delay progress schedule.
- Cost data as stated above is complete. Claims for additional costs related to proposed substitution which may subsequently become apparent are waived.
- Proposed substitution does not affect dimensions and functional clearances.
- All costs caused by the substitution, including costs for changes to building design, including Architect/Engineer design fees, detailing, and construction costs will be paid by the Contractor.
- Coordination, installation, and changes in the Work, as needed to accommodate proposed substitution, will be complete in all respects.

Submitted By: _____

Signed By: _____

Firm: _____

Address _____

Phone: _____

Attachments: _____

ARCHITECT/ENGINEER REVIEW AND ACTION

- ☐ No Exception Taken to Substitution - Make submittals in accordance with Specification Section 01330.
- ☐ Furnish Substitution as noted - Make submittals in accordance with Specification Section 01330.
- ☐ Substitution Rejected - Use specified materials.
- ☐ Substitution Request received too late - Use specified materials.

Clark Patterson Lee

By: _____ Date: _____

Additional Comments: ☐ Contractor ☐ Subcontractor ☐ Supplier ☐ Manufacturer ☐ Architect/Engineer

☐ _____



AIA® Document A305™ – 1986

Contractor's Qualification Statement

The Undersigned certifies under oath that the information provided herein is true and sufficiently complete so as not to be misleading.

SUBMITTED TO:

ADDRESS:

SUBMITTED BY:

NAME:

ADDRESS:

PRINCIPAL OFFICE:

- ☐ Corporation
- ☐ Partnership
- ☐ Individual
- ☐ Joint Venture
- ☐ Other

NAME OF PROJECT (if applicable):

TYPE OF WORK (file separate form for each Classification of Work):

- ☐ General Construction
- ☐ HVAC
- ☐ Electrical
- ☐ Plumbing
- ☐ Other (please specify)

§ 1. ORGANIZATION

§ 1.1 How many years has your organization been in business as a Contractor?

§ 1.2 How many years has your organization been in business under its present business name?

§ 1.2.1 Under what other or former names has your organization operated?

§ 1.3 If your organization is a corporation, answer the following:

§ 1.3.1 Date of incorporation:

ADDITIONS AND DELETIONS:

The author of this document has added information needed for its completion. The author may also have revised the text of the original AIA standard form. An *Additions and Deletions Report* that notes added information as well as revisions to the standard form text is available from the author and should be reviewed. A vertical line in the left margin of this document indicates where the author has added necessary information and where the author has added to or deleted from the original AIA text.

This document has important legal consequences. Consultation with an attorney is encouraged with respect to its completion or modification.

This form is approved and recommended by the American Institute of Architects (AIA) and The Associated General Contractors of America (AGC) for use in evaluating the qualifications of contractors. No endorsement of the submitting party or verification of the information is made by AIA or AGC.

- § 1.3.2 State of incorporation:
§ 1.3.3 President's name:
§ 1.3.4 Vice-president's name(s)

- § 1.3.5 Secretary's name:
§ 1.3.6 Treasurer's name:

§ 1.4 If your organization is a partnership, answer the following:

- § 1.4.1 Date of organization:
§ 1.4.2 Type of partnership (if applicable):
§ 1.4.3 Name(s) of general partner(s)

§ 1.5 If your organization is individually owned, answer the following:

- § 1.5.1 Date of organization:
§ 1.5.2 Name of owner:

§ 1.6 If the form of your organization is other than those listed above, describe it and name the principals:

§ 2. LICENSING

§ 2.1 List jurisdictions and trade categories in which your organization is legally qualified to do business, and indicate registration or license numbers, if applicable.

§ 2.2 List jurisdictions in which your organization's partnership or trade name is filed.

§ 3. EXPERIENCE

§ 3.1 List the categories of work that your organization normally performs with its own forces.

§ 3.2 Claims and Suits. (If the answer to any of the questions below is yes, please attach details.)

§ 3.2.1 Has your organization ever failed to complete any work awarded to it?

§ 3.2.2 Are there any judgments, claims, arbitration proceedings or suits pending or outstanding against your organization or its officers?

§ 3.2.3 Has your organization filed any law suits or requested arbitration with regard to construction contracts within the last five years?

§ 3.3 Within the last five years, has any officer or principal of your organization ever been an officer or principal of another organization when it failed to complete a construction contract? (If the answer is yes, please attach details.)

§ 3.4 On a separate sheet, list major construction projects your organization has in progress, giving the name of project, owner, architect, contract amount, percent complete and scheduled completion date.

§ 3.4.1 State total worth of work in progress and under contract:

§ 3.5 On a separate sheet, list the major projects your organization has completed in the past five years, giving the name of project, owner, architect, contract amount, date of completion and percentage of the cost of the work performed with your own forces.

§ 3.5.1 State average annual amount of construction work performed during the past five years:

§ 3.6 On a separate sheet, list the construction experience and present commitments of the key individuals of your organization.

§ 4. REFERENCES

§ 4.1 Trade References:

§ 4.2 Bank References:

§ 4.3 Surety:

§ 4.3.1 Name of bonding company:

§ 4.3.2 Name and address of agent:

§ 5. FINANCING

§ 5.1 Financial Statement.

§ 5.1.1 Attach a financial statement, preferably audited, including your organization's latest balance sheet and income statement showing the following items:

Current Assets (e.g., cash, joint venture accounts, accounts receivable, notes receivable, accrued income, deposits, materials inventory and prepaid expenses);

Net Fixed Assets;

Other Assets;

Current Liabilities (e.g., accounts payable, notes payable, accrued expenses, provision for income taxes, advances, accrued salaries and accrued payroll taxes);

Other Liabilities (e.g., capital, capital stock, authorized and outstanding shares par values, earned surplus and retained earnings).

§ 5.1.2 Name and address of firm preparing attached financial statement, and date thereof:

§ 5.1.3 Is the attached financial statement for the identical organization named on page one?

§ 5.1.4 If not, explain the relationship and financial responsibility of the organization whose financial statement is provided (e.g., parent-subsiary).

§ 5.2 Will the organization whose financial statement is attached act as guarantor of the contract for construction?

§ 6. SIGNATURE

§ 6.1 Dated at this day of

Name of Organization:

By:

Title:

§ 6.2

M being duly sworn deposes and says that the information provided herein is true and sufficiently complete so as not to be misleading.

Subscribed and sworn before me this day of 20

Notary Public:

My Commission Expires:

AIA® Document A310™ – 2010

Bid Bond

CONTRACTOR:

(Name, legal status and address)

SURETY:

(Name, legal status and principal place of business)

OWNER:

(Name, legal status and address)

BOND AMOUNT:**PROJECT:**

(Name, location or address, and Project number, if any)

This document has important legal consequences. Consultation with an attorney is encouraged with respect to its completion or modification.

Any singular reference to Contractor, Surety, Owner or other party shall be considered plural where applicable.

The Contractor and Surety are bound to the Owner in the amount set forth above, for the payment of which the Contractor and Surety bind themselves, their heirs, executors, administrators, successors and assigns, jointly and severally, as provided herein. The conditions of this Bond are such that if the Owner accepts the bid of the Contractor within the time specified in the bid documents, or within such time period as may be agreed to by the Owner and Contractor, and the Contractor either (1) enters into a contract with the Owner in accordance with the terms of such bid, and gives such bond or bonds as may be specified in the bidding or Contract Documents, with a surety admitted in the jurisdiction of the Project and otherwise acceptable to the Owner, for the faithful performance of such Contract and for the prompt payment of labor and material furnished in the prosecution thereof; or (2) pays to the Owner the difference, not to exceed the amount of this Bond, between the amount specified in said bid and such larger amount for which the Owner may in good faith contract with another party to perform the work covered by said bid, then this obligation shall be null and void, otherwise to remain in full force and effect. The Surety hereby waives any notice of an agreement between the Owner and Contractor to extend the time in which the Owner may accept the bid. Waiver of notice by the Surety shall not apply to any extension exceeding sixty (60) days in the aggregate beyond the time for acceptance of bids specified in the bid documents, and the Owner and Contractor shall obtain the Surety's consent for an extension beyond sixty (60) days.

If this Bond is issued in connection with a subcontractor's bid to a Contractor, the term Contractor in this Bond shall be deemed to be Subcontractor and the term Owner shall be deemed to be Contractor.

When this Bond has been furnished to comply with a statutory or other legal requirement in the location of the Project, any provision in this Bond conflicting with said statutory or legal requirement shall be deemed deleted herefrom and provisions conforming to such statutory or other legal requirement shall be deemed incorporated herein. When so furnished, the intent is that this Bond shall be construed as a statutory bond and not as a common law bond.

Signed and sealed this _____ day of _____

_____	(Contractor as Principal)	(Seal)
(Witness)	_____	(Title)
_____	(Surety)	(Seal)
(Witness)	_____	(Title)

CAUTION: You should sign an original AIA Contract Document, on which this text appears in RED. An original assures that changes will not be obscured.

AIA Document A310™ – 2010 (rev. 10/2010). Copyright © 1963, 1970 and 2010 by The American Institute of Architects. All rights reserved.

WARNING: This AIA® Document is protected by U.S. Copyright Law and International Treaties. Unauthorized reproduction or distribution of this AIA® Document, or any portion of it, may result in severe civil and criminal penalties, and will be prosecuted to the maximum extent possible under the law. Purchasers are permitted to reproduce ten (10) copies of this document when completed. To report copyright violations of AIA Contract Documents, e-mail The American Institute of Architects' legal counsel, copyright@aia.org.

ACD-A30708-10



AIA® Document A312™ – 2010

Performance Bond

CONTRACTOR:

(Name, legal status and address)

SURETY:

(Name, legal status and principal place of business)

OWNER:

(Name, legal status and address)

This document has important legal consequences. Consultation with an attorney is encouraged with respect to its completion or modification.

Any singular reference to Contractor, Surety, Owner or other party shall be considered plural where applicable.

CONSTRUCTION CONTRACT

Date:

Amount:

Description:

(Name and location)

BOND

Date:

(Not earlier than Construction Contract Date)

Amount:

Modifications to this Bond: ☐ None ☐ See Section 16

CONTRACTOR AS PRINCIPAL

Company: (Corporate Seal)

SURETY

Company: (Corporate Seal)

Signature: _____
Name
and Title:

(Any additional signatures appear on the last page of this Performance Bond.)

(FOR INFORMATION ONLY — Name, address and telephone)

AGENT or BROKER:

OWNER'S REPRESENTATIVE:

(Architect, Engineer or other party:)

§ 1 The Contractor and Surety, jointly and severally, bind themselves, their heirs, executors, administrators, successors and assigns to the Owner for the performance of the Construction Contract, which is incorporated herein by reference.

§ 2 If the Contractor performs the Construction Contract, the Surety and the Contractor shall have no obligation under this Bond, except when applicable to participate in a conference as provided in Section 3.

§ 3 If there is no Owner Default under the Construction Contract, the Surety's obligation under this Bond shall arise after

- .1 the Owner first provides notice to the Contractor and the Surety that the Owner is considering declaring a Contractor Default. Such notice shall indicate whether the Owner is requesting a conference among the Owner, Contractor and Surety to discuss the Contractor's performance. If the Owner does not request a conference, the Surety may, within five (5) business days after receipt of the Owner's notice, request such a conference. If the Surety timely requests a conference, the Owner shall attend. Unless the Owner agrees otherwise, any conference requested under this Section 3.1 shall be held within ten (10) business days of the Surety's receipt of the Owner's notice. If the Owner, the Contractor and the Surety agree, the Contractor shall be allowed a reasonable time to perform the Construction Contract, but such an agreement shall not waive the Owner's right, if any, subsequently to declare a Contractor Default;
- .2 the Owner declares a Contractor Default, terminates the Construction Contract and notifies the Surety; and
- .3 the Owner has agreed to pay the Balance of the Contract Price in accordance with the terms of the Construction Contract to the Surety or to a contractor selected to perform the Construction Contract.

§ 4 Failure on the part of the Owner to comply with the notice requirement in Section 3.1 shall not constitute a failure to comply with a condition precedent to the Surety's obligations, or release the Surety from its obligations, except to the extent the Surety demonstrates actual prejudice.

§ 5 When the Owner has satisfied the conditions of Section 3, the Surety shall promptly and at the Surety's expense take one of the following actions:

§ 5.1 Arrange for the Contractor, with the consent of the Owner, to perform and complete the Construction Contract;

§ 5.2 Undertake to perform and complete the Construction Contract itself, through its agents or independent contractors;

§ 5.3 Obtain bids or negotiated proposals from qualified contractors acceptable to the Owner for a contract for performance and completion of the Construction Contract, arrange for a contract to be prepared for execution by the Owner and a contractor selected with the Owner's concurrence, to be secured with performance and payment bonds executed by a qualified surety equivalent to the bonds issued on the Construction Contract, and pay to the Owner the amount of damages as described in Section 7 in excess of the Balance of the Contract Price incurred by the Owner as a result of the Contractor Default; or

§ 5.4 Waive its right to perform and complete, arrange for completion, or obtain a new contractor and with reasonable promptness under the circumstances:

- .1 After investigation, determine the amount for which it may be liable to the Owner and, as soon as practicable after the amount is determined, make payment to the Owner; or
- .2 Deny liability in whole or in part and notify the Owner, citing the reasons for denial.

§ 6 If the Surety does not proceed as provided in Section 5 with reasonable promptness, the Surety shall be deemed to be in default on this Bond seven days after receipt of an additional written notice from the Owner to the Surety demanding that the Surety perform its obligations under this Bond, and the Owner shall be entitled to enforce any remedy available to the Owner. If the Surety proceeds as provided in Section 5.4, and the Owner refuses the payment or the Surety has denied liability, in whole or in part, without further notice the Owner shall be entitled to enforce any remedy available to the Owner.

§ 7 If the Surety elects to act under Section 5.1, 5.2 or 5.3, then the responsibilities of the Surety to the Owner shall not be greater than those of the Contractor under the Construction Contract, and the responsibilities of the Owner to the Surety shall not be greater than those of the Owner under the Construction Contract. Subject to the commitment by the Owner to pay the Balance of the Contract Price, the Surety is obligated, without duplication, for

- .1 the responsibilities of the Contractor for correction of defective work and completion of the Construction Contract;
- .2 additional legal, design professional and delay costs resulting from the Contractor's Default, and resulting from the actions or failure to act of the Surety under Section 5; and
- .3 liquidated damages, or if no liquidated damages are specified in the Construction Contract, actual damages caused by delayed performance or non-performance of the Contractor.

§ 8 If the Surety elects to act under Section 5.1, 5.3 or 5.4, the Surety's liability is limited to the amount of this Bond.

§ 9 The Surety shall not be liable to the Owner or others for obligations of the Contractor that are unrelated to the Construction Contract, and the Balance of the Contract Price shall not be reduced or set off on account of any such unrelated obligations. No right of action shall accrue on this Bond to any person or entity other than the Owner or its heirs, executors, administrators, successors and assigns.

§ 10 The Surety hereby waives notice of any change, including changes of time, to the Construction Contract or to related subcontracts, purchase orders and other obligations.

§ 11 Any proceeding, legal or equitable, under this Bond may be instituted in any court of competent jurisdiction in the location in which the work or part of the work is located and shall be instituted within two years after a declaration of Contractor Default or within two years after the Contractor ceased working or within two years after the Surety refuses or fails to perform its obligations under this Bond, whichever occurs first. If the provisions of this Paragraph are void or prohibited by law, the minimum period of limitation available to sureties as a defense in the jurisdiction of the suit shall be applicable.

§ 12 Notice to the Surety, the Owner or the Contractor shall be mailed or delivered to the address shown on the page on which their signature appears.

§ 13 When this Bond has been furnished to comply with a statutory or other legal requirement in the location where the construction was to be performed, any provision in this Bond conflicting with said statutory or legal requirement shall be deemed deleted herefrom and provisions conforming to such statutory or other legal requirement shall be deemed incorporated herein. When so furnished, the intent is that this Bond shall be construed as a statutory bond and not as a common law bond.

§ 14 Definitions

§ 14.1 Balance of the Contract Price. The total amount payable by the Owner to the Contractor under the Construction Contract after all proper adjustments have been made, including allowance to the Contractor of any amounts received or to be received by the Owner in settlement of insurance or other claims for damages to which the Contractor is entitled, reduced by all valid and proper payments made to or on behalf of the Contractor under the Construction Contract.

§ 14.2 Construction Contract. The agreement between the Owner and Contractor identified on the cover page, including all Contract Documents and changes made to the agreement and the Contract Documents.

§ 14.3 Contractor Default. Failure of the Contractor, which has not been remedied or waived, to perform or otherwise to comply with a material term of the Construction Contract.

§ 14.4 Owner Default. Failure of the Owner, which has not been remedied or waived, to pay the Contractor as required under the Construction Contract or to perform and complete or comply with the other material terms of the Construction Contract.

§ 14.5 Contract Documents. All the documents that comprise the agreement between the Owner and Contractor.

§ 15 If this Bond is issued for an agreement between a Contractor and subcontractor, the term Contractor in this Bond shall be deemed to be Subcontractor and the term Owner shall be deemed to be Contractor.

§ 16 Modifications to this bond are as follows:

(Space is provided below for additional signatures of added parties, other than those appearing on the cover page.)

CONTRACTOR AS PRINCIPAL

Company:

(Corporate Seal)

SURETY

Company:

(Corporate Seal)

Signature: _____

Name and Title: _____

Address _____

Signature: _____

Name and Title: _____

Address _____

Init.

AIA® Document A312™ – 2010

Payment Bond

CONTRACTOR:

(Name, legal status and address)

SURETY:

(Name, legal status and principal place of business)

OWNER:

(Name, legal status and address)

CONSTRUCTION CONTRACT

Date:

Amount:

Description:

(Name and location)

BOND

Date:

(Not earlier than Construction Contract Date)

Amount:

Modifications to this Bond: ☐ None ☐ See Section 18

CONTRACTOR AS PRINCIPAL

Company: (Corporate Seal)

SURETY

Company: (Corporate Seal)

Signature: _____

Name
and Title:

(Any additional signatures appear on the last page of this Payment Bond.)

Signature: _____

Name
and Title:

(FOR INFORMATION ONLY — Name, address and telephone)

AGENT or BROKER:

OWNER'S REPRESENTATIVE:

(Architect, Engineer or other party:)

This document has important legal consequences. Consultation with an attorney is encouraged with respect to its completion or modification.

Any singular reference to Contractor, Surety, Owner or other party shall be considered plural where applicable.

§ 1 The Contractor and Surety, jointly and severally, bind themselves, their heirs, executors, administrators, successors and assigns to the Owner to pay for labor, materials and equipment furnished for use in the performance of the Construction Contract, which is incorporated herein by reference, subject to the following terms.

§ 2 If the Contractor promptly makes payment of all sums due to Claimants, and defends, indemnifies and holds harmless the Owner from claims, demands, liens or suits by any person or entity seeking payment for labor, materials or equipment furnished for use in the performance of the Construction Contract, then the Surety and the Contractor shall have no obligation under this Bond.

§ 3 If there is no Owner Default under the Construction Contract, the Surety's obligation to the Owner under this Bond shall arise after the Owner has promptly notified the Contractor and the Surety (at the address described in Section 13) of claims, demands, liens or suits against the Owner or the Owner's property by any person or entity seeking payment for labor, materials or equipment furnished for use in the performance of the Construction Contract and tendered defense of such claims, demands, liens or suits to the Contractor and the Surety.

§ 4 When the Owner has satisfied the conditions in Section 3, the Surety shall promptly and at the Surety's expense defend, indemnify and hold harmless the Owner against a duly tendered claim, demand, lien or suit.

§ 5 The Surety's obligations to a Claimant under this Bond shall arise after the following:

§ 5.1 Claimants, who do not have a direct contract with the Contractor,

- .1 have furnished a written notice of non-payment to the Contractor, stating with substantial accuracy the amount claimed and the name of the party to whom the materials were, or equipment was, furnished or supplied or for whom the labor was done or performed, within ninety (90) days after having last performed labor or last furnished materials or equipment included in the Claim; and
- .2 have sent a Claim to the Surety (at the address described in Section 13).

§ 5.2 Claimants, who are employed by or have a direct contract with the Contractor, have sent a Claim to the Surety (at the address described in Section 13).

§ 6 If a notice of non-payment required by Section 5.1.1 is given by the Owner to the Contractor, that is sufficient to satisfy a Claimant's obligation to furnish a written notice of non-payment under Section 5.1.1.

§ 7 When a Claimant has satisfied the conditions of Sections 5.1 or 5.2, whichever is applicable, the Surety shall promptly and at the Surety's expense take the following actions:

§ 7.1 Send an answer to the Claimant, with a copy to the Owner, within sixty (60) days after receipt of the Claim, stating the amounts that are undisputed and the basis for challenging any amounts that are disputed; and

§ 7.2 Pay or arrange for payment of any undisputed amounts.

§ 7.3 The Surety's failure to discharge its obligations under Section 7.1 or Section 7.2 shall not be deemed to constitute a waiver of defenses the Surety or Contractor may have or acquire as to a Claim, except as to undisputed amounts for which the Surety and Claimant have reached agreement. If, however, the Surety fails to discharge its obligations under Section 7.1 or Section 7.2, the Surety shall indemnify the Claimant for the reasonable attorney's fees the Claimant incurs thereafter to recover any sums found to be due and owing to the Claimant.

§ 8 The Surety's total obligation shall not exceed the amount of this Bond, plus the amount of reasonable attorney's fees provided under Section 7.3, and the amount of this Bond shall be credited for any payments made in good faith by the Surety.

§ 9 Amounts owed by the Owner to the Contractor under the Construction Contract shall be used for the performance of the Construction Contract and to satisfy claims, if any, under any construction performance bond. By the Contractor furnishing and the Owner accepting this Bond, they agree that all funds earned by the Contractor in the performance of the Construction Contract are dedicated to satisfy obligations of the Contractor and Surety under this Bond, subject to the Owner's priority to use the funds for the completion of the work.

§ 10 The Surety shall not be liable to the Owner, Claimants or others for obligations of the Contractor that are unrelated to the Construction Contract. The Owner shall not be liable for the payment of any costs or expenses of any Claimant under this Bond, and shall have under this Bond no obligation to make payments to, or give notice on behalf of, Claimants or otherwise have any obligations to Claimants under this Bond.

§ 11 The Surety hereby waives notice of any change, including changes of time, to the Construction Contract or to related subcontracts, purchase orders and other obligations.

§ 12 No suit or action shall be commenced by a Claimant under this Bond other than in a court of competent jurisdiction in the state in which the project that is the subject of the Construction Contract is located or after the expiration of one year from the date (1) on which the Claimant sent a Claim to the Surety pursuant to Section 5.1.2 or 5.2, or (2) on which the last labor or service was performed by anyone or the last materials or equipment were furnished by anyone under the Construction Contract, whichever of (1) or (2) first occurs. If the provisions of this Paragraph are void or prohibited by law, the minimum period of limitation available to sureties as a defense in the jurisdiction of the suit shall be applicable.

§ 13 Notice and Claims to the Surety, the Owner or the Contractor shall be mailed or delivered to the address shown on the page on which their signature appears. Actual receipt of notice or Claims, however accomplished, shall be sufficient compliance as of the date received.

§ 14 When this Bond has been furnished to comply with a statutory or other legal requirement in the location where the construction was to be performed, any provision in this Bond conflicting with said statutory or legal requirement shall be deemed deleted herefrom and provisions conforming to such statutory or other legal requirement shall be deemed incorporated herein. When so furnished, the intent is that this Bond shall be construed as a statutory bond and not as a common law bond.

§ 15 Upon request by any person or entity appearing to be a potential beneficiary of this Bond, the Contractor and Owner shall promptly furnish a copy of this Bond or shall permit a copy to be made.

§ 16 Definitions

§ 16.1 Claim. A written statement by the Claimant including at a minimum:

- .1 the name of the Claimant;
- .2 the name of the person for whom the labor was done, or materials or equipment furnished;
- .3 a copy of the agreement or purchase order pursuant to which labor, materials or equipment was furnished for use in the performance of the Construction Contract;
- .4 a brief description of the labor, materials or equipment furnished;
- .5 the date on which the Claimant last performed labor or last furnished materials or equipment for use in the performance of the Construction Contract;
- .6 the total amount earned by the Claimant for labor, materials or equipment furnished as of the date of the Claim;
- .7 the total amount of previous payments received by the Claimant; and
- .8 the total amount due and unpaid to the Claimant for labor, materials or equipment furnished as of the date of the Claim.

§ 16.2 Claimant. An individual or entity having a direct contract with the Contractor or with a subcontractor of the Contractor to furnish labor, materials or equipment for use in the performance of the Construction Contract. The term Claimant also includes any individual or entity that has rightfully asserted a claim under an applicable mechanic's lien or similar statute against the real property upon which the Project is located. The intent of this Bond shall be to include without limitation in the terms "labor, materials or equipment" that part of water, gas, power, light, heat, oil, gasoline, telephone service or rental equipment used in the Construction Contract, architectural and engineering services required for performance of the work of the Contractor and the Contractor's subcontractors, and all other items for which a mechanic's lien may be asserted in the jurisdiction where the labor, materials or equipment were furnished.

§ 16.3 Construction Contract. The agreement between the Owner and Contractor identified on the cover page, including all Contract Documents and all changes made to the agreement and the Contract Documents.

§ 16.4 Owner Default. Failure of the Owner, which has not been remedied or waived, to pay the Contractor as required under the Construction Contract or to perform and complete or comply with the other material terms of the Construction Contract.

§ 16.5 Contract Documents. All the documents that comprise the agreement between the Owner and Contractor.

§ 17 If this Bond is issued for an agreement between a Contractor and subcontractor, the term Contractor in this Bond shall be deemed to be Subcontractor and the term Owner shall be deemed to be Contractor.

§ 18 Modifications to this bond are as follows:

(Space is provided below for additional signatures of added parties, other than those appearing on the cover page.)

CONTRACTOR AS PRINCIPAL

Company:

(Corporate Seal)

SURETY

Company:

(Corporate Seal)

Signature: _____

Name and Title: _____

Address _____

Signature: _____

Name and Title: _____

Address _____

Init.



AIA[®] Document G701[™] – 2001

Change Order

PROJECT (Name and address):	CHANGE ORDER NUMBER:	OWNER: <input type="checkbox"/>
	DATE:	ARCHITECT: <input type="checkbox"/>
		CONTRACTOR: <input type="checkbox"/>
TO CONTRACTOR (Name and address):	ARCHITECT'S PROJECT NUMBER:	FIELD: <input type="checkbox"/>
	CONTRACT DATE:	OTHER: <input type="checkbox"/>
	CONTRACT FOR:	

THE CONTRACT IS CHANGED AS FOLLOWS:

(Include, where applicable, any undisputed amount attributable to previously executed Construction Change Directives)

The original Contract Sum was _____
 The net change by previously authorized Change Orders _____
 The Contract Sum prior to this Change Order was _____
 The Contract Sum will be _____ by this Change Order in the amount of _____
 The new Contract Sum including this Change Order will be _____

\$ _____
 \$ _____
 \$ _____
 \$ _____
 \$ _____

The Contract Time will be _____ by _____ () days.
 The date of Substantial Completion as of the date of this Change Order therefore is _____

NOTE: This Change Order does not include changes in the Contract Sum, Contract Time or Guaranteed Maximum Price which have been authorized by Construction Change Directive until the cost and time have been agreed upon by both the Owner and Contractor, in which case a Change Order is executed to supersede the Construction Change Directive.

NOT VALID UNTIL SIGNED BY THE ARCHITECT, CONTRACTOR AND OWNER.

ARCHITECT (Firm name)	CONTRACTOR (Firm name)	OWNER (Firm name)
ADDRESS	ADDRESS	ADDRESS
BY (Signature)	BY (Signature)	BY (Signature)
(Typed name)	(Typed name)	(Typed name)
DATE	DATE	DATE

Application and Certificate for Payment

TO OWNER:		PROJECT:	APPLICATION NO:	Distribution to:
			PERIOD TO:	<input type="checkbox"/> OWNER
FROM CONTRACTOR:	VIA ARCHITECT:		CONTRACT FOR:	<input type="checkbox"/> ARCHITECT
			CONTRACT DATE:	<input type="checkbox"/> CONTRACTOR
			PROJECT NOS:	<input type="checkbox"/> FIELD
				<input type="checkbox"/> OTHER

The undersigned Contractor certifies that to the best of the Contractor's knowledge, information and belief the Work covered by this Application for Payment has been completed in accordance with the Contract Documents, that all amounts have been paid by the Contractor for Work for which previous Certificates for Payment were issued and payments received from the Owner, and that current payment shown herein is now due.

CONTRACTOR'S APPLICATION FOR PAYMENT

Application is made for payment, as shown below, in connection with the Contract.

Continuation Sheet, AIA Document G703, is attached.

1. ORIGINAL CONTRACT SUM	\$
2. Net change by Change Orders	\$
3. CONTRACT SUM TO DATE (Line 1 ± 2)	\$
4. TOTAL COMPLETED & STORED TO DATE (Column G on G703)	\$
5. RETAINAGE:	
a. _____ % of Completed Work	
(Column D + E on G703)	\$
b. _____ % of Stored Material	
(Column F on G703)	\$
Total Retainage (Lines 5a + 5b or Total in Column I of G703)	\$

6. TOTAL EARNED LESS RETAINAGE	\$
(Line 4 Less Line 5 Total)	
7. LESS PREVIOUS CERTIFICATES FOR PAYMENT	\$
(Line 6 from prior Certificate)	
8. CURRENT PAYMENT DUE	\$
9. BALANCE TO FINISH, INCLUDING RETAINAGE	
(Line 3 less Line 6)	\$

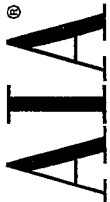
ARCHITECT'S CERTIFICATE FOR PAYMENT

In accordance with the Contract Documents, based on on-site observations and the data comprising this application, the Architect certifies to the Owner that to the best of the Architect's knowledge, information and belief the Work has progressed as indicated, the quality of the Work is in accordance with the Contract Documents, and the Contractor is entitled to payment of the AMOUNT CERTIFIED.

AMOUNT CERTIFIED	\$
(Attach explanation if amount certified differs from the amount applied. Initial all figures on this Application and on the Continuation Sheet that are changed to conform with the amount certified.)	
ARCHITECT:	
By: _____	Date: _____

This Certificate is not negotiable. The AMOUNT CERTIFIED is payable only to the Contractor named herein. Issuance, payment and acceptance of payment are without prejudice to any rights of the Owner or Contractor under this Contract

CHANGE ORDER SUMMARY	ADDITIONS	DEDUCTIONS
Total changes approved in previous months by Owner	\$	\$
Total approved this Month	\$	\$
TOTALS	\$	\$
NET CHANGES by Change Order	\$	



Document G703™ - 1992

Continuation Sheet

AIA Document G702, APPLICATION AND CERTIFICATION FOR PAYMENT, containing Contractor's signed certification is attached.

In tabulations below, amounts are stated to the nearest dollar.

Use Column I on Contracts where variable retainage for line items may apply.

APPLICATION NO:

APPLICATION DATE:

PERIOD TO:

ARCHITECT'S PROJECT NO:

A	B	C	D	E	F	G	H	I
ITEM NO.	DESCRIPTION OF WORK	SCHEDULED VALUE	WORK COMPLETED FROM PREVIOUS APPLICATION (D + E)	THIS PERIOD	MATERIALS PRESENTLY STORED (NOT IN D OR E)	TOTAL COMPLETED AND STORED TO DATE (D+E+F)	BALANCE TO FINISH (C - G)	RETAINAGE (IF VARIABLE RATE)
							% (G ÷ C)	
	GRAND TOTAL						%	

AIA Document G703™ – 1992. Copyright © 1983, 1985, 1986, 1987, 1970, 1978, 1983 and 1992 by The American Institute of Architects. All rights reserved. **WARNING: This AIA® Document is protected by U.S. Copyright Law and International Treaties. Unauthorized reproduction or distribution of this AIA® Document, or any portion of it, may result in severe civil and criminal penalties, and will be prosecuted to the maximum extent possible under the law.** This document was produced by AIA software at 11:40:33 on 10/30/2006 under Order No. 1000240782, which expires on 5/30/2007, and is not for resale.

User Notes:

(2811165891)



AIA® Document G704™ – 2000

Certificate of Substantial Completion

PROJECT:
(Name and address):

PROJECT NUMBER:
CONTRACT FOR:
CONTRACT DATE:

OWNER: ☐
ARCHITECT: ☐
CONTRACTOR: ☐
FIELD: ☐
OTHER: ☐

TO OWNER:
(Name and address):

TO CONTRACTOR:
(Name and address):

PROJECT OR PORTION OF THE PROJECT DESIGNATED FOR PARTIAL OCCUPANCY OR USE SHALL INCLUDE:

The Work performed under this Contract has been reviewed and found, to the Architect's best knowledge, information and belief, to be substantially complete. Substantial Completion is the stage in the progress of the Work when the Work or designated portion is sufficiently complete in accordance with the Contract Documents so that the Owner can occupy or utilize the Work for its intended use. The date of Substantial Completion of the Project or portion designated above is the date of issuance established by this Certificate, which is also the date of commencement of applicable warranties required by the Contract Documents, except as stated below:

Warranty

Date of Commencement

Clark Patterson Associates

ARCHITECT

BY

DATE OF ISSUANCE

A list of items to be completed or corrected is attached hereto. The failure to include any items on such list does not alter the responsibility of the Contractor to complete all Work in accordance with the Contract Documents. Unless otherwise agreed to in writing, the date of commencement of warranties for items on the attached list will be the date of issuance of the final Certificate of Payment or the date of final payment.

Cost estimate of Work that is incomplete or defective: \$

The Contractor will complete or correct the Work on the list of items attached hereto within Zero (0) days from the above date of Substantial Completion.

CONTRACTOR

BY

DATE

The Owner accepts the Work or designated portion as substantially complete and will assume full possession at (time) on (date).

OWNER

BY

DATE

The responsibilities of the Owner and Contractor for security, maintenance, heat, utilities, damage to the Work and insurance shall be as follows:

(Note: Owner's and Contractor's legal and insurance counsel should determine and review insurance requirements and coverage.)



AIA[®] Document G706[™] – 1994

Contractor's Affidavit of Payment of Debts and Claims

PROJECT: *(Name and address)*

ARCHITECT'S PROJECT NUMBER:

OWNER: ☐
ARCHITECT: ☐
CONTRACTOR: ☐
SURETY: ☐
OTHER: ☐

CONTRACT FOR:

TO OWNER: *(Name and address)*

CONTRACT DATED:

STATE OF:
COUNTY OF:

The undersigned hereby certifies that, except as listed below, payment has been made in full and all obligations have otherwise been satisfied for all materials and equipment furnished, for all work, labor, and services performed, and for all known indebtedness and claims against the Contractor for damages arising in any manner in connection with the performance of the Contract referenced above for which the Owner or Owner's property might in any way be held responsible or encumbered.

EXCEPTIONS:

SUPPORTING DOCUMENTS ATTACHED HERETO:

1. Consent of Surety to Final Payment. Whenever Surety is involved, Consent of Surety is required. AIA Document G707, Consent of Surety, may be used for this purpose

Indicate Attachment ☐ Yes ☐ No

CONTRACTOR: *(Name and address)*

BY: _____
(Signature of authorized representative)

The following supporting documents should be attached hereto if required by the Owner:

1. Contractor's Release or Waiver of Liens, conditional upon receipt of final payment.
2. Separate Releases or Waivers of Liens from Subcontractors and material and equipment suppliers, to the extent required by the Owner, accompanied by a list thereof.
3. Contractor's Affidavit of Release of Liens (AIA Document G706A).

(Printed name and title)

Subscribed and sworn to before me on this date:

Notary Public:
My Commission Expires:



AIA[®] Document G706A[™] – 1994

Contractor's Affidavit of Release of Liens

PROJECT: <i>(Name and address)</i>	ARCHITECT'S PROJECT NUMBER:	OWNER: <input type="checkbox"/>
		ARCHITECT: <input type="checkbox"/>
	CONTRACT FOR:	CONTRACTOR: <input type="checkbox"/>
TO OWNER: <i>(Name and address)</i>	CONTRACT DATED:	SURETY: <input type="checkbox"/>
		OTHER: <input type="checkbox"/>

STATE OF:
COUNTY OF:

The undersigned hereby certifies that to the best of the undersigned's knowledge, information and belief, except as listed below, the Releases or Waivers of Lien attached hereto include the Contractor, all Subcontractors, all suppliers of materials and equipment, and all performers of Work, labor or services who have or may have liens or encumbrances or the right to assert liens or encumbrances against any property of the Owner arising in any manner out of the performance of the Contract referenced above.

EXCEPTIONS:

SUPPORTING DOCUMENTS ATTACHED HERETO:

1. Contractor's Release or Waiver of Liens, conditional upon receipt of final payment.
2. Separate Releases or Waivers of Liens from Subcontractors and material and equipment suppliers, to the extent required by the Owner, accompanied by a list thereof.

CONTRACTOR: *(Name and address)*

BY:

(Signature of authorized representative)

(Printed name and title)

Subscribed and sworn to before me on this date:

Notary Public:

My Commission Expires:



AIA® Document G707™ – 1994

Consent Of Surety to Final Payment

PROJECT: *(Name and address)*

ARCHITECT'S PROJECT NUMBER:

OWNER: ☐

ARCHITECT: ☐

CONTRACT FOR:

CONTRACTOR: ☐

TO OWNER: *(Name and address)*

CONTRACT DATED:

SURETY: ☐

OTHER: ☐

In accordance with the provisions of the Contract between the Owner and the Contractor as indicated above, the
(Insert name and address of Surety)

on bond of

(Insert name and address of Contractor)

, SURETY,

hereby approves of the final payment to the Contractor, and agrees that final payment to the Contractor shall not relieve the
Surety of any of its obligations to
(Insert name and address of Owner)

, CONTRACTOR,

, OWNER,

as set forth in said Surety's bond.

IN WITNESS WHEREOF, the Surety has hereunto set its hand on this date:
(Insert in writing the month followed by the numeric date and year.)

(Surety)

(Signature of authorized representative)

(Printed name and title)

Attest:

(Seal):



AIA[®] Document G709[™] – 2001

Work Changes Proposal Request

PROJECT (Name and address):

PROPOSAL REQUEST NUMBER:

OWNER: ☐

ARCHITECT: ☐

DATE OF ISSUANCE:

CONSULTANT: ☐

CONTRACTOR: ☐

OWNER (Name and address):

CONTRACT FOR:

FIELD: ☐

OTHER: ☐

CONTRACT DATE:

FROM ARCHITECT (Name and address):

ARCHITECT'S PROJECT NUMBER:

TO CONTRACTOR (Name and address):

Please submit an itemized proposal for changes in the Contract Sum and Contract Time for proposed modifications to the Contract Documents described herein. Within () days, the Contractor must submit this proposal or notify the Architect, in writing, of the date on which proposal submission is anticipated.

THIS IS NOT A CHANGE ORDER, A CONSTRUCTION CHANGE DIRECTIVE OR A DIRECTION TO PROCEED WITH THE WORK DESCRIBED IN THE PROPOSED MODIFICATIONS.

DESCRIPTION (Insert a written description of the Work):

ATTACHMENTS (List attached documents that support description):

REQUESTED BY THE ARCHITECT:

(Signature)

(Printed name and title)



AIA[®] Document G710[™] – 1992

Architect's Supplemental Instructions

PROJECT *(Name and address):*

ARCHITECT'S SUPPLEMENTAL
INSTRUCTION NO:

OWNER: ☐

ARCHITECT: ☐

CONSULTANT: ☐

CONTRACTOR: ☐

OWNER *(Name and address):*

DATE OF ISSUANCE:

FIELD: ☐

OTHER: ☐

CONTRACT FOR:

FROM ARCHITECT *(Name and
address):*

CONTRACT DATE:

TO CONTRACTOR *(Name and
address):*

ARCHITECT'S PROJECT NUMBER:

The Work shall be carried out in accordance with the following supplemental instructions issued in accordance with the Contract Documents without change in Contract Sum or Contract Time. Proceeding with the Work in accordance with these instructions indicates your acknowledgment that there will be no change in the Contract Sum or Contract Time.

DESCRIPTION:

ATTACHMENTS:

(Here insert listing of documents that support description.)

ISSUED BY THE ARCHITECT:

(Signature)

(Printed name and title)



AIA® Document G714™ – 2001

Construction Change Directive

PROJECT: (Name and address)	DIRECTIVE NUMBER: _____ DATE: _____	OWNER: <input type="checkbox"/>
	CONTRACT FOR: _____	ARCHITECT: <input type="checkbox"/>
TO CONTRACTOR: (Name and address)	CONTRACT DATED: _____ ARCHITECT'S PROJECT NUMBER: _____	CONSULTANT: <input type="checkbox"/>
		CONTRACTOR: <input type="checkbox"/>
		FIELD: <input type="checkbox"/>
		OTHER: <input type="checkbox"/>

You are hereby directed to make the following change(s) in this Contract:
(Describe briefly any proposed changes or list any attached information in the alternative)

PROPOSED ADJUSTMENTS

1. The proposed basis of adjustment to the Contract Sum or Guaranteed Maximum Price is:

- ☐ • Lump Sum
- ☐ • Unit Price of \$ _____ per _____
- ☐ • As provided in Section 7.3.3 of AIA Document A201-1997
- ☐ • As follows:

2. The Contract Time is proposed to (_____). The proposed adjustment, if any, is (_____ of days).

When signed by the Owner and Architect and received by the Contractor, this document becomes effective IMMEDIATELY as a Construction Change Directive (CCD), and the Contractor shall proceed with the change(s) described above.

Contractor signature indicates agreement with the proposed adjustments in Contract Sum and Contract Time set forth in this CCD.

Clark Patterson Associates

ARCHITECT (Firm name)

OWNER (Firm name)

CONTRACTOR (Firm name)

ADDRESS

ADDRESS

ADDRESS

BY (Signature)

BY (Signature)

BY (Signature)

(Typed name)

(Typed name)

(Typed name)

DATE

DATE

DATE



AIA[®] Document G715[™] – 1991

Supplemental Attachment for ACORD Certificate of Insurance 25-S

(This document replaces AIA Document G705, Certificate of Insurance.)

PROJECT (Name and address): _____

INSURED _____

- | | Yes | No | N/A |
|---|--------------------------|--------------------------|--------------------------|
| A. General Liability | | | |
| 1. Does the General Aggregate apply to this Project only? | <input type="checkbox"/> | <input type="checkbox"/> | <input type="checkbox"/> |
| 2. Does this policy include coverage for: | | | |
| a. Premises - Operations? | <input type="checkbox"/> | <input type="checkbox"/> | <input type="checkbox"/> |
| b. Explosion, Collapse and Underground Hazards? | <input type="checkbox"/> | <input type="checkbox"/> | <input type="checkbox"/> |
| c. Personal Injury Coverage? | <input type="checkbox"/> | <input type="checkbox"/> | <input type="checkbox"/> |
| d. Products Coverage? | <input type="checkbox"/> | <input type="checkbox"/> | <input type="checkbox"/> |
| e. Completed Operations? | <input type="checkbox"/> | <input type="checkbox"/> | <input type="checkbox"/> |
| f. Contractual Coverage for the Insured's obligations in A201? | <input type="checkbox"/> | <input type="checkbox"/> | <input type="checkbox"/> |
| 3. If coverage is written on a claims-made basis, what is the: | | | |
| a. Retroactive Date? | | | |
| b. Extended Reporting Date? | | | |
| B. Worker's Compensation | | | |
| 1. If the Insured is exempt from Worker's Compensation statutes, does the Insured carry the equivalent Voluntary Compensation coverage? | <input type="checkbox"/> | <input type="checkbox"/> | <input type="checkbox"/> |
| C. Final Payment Information | | | |
| 1. Is this certificate being furnished in connection with the Contractor's request for final payment in accordance with the requirements of Sections 9.10.2 and 11.1.3 of AIA Document A201, General Conditions of the Contract for Construction? | <input type="checkbox"/> | <input type="checkbox"/> | <input type="checkbox"/> |
| 2. If so, and if the policy period extends beyond termination of the Contract for Construction, is Completed Operations coverage for this Project continued for the balance of the policy period? | <input type="checkbox"/> | <input type="checkbox"/> | <input type="checkbox"/> |
| D. Termination Provisions | | | |
| 1. Has each policy shown on the certificate and this Supplement been endorsed to provide the holder with 30 days notice of cancellation and/or expiration? List below any policies which do not contain this notice. | <input type="checkbox"/> | <input type="checkbox"/> | <input type="checkbox"/> |
| E. Other Provisions | | | |

Authorized Representative

Date of Issue

SECTION 00 3350 STATEMENT OF SPECIAL INSPECTIONS AND TESTS

PART 1 - GENERAL

1.1 SUMMARY

- A. Attached is NYS Education Department Statement of Special Inspections and Tests.
1. The document is provided for the Contractor's reference.

PART 2 - PRODUCTS (Not Used)

PART 3 - EXECUTION (Not Used)

END OF SECTION 00 3350

SECTION 00 4050 - FORM OF PROPOSAL
CONTRACT 1: GENERAL CONSTRUCTION WORK

1.1 GENERAL

- A. Pursuant to, and in compliance with, the Advertisement for Bids and the Instructions to Bidders relative thereto, and all of the Contract Documents, including any and all Addenda issued by the Architect and mailed or delivered to the Undersigned prior to the opening of Bids, whether received by the Undersigned or not, we, _____ hereby propose to furnish all plant, labor, supplies, materials and equipment incidental to **CONTRACT 1: GENERAL CONSTRUCTION WORK** as required by, and in strict accord with, the applicable provisions of the Drawings and Specifications entitled **Pine Bush Central School District – 2019 Capital Improvement Project – Phase 2**, to the satisfaction and approval of the Owner, Architect and Construction Manager in accordance with the terms and conditions of the Contract Documents for the following sum:

BASE BID:

Total: (\$ _____)
_____ Dollars

1.2 BID GUARANTEE

- A. The undersigned Bidder agrees to execute a contract for this Work in the above amount and to furnish surety as specified within 10 days after a written Notice of Award, if offered within 45 days after receipt of bids, and on failure to do so agrees to forfeit to Owner the attached Bid Security as liquidated damages for such failure, in an amount constituting five percent (5%) of the Base Bid.
- B. In the event Owner does not offer Notice of Award within the time limits stated above, Owner will return to the undersigned the Bid Security.

1.3 TIME OF COMPLETION

- A. It is agreed by the undersigned that after receipt of a Notice of Award and a consummation of a Contract Agreement in accord with the terms of the Contract Documents, he will start work within 10 consecutive calendar days of the notice to proceed and fully complete the work as indicated in the Construction Schedule (Specification Section 01 3216).

1.4 SCHEDULE OF WORK

- A. Scheduling of all work shall be coordinated through the District and or the District's Representative. Contractor shall coordinate their work around the District's needs.
- B. It is the District's intent to work with the Contractor and make the building available for the work to be performed within the time frame allowed.

1.5 ALLOWANCES (Reference specification section 01 2100).

- A. The Bidder acknowledges that the Allowance(s) applicable to this Contract is (are) included in the Base Bid.
- B. General Construction Work Allowances for Contract 1:
1. **GC-1: Contingency Allowance = \$180,000.00**

1.6 ALTERNATES (Reference specification Section 01 2300).

- A. Enter dollar amount, even if it is zero dollars (\$0.00), for each Alternate. Do not leave any Alternate amount blank. If any amount is blank, it will be assumed the Bidder will provide that Alternate for no change in Contract Price.

- B. Alternate **HS-GC-01**: Provide window replacement work as outlined on Construction Documents at Pine Bush High School.

ADD / DEDUCT (\$ _____)
_____ Dollars

- C. Alternate **HS-GC-02**: Provide brick repointing work as outlined on Construction Documents at Pine Bush High School.

ADD / DEDUCT (\$ _____)
_____ Dollars

- D. Alternate **PAK-GC-01**: Provide window replacement work as outlined on Construction Documents at Pakanasink Elementary School.

ADD / DEDUCT (\$ _____)
_____ Dollars

- E. Alternate **CVMS-GC-01**: Provide window replacement work as outlined on Construction Documents at Circleville Middle School.

ADD / DEDUCT (\$ _____)
_____ Dollars

- F. Alternate **CVMS-GC-02**: Provide brick repointing work as outlined on Construction Documents at Circleville Middle School.

ADD / DEDUCT (\$ _____)
_____ Dollars

- G. Alternate **CES-GC-01**: Provide window replacement work as outlined on Construction Documents at Circleville Elementary School.

ADD / DEDUCT (\$ _____)
_____ Dollars

- H. Alternate **CES-GC-02**: Provide brick repointing work as outlined on Construction Documents at Circleville Elementary School.

ADD / DEDUCT (\$ _____)
_____ Dollars

1.7 NON-COLLUSIVE BIDDING CERTIFICATION

- A. By submission of this bid, the bidder, and each person signing on behalf of the bidder, certifies, and in the case of a joint bid each party thereto certifies as to its own organization, under penalty of perjury, that to the best of knowledge and belief:

1. The prices in this bid have been arrived at independently without collusion, consultation, communication, or agreement, for the purpose of restricting competition, as to any matter relating to such prices with any other bidder or with any competitor;
2. Unless otherwise required by law, the prices which have been quoted in this bid have not been knowingly disclosed by the bidder and will not knowingly be disclosed by the bidder prior to opening, directly or indirectly, to any other bidder or to any competitor; and,
3. No attempt has been made, or will be made, by the bidder to induce any other person, partnership or corporation to submit, or not to submit, a bid for the purpose of restricting competition.
- B. The person signing this bid or proposal certifies that he/she has fully informed himself/herself regarding the accuracy of the statements contained in this certification, and under the penalties or perjury, affirms the truth thereof, such penalties being applicable to the bidder as well as the person signing in its behalf;
1. That, attached hereto (if a corporate bidder), is a certified copy of a resolution authorizing the execution of this certificate by the signature of this bid or proposal on behalf of the corporate bidder.
- Resolved that _____
- (Name of Individual)*
- be authorized to sign and submit the bid or proposal of this corporation for the **Pine Bush Central School District, 2019 Capital Improvement Project – Phase 2**, and to include in such bid or proposal the certificate as to non-collusion required by Section One Hundred Three (d) ((103d)) of the General Municipal Law as the act and deed of such corporation, and for any inaccuracies or misstatements in such certificate this corporate bidder shall be liable under the penalties of perjury.
- The foregoing is a true and correct copy of the resolution by:
- _____
Corporation at a meeting of its Board of Directors held on the: ____ day of _____, 20__.

(SEAL OF THE CORPORATION)

Secretary

1.8 BID SECURITY

- A. Bid Security in the form of a Certified or Cashier's Check or a Bid Bond in the form required by the Contract Documents is attached to and made a part of this Proposal. A Statement of Surety's Intent is also attached to, and made a part of, this Proposal.

1.9 REPRESENTATIONS & NON-COLLUSIVE BIDDING CERTIFICATION

- A. By submitting this Proposal the Bidder represents and certifies that:
1. It has examined the Contract Documents, the site of the proposed Work, is familiar with the local conditions at the place where the Work is to be performed and fully comprehends the requirements and intent of the plans and specifications for this Project in accordance with the Contract Documents.
 2. It has examined and reviewed, where applicable, all information and data in the Contract Documents related to existing underground facilities at or contiguous to the site. Bidder shall require of the Owner or Architect no further investigations, explorations, tests or reports with respect to such underground facilities in order for the Bidder to perform the Work of the Proposal within the Contract Time and in accordance with the Contract Documents.
 3. It has given notice to the Architect, as required by the Contract Documents, of any and all discrepancies it has discovered and accepts the resolution of those discrepancies offered by the Architect.
 4. Pursuant to New York State General Municipal Law Section 103-d, by submission of this bid, each bidder and each person signing on behalf of any bidder certifies, and in the case of a joint bid each party thereto certifies as to its own organization, under penalty of perjury, that to the best of knowledge and belief:
 - a. The prices in this bid have been arrived at independently without collusion, communication, or agreement, for the purpose of restricting competition, as to any matter relating to such prices with any other bidder or with any competitor;
 - b. Unless otherwise required by law, the prices which have been quoted in this bid have not been knowingly disclosed by the bidder and will not be knowingly disclosed by the bidder prior to opening, directly or indirectly, to any other bidder or competitor; and
 - c. No attempt has been made or will be made by bidder to induce any other person, partnership or corporation to submit or not to submit a bid for the purpose of restricting competition.
 5. The proposal is based upon the materials, equipment and systems required by the Contract Documents, without exception, unless otherwise set forth in this Proposal in detail.

1.10 CHANGE ORDERS

- A. We propose and agree that the Contract Sum shall be adjusted for changes in the Contract Work not included in unit prices by addition of the following costs:
1. Profit and overhead as permitted in the Contract Documents.

1.11 ACCEPTANCE

- A. When this Proposal is accepted, the Undersigned agrees to enter into a Contract with the Owner as provided in the Contract Documents.

1.12 AFFIRMS

- A. The undersigned affirms and agrees that this Proposal is a firm one which remains in effect and will be irrevocable for a period of forty-five (45) days after opening of Bids.

1.13 TYPE OF BUSINESS

- A. The undersigned hereby represents that it is a (check one) __Corporation, __Partnership, __Individual. If a Corporation, then the undersigned further represents that it is duly qualified as a Corporation under the laws of New York State and it is authorized to do business in this State.

1.14 PLACE OF BUSINESS

- A. The following is the name and address of the person to whom all notices required in connection with this Proposal may be telephoned, mailed, e-mailed, or delivered.

Name of Contact Person: _____

Name of Business or Firm: _____

Address: _____

Address: _____

Telephone: _____

Fax: _____

E-mail: _____

1.15 EXECUTION OF CONTRACT

- A. When written Notice of Acceptance of the Proposal is mailed or delivered to the undersigned within forty-five (45) days after the opening of Bids, or anytime thereafter should the Proposal not be withdrawn, the undersigned, within ten (10) days, will execute the Form of Agreement with the Owner.

1.16 ADDENDA

- A. The Undersigned acknowledges the receipt of the following Addenda, but agrees that it is bound by all Addenda whether or not listed below:

Addendum # _____ Dated: _____

Addendum # _____ Dated: _____

Addendum # _____ Dated: _____

Addendum # _____ Dated: _____

Addendum # _____ Dated: _____

Addendum # _____ Dated: _____

1.17 ASBESTOS

- A. The bidder certifies that no asbestos or asbestos-containing materials will be incorporated into the Work of this Contract.

1.18 AUTHORIZED SIGNATURES FOR PROPOSALS

Signature: _____

Name: _____
(Typed or Printed)

Title: _____

Firm: _____
(Legal Name of Person, Single Proprietorship, Partnership, or Corporation)

Date: _____

(if Corporation, provide seal above)

END OF SECTION 00 4050

SECTION 00 4051 - FORM OF PROPOSAL
CONTRACT 2: MECHANICAL CONSTRUCTION WORK

1.1 GENERAL

- A. Pursuant to, and in compliance with, the Advertisement for Bids and the Instructions to Bidders relative thereto, and all of the Contract Documents, including any and all Addenda issued by the Architect and mailed or delivered to the Undersigned prior to the opening of Bids, whether received by the Undersigned or not, we, _____ hereby propose to furnish all plant, labor, supplies, materials and equipment incidental to **CONTRACT 2: MECHANICAL CONSTRUCTION WORK** as required by, and in strict accord with, the applicable provisions of the Drawings and Specifications entitled **Pine Bush Central School District – 2019 Capital Improvement Project – Phase 2**, to the satisfaction and approval of the Owner, Architect and Construction Manager in accordance with the terms and conditions of the Contract Documents for the following sum:

BASE BID:

Total: (\$ _____)
_____ Dollars

1.2 BID GUARANTEE

- A. The undersigned Bidder agrees to execute a contract for this Work in the above amount and to furnish surety as specified within 10 days after a written Notice of Award, if offered within 45 days after receipt of bids, and on failure to do so agrees to forfeit to Owner the attached Bid Security as liquidated damages for such failure, in an amount constituting five percent (5%) of the Base Bid.
- B. In the event Owner does not offer Notice of Award within the time limits stated above, Owner will return to the undersigned the Bid Security.

1.3 TIME OF COMPLETION

- A. It is agreed by the undersigned that after receipt of a Notice of Award and a consummation of a Contract Agreement in accord with the terms of the Contract Documents, he will start work within 10 consecutive calendar days of the notice to proceed and fully complete the work as indicated in the Construction Schedule (Specification Section 01 3216).

1.4 SCHEDULE OF WORK

- A. Scheduling of all work shall be coordinated through the District and or the District's Representative. Contractor shall coordinate their work around the District's needs.
- B. It is the District's intent to work with the Contractor and make the building available for the work to be performed within the time frame allowed.

1.5 ALLOWANCES (Reference specification section 01 2100).

- A. The Bidder acknowledges that the Allowance(s) applicable to this Contract is (are) included in the Base Bid.
- B. Mechanical Construction Work Allowances for Contract 2:
1. **MC-1: Contingency Allowance = \$100,000.00**

1.6 ALTERNATES (Reference specification Section 01 2300).

- A. Enter dollar amount, even if it is zero dollars (\$0.00), for each Alternate. Do not leave any Alternate amount blank. If any amount is blank, it will be assumed the Bidder will provide that Alternate for no change in Contract Price.
- B. Alternate **PAK-MC-01**: Provide Gymnasium RTU Replacement work as outlined on Construction Documents at Pakanasink Elementary School.

ADD / DEDUCT (\$ _____)
_____ Dollars

1.7 NON-COLLUSIVE BIDDING CERTIFICATION

- A. By submission of this bid, the bidder, and each person signing on behalf of the bidder, certifies, and in the case of a joint bid each party thereto certifies as to its own organization, under penalty of perjury, that to the best of knowledge and belief:
1. The prices in this bid have been arrived at independently without collusion, consultation, communication, or agreement, for the purpose of restricting competition, as to any matter relating to such prices with any other bidder or with any competitor;
 2. Unless otherwise required by law, the prices which have been quoted in this bid have not been knowingly disclosed by the bidder and will not knowingly be disclosed by the bidder prior to opening, directly or indirectly, to any other bidder or to any competitor; and,
 3. No attempt has been made, or will be made, by the bidder to induce any other person, partnership or corporation to submit, or not to submit, a bid for the purpose of restricting competition.
- B. The person signing this bid or proposal certifies that he/she has fully informed himself/herself regarding the accuracy of the statements contained in this certification, and under the penalties or perjury, affirms the truth thereof, such penalties being applicable to the bidder as well as the person signing in its behalf;
1. That, attached hereto (if a corporate bidder), is a certified copy of a resolution authorizing the execution of this certificate by the signature of this bid or proposal on behalf of the corporate bidder.

Resolved that _____
(Name of Individual)

be authorized to sign and submit the bid or proposal of this corporation for the **Pine Bush Central School District, 2019 Capital Improvement Project – Phase 2**, and to include in such bid or proposal the certificate as to non-collusion required by Section One Hundred Three (d) ((103d)) of the General Municipal Law as the act and deed of such corporation, and for any inaccuracies or misstatements in such certificate this corporate bidder shall be liable under the penalties of perjury.

The foregoing is a true and correct copy of the resolution by:

_____ Corporation at a
meeting of its Board of Directors held on the: _____ day of _____,
20 ____.

(SEAL OF THE CORPORATION)

Secretary

1.8 BID SECURITY

- A. Bid Security in the form of a Certified or Cashier's Check or a Bid Bond in the form required by the Contract Documents is attached to and made a part of this Proposal. A Statement of Surety's Intent is also attached to, and made a part of, this Proposal.

1.9 REPRESENTATIONS & NON-COLLUSIVE BIDDING CERTIFICATION

- A. By submitting this Proposal the Bidder represents and certifies that:
1. It has examined the Contract Documents, the site of the proposed Work, is familiar with the local conditions at the place where the Work is to be performed and fully comprehends the requirements and intent of the plans and specifications for this Project in accordance with the Contract Documents.
 2. It has examined and reviewed, where applicable, all information and data in the Contract Documents related to existing underground facilities at or contiguous to the site. Bidder shall require of the Owner or Architect no further investigations, explorations, tests or reports with respect to such underground facilities in order for the Bidder to perform the Work of the Proposal within the Contract Time and in accordance with the Contract Documents.
 3. It has given notice to the Architect, as required by the Contract Documents, of any and all discrepancies it has discovered and accepts the resolution of those discrepancies offered by the Architect.
 4. Pursuant to New York State General Municipal Law Section 103-d, by submission of this bid, each bidder and each person signing on behalf of any bidder certifies, and in the case of a joint bid each party thereto certifies as to its own organization, under penalty of perjury, that to the best of knowledge and belief:
 - a. The prices in this bid have been arrived at independently without collusion, communication, or agreement, for the purpose of restricting competition, as to any matter relating to such prices with any other bidder or with any competitor;
 - b. Unless otherwise required by law, the prices which have been quoted in this bid have not been knowingly disclosed by the bidder and will not be knowingly disclosed by the bidder prior to opening, directly or indirectly, to any other bidder or competitor; and
 - c. No attempt has been made or will be made by bidder to induce any other person, partnership or corporation to submit or not to submit a bid for the purpose of restricting competition.

5. The proposal is based upon the materials, equipment and systems required by the Contract Documents, without exception, unless otherwise set forth in this Proposal in detail.

1.10 CHANGE ORDERS

- A. We propose and agree that the Contract Sum shall be adjusted for changes in the Contract Work not included in unit prices by addition of the following costs:
1. Profit and overhead as permitted in the Contract Documents.

1.11 ACCEPTANCE

- A. When this Proposal is accepted, the Undersigned agrees to enter into a Contract with the Owner as provided in the Contract Documents.

1.12 AFFIRMS

- A. The undersigned affirms and agrees that this Proposal is a firm one which remains in effect and will be irrevocable for a period of forty-five (45) days after opening of Bids.

1.13 TYPE OF BUSINESS

- A. The undersigned hereby represents that it is a (check one) __Corporation, __Partnership, __Individual. If a Corporation, then the undersigned further represents that it is duly qualified as a Corporation under the laws of New York State and it is authorized to do business in this State.

1.14 PLACE OF BUSINESS

- A. The following is the name and address of the person to whom all notices required in connection with this Proposal may be telephoned, mailed, e-mailed, or delivered.

Name of Contact Person: _____

Name of Business or Firm: _____

Address: _____

Address: _____

Telephone: _____

Fax: _____

E-mail: _____

1.15 EXECUTION OF CONTRACT

- A. When written Notice of Acceptance of the Proposal is mailed or delivered to the undersigned within forty-five (45) days after the opening of Bids, or anytime thereafter should the Proposal not be withdrawn, the undersigned, within ten (10) days, will execute the Form of Agreement with the Owner.

1.16 ADDENDA

- A. The Undersigned acknowledges the receipt of the following Addenda, but agrees that it is bound by all Addenda whether or not listed below:

Addendum # _____	Dated: _____
Addendum # _____	Dated: _____
Addendum # _____	Dated: _____
Addendum # _____	Dated: _____
Addendum # _____	Dated: _____
Addendum # _____	Dated: _____

1.17 ASBESTOS

- A. The bidder certifies that no asbestos or asbestos-containing materials will be incorporated into the Work of this Contract.

1.18 AUTHORIZED SIGNATURES FOR PROPOSALS

Signature: _____

Name: _____
(Typed or Printed)

Title: _____

Firm: _____
(Legal Name of Person, Single Proprietorship, Partnership, or Corporation)

Date: _____

(if Corporation, provide seal above)

END OF SECTION 00 4051

SECTION 00 4052 - FORM OF PROPOSAL
CONTRACT 3: ELECTRICAL CONSTRUCTION WORK

1.1 GENERAL

- A. Pursuant to, and in compliance with, the Advertisement for Bids and the Instructions to Bidders relative thereto, and all of the Contract Documents, including any and all Addenda issued by the Architect and mailed or delivered to the Undersigned prior to the opening of Bids, whether received by the Undersigned or not, we, _____ hereby propose to furnish all plant, labor, supplies, materials and equipment incidental to **CONTRACT 3: ELECTRICAL CONSTRUCTION WORK** as required by, and in strict accord with, the applicable provisions of the Drawings and Specifications entitled **Pine Bush Central School District – 2019 Capital Improvement Project – Phase 2**, to the satisfaction and approval of the Owner, Architect and Construction Manager in accordance with the terms and conditions of the Contract Documents for the following sum:

BASE BID:

Total: (\$ _____)
_____ Dollars

1.2 BID GUARANTEE

- A. The undersigned Bidder agrees to execute a contract for this Work in the above amount and to furnish surety as specified within 10 days after a written Notice of Award, if offered within 45 days after receipt of bids, and on failure to do so agrees to forfeit to Owner the attached Bid Security as liquidated damages for such failure, in an amount constituting five percent (5%) of the Base Bid.
- B. In the event Owner does not offer Notice of Award within the time limits stated above, Owner will return to the undersigned the Bid Security.

1.3 TIME OF COMPLETION

- A. It is agreed by the undersigned that after receipt of a Notice of Award and a consummation of a Contract Agreement in accord with the terms of the Contract Documents, he will start work within 10 consecutive calendar days of the notice to proceed and fully complete the work as indicated in the Construction Schedule (Specification Section 01 3216).

1.4 SCHEDULE OF WORK

- A. Scheduling of all work shall be coordinated through the District and or the District's Representative. Contractor shall coordinate their work around the District's needs.
- B. It is the District's intent to work with the Contractor and make the building available for the work to be performed within the time frame allowed.

1.5 ALLOWANCES (Reference specification section 01 2100).

- A. The Bidder acknowledges that the Allowance(s) applicable to this Contract is (are) included in the Base Bid.
- B. Electrical Construction Work Allowances for Contract 3:
1. **EC-1: Contingency Allowance = \$50,000.00**

1.6 ALTERNATES (Reference specification Section 01 2300).

- A. Enter dollar amount, even if it is zero dollars (\$0.00), for each Alternate. Do not leave any Alternate amount blank. If any amount is blank, it will be assumed the Bidder will provide that Alternate for no change in Contract Price.

- B. Alternate **PAK-EC-01**: Provide Electrical Work related to Gymnasium RTU Replacement as outlined on Construction Documents at Pakanasink Elementary School.

ADD / DEDUCT (\$ _____)
_____ Dollars

- C. Alternate **CES-EC-01**: Provide Electrical Work related to Site Work as outlined on Construction Documents at Circleville Elementary School Site.

ADD / DEDUCT (\$ _____)
_____ Dollars

- D. Alternate **CVMS-EC-01**: Provide Electrical Work related to Site Work as outlined on Construction Documents at Circleville Middle School / Pakanasink Elementary School Site.

ADD / DEDUCT (\$ _____)
_____ Dollars

1.7 NON-COLLUSIVE BIDDING CERTIFICATION

- A. By submission of this bid, the bidder, and each person signing on behalf of the bidder, certifies, and in the case of a joint bid each party thereto certifies as to its own organization, under penalty of perjury, that to the best of knowledge and belief:

1. The prices in this bid have been arrived at independently without collusion, consultation, communication, or agreement, for the purpose of restricting competition, as to any matter relating to such prices with any other bidder or with any competitor;

2. Unless otherwise required by law, the prices which have been quoted in this bid have not been knowingly disclosed by the bidder and will not knowingly be disclosed by the bidder prior to opening, directly or indirectly, to any other bidder or to any competitor; and,

3. No attempt has been made, or will be made, by the bidder to induce any other person, partnership or corporation to submit, or not to submit, a bid for the purpose of restricting competition.

- B. The person signing this bid or proposal certifies that he/she has fully informed himself/herself regarding the accuracy of the statements contained in this certification, and under the penalties or perjury, affirms the truth thereof, such penalties being applicable to the bidder as well as the person signing in its behalf;

1. That, attached hereto (if a corporate bidder), is a certified copy of a resolution authorizing the execution of this certificate by the signature of this bid or proposal on behalf of the corporate bidder.

Resolved that _____
(Name of Individual)

be authorized to sign and submit the bid or proposal of this corporation for the **Pine Bush Central School District, 2019 Capital Improvement Project – Phase 2**, and to include in such bid or proposal the certificate as to non-collusion required by Section One Hundred Three (d) ((103d)) of the General Municipal Law as the act and deed of such corporation, and for any inaccuracies or misstatements in such certificate this corporate bidder shall be liable under the penalties of perjury.

The foregoing is a true and correct copy of the resolution by:

 meeting of its Board of Directors held on the: ____ day of _____,
 20 ____.

(SEAL OF THE CORPORATION)

 Secretary

1.8 BID SECURITY

- A. Bid Security in the form of a Certified or Cashier's Check or a Bid Bond in the form required by the Contract Documents is attached to and made a part of this Proposal. A Statement of Surety's Intent is also attached to, and made a part of, this Proposal.

1.9 REPRESENTATIONS & NON-COLLUSIVE BIDDING CERTIFICATION

- A. By submitting this Proposal the Bidder represents and certifies that:
1. It has examined the Contract Documents, the site of the proposed Work, is familiar with the local conditions at the place where the Work is to be performed and fully comprehends the requirements and intent of the plans and specifications for this Project in accordance with the Contract Documents.
 2. It has examined and reviewed, where applicable, all information and data in the Contract Documents related to existing underground facilities at or contiguous to the site. Bidder shall require of the Owner or Architect no further investigations, explorations, tests or reports with respect to such underground facilities in order for the Bidder to perform the Work of the Proposal within the Contract Time and in accordance with the Contract Documents.

3. It has given notice to the Architect, as required by the Contract Documents, of any and all discrepancies it has discovered and accepts the resolution of those discrepancies offered by the Architect.
4. Pursuant to New York State General Municipal Law Section 103-d, by submission of this bid, each bidder and each person signing on behalf of any bidder certifies, and in the case of a joint bid each party thereto certifies as to its own organization, under penalty of perjury, that to the best of knowledge and belief:
 - a. The prices in this bid have been arrived at independently without collusion, communication, or agreement, for the purpose of restricting competition, as to any matter relating to such prices with any other bidder or with any competitor;
 - b. Unless otherwise required by law, the prices which have been quoted in this bid have not been knowingly disclosed by the bidder and will not be knowingly disclosed by the bidder prior to opening, directly or indirectly, to any other bidder or competitor; and
 - c. No attempt has been made or will be made by bidder to induce any other person, partnership or corporation to submit or not to submit a bid for the purpose of restricting competition.
5. The proposal is based upon the materials, equipment and systems required by the Contract Documents, without exception, unless otherwise set forth in this Proposal in detail.

1.10 CHANGE ORDERS

- A. We propose and agree that the Contract Sum shall be adjusted for changes in the Contract Work not included in unit prices by addition of the following costs:
 1. Profit and overhead as permitted in the Contract Documents.

1.11 ACCEPTANCE

- A. When this Proposal is accepted, the Undersigned agrees to enter into a Contract with the Owner as provided in the Contract Documents.

1.12 AFFIRMS

- A. The undersigned affirms and agrees that this Proposal is a firm one which remains in effect and will be irrevocable for a period of forty-five (45) days after opening of Bids.

1.13 TYPE OF BUSINESS

- A. The undersigned hereby represents that it is a (check one) __Corporation, __Partnership, __Individual. If a Corporation, then the undersigned further represents that it is duly qualified as a Corporation under the laws of New York State and it is authorized to do business in this State.

1.14 PLACE OF BUSINESS

- A. The following is the name and address of the person to whom all notices required in connection with this Proposal may be telephoned, mailed, e-mailed, or delivered.

Name of Contact Person: _____

Name of Business or Firm: _____

Address: _____

Address: _____
Telephone: _____
Fax: _____
E-mail: _____

1.15 EXECUTION OF CONTRACT

- A. When written Notice of Acceptance of the Proposal is mailed or delivered to the undersigned within forty-five (45) days after the opening of Bids, or anytime thereafter should the Proposal not be withdrawn, the undersigned, within ten (10) days, will execute the Form of Agreement with the Owner.

1.16 ADDENDA

- A. The Undersigned acknowledges the receipt of the following Addenda, but agrees that it is bound by all Addenda whether or not listed below:

Addendum # _____ Dated: _____
Addendum # _____ Dated: _____
Addendum # _____ Dated: _____
Addendum # _____ Dated: _____
Addendum # _____ Dated: _____
Addendum # _____ Dated: _____

1.17 ASBESTOS

- A. The bidder certifies that no asbestos or asbestos-containing materials will be incorporated into the Work of this Contract.

1.18 AUTHORIZED SIGNATURES FOR PROPOSALS

Signature: _____
Name: _____
(Typed or Printed)
Title: _____
Firm: _____
(Legal Name of Person, Single Proprietorship, Partnership, or Corporation)
Date: _____

(if Corporation, provide seal above)

END OF SECTION 00 4052

SECTION 00 4053 - FORM OF PROPOSAL
CONTRACT 4: PLUMBING CONSTRUCTION WORK

1.1 GENERAL

- A. Pursuant to, and in compliance with, the Advertisement for Bids and the Instructions to Bidders relative thereto, and all of the Contract Documents, including any and all Addenda issued by the Architect and mailed or delivered to the Undersigned prior to the opening of Bids, whether received by the Undersigned or not, we, _____ hereby propose to furnish all plant, labor, supplies, materials and equipment incidental to **CONTRACT 4: PLUMBING CONSTRUCTION WORK** as required by, and in strict accord with, the applicable provisions of the Drawings and Specifications entitled **Pine Bush Central School District – 2019 Capital Improvement Project – Phase 2**, to the satisfaction and approval of the Owner, Architect and Construction Manager in accordance with the terms and conditions of the Contract Documents for the following sum:

BASE BID:

Total: (\$ _____)
_____ Dollars

1.2 BID GUARANTEE

- A. The undersigned Bidder agrees to execute a contract for this Work in the above amount and to furnish surety as specified within 10 days after a written Notice of Award, if offered within 45 days after receipt of bids, and on failure to do so agrees to forfeit to Owner the attached Bid Security as liquidated damages for such failure, in an amount constituting five percent (5%) of the Base Bid.
- B. In the event Owner does not offer Notice of Award within the time limits stated above, Owner will return to the undersigned the Bid Security.

1.3 TIME OF COMPLETION

- A. It is agreed by the undersigned that after receipt of a Notice of Award and a consummation of a Contract Agreement in accord with the terms of the Contract Documents, he will start work within 10 consecutive calendar days of the notice to proceed and fully complete the work as indicated in the Construction Schedule (Specification Section 01 3216).

1.4 SCHEDULE OF WORK

- A. Scheduling of all work shall be coordinated through the District and or the District's Representative. Contractor shall coordinate their work around the District's needs.
- B. It is the District's intent to work with the Contractor and make the building available for the work to be performed within the time frame allowed.

1.5 ALLOWANCES (Reference specification section 01 2100).

- A. The Bidder acknowledges that the Allowance(s) applicable to this Contract is (are) included in the Base Bid.
- B. Plumbing Construction Work Allowances for Contract 4:
1. **PC-1: Contingency Allowance = \$25,000.00**

1.6 NON-COLLUSIVE BIDDING CERTIFICATION

A. By submission of this bid, the bidder, and each person signing on behalf of the bidder, certifies, and in the case of a joint bid each party thereto certifies as to its own organization, under penalty of perjury, that to the best of knowledge and belief:

1. The prices in this bid have been arrived at independently without collusion, consultation, communication, or agreement, for the purpose of restricting competition, as to any matter relating to such prices with any other bidder or with any competitor;

2. Unless otherwise required by law, the prices which have been quoted in this bid have not been knowingly disclosed by the bidder and will not knowingly be disclosed by the bidder prior to opening, directly or indirectly, to any other bidder or to any competitor; and,

3. No attempt has been made, or will be made, by the bidder to induce any other person, partnership or corporation to submit, or not to submit, a bid for the purpose of restricting competition.

B. The person signing this bid or proposal certifies that he/she has fully informed himself/herself regarding the accuracy of the statements contained in this certification, and under the penalties or perjury, affirms the truth thereof, such penalties being applicable to the bidder as well as the person signing in its behalf;

1. That, attached hereto (if a corporate bidder), is a certified copy of a resolution authorizing the execution of this certificate by the signature of this bid or proposal on behalf of the corporate bidder.

Resolved that _____

(Name of Individual)

be authorized to sign and submit the bid or proposal of this corporation for the **Pine Bush Central School District, 2019 Capital Improvement Project – Phase 2**, and to include in such bid or proposal the certificate as to non-collusion required by Section One Hundred Three (d) ((103d)) of the General Municipal Law as the act and deed of such corporation, and for any inaccuracies or misstatements in such certificate this corporate bidder shall be liable under the penalties of perjury.

The foregoing is a true and correct copy of the resolution by:

_____ Corporation at a
meeting of its Board of Directors held on the: ____ day of _____,
20 ____.

(SEAL OF THE CORPORATION)

Secretary

1.7 BID SECURITY

- A. Bid Security in the form of a Certified or Cashier's Check or a Bid Bond in the form required by the Contract Documents is attached to and made a part of this Proposal. A Statement of Surety's Intent is also attached to, and made a part of, this Proposal.

1.8 REPRESENTATIONS & NON-COLLUSIVE BIDDING CERTIFICATION

- A. By submitting this Proposal the Bidder represents and certifies that:
1. It has examined the Contract Documents, the site of the proposed Work, is familiar with the local conditions at the place where the Work is to be performed and fully comprehends the requirements and intent of the plans and specifications for this Project in accordance with the Contract Documents.
 2. It has examined and reviewed, where applicable, all information and data in the Contract Documents related to existing underground facilities at or contiguous to the site. Bidder shall require of the Owner or Architect no further investigations, explorations, tests or reports with respect to such underground facilities in order for the Bidder to perform the Work of the Proposal within the Contract Time and in accordance with the Contract Documents.
 3. It has given notice to the Architect, as required by the Contract Documents, of any and all discrepancies it has discovered and accepts the resolution of those discrepancies offered by the Architect.
 4. Pursuant to New York State General Municipal Law Section 103-d, by submission of this bid, each bidder and each person signing on behalf of any bidder certifies, and in the case of a joint bid each party thereto certifies as to its own organization, under penalty of perjury, that to the best of knowledge and belief:
 - a. The prices in this bid have been arrived at independently without collusion, communication, or agreement, for the purpose of restricting competition, as to any matter relating to such prices with any other bidder or with any competitor;
 - b. Unless otherwise required by law, the prices which have been quoted in this bid have not been knowingly disclosed by the bidder and will not be knowingly disclosed by the bidder prior to opening, directly or indirectly, to any other bidder or competitor; and
 - c. No attempt has been made or will be made by bidder to induce any other person, partnership or corporation to submit or not to submit a bid for the purpose of restricting competition.
 5. The proposal is based upon the materials, equipment and systems required by the Contract Documents, without exception, unless otherwise set forth in this Proposal in detail.

1.9 CHANGE ORDERS

- A. We propose and agree that the Contract Sum shall be adjusted for changes in the Contract Work not included in unit prices by addition of the following costs:
1. Profit and overhead as permitted in the Contract Documents.

1.10 ACCEPTANCE

- A. When this Proposal is accepted, the Undersigned agrees to enter into a Contract with the Owner as provided in the Contract Documents.

1.11 AFFIRMS

- A. The undersigned affirms and agrees that this Proposal is a firm one which remains in effect and will be irrevocable for a period of forty-five (45) days after opening of Bids.

1.12 TYPE OF BUSINESS

- A. The undersigned hereby represents that it is a (check one) __Corporation, __Partnership, __Individual. If a Corporation, then the undersigned further represents that it is duly qualified as a Corporation under the laws of New York State and it is authorized to do business in this State.

1.13 PLACE OF BUSINESS

- A. The following is the name and address of the person to whom all notices required in connection with this Proposal may be telephoned, mailed, e-mailed, or delivered.

Name of Contact Person: _____

Name of Business or Firm: _____

Address: _____

Address: _____

Telephone: _____

Fax: _____

E-mail: _____

1.14 EXECUTION OF CONTRACT

- A. When written Notice of Acceptance of the Proposal is mailed or delivered to the undersigned within forty-five (45) days after the opening of Bids, or anytime thereafter should the Proposal not be withdrawn, the undersigned, within ten (10) days, will execute the Form of Agreement with the Owner.

1.15 ADDENDA

- A. The Undersigned acknowledges the receipt of the following Addenda, but agrees that it is bound by all Addenda whether or not listed below:

Addendum # _____ Dated: _____

Addendum # _____ Dated: _____

Addendum # _____ Dated: _____

Addendum # _____ Dated: _____

Addendum # _____ Dated: _____

Addendum # _____ Dated: _____

1.16 ASBESTOS

- A. The bidder certifies that no asbestos or asbestos-containing materials will be incorporated into the Work of this Contract.

1.17 AUTHORIZED SIGNATURES FOR PROPOSALS

Signature: _____

Name: _____
(Typed or Printed)

Title: _____

Firm: _____
(Legal Name of Person, Single Proprietorship, Partnership, or Corporation)

Date: _____

(if Corporation, provide seal above)

END OF SECTION 00 4053

PROJECT NO. 14533.05

Pine Bush Central School District
2019 Capital Improvement Project – Phase 2

(Name of Bidder)

Federal Employer's Identification No.:

STATEMENT OF BIDDER'S QUALIFICATIONS

CONTRACT FOR: GENERAL CONSTRUCTION WORK

NOTARIZED AND SUBMITTED BY 3 LOWEST BIDDERS

WITHIN 72 HOURS UPON REQUEST BY ARCHITECT

All questions must be answered and the data given must be clear and comprehensive. If necessary, questions may be answered on separate attached sheet.

1. Name of Bidder
2. Permanent main office address
3. When organized
4. If a corporation, where incorporated
5. How many years have you been engaged in the contracting business under your present firm or trade name?
6. Contracts on hand: (Schedule these, showing amount of each contract and the appropriate anticipated dates of completion.)
7. General character of work performed by your company
8. Has any construction contract to which you have been a party been terminated by the OWNER; have you ever terminated work on a project prior to its completion for any reason; has any surety which issued a performance bond on your behalf ever completed the work in its own name or financed such completion on your behalf; has any surety expended any monies in connection with a contract for which they furnished a bond on your behalf? If the answer to any portion of this question is "yes", please furnish details of all such occurrences including name of Owner, Architect, Construction Manager, surety, and name and date of project.
9. Has any officer, partner, member or manager of your organization ever been an officer, partner, member or manager of another organization that had any construction contract terminated by the OWNER; terminated work on a project prior to its completion for any reason; had any surety which issued a performance bond complete the work in its own name or financed such completion; or had any surety expend any monies in connection with a contract for which they furnished a bond? If the answer to any portion of this question is "yes", please furnish details of all such occurrences including name of Owner, Architect, Construction Manager, surety, and name and date of project.
10. List your experience in work similar to this project.
11. List name of Project, Owner, Architect, Construction Manager, contract amount, percent complete and scheduled completion of the major construction projects your organization has in process on this date.
12. List name of Project, Owner, Architect, Construction Manager, contract amount, date of completion and percent of work with own forces of the major projects of the same general nature as this project which your organization has completed in the past five (5) years.

13. List name, address and telephone number of a reference for each Project listed under items 8, 9, 11 and 12 above.
14. List names and construction experience of the principal individuals of our organization, including officers.
15. List the states and categories of construction in which your organization is legally qualified to do business.
16. List name, address and telephone number of an individual who represents each of the following and whom OWNER may contact for a financial reference:

.1 One Surety Company:

.2 Two banks:

.3 Three major material suppliers:

17. Attach a financial statement, prepared on an accrual basis, in a form which clearly indicates assets, liabilities and net worth.

1.1 Date of financial Statement: _____

2 Name of firm preparing statement: _____

18. The undersigned hereby authorizes and requests any person, firm or corporation to furnish any information requested by the Owner in verification of the recitals comprising this Statement of Bidder's Qualifications.

Dated _____ this _____ date of _____,
20__.

(Name of Bidder)

By

Title

State of _____)
) ss.

County of

_____ being duly sworn deposes and says that he is
_____ of

(Name of Organization)

and that the answers to the foregoing questions and all statements therein contained are true and correct.

Subscribed and sworn to before me

this _____ day of _____, 20_____

My commission expires _____, 20

Bidders Statement

I am _____
(Name)

of _____
(Firm or Corporation)

The undersigned Bidder certifies that I, or my authorized representative, have personally inspected the job site. Bidder has relied on its own knowledge and a review and interpretation of the Bidding Documents and all relevant plans and specifications, boring logs and other data in submitting his bid and not on any representation made by the Owner, Architect, Construction Manager, or any other person, with respect to the character, quality or quantities of Work to be performed, or materials or equipment to be furnished. Bidder acknowledges that any quantities are an estimate only so that Bidder agrees not to seek additional compensation or request an adjustment in any unit price as a result of any variation in quantities or unforeseen site conditions encountered for any reason whatsoever. The Bidder represents that it has reviewed and accepts the applicable Project schedule and all revisions thereto. The Bidder agrees and understands that any such project schedule is incorporated by reference in the Contract Documents and further acknowledges that its failure to adhere to any such project schedule will expose Owner to severe financial hardship. Accordingly, Bidder agrees to exonerate, indemnify and hold Owner harmless from and against any and all losses, damages (including claims made by other Contractors performing Work at the Project) and claims arising out of Bidder's failure to adhere to any project schedule or any modifications, updates or revisions thereto. The Bidder's failure to adhere to and maintain the project schedule, including any revisions thereto, shall be grounds for termination.

By: _____
(Signature of Bidder)

(Title or Position)

(Seal if Bidder is a Corporation)

(Printed or Typed Name of Bidder)

PERFORMANCE BOND INFORMATION FORM

City/Town/Village	_____
School District	_____
Construction Contract Number	_____
Name of Contract	_____
Name of Contractor	_____
Address	_____ _____ _____
Entity Issuing Security Bond	_____
Address	_____ _____ _____
Bonding Agent	_____
Address	_____ _____ _____
Amount of Bid	_____
Duration of Bond	From: _____ To: _____
Bond Identification Number	_____

END OF SECTION 00 4550

PROJECT NO. 14533.05

**Pine Bush Central School District
2019 Capital Improvement Project – Phase 2**

(Name of Bidder)

Federal Employer's Identification No.:

STATEMENT OF BIDDER'S QUALIFICATIONS

CONTRACT FOR: MECHANICAL CONSTRUCTION WORK

NOTARIZED AND SUBMITTED BY 3 LOWEST BIDDERS

WITHIN 72 HOURS UPON REQUEST BY ARCHITECT

All questions must be answered and the data given must be clear and comprehensive. If necessary, questions may be answered on separate attached sheet.

1. Name of Bidder
2. Permanent main office address
3. When organized
4. If a corporation, where incorporated
5. How many years have you been engaged in the contracting business under your present firm or trade name?
6. Contracts on hand: (Schedule these, showing amount of each contract and the appropriate anticipated dates of completion.)
7. General character of work performed by your company
8. Has any construction contract to which you have been a party been terminated by the OWNER; have you ever terminated work on a project prior to its completion for any reason; has any surety which issued a performance bond on your behalf ever completed the work in its own name or financed such completion on your behalf; has any surety expended any monies in connection with a contract for which they furnished a bond on your behalf? If the answer to any portion of this question is "yes", please furnish details of all such occurrences including name of Owner, Architect, Construction Manager, surety, and name and date of project.
9. Has any officer, partner, member or manager of your organization ever been an officer, partner, member or manager of another organization that had any construction contract terminated by the OWNER; terminated work on a project prior to its completion for any reason; had any surety which issued a performance bond complete the work in its own name or financed such completion; or had any surety expend any monies in connection with a contract for which they furnished a bond? If the answer to any portion of this question is "yes", please furnish details of all such occurrences including name of Owner, Architect, Construction Manager, surety, and name and date of project.
10. List your experience in work similar to this project.
11. List name of Project, Owner, Architect, Construction Manager, contract amount, percent complete and scheduled completion of the major construction projects your organization has in process on this date.
12. List name of Project, Owner, Architect, Construction Manager, contract amount, date of completion and percent of work with own forces of the major projects of the same general nature as this project which your organization has completed in the past five (5) years.

13. List name, address and telephone number of a reference for each Project listed under items 8, 9, 11 and 12 above.
14. List names and construction experience of the principal individuals of our organization, including officers.
15. List the states and categories of construction in which your organization is legally qualified to do business.
16. List name, address and telephone number of an individual who represents each of the following and whom OWNER may contact for a financial reference:

.1 One Surety Company:

.2 Two banks:

.3 Three major material suppliers:

17. Attach a financial statement, prepared on an accrual basis, in a form which clearly indicates assets, liabilities and net worth.

1.1 Date of financial Statement: _____

2 Name of firm preparing statement: _____

18. The undersigned hereby authorizes and requests any person, firm or corporation to furnish any information requested by the Owner in verification of the recitals comprising this Statement of Bidder's Qualifications.

Dated _____ this _____ date of _____, 20__

(Name of Bidder)

By

Title

State of _____)
) ss.

County of

_____ being duly sworn deposes and says that he is
_____ of

(Name of Organization)

and that the answers to the foregoing questions and all statements therein contained are true and correct.

Subscribed and sworn to before me

this _____ day of _____, 20_____

My commission expires _____, 20

Bidders Statement

I am _____
(Name)

of _____
(Firm or Corporation)

The undersigned Bidder certifies that I, or my authorized representative, have personally inspected the job site. Bidder has relied on its own knowledge and a review and interpretation of the Bidding Documents and all relevant plans and specifications, boring logs and other data in submitting his bid and not on any representation made by the Owner, Architect, Construction Manager, or any other person, with respect to the character, quality or quantities of Work to be performed, or materials or equipment to be furnished. Bidder acknowledges that any quantities are an estimate only so that Bidder agrees not to seek additional compensation or request an adjustment in any unit price as a result of any variation in quantities or unforeseen site conditions encountered for any reason whatsoever. The Bidder represents that it has reviewed and accepts the applicable Project schedule and all revisions thereto. The Bidder agrees and understands that any such project schedule is incorporated by reference in the Contract Documents and further acknowledges that its failure to adhere to any such project schedule will expose Owner to severe financial hardship. Accordingly, Bidder agrees to exonerate, indemnify and hold Owner harmless from and against any and all losses, damages (including claims made by other Contractors performing Work at the Project) and claims arising out of Bidder's failure to adhere to any project schedule or any modifications, updates or revisions thereto. The Bidder's failure to adhere to and maintain the project schedule, including any revisions thereto, shall be grounds for termination.

By: _____
(Signature of Bidder)

(Title or Position)

(Seal if Bidder is a Corporation)

(Printed or Typed Name of Bidder)

PERFORMANCE BOND INFORMATION FORM

City/Town/Village	_____
School District	_____
Construction Contract Number	_____
Name of Contract	_____
Name of Contractor	_____
Address	_____ _____ _____
Entity Issuing Security Bond	_____
Address	_____ _____ _____
Bonding Agent	_____
Address	_____ _____ _____
Amount of Bid	_____
Duration of Bond	From: _____ To: _____
Bond Identification Number	_____

END OF SECTION 00 4551

PROJECT NO. 14533.05

**Pine Bush Central School District
2019 Capital Improvement Project – Phase 2**

(Name of Bidder)

Federal Employer's Identification No.:

STATEMENT OF BIDDER'S QUALIFICATIONS

CONTRACT FOR: ELECTRICAL CONSTRUCTION WORK

NOTARIZED AND SUBMITTED BY 3 LOWEST BIDDERS

WITHIN 72 HOURS UPON REQUEST BY ARCHITECT

All questions must be answered and the data given must be clear and comprehensive. If necessary, questions may be answered on separate attached sheet.

1. Name of Bidder
2. Permanent main office address
3. When organized
4. If a corporation, where incorporated
5. How many years have you been engaged in the contracting business under your present firm or trade name?
6. Contracts on hand: (Schedule these, showing amount of each contract and the appropriate anticipated dates of completion.)
7. General character of work performed by your company
8. Has any construction contract to which you have been a party been terminated by the OWNER; have you ever terminated work on a project prior to its completion for any reason; has any surety which issued a performance bond on your behalf ever completed the work in its own name or financed such completion on your behalf; has any surety expended any monies in connection with a contract for which they furnished a bond on your behalf? If the answer to any portion of this question is "yes", please furnish details of all such occurrences including name of Owner, Architect, Construction Manager, surety, and name and date of project.
9. Has any officer, partner, member or manager of your organization ever been an officer, partner, member or manager of another organization that had any construction contract terminated by the OWNER; terminated work on a project prior to its completion for any reason; had any surety which issued a performance bond complete the work in its own name or financed such completion; or had any surety expend any monies in connection with a contract for which they furnished a bond? If the answer to any portion of this question is "yes", please furnish details of all such occurrences including name of Owner, Architect, Construction Manager, surety, and name and date of project.
10. List your experience in work similar to this project.
11. List name of Project, Owner, Architect, Construction Manager, contract amount, percent complete and scheduled completion of the major construction projects your organization has in process on this date.
12. List name of Project, Owner, Architect, Construction Manager, contract amount, date of completion and percent of work with own forces of the major projects of the same general nature as this project which your organization has completed in the past five (5) years.

13. List name, address and telephone number of a reference for each Project listed under items 8, 9, 11 and 12 above.
14. List names and construction experience of the principal individuals of our organization, including officers.
15. List the states and categories of construction in which your organization is legally qualified to do business.
16. List name, address and telephone number of an individual who represents each of the following and whom OWNER may contact for a financial reference:

.1 One Surety Company:

.2 Two banks:

.3 Three major material suppliers:

17. Attach a financial statement, prepared on an accrual basis, in a form which clearly indicates assets, liabilities and net worth.

1.1 Date of financial Statement: _____

2 Name of firm preparing statement: _____

18. The undersigned hereby authorizes and requests any person, firm or corporation to furnish any information requested by the Owner in verification of the recitals comprising this Statement of Bidder's Qualifications.

Dated _____ this _____ date of _____, 20__

(Name of Bidder)

By

Title

State of _____)
) ss.

County of

_____ being duly sworn deposes and says that he is
_____ of

(Name of Organization)

and that the answers to the foregoing questions and all statements therein contained are true and correct.

Subscribed and sworn to before me

this _____ day of _____, 20_____

My commission expires _____, 20

Bidders Statement

I am _____
(Name)

of _____
(Firm or Corporation)

The undersigned Bidder certifies that I, or my authorized representative, have personally inspected the job site. Bidder has relied on its own knowledge and a review and interpretation of the Bidding Documents and all relevant plans and specifications, boring logs and other data in submitting his bid and not on any representation made by the Owner, Architect, Construction Manager, or any other person, with respect to the character, quality or quantities of Work to be performed, or materials or equipment to be furnished. Bidder acknowledges that any quantities are an estimate only so that Bidder agrees not to seek additional compensation or request an adjustment in any unit price as a result of any variation in quantities or unforeseen site conditions encountered for any reason whatsoever. The Bidder represents that it has reviewed and accepts the applicable Project schedule and all revisions thereto. The Bidder agrees and understands that any such project schedule is incorporated by reference in the Contract Documents and further acknowledges that its failure to adhere to any such project schedule will expose Owner to severe financial hardship. Accordingly, Bidder agrees to exonerate, indemnify and hold Owner harmless from and against any and all losses, damages (including claims made by other Contractors performing Work at the Project) and claims arising out of Bidder's failure to adhere to any project schedule or any modifications, updates or revisions thereto. The Bidder's failure to adhere to and maintain the project schedule, including any revisions thereto, shall be grounds for termination.

By: _____
(Signature of Bidder)

(Title or Position)

(Seal if Bidder is a Corporation)

(Printed or Typed Name of Bidder)

PERFORMANCE BOND INFORMATION FORM

City/Town/Village	_____
School District	_____
Construction Contract Number	_____
Name of Contract	_____
Name of Contractor	_____
Address	_____ _____ _____
Entity Issuing Security Bond	_____
Address	_____ _____ _____
Bonding Agent	_____
Address	_____ _____ _____
Amount of Bid	_____
Duration of Bond	From: _____ To: _____
Bond Identification Number	_____

END OF SECTION 00 4552

PROJECT NO. 14533.05

**Pine Bush Central School District
2019 Capital Improvement Project – Phase 2**

(Name of Bidder)

Federal Employer's Identification No.:

STATEMENT OF BIDDER'S QUALIFICATIONS

CONTRACT FOR: PLUMBING CONSTRUCTION WORK

NOTARIZED AND SUBMITTED BY 3 LOWEST BIDDERS

WITHIN 72 HOURS UPON REQUEST BY ARCHITECT

All questions must be answered and the data given must be clear and comprehensive. If necessary, questions may be answered on separate attached sheet.

1. Name of Bidder
2. Permanent main office address
3. When organized
4. If a corporation, where incorporated
5. How many years have you been engaged in the contracting business under your present firm or trade name?
6. Contracts on hand: (Schedule these, showing amount of each contract and the appropriate anticipated dates of completion.)
7. General character of work performed by your company
8. Has any construction contract to which you have been a party been terminated by the OWNER; have you ever terminated work on a project prior to its completion for any reason; has any surety which issued a performance bond on your behalf ever completed the work in its own name or financed such completion on your behalf; has any surety expended any monies in connection with a contract for which they furnished a bond on your behalf? If the answer to any portion of this question is "yes", please furnish details of all such occurrences including name of Owner, Architect, Construction Manager, surety, and name and date of project.
9. Has any officer, partner, member or manager of your organization ever been an officer, partner, member or manager of another organization that had any construction contract terminated by the OWNER; terminated work on a project prior to its completion for any reason; had any surety which issued a performance bond complete the work in its own name or financed such completion; or had any surety expend any monies in connection with a contract for which they furnished a bond? If the answer to any portion of this question is "yes", please furnish details of all such occurrences including name of Owner, Architect, Construction Manager, surety, and name and date of project.
10. List your experience in work similar to this project.
11. List name of Project, Owner, Architect, Construction Manager, contract amount, percent complete and scheduled completion of the major construction projects your organization has in process on this date.
12. List name of Project, Owner, Architect, Construction Manager, contract amount, date of completion and percent of work with own forces of the major projects of the same general nature as this project which your organization has completed in the past five (5) years.

13. List name, address and telephone number of a reference for each Project listed under items 8, 9, 11 and 12 above.
14. List names and construction experience of the principal individuals of our organization, including officers.
15. List the states and categories of construction in which your organization is legally qualified to do business.
16. List name, address and telephone number of an individual who represents each of the following and whom OWNER may contact for a financial reference:

.1 One Surety Company:

.2 Two banks:

.3 Three major material suppliers:

17. Attach a financial statement, prepared on an accrual basis, in a form which clearly indicates assets, liabilities and net worth.

1.1 Date of financial Statement: _____

.2 Name of firm preparing statement: _____

18. The undersigned hereby authorizes and requests any person, firm or corporation to furnish any information requested by the Owner in verification of the recitals comprising this Statement of Bidder's Qualifications.

Dated _____ this _____ date of _____, 20__

(Name of Bidder)

By

Title

State of _____)
) ss.

County of

_____being duly sworn deposes and says that he is

_____ of

(Name of Organization)

and that the answers to the foregoing questions and all statements therein contained are true and correct.

Subscribed and sworn to before me

this _____ day of _____, 20_____

My commission expires _____, 20

Bidders Statement

I am _____
(Name)

of _____
(Firm or Corporation)

The undersigned Bidder certifies that I, or my authorized representative, have personally inspected the job site. Bidder has relied on its own knowledge and a review and interpretation of the Bidding Documents and all relevant plans and specifications, boring logs and other data in submitting his bid and not on any representation made by the Owner, Architect, Construction Manager, or any other person, with respect to the character, quality or quantities of Work to be performed, or materials or equipment to be furnished. Bidder acknowledges that any quantities are an estimate only so that Bidder agrees not to seek additional compensation or request an adjustment in any unit price as a result of any variation in quantities or unforeseen site conditions encountered for any reason whatsoever. The Bidder represents that it has reviewed and accepts the applicable Project schedule and all revisions thereto. The Bidder agrees and understands that any such project schedule is incorporated by reference in the Contract Documents and further acknowledges that its failure to adhere to any such project schedule will expose Owner to severe financial hardship. Accordingly, Bidder agrees to exonerate, indemnify and hold Owner harmless from and against any and all losses, damages (including claims made by other Contractors performing Work at the Project) and claims arising out of Bidder's failure to adhere to any project schedule or any modifications, updates or revisions thereto. The Bidder's failure to adhere to and maintain the project schedule, including any revisions thereto, shall be grounds for termination.

By: _____
(Signature of Bidder)

(Title or Position)

(Seal if Bidder is a Corporation)

(Printed or Typed Name of Bidder)

PERFORMANCE BOND INFORMATION FORM

City/Town/Village	_____
School District	_____
Construction Contract Number	_____
Name of Contract	_____
Name of Contractor	_____
Address	_____ _____ _____
Entity Issuing Security Bond	_____
Address	_____ _____ _____
Bonding Agent	_____
Address	_____ _____ _____
Amount of Bid	_____
Duration of Bond	From: _____ To: _____
Bond Identification Number	_____

END OF SECTION 00 4553

IRAN DIVESTMENT ACT CERTIFICATION

The Iran Divestment Act of 2012 (“Act”), Chapter 1 of the 2012 Laws of New York, added State Finance Law (SFL), §165-a and General Municipal Law §103-g, effective April 12, 2012. Under the Act, the Commissioner of the New York State Office of General Services (“OGS”) developed a list (“Prohibited Entities List”) of “persons” who are engaged in “investment activities in Iran” (both are defined terms in the law). In accordance with SFL § 165-a(3), the Prohibited Entities List may be found on the OGS website at

<http://www.ogs.ny.gov/about/regs/docs/ListofEntities.pdf>.

Pursuant to General Municipal Law §103-g, by signing below, Bidder certifies as true under the penalties of perjury that:

By submission of this Bid each Bidder and each person signing on behalf of any Bidder certifies, and in the case of a joint Bid each party thereto certifies as to its own organization, under penalty of perjury, that to the best of its knowledge and belief that each Bidder is not on the list created pursuant to paragraph (b) of subdivision 3 of section 165-a of the State Finance Law.

A Bid shall not be considered for award nor shall any award be made where the certification has not been made, provided, however, that if in any case the Bidder cannot make the certification, the Bidder shall so state and shall furnish with the Bid a signed statement which sets forth in detail the reasons therefor. The Owner may award a contract to a Bidder who cannot make the required certification on a case-by-case basis if:

- (1) The investment activities in Iran were made before April 12, 2012, the investment activities in Iran have not been expanded or renewed after April 12, 2012, and the person has adopted, publicized, and is implementing a formal plan to cease the investment activities in Iran and to refrain from engaging in any new investments in Iran; or
- (2) The Owner makes a determination that the goods and services are necessary for the Owner to perform its functions and that, absent such an exemption, the political subdivision would be unable to obtain the goods or services for which the contract is offered. Such determination shall be made in writing and shall be a public document.

During the term of the Contract, should the Owner receive information that a person is in violation of the above-referenced certifications, the Owner will offer the person an opportunity to respond. If the person fails to demonstrate that it has ceased its engagement in the investment which is in violation of the Act within 90 days after the determination of such violation, then the Owner shall take such action as may be appropriate including, but not limited to, imposing sanctions, seeking compliance, recovering damages, or declaring the contractor in default.

The Owner reserves the right to reject any bid, proposal, contract or request for assignment for an entity that appears on the Prohibited Entities List prior to the award or execution of a contract or

any renewal thereof, as applicable, and to pursue a responsibility review with respect to any entity that is awarded a contract and appears on the Prohibited Entities List after contract award.

BUSINESS NAME

NAME

TITLE

SIGNATURE

DATE

END OF SECTION 00 4951

SECTION 00 5100 – AGREEMENT FORM

PART 1 - GENERAL

1.1 SUMMARY

Attached to this Section is *AIA Document A132-2009, Standard Form of Agreement Between Owner and Contractor, Construction Manager as Adviser Edition*. It shall be the form of agreement between Owner and Contractor for this project.

PART 2 - PRODUCTS (Not Applicable)

PART 3 - EXECUTION (Not Applicable)

END OF SECTION 00 5100



AIA® Document A132™ – 2009

Standard Form of Agreement Between Owner and Contractor, Construction Manager as Adviser Edition

AGREEMENT made as of the _____ day of _____ in the year Two Thousand Twenty-One.
(In words, indicate day, month and year.)

BETWEEN the Owner:
(Name, legal status, address and other information)

PINE BUSH CENTRAL SCHOOL DISTRICT
156 State Route 302
Pine Bush, NY 12566

and the Contractor:
(Name, legal status, address and other information)

for the following Project:
(Name, location and detailed description)
PINE BUSH CENTRAL SCHOOL DISTRICT
2019 CAPITAL IMPROVEMENT PROJECT – PHASE II

Pine Bush High School SED #44-04-01-06-0-007-027
156 State Route 302
Pine Bush, NY 12566

Pakanasink Elementary School SED #44-04-01-06-0-012-015
1953 State Route 302
Circleville, NY 10919

Circleville Middle School SED #44-04-01-06-0-014-015
1951 State Route 302
Circleville, NY 10919

Circleville Elementary School SED #44-04-01-06-0-009-016
2000 State Route 302
Circleville, NY 10919

The Construction Manager:
(Name, legal status, address and other information)

THE PIKE COMPANY
20 Loudonville Road
Albany, NY 12204

ADDITIONS AND DELETIONS:

The author of this document has added information needed for its completion. The author may also have revised the text of the original AIA standard form. An *Additions and Deletions Report* that notes added information as well as revisions to the standard form text is available from the author and should be reviewed. A vertical line in the left margin of this document indicates where the author has added necessary information and where the author has added to or deleted from the original AIA text.

This document has important legal consequences. Consultation with an attorney is encouraged with respect to its completion or modification.

This document is intended to be used in conjunction with AIA Documents A232™–2009, General Conditions of the Contract for Construction, Construction Manager as Adviser Edition; B132™–2009, Standard Form of Agreement Between Owner and Architect, Construction Manager as Adviser Edition; and C132™–2009, Standard Form of Agreement Between Owner and Construction Manager as Adviser. ^AIA Document A232™–2009 is adopted in this document by reference. Do not use with other general conditions unless this document is modified.

The Architect:

Init. AIA Document A132™ – 2009 (formerly A101™ CMA – 1992). Copyright © 1975, 1980, 1992 and 2009 by The American Institute of Architects. All rights reserved. The "American Institute of Architects," "AIA," the AIA Logo, and "AIA Contract Documents" are registered trademarks and may not be used without permission. This document was produced by AIA software at 09:49:25 ET on 03/05/2021 under Order No.9728404439 which expires on 12/10/2021, is not for resale, is licensed for one-time use only, and may only be used in accordance with the AIA Contract Documents® Terms of Service. To report copyright violations, e-mail copyright@aia.org.

User Notes:

(1884245090)

e, legal status, address and other information)

CPL
50 Front Street, Suite 202
Newburgh, NY 12550

The Owner and Contractor agree as follows.

TABLE OF ARTICLES

- 1 THE CONTRACT DOCUMENTS
- 2 THE WORK OF THIS CONTRACT
- 3 DATE OF COMMENCEMENT AND SUBSTANTIAL COMPLETION
- 4 CONTRACT SUM
- 5 PAYMENTS
- 6 DISPUTE RESOLUTION
- 7 TERMINATION OR SUSPENSION

her provision for determining the Contractor's Fee.)

(Paragraphs deleted)

(Paragraphs deleted)

(Table deleted)

(Paragraphs deleted)

(Table deleted)

(Paragraphs deleted)

(Table deleted)

§ 4.3.3 The method of adjustment of the Contractor's Fee for changes in the Work:

§ 4.3.4 Limitations, if any, on a Subcontractor's overhead and profit for increases in the cost of its portion of the Work:

§ 4.3.5 Rental rates for Contractor-owned equipment shall not exceed percent (%) of the standard rate paid at the place of the Project.

§ 4.3.6 Unit prices, if any:
(Identify and state the unit price; state quantity limitations, if any, to which the unit price will be applicable.)

Item	Units and Limitations	Price per Unit (\$0.00)
------	-----------------------	-------------------------

§ 4.3.7 The Contractor shall prepare and submit to the Construction Manager for the Owner, in writing, a Control Estimate within 14 days of executing this Agreement. The Control Estimate shall include the items in Section A.1 of Exhibit A, Determination of the Cost of the Work.

§ 4.4 Cost of the Work Plus Contractor's Fee with a Guaranteed Maximum Price

§ 4.4.1 The Contract Sum is the Cost of the Work as defined in Exhibit A, Determination of the Cost of the Work, plus the Contractor's Fee.

§ 4.4.2 The Contractor's Fee:

(State a lump sum, percentage of Cost of the Work or other provision for determining the Contractor's Fee.)

§ 4.4.3 The method of adjustment of the Contractor's Fee for changes in the Work:

§ 4.4.4 Limitations, if any, on a Subcontractor's overhead and profit for increases in the cost of its portion of the Work:

§ 4.4.5 Rental rates for Contractor-owned equipment shall not exceed percent (%) of the standard rate paid at the place of the Project.

§ 4.4.6 Unit Prices, if any:

(Identify and state the unit price, and state the quantity limitations, if any, to which the unit price will be applicable.)

Item	Units and Limitations	Price per Unit (\$0.00)
------	-----------------------	-------------------------

§ 4.4.7 Guaranteed Maximum Price

§ 4.4.7.1 The sum of the Cost of the Work and the Contractor's Fee is guaranteed by the Contractor not to exceed (\$), subject to additions and deductions by changes in the Work as provided in the Contract Documents. Such maximum sum is referred to in the Contract Documents as the Guaranteed Maximum Price. Costs which would cause the Guaranteed Maximum Price to be exceeded shall be paid by the Contractor without reimbursement by the Owner. *(Insert specific provisions if the Contractor is to participate in any savings.)*

§ 4.4.7.2 The Guaranteed Maximum Price is based on the following alternates, if any, which are described in the Contract Documents and are hereby accepted by the Owner:

§ 4.4.7.3 Allowances included in the Guaranteed Maximum Price, if any:

(Identify and state the amounts of any allowances, and state whether they include labor, materials, or both.)

Item	Allowance
------	-----------

§ 4.4.7.4 Assumptions, if any, on which the Guaranteed Maximum Price is based:

ARTICLE 5 PAYMENTS

§ 5.1 Progress Payments

§ 5.1.1 Based upon Applications for Payment submitted to the Construction Manager by the Contractor prepared in such form and supported by such data to substantiate its accuracy as the Construction Manager and Architect may require, and upon certification of the Project Application and Project Certificate for Payment or Application for Payment and Certificate for Payment by the Construction Manager and Architect and issuance by the Architect, and subject to audits and verifications, of the Applications for Payment to be performed by the Owner's auditors acting in

the sole interest of the Owner, the Owner shall make progress payments for undisputed amounts on account of the Contract Sum to the Contractor as provided below and elsewhere in the Contract Documents.

§ 5.1.2 The period covered by each Application for Payment shall be one calendar month ending on the last day of the month, or as follows:

n/a

§ 5.1.3 Provided that an Application for Payment is received by the Construction Manager not later than the 5 day of a month, the Owner shall make payment of the undisputed certified amount in the Application for Payment to the Contractor not later than the 1st day of the preceding month. If an Application for Payment is received by the Construction Manager after the application date fixed above, payment for undisputed amounts shall be made by the Owner not later than 45 () days after the Construction Manager receives the Application for Payment.
(Federal, state or local laws may require payment within a certain period of time.)

§ 5.1.4 Progress Payments Where the Contract Sum is Based on a Stipulated Sum

§ 5.1.4.1 Each Application for Payment shall be based on the most recent schedule of values submitted by the Contractor in accordance with the Contract Documents. The schedule of values shall allocate the entire Contract Sum among the various portions of the Work and be prepared in such form and supported by such data to substantiate its accuracy as the Construction Manager and Architect and Owner may require. This schedule, unless objected to by the Construction Manager or Architect, shall be used as a basis for reviewing the Contractor's Applications for Payment.

§ 5.1.4.2 Applications for Payment shall show the percentage of completion of each portion of the Work as of the end of the period covered by the Application for Payment and shall include certification of payrolls.

§ 5.1.4.3 Subject to the provisions of the Contract Documents, the amount of each progress payment shall be computed as follows:

- .1 Take that portion of the Contract Sum properly allocable to completed Work as determined by multiplying the percentage completion of each portion of the Work by the share of the total Contract Sum allocated to that portion of the Work in the schedule of values, less retainage of 10 percent (10 %). Pending final determination of cost to the Owner of changes in the Work, amounts not in dispute may be included as provided in Section 7.3.9 of the General Conditions;
- .2 Add that portion of the Contract Sum properly allocable to materials and equipment delivered and suitably stored at the site for subsequent incorporation in the completed construction (or, if approved in advance by the Owner, suitably stored off the site at a location agreed upon in writing), less retainage of 10 percent (10 %);
- .3 Subtract the aggregate of previous payments made by the Owner; and
- .4 Subtract amounts, if any, for which the Construction Manager or Architect has withheld or nullified a Certificate for Payment as provided in Section 9.5 of the General Conditions.

§ 5.1.4.4 The progress payment amount determined in accordance with Section 5.1.4.3 shall be further modified under the following circumstances:

- .1 Add, upon Substantial Completion of the Work, a sum sufficient to increase the total payments to percent (%) of the Contract Sum, less such amounts as the Construction Manager recommends and the Architect determines for incomplete Work and unsettled claims; and
- .2 Add, if final completion of the Work is thereafter materially delayed through no fault of the Contractor, any additional amounts payable in accordance with Section 9.10.3 of the General Conditions.

§ 5.1.4.5 Reduction or limitation of retainage, if any, shall be as follows:

(If it is intended, prior to Substantial Completion of the entire Work, to reduce or limit the retainage resulting from the percentages inserted in Sections 5.1.4.3.1 and 5.1.4.3.2 above, and this is not explained elsewhere in the Contract Documents, insert here provisions for such reduction or limitation.)

n/a

§ 5.1.5 Progress Payments Where the Contract Sum is Based on the Cost of the Work without a Guaranteed Maximum Price

§ 5.1.5.1 With each Application for Payment, the Contractor shall submit the cost control information required in Exhibit A, Determination of the Cost of the Work, along with certified payrolls, petty cash accounts, receipted invoices or invoices with check vouchers attached and any other evidence required by the Owner, Construction Manager or Architect to demonstrate that cash disbursements already made by the Contractor on account of the Cost of the Work equal or exceed (1) progress payments already received by the Contractor; less (2) that portion of those payments attributable to the Contractor's Fee; plus (3) payrolls for the period covered by the present Application for Payment.

§ 5.1.5.2 Applications for Payment shall show the Cost of the Work actually incurred by the Contractor through the end of the period covered by the Application for Payment and for which the Contractor has made or intends to make actual payment prior to the next Application for Payment.

§ 5.1.5.3 Subject to other provisions of the Contract Documents, the amount of each progress payment shall be computed as follows:

- .1 Take the Cost of the Work as described in Exhibit A, Determination of the Cost of the Work;
- .2 Add the Contractor's Fee, less retainage of 10 percent (10 %). The Contractor's Fee shall be computed upon the Cost of the Work described in that Section at the rate stated in that Section; or if the Contractor's Fee is stated as a fixed sum, an amount which bears the same ratio to that fixed-sum Fee as the Cost of the Work bears to a reasonable estimate of the probable Cost of the Work upon its completion;
- .3 Subtract retainage of 10 percent (10 %) from that portion of the Work that the Contractor self-performs;
- .4 Subtract the aggregate of previous payments made by the Owner;
- .5 Subtract the shortfall, if any, indicated by the Contractor in the documentation required by Article 5 or resulting from errors subsequently discovered by the Owner's auditors in such documentation; and
- .6 Subtract amounts, if any, for which the Construction Manager or Architect has withheld or withdrawn a Certificate for Payment as provided in Section 9.5 of AIA Document A232™-2009, General Conditions of the Contract for Construction, Construction Manager as Adviser Edition.

§ 5.1.5.4 The Owner, Construction Manager and Contractor shall agree upon (1) a mutually acceptable procedure for review and approval of payments to Subcontractors and (2) the percentage of retainage held on Subcontracts, and the Contractor shall execute subcontracts in accordance with those agreements.

§ 5.1.5.5 In taking action on the Contractor's Applications for Payment, the Construction Manager and Architect shall be entitled to rely on the accuracy and completeness of the information furnished by the Contractor and shall not be deemed to represent that the Construction Manager and Architect have made a detailed examination, audit or arithmetic verification of the documentation submitted in accordance with Article 5 or other supporting data; that the Construction Manager and Architect have made exhaustive or continuous on-site inspections; or that the Construction Manager and Architect have made examinations to ascertain how or for what purposes the Contractor has used amounts previously paid on account of the Contract. Such examinations, audits and verifications, if required by the Owner, will be performed by the Owner's auditors acting in the sole interest of the Owner.

§ 5.1.5.6 Except with the Owner's prior approval, the Contractor shall not make advance payments to suppliers for materials or equipment which have not been delivered and stored at the site.

§ 5.1.6 Progress Payments Where the Contract Sum is Based on the Cost of the Work with a Guaranteed Maximum Price

§ 5.1.6.1 With each Application for Payment, the Contractor shall submit certified payrolls, petty cash accounts, receipted invoices or invoices with check vouchers attached, and any other evidence required by the Owner or Architect to demonstrate that cash disbursements already made by the Contractor on account of the Cost of the Work equal or exceed (1) progress payments already received by the Contractor; less (2) that portion of those payments attributable to the Contractor's Fee; plus (3) payrolls for the period covered by the present Application for Payment.

§ 5.1.6.2 Each Application for Payment shall be based on the most recent schedule of values submitted by the Contractor in accordance with the Contract Documents. The schedule of values shall allocate the entire Contract Sum

Int.

among the various portions of the Work and be prepared in such form and supported by such data to substantiate its accuracy as the Construction Manager and Architect may require. This schedule, unless objected to by the Construction Manager or Architect, shall be used as a basis for reviewing the Contractor's Applications for Payment.

§ 5.1.6.3 Applications for Payment shall show the percentage of completion of each portion of the Work as of the end of the period covered by the Application for Payment. The percentage of completion shall be the lesser of (1) the percentage of that portion of the Work which has actually been completed; or (2) the percentage obtained by dividing (a) the expense that has actually been incurred by the Contractor on account of that portion of the Work for which the Contractor has made or intends to make actual payment prior to the next Application for Payment by (b) the share of the Guaranteed Maximum Price allocated to that portion of the Work in the schedule of values.

§ 5.1.6.4 Subject to other provisions of the Contract Documents, the amount of each progress payment shall be computed as follows:

- .1 Take that portion of the Guaranteed Maximum Price properly allocable to completed Work as determined by multiplying the percentage of completion of each portion of the Work by the share of the Guaranteed Maximum Price allocated to that portion of the Work in the schedule of values. Pending final determination of cost to the Owner of changes in the Work, amounts not in dispute shall be included as provided in Section 7.3.10 of AIA Document A232-2009;
- .2 Add that portion of the Guaranteed Maximum Price properly allocable to materials and equipment delivered and suitably stored at the site for subsequent incorporation in the Work, or if approved in advance by the Owner, suitably stored off the site at a location agreed upon in writing;
- .3 Add the Contractor's Fee, less retainage of 10 percent (10 %). The Contractor's Fee shall be computed upon the Cost of the Work at the rate stated in Section 4.4.2 or, if the Contractor's Fee is stated as a fixed sum in that Section, shall be an amount that bears the same ratio to that fixed-sum fee as the Cost of the Work bears to a reasonable estimate of the probable Cost of the Work upon its completion;
- .4 Subtract retainage of 10 percent (10 %) from that portion of the Work that the Contractor self-performs;
- .5 Subtract the aggregate of previous payments made by the Owner;
- .6 Subtract the shortfall, if any, indicated by the Contractor in the documentation required by Section 5.1.6.1 to substantiate prior Applications for Payment, or resulting from errors subsequently discovered by the Owner's auditors in such documentation; and
- .7 Subtract amounts, if any, for which the Construction Manager or Architect have withheld or nullified a Certificate for Payment as provided in Section 9.5 of AIA Document A232-2009.

§ 5.1.6.5 The Owner and the Contractor shall agree upon a (1) mutually acceptable procedure for review and approval of payments to Subcontractors and (2) the percentage of retainage held on Subcontracts, and the Contractor shall execute subcontracts in accordance with those agreements.

§ 5.1.6.6 In taking action on the Contractor's Applications for Payment, the Construction Manager and Architect shall be entitled to rely on the accuracy and completeness of the information furnished by the Contractor and shall not be deemed to represent that the Construction Manager or Architect have made a detailed examination, audit or arithmetic verification of the documentation submitted in accordance with Section 5.1.6.1 or other supporting data; that the Construction Manager or Architect have made exhaustive or continuous on-site inspections; or that the Construction Manager or Architect have made examinations to ascertain how or for what purposes the Contractor has used amounts previously paid on account of the Contract. Such examinations, audits and verifications, if required by the Owner, will be performed by the Owner's auditors acting in the sole interest of the Owner.

§ 5.1.6.7 Except with the Owner's prior approval, the Contractor shall not make advance payments to suppliers for materials or equipment which have not been delivered and stored at the site.

§ 5.2 Final Payment

§ 5.2.1 Final payment, constituting the entire unpaid balance of the Contract Sum, shall be made by the Owner to the Contractor when

- .1 the Contractor has fully performed the Contract except for the Contractor's responsibility to correct Work as provided in Section 12.2 of AIA Document A232-2009, and to satisfy other requirements, if any, which extend beyond final payment;

- .2 the Contractor has submitted a final accounting for the Cost of the Work, pursuant to Exhibit A, Determination of the Cost of the Work when payment is on the basis of the Cost of the Work, with or without a Guaranteed Maximum payment; and
- .3 a final Certificate for Payment or Project Certificate for Payment has been issued by the Architect; such final payment shall be made by the Owner not more than 30 days after the issuance of the final Certificate for Payment or Project Certificate for Payment, or as follows:

ARTICLE 6 DISPUTE RESOLUTION

§ 6.1 Initial Decision Maker

The Architect will serve as Initial Decision Maker pursuant to Section 15.2 of AIA Document A232-2009, unless the parties appoint below another individual, not a party to this Agreement, to serve as Initial Decision Maker.

(If the parties mutually agree, insert the name, address and other contact information of the Initial Decision Maker, if other than the Architect.)

§ 6.2 Binding Dispute Resolution

For any Claim, the method of binding dispute resolution shall be as follows:

(Check the appropriate box. If the Owner and Contractor do not select a method of binding dispute resolution below, or do not subsequently agree in writing to a binding dispute resolution method other than litigation, Claims will be resolved by litigation in a court of competent jurisdiction.)

☐ Arbitration pursuant to Section 15.4 of AIA Document A232-2009.

☒ Litigation in a court of competent jurisdiction.

☐ Other: *(Specify)*

ARTICLE 7 TERMINATION OR SUSPENSION

§ 7.1 Where the Contract Sum is a Stipulated Sum

§ 7.1.1 The Contract may be terminated by the Owner or the Contractor as provided in Article 14 of AIA Document A232-2009.

§ 7.1.2 The Work may be suspended by the Owner as provided in Article 14 of AIA Document A232-2009.

§ 7.2

Where the Contract Sum is Based on the Cost of the Work with or without a Guaranteed Maximum Price

§ 7.2.1 Subject to the provisions of Section 7.2.2 below, the Contract may be terminated by the Owner or the Contractor as provided in Article 14 of AIA Document A232-2009.

§ 7.2.2 The Contract may be terminated by the Owner for cause as provided in Article 14 of AIA Document A232-2009; however, the Owner shall then only pay the Contractor an amount calculated as follows:

- .1 Take the Cost of the Work incurred by the Contractor to the date of termination;
- .2 Add the Contractor's Fee computed upon the Cost of the Work to the date of termination at the rate stated in Sections 4.3.2 or 4.4.2, as applicable, or, if the Contractor's Fee is stated as a fixed sum, an amount that bears the same ratio to that fixed-sum Fee as the Cost of the Work at the time of termination bears to a reasonable estimate of the probable Cost of the Work upon its completion; and
- .3 Subtract the aggregate of previous payments made by the Owner.

§ 7.2.3 If the Owner terminates the Contract for cause when the Contract Sum is based on the Cost of the Work with a Guaranteed Maximum Price, and as provided in Article 14 of AIA Document A232–2009, the amount, if any, to be paid to the Contractor under Section 14.2.4 of AIA Document A232–2009 shall not cause the Guaranteed Maximum Price to be exceeded, nor shall it exceed the amount calculated in Section 7.2.2.

§ 7.2.4 The Owner shall also pay the Contractor fair compensation, either by purchase or rental at the election of the Owner, for any equipment owned by the Contractor that the Owner elects to retain and that is not otherwise included in the Cost of the Work under Section 7.2.1. To the extent that the Owner elects to take legal assignment of subcontracts and purchase orders (including rental agreements), the Contractor shall, as a condition of receiving the payments referred to in this Article 7, execute and deliver all such papers and take all such steps, including the legal assignment of such subcontracts and other contractual rights of the Contractor, as the Owner may require for the purpose of fully vesting in the Owner the rights and benefits of the Contractor under such subcontracts or purchase orders.

§ 7.2.5 The Work may be suspended by the Owner as provided in Article 14 of AIA Document A232–2009; in such case, the Contract Sum and Contract Time shall be increased as provided in Section 14.3.2 of AIA Document A232–2009, except that the term 'profit' shall be understood to mean the Contractor's Fee as described in Sections 4.3.2 and 4.4.2 of this Agreement.

ARTICLE 8 MISCELLANEOUS PROVISIONS

§ 8.1 Where reference is made in this Agreement to a provision of AIA Document A232–2009 or another Contract Document, the reference refers to that provision as amended or supplemented by other provisions of the Contract Documents.

§ 8.2 Undisputed payments due and unpaid under the Contract shall bear interest from the date payment is due at the rate stated below, or in the absence thereof, at the legal rate prevailing from time to time at the place where the Project is located.

(Insert rate of interest agreed upon, if any.)

0 %

§ 8.3 The Owner's representative:
(Name, address and other information)

§ 8.4 The Contractor's representative:
(Name, address and other information)

§ 8.5 Neither the Owner's nor the Contractor's representative shall be changed without ten days written notice to the other party.

§ 8.6 Other provisions:

ARTICLE 9 ENUMERATION OF CONTRACT DOCUMENTS

§ 9.1 The Contract Documents, except for Modifications issued after execution of this Agreement, are enumerated in the sections below.

§ 9.1.1 The Agreement is this executed AIA Document A132–2009, Standard Form of Agreement Between Owner and Contractor, Construction Manager as Adviser Edition.

§ 9.1.2 The General Conditions are AIA Document A232–2009, General Conditions of the Contract for Construction, Construction Manager as Adviser Edition.

§ 9.1.3 The Supplementary and other Conditions of the Contract:

Document	Title	Date	Pages
----------	-------	------	-------

§ 9.1.4 The Specifications:

(Either list the Specifications here or refer to an exhibit attached to this Agreement.)

Section	Title	Date	Pages
---------	-------	------	-------

§ 9.1.5 The Drawings:

(Either list the Drawings here or refer to an exhibit attached to this Agreement.)

Number	Title	Date
--------	-------	------

§ 9.1.6 The Addenda, if any:

Number	Date	Pages
--------	------	-------

Portions of Addenda relating to bidding requirements are not part of the Contract Documents unless the bidding requirements are also enumerated in this Article 9.

§ 9.1.7 Additional documents, if any, forming part of the Contract Documents are:

- .1 AIA Document A132™–2009, Exhibit A, Determination of the Cost of the Work, if applicable.
- .2 AIA Document E201™–2007, Digital Data Protocol Exhibit, if completed, or the following:
- .3 AIA Document E202™–2008, Building Information Modeling Protocol Exhibit, if completed, or the following:
- .4 Other documents, if any, listed below:
(List here any additional documents which are intended to form part of the Contract Documents. AIA Document A232–2009 provides that bidding requirements such as advertisement or invitation to bid, Instructions to Bidders, sample forms and the Contractor's bid are not part of the Contract Documents unless enumerated in this Agreement. They should be listed here only if intended to be part of the Contract Documents.)

Init.

Advertisement or invitation to bid, Instructions to Bidders, supplementary instructions to bidders, the bid form, and any other bidding forms, including Addenda and the Project Manual, and exhibits and the Contractor's bid

ARTICLE 10 INSURANCE AND BONDS

The Contractor shall purchase and maintain insurance and provide bonds as set forth in Article 11 of AIA Document A232-2009.

(State bonding requirements, if any, and limits of liability for insurance required in Article 11 of AIA Document A232-2009.)

Type of Insurance or Bond

Limit of Liability or Bond Amount (\$0.00)

This Agreement is entered into as of the day and year first written above.

OWNER (Signature)

CONTRACTOR (Signature)

(Printed name and title)

(Printed name and title)

init.

AIA Document A132™ – 2009 (formerly A101™ CMA – 1992). Copyright © 1975, 1980, 1992 and 2009 by The American Institute of Architects. All rights reserved. The "American Institute of Architects," "AIA," the AIA Logo, and "AIA Contract Documents" are registered trademarks and may not be used without permission. This document was produced by AIA software at 09:49:25 ET on 03/05/2021 under Order No.9726404439 which expires on 12/10/2021, is not for resale, is licensed for one-time use only, and may only be used in accordance with the AIA Contract Documents® Terms of Service. To report copyright violations, e-mail copyright@aia.org.

User Notes:

(1884245090)

SECTION 00 7200 – GENERAL CONDITIONS

1.1 SUMMARY

A. Attached to this Section is:

1. *AIA Document A232-2009, General Conditions of the Contract for Construction, Construction Manager as Adviser Edition.* It sets forth the rights, responsibilities, and relationships of the Owner, Contractor, Construction Manager and Architect for this project.
2. *Schedule C, Standard Contract Insurance Requirements.*

END OF SECTION 00 7200

AIA® Document A232™ – 2019

General Conditions of the Contract for Construction, Construction Manager as Adviser Edition

for the following PROJECT:

(Name, and location or address)

PINE BUSH CENTRAL SCHOOL DISTRICT 2019 CAPITAL IMPROVEMENT PROJECT – PHASE II

Pine Bush High School
156 State Route 302
Pine Bush, NY 12566
SED #44-04-01-06-0-007-027

Pakanasink Elementary School
1953 State Route 302
Circleville, NY 10919
SED #44-04-01-06-0-012-015

Circleville Middle School
1951 State Route 302
Circleville, NY 10919
SED #44-04-01-06-0-014-015

Circleville Elementary School
2000 State Route 302
Circleville, NY 10919
SED #44-04-01-06-0-009-016

THE CONSTRUCTION MANAGER: *(Name, legal status, and address)*

THE PIKE COMPANY
20 Loudonville Road
Albany, NY 12204

THE OWNER: *(Name, legal status, and address)*

PINE BUSH CENTRAL SCHOOL DISTRICT
156 State Route 302
Pine Bush, NY 12566

THE ARCHITECT: *(Name, legal status, and address)*

CPL
50 Front Street, Suite 202
Newburgh, NY 12550

ADDITIONS AND DELETIONS:

The author of this document has added information needed for its completion. The author may also have revised the text of the original AIA standard form. An *Additions and Deletions Report* that notes added information as well as revisions to the standard form text is available from the author and should be reviewed. A vertical line in the left margin of this document indicates where the author has added necessary information and where the author has added to or deleted from the original AIA text.

This document has important legal consequences. Consultation with an attorney is encouraged with respect to its completion or modification.

This document is intended to be used in conjunction with AIA Documents A132™–2019, Standard Form of Agreement Between Owner and Contractor, Construction Manager as Adviser Edition; B132™–2019, Standard Form of Agreement Between Owner and Architect, Construction Manager as Adviser Edition; and C132™–2019, Standard Form of Agreement Between Owner and Construction Manager as Adviser.

TABLE OF ARTICLES

1	GENERAL PROVISIONS
2	OWNER
3	CONTRACTOR
4	ARCHITECT AND CONSTRUCTION MANAGER
5	SUBCONTRACTORS
6	CONSTRUCTION BY OWNER OR BY SEPARATE CONTRACTORS
7	CHANGES IN THE WORK
8	TIME
9	PAYMENTS AND COMPLETION
10	PROTECTION OF PERSONS AND PROPERTY
11	INSURANCE AND BONDS
12	UNCOVERING AND CORRECTION OF WORK
13	MISCELLANEOUS PROVISIONS
14	TERMINATION OR SUSPENSION OF THE CONTRACT
15	CLAIMS AND DISPUTES

ARTICLE 1 GENERAL PROVISIONS

§ 1.1 Basic Definitions

§ 1.1.1 The Contract Documents. The Contract Documents are enumerated in the Agreement between the Owner and Contractor (hereinafter the Agreement) and consist of the Agreement, Conditions of the Contract (General, Supplementary and other Conditions), Drawings, Specifications, Addenda issued prior to execution of the Contract, other documents listed in the Agreement, and Modifications issued after execution of the Contract. A Modification is (1) a written amendment to the Contract signed by both parties, (2) a Change Order, (3) a Construction Change Directive, or (4) a written order for a minor change in the Work issued by the Architect. Unless specifically enumerated in the Agreement, the Contract Documents do not include the advertisement or invitation to bid, Instructions to Bidders, sample forms, other information furnished by the Owner in anticipation of receiving bids or proposals, the Contractor's bid or proposal, or portions of addenda relating to bidding or proposal requirements.

§ 1.1.2 The Contract. The Contract Documents form the Contract for Construction. The Contract represents the entire and integrated agreement between the parties hereto and supersedes prior negotiations, representations, or agreements, either written or oral. The Contract may be amended or modified only by a Modification. The Contract Documents shall not be construed to create a contractual relationship of any kind (1) between the Contractor and the Architect or the Architect's consultants, (2) between the Owner and the Construction Manager or the Construction Manager's consultants, (3) between the Owner and the Architect or the Architect's consultants, (4) between the Contractor and the Construction Manager or the Construction Manager's consultants, (5) between the Owner and a Subcontractor or Sub-subcontractor (6) between the Construction Manager and the Architect, or (7) between any persons or entities other than the Owner and Contractor. The Construction Manager and Architect shall, however, be entitled to performance and enforcement of obligations under the Contract intended to facilitate performance of their duties.

§ 1.1.3 The Work. The term "Work" means the construction and services required by the Contract Documents, whether completed or partially completed, and includes all other labor, materials, equipment, and services provided or to be provided by the Contractor to fulfill the Contractor's obligations. The Work may constitute the whole or a part of the Project.

§ 1.1.4 The Project. The Project is the total construction of which the Work performed under the Contract Documents may be the whole or a part and which may include construction by other Contractors, and by the Owner's own forces and Separate Contractors.

§ 1.1.5 Contractors. Contractors are persons or entities, other than the Contractor or Separate Contractors, who perform Work under contracts with the Owner that are administered by the Architect and Construction Manager.

§ 1.1.6 Separate Contractors. Separate Contractors are persons or entities who perform construction under separate contracts with the Owner not administered by the Architect and Construction Manager.

§ 1.1.7 The Drawings. The Drawings are the graphic and pictorial portions of the Contract Documents showing the design, location and dimensions of the Work, generally including plans, elevations, sections, details, schedules, and diagrams.

§ 1.1.8 The Specifications. The Specifications are that portion of the Contract Documents consisting of the written requirements for materials, equipment, systems, standards and workmanship for the Work, and performance of related services.

The Specifications may describe (or the Drawings may show) the general placement required of materials or equipment, but the actual required placement may vary depending on the specific material or equipment used by the Contractor or the existing field conditions. The Contractor shall bear all direct and indirect costs associated with such variances.

Some Specifications may be written in a condensed outline form and omitted words shall be included by inference. If the Specifications identify a task, it shall mean the "Contractor shall furnish, install and complete" the identified task unless otherwise stated.

Reference to standard specifications, manuals or codes shall mean reference to the latest standard specification, manual or code in effect at the time of the execution of the Owner-Contractor Agreement, unless otherwise stated. When reference is made to a manufacturer, trade association, reference standard or similar source (such as ASTM, ASA, AISC, ACI, etc.) the standards or requirements of such entity shall be incorporated into the Specifications and have the force and effect as though they were set forth expressly. Upon entering into the Owner-Contractor Agreement, the Contractor acknowledges its familiarity with those references, codes, etc. The date of the referenced standard shall be the latest edition in effect at the time of the execution of the Owner-Contractor Agreement unless otherwise stated.

§ 1.1.9 Instruments of Service. Instruments of Service are representations, in any medium of expression now known or later developed, of the tangible and intangible creative work performed by the Architect and the Architect's consultants under their respective professional services agreements. Instruments of Service may include, without limitation, studies, surveys, models, sketches, drawings, specifications, and other similar materials.

§ 1.1.10 Initial Decision Maker. The Initial Decision Maker is the person identified in the Agreement to render initial decisions on Claims in accordance with Section 15.2. The Initial Decision Maker shall not show partiality to the Owner or Contractor and shall not be liable for results of interpretations or decisions rendered in good faith.

§ 1.2 Correlation and Intent of the Contract Documents

§ 1.2.1 The intent of the Contract Documents is to include all items necessary for the proper execution and completion of the Work by the Contractor. The Contract Documents are complementary, and what is required by one shall be as binding as if required by all; performance by the Contractor shall be required only to the extent consistent with the Contract Documents and reasonably inferable from them as being necessary to produce the indicated results. In the event of inconsistencies within or between parts of the Contract Documents, the Contractor shall (1) provide the better quality of Work or (2) comply with the more stringent requirement; either or both in accordance with the Architect's interpretation. The terms and conditions of the Subparagraph 1.2.1, however shall not relieve the Contractor of any of the obligations set forth elsewhere in this Agreement. All work shall conform to the Contract Documents. No significant change there from shall be made without prior written authorization by the Owner. Where only part of the Work is indicated, similar parts shall be considered repetition. When any detail is shown and the components therefore are fully described, similar details shall be construed to require the same materials and construction. Items required by either the Drawings or the Specifications and not mentioned in the other shall be of like effect as if shown or mentioned in both. Should the Specifications and Drawings fail to particularly describe a product or material shown to be used in any place, the Contractor shall furnish the product that would normally be used in that place.

§ 1.2.1.1 The invalidity of any provision of the Contract Documents shall not invalidate the Contract or its remaining provisions. If it is determined that any provision of the Contract Documents violates any law, or is otherwise invalid or unenforceable, then that provision shall be revised to the extent necessary to make that provision legal and enforceable. In such case the Contract Documents shall be construed, to the fullest extent permitted by law, to give effect to the parties' intentions and purposes in executing the Contract.

§ 1.2.2 Organization of the Specifications into divisions, sections and articles, and arrangement of Drawings shall not control the Contractor in dividing the Work among Subcontractors or in establishing the extent of Work to be performed nor to limit the scope of work performed by any trade or by any Subcontractor or supplier. Such separations shall not operate to make the Architect an arbiter to establish limits of work between Subcontractors or between Contractor and Subcontractor.

§ 1.2.3 Unless otherwise stated in the Contract Documents, words that have well-known technical or construction industry meanings are used in the Contract Documents in accordance with such recognized meanings.

§ 1.2.4 Reference to "match existing" in Contract Documents refer to existing finishes, materials, details, and qualities which have been used in adjacent portions of existing facilities. Material designations or details not specifically shown shall either match existing or be similar in finish, material or quality to similar adjacent conditions.

§ 1.3 Capitalization

Terms capitalized in these General Conditions include those that are (1) specifically defined, (2) the titles of numbered articles, or (3) the titles of other documents published by the American Institute of Architects.

§ 1.4 Interpretation

In the interest of brevity the Contract Documents frequently omit modifying words such as "all" and "any" and articles such as "the" and "an," but the fact that a modifier or an article is absent from one statement and appears in another is not intended to affect the interpretation of either statement.

§ 1.5 Ownership and Use of Drawings, Specifications, and Other Instruments of Service

§ 1.5.1 The Architect and the Architect's consultants shall be deemed the authors and owners of their respective Instruments of Service, including the Drawings and Specifications, and retain all common law, statutory, and other reserved rights in their Instruments of Service, including copyrights. The Owner, Contractor, Subcontractors, Sub-subcontractors, and suppliers shall not own or claim a copyright in the Instruments of Service. Submittal or distribution to meet official regulatory requirements or for other purposes in connection with the Project is not to be construed as publication in derogation of the Architect's or Architect's consultants' reserved rights.

(Paragraph deleted)

§ 1.5.2 The Owner, Contractor, Subcontractors, Sub-subcontractors, and suppliers are authorized to use and reproduce the Instruments of Service provided to them, subject to any protocols established pursuant to Sections 1.7 and 1.8, solely and exclusively for execution of the Work. All copies made under this authorization shall bear the copyright notice, if any, shown on the Instruments of Service. The Contractor, Subcontractors, Sub-subcontractors, and suppliers may not use the Instruments of Service on other projects or for additions to the Project outside the scope of the Work without the specific written consent of the Owner, Architect, and the Architect's consultants.

§ 1.6 Notice

§ 1.6.1 Except as otherwise provided in Section 1.6.2, where the Contract Documents require one party to notify or give notice to the other party, such notice shall be provided in writing to the designated representative of the party to whom the notice is addressed and shall be deemed to have been duly served if delivered in person, by mail, by courier, or by electronic transmission if a method for electronic transmission is set forth in the Agreement.

§ 1.6.2 Notice of Claims as provided in Section 15.1.3 shall be provided in writing and shall be deemed to have been duly served only if delivered to the designated representative of the party to whom the notice is addressed by certified or registered mail, or by courier providing proof of delivery.

§ 1.7 Digital Data Use and Transmission

The parties shall agree upon protocols governing the transmission and use of Instruments of Service or any other information or documentation in digital form. The parties will use AIA Document E203™-2013, Building Information Modeling and Digital Data Exhibit, to establish the protocols for the development, use, transmission, and exchange of digital data.

§ 1.8 Building Information Models Use and Reliance

Any use of, or reliance on, all or a portion of a building information model without agreement to protocols governing the use of, and reliance on, the information contained in the model and without having those protocols set forth in AIA Document E203™-2013, Building Information Modeling and Digital Data Exhibit, and the requisite AIA Document G202™-2013, Project Building Information Modeling Protocol Form, shall be at the using or relying party's sole risk and without liability to the other party and its contractors or consultants, the authors of, or contributors to, the building information model, and each of their agents and employees.

ARTICLE 2 OWNER

§ 2.1 General

§ 2.1.1 The Owner is the person or entity identified as such in the Agreement and is referred to throughout the Contract Documents as if singular in number. The Owner shall designate in writing a representative who shall have express authority to bind the Owner with respect to all matters requiring the Owner's approval or authorization, other than change orders adjusting the Contract Sum.. And except as otherwise provided in Section 4.2.1, the Construction Manager and the Architect do not have such authority. The term "Owner" means the Owner or the Owner's authorized representative.

(Paragraph deleted)

§ 2.2 Evidence of the Owner's Financial Arrangements

§ 2.2.1 Omitted.

(Paragraph deleted)

§ 2.2.3 Omitted.

(Paragraph deleted)

§ 2.3 Information and Services Required of the Owner

§ 2.3.1 Except for permits and fees that are the responsibility of the Contractor under the Contract Documents, including those required under Section 3.7.1, the Owner shall secure and pay for necessary approvals, easements, assessments and charges required for construction, use or occupancy of permanent structures or for permanent changes in existing facilities. Unless otherwise provided under the Contract Documents, the Owner, assisted by the Construction Manager, shall secure and pay for the building permit.

§ 2.3.2 The Owner shall retain an architect lawfully licensed to practice architecture, or an entity lawfully practicing architecture, in the jurisdiction where the Project is located. That person or entity is identified as the Architect in the Agreement and is referred to throughout the Contract Documents as if singular in number.

§ 2.3.3 The Owner shall retain a construction manager adviser lawfully practicing construction management in the jurisdiction where the Project is located. That person or entity is identified as the Construction Manager in the Agreement and is referred to throughout the Contract Documents as if singular in number.

§ 2.3.4 If the employment of the Construction Manager or Architect terminates, the Owner shall employ a successor construction manager or architect to whom the Contractor has no reasonable objection and whose status under the Contract Documents shall be that of the Construction Manager or Architect, respectively.

§ 2.3.5 The Owner shall furnish surveys describing physical characteristics, legal limitations and utility locations for the site of the Project, and a legal description of the site. The Contractor shall be entitled to rely on the accuracy of information furnished by the Owner but shall exercise proper precautions relating to the safe performance of the Work.

§ 2.3.6 The Owner shall furnish information or services required of the Owner by the Contract Documents with reasonable promptness. The Owner shall also furnish any other information or services under the Owner's control and relevant to the Contractor's performance of the Work with reasonable promptness after receiving the Contractor's written request for such information or services.

§ 2.3.7 Unless otherwise provided in the Contract Documents, the Owner shall furnish to the Contractor one copy of the Contract Documents for purposes of making reproductions pursuant to Section 1.5.2.

§ 2.3.8 The Owner shall forward all communications to the Contractor through the Construction Manager. Other communication shall be made as set forth in Section 4.2.6.

§ 2.4 Owner's Right to Stop the Work

If the Contractor fails to correct Work that is not in accordance with the requirements of the Contract Documents as required by Section 12.2 or repeatedly fails to carry out Work in accordance with the Contract Documents, the Owner may issue a written order to the Contractor to stop the Work, or any portion thereof, until the cause for such order has been eliminated; however, the right of the Owner to stop the Work shall not give rise to a duty on the part of the Owner to exercise this right for the benefit of the Contractor or any other person or entity, except to the extent required by Section 6.1.3. Such order or stoppage by the Owner shall not constitute grounds for contract termination by the Contractor under Article 14 and shall not be the basis of Time Extensions by the Contractor under Article 8.3.

§ 2.5 Owner's Right to Carry Out the Work

§ 2.5.1 If the Contractor defaults or neglects to carry out the Work in accordance with the Contract Documents and fails within a ten-day period after receipt of notice from the Owner to commence and continue correction of such default or neglect with diligence and promptness, the Owner may, without prejudice to other remedies the Owner may have, correct such default or neglect. Such action by the Owner and amounts charged to the Contractor are both

subject to review by the Construction Manager and prior approval of the Architect, and the Construction Manager or Architect may, pursuant to Section 9.5.1, withhold or nullify a Certificate for Payment in whole or in part, to the extent reasonably necessary to reimburse the Owner for the reasonable cost of correcting such deficiencies, including Owner's expenses and compensation for the Construction Manager's and Architect's and their respective consultants' additional services made necessary by such default, neglect, or failure, including attorneys' fees incurred by Owner. If current and future payments are not sufficient to cover such amounts, the Contractor shall pay the difference to the Owner. If the Contractor disagrees with the actions of the Owner or the Architect, or the amounts claimed as costs to the Owner, the Contractor may file a Claim pursuant to Article 15.

§ 2.5.2 The rights stated in this Article 2 and elsewhere in the Contract Documents are cumulative and not in limitation of any rights of the Owner or Contractor (1) granted in the Contract Documents; (2) law; or (3) in equity.

§ 2.5.3 In no event shall the Owner have control over, charge of, or any responsibility for construction means, methods, techniques, sequences, or procedures or for safety precautions and programs in connection with the Work. The Owner assumes no responsibility for liability for the safety of the Project site. The Contractor shall be solely responsible for providing a safe place for the performance of the Work; provided that the Owner shall be responsible for, and the Contractor shall upon discovery notify the Owner of, any unsafe condition created by the Owner.

ARTICLE 3 CONTRACTOR

§ 3.1 General

§ 3.1.1 The Contractor is the person or entity identified as such in the Agreement and is referred to throughout the Contract Documents as if singular in number. The Contractor shall be lawfully licensed, if required in the jurisdiction where the Project is located. The Contractor shall designate in writing a representative who shall have express authority to bind the Contractor with respect to all matters under this Contract. The term "Contractor" means the Contractor or the Contractor's authorized representative.

§ 3.1.2 The Contractor shall perform the Work in accordance with the Contract Documents.

§ 3.1.3 The Contractor shall not be relieved of its obligations to perform the Work in accordance with the Contract Documents either by activities or duties of the Construction Manager or Architect in their administration of the Contract, or by tests, inspections or approvals required or performed by persons or entities other than the Contractor.

§ 3.2 Review of Contract Documents and Field Conditions by Contractor

§ 3.2.1 Execution of the Contract by the Contractor is a representation that the Contractor has visited the site, become familiar with local conditions under which the Work is to be performed, and correlated personal observations with requirements of the Contract Documents.

The Contractor shall rely on its own knowledge and its review and interpretation of the Contract Documents and data provided in entering the Contract and not the representations of the Owner or other persons. The Contractor acknowledges that quantities provided in the Contract Documents are estimates only and Contractor shall not seek additional compensation or adjustment in price based on a variation in actual quantities.

Prior to execution of the Contract, the Contractor and each Subcontractor shall evaluate and satisfy themselves as to the conditions and limitations under which the Work is to be performed, including, without limitation, (i) the location, condition, layout, and nature of the Project site and surrounding areas, (ii) generally prevailing climatic and seasonal conditions, (iii) anticipated labor supply and costs, and (iv) availability and cost of materials, tools, and equipment.

The location of existing features shown on plans is intended for general information only. The Contractor, alone, is responsible for accurate determination of the location of all structures, and shall not be entitled to any extra payment for discrepancies between the Work as shown in the Contract Documents and existing conditions.

The locations, depths and data as to underground conditions have been obtained from records, surface indications and data furnished by others. Information furnished is solely for the convenience of the Contractor without any warranty, expressed or implied as to its accuracy or completeness. The Contractor shall verify all existing conditions prior to commencing the Work. The Contractor shall make no claim against the Owner or Architect with respect to the accuracy or completeness of such information if the conditions found after commencement of the Work are different from those as indicated.

The Contractor shall be solely responsible for the conditions which develop during construction and in the event any structure is dislocated, or over strained, or damaged so as to affect its usefulness, the Contractor shall correct or repair any dislocations, over strains or damages caused.

The Contractor is responsible for restoration and/or repair of utilities, private property, buildings, pavement, walkways, roads, etc. damaged by its activities during the performance of its Work.

§ 3.2.2 Because the Contract Documents are complementary, the Contractor shall, before starting each portion of the Work, carefully study and compare the various Contract Documents relative to that portion of the Work, as well as the information furnished by the Owner pursuant to Section 2.3.5, shall take field measurements of any existing conditions related to that portion of the Work, and shall observe any conditions at the site affecting it. These obligations are for the purpose of facilitating coordination and construction by the Contractor and are not for the purpose of discovering errors, omissions, or inconsistencies in the Contract Documents; however, the Contractor shall promptly report to the Construction Manager and Architect any errors, inconsistencies or omissions discovered by or made known to the Contractor as a request for information submitted to the Construction Manager in such form as the Construction Manager and Architect may require. It is recognized that the Contractor's review is made in the Contractor's capacity as a contractor and not as a licensed design professional, unless otherwise specifically provided in the Contract Documents.

The Contractor shall assume full responsibility for accuracy of measurements obtained at the site. No extra compensation will be allowed because of differences between actual measurements and dimensions indicated on the Drawings, nor for Contractor's failure to coordinate work with actual field measurements.

§ 3.2.3 The Contractor is not required to ascertain that the Contract Documents are in accordance with applicable laws, statutes, ordinances, codes, rules and regulations, or lawful orders of public authorities, but the Contractor shall promptly report to the Construction Manager and Architect any nonconformity discovered by or made known to the Contractor as a request for information submitted to Construction Manager in such form as the Construction Manager and Architect may require.

§ 3.2.4 If the Contractor believes that additional cost or time is involved because of clarifications or instructions the Architect issues in response to the Contractor's notices or requests for information pursuant to Sections 3.2.2 or 3.2.3, the Contractor shall submit Claims as provided in Article 15. If the Contractor fails to perform the obligations of Sections 3.2.2 or 3.2.3, the Contractor shall pay such costs and damages to the Owner, subject to section 15.1.7, as would have been avoided if the Contractor had performed such obligations. If the Contractor performs those obligations, the Contractor shall not be liable to the Owner or Architect for damages resulting from errors, inconsistencies or omissions in the Contract Documents, for differences between field measurements or conditions and the Contract Documents, or for nonconformities of the Contract Documents to applicable laws, statutes, ordinances, codes, rules and regulations, and lawful orders of public authorities.

§ 3.2.5 The Contractor shall be responsible for laying out the Work, shall protect and preserve the established reference points and shall make no changes or relocations without the prior written approval of the Owner. The Contractor shall report to the Architect whenever any reference point is lost or destroyed or requires relocation because of necessary changes in grades or locations, and shall be responsible for the accurate replacement or relocation of such reference points by professionally qualified personnel.

§ 3.3 Supervision and Construction Procedures

§ 3.3.1 The Contractor shall supervise and direct the Work, using the Contractor's best skill and attention for the work to be performed in schools. The Contractor shall be solely responsible for, and have control over, construction means, methods, techniques, sequences, and procedures, and for coordinating all portions of the Work under the Contract. If the Contract Documents give specific instructions concerning construction means, methods, techniques, sequences, or procedures, the Contractor shall evaluate the jobsite safety thereof and shall be solely responsible for the jobsite safety of such means, methods, techniques, sequences, or procedures. If the Contractor determines that such means, methods, techniques, sequences or procedures may not be safe, the Contractor shall give timely notice to the Owner, the Construction Manager, and the Architect, and shall propose alternative means, methods, techniques, sequences, or procedures. The Architect shall evaluate the proposed alternative solely for conformance with the design intent for the completed construction. The Construction Manager shall review the proposed alternative for sequencing,

constructability, and coordination impacts on the other Contractors. Unless the Architect or the Construction Manager objects to the Contractor's proposed alternative, the Contractor shall perform the Work using its alternative means, methods, techniques, sequences, or procedures.

§ 3.3.2 The Contractor shall be responsible to the Owner for acts and omissions of the Contractor's employees, Subcontractors and their agents and employees, and other persons or entities performing portions of the Work for, or on behalf of, the Contractor or any of its Subcontractors.

§ 3.3.3 The Contractor shall be responsible for inspection of portions of the Project already performed to determine that such portions are in proper condition to receive subsequent Work.

§ 3.3.4 The Contractor shall employ a licensed surveyor to locate and stake out the Work and establish necessary reference and bench marks. The contractor shall work from established bench marks and reference points, layout and correctly establish all lines, levels, grades and locations of all parts of their own Work and be responsible for their accuracy and proper correlation with Work and established data.

§ 3.3.5 Prohibitions: There shall be no use of tobacco products, alcohol or illegal drugs at the construction site. No weapons are permitted at the construction site. Contractor and its agents shall refrain from the use of profanity or dressing in any way that is disrespectful or harassing to legally protected groups, including, but not limited to race, color, sex, age, disability, religion, national orientation or sexual orientation.

§ 3.4 Labor and Materials

§ 3.4.1 Unless otherwise provided in the Contract Documents, the Contractor shall provide and pay for labor, materials, equipment, tools, construction equipment and machinery, water, heat, utilities, transportation, and other facilities and services necessary for proper execution and completion of the Work, whether temporary or permanent and whether or not incorporated or to be incorporated in the Work.

- .1 All materials and equipment shall be applied, installed, connected, erected, used, cleaned and conditioned in accordance with the instructions of the applicable manufacturer, fabricator, supplier or distributor, except as otherwise provided in the Contract Documents.
- .2 Contractor shall confine construction equipment, the storage of materials and equipment and the operations of all workers to areas permitted by law, ordinances, permits or the Contract Documents, and shall not disturb the premises more than required for the proper performance of the Work and/or permitted in writing by the Owner.
- .3 Contractors and Subcontractors warrant that they have good title to all materials used in performing Work on this Contract.

§ 3.4.2 Except in the case of minor changes in the Work approved by the Architect in accordance with Section 3.12.8 or ordered by the Architect in accordance with Section 7.4, the Contractor may make substitutions only with the prior written consent of the Owner, after evaluation by the Architect, in consultation with the Construction Manager, and in accordance with a Change Order or Construction Change Directive.

After the Contract has been executed, the Owner and Architect will consider requests for the substitution of products in place of those specified only if the Contractor satisfies the procedural requirements set forth in the General Requirements (Division 01) of the Specifications. By making requests for substitutions, the Contractor:

- .1 Represents that it has personally investigated the proposed substitute product and determined that it is equal or superior in all respects to that specified;
- .2 Represents that it will provide the same warranty for the substitution as it would have provided for the product specified;
- .3 Certifies that the cost data presented is complete and includes all related costs for the substituted product and for Work that must be changed as a result of the substitution, except for the Architect's redesign costs, and waives all claims for additional costs related to the substitution that may subsequently be incurred by the Contractor; and
- .4 Shall coordinate the installation of the accepted substitute, making such changes as may be required for the Work to be complete in all respects.

§ 3.4.2.1 The Owner shall be entitled to reimbursement from the Contractor for amounts paid to the Architect for reviewing the Contractor's proposed substitutions and making agreed upon changes in the Drawings and Specifications resulting from such substitutions. The Owner may seek reimbursement pursuant to the procedures set forth in § 9.5.1.

§ 3.4.2.2 The Contractor shall bear all expenses resulting from substitutions including the cost General Conditions as well as any structural, plumbing, mechanical and electrical trade costs made necessary by the substitution.

§ 3.4.3 The Contractor shall enforce strict discipline and good order among the Contractor's employees and other persons carrying out the Work. The Contractor shall not permit employment of unfit persons or persons not properly skilled in tasks assigned to them.

§ 3.4.4 The Owner shall have the right, but not the obligation, to require the Contractor to remove and replace, with a person acceptable to Owner, promptly after notice from Owner, any employee of Contractor or Subcontractor who: (1) has engaged in conduct on Owner's property that is contrary to the requirements of any applicable law, the Contract Documents, or any rule or directive of Owner relating to conduct on Owner's property; or (2) is incapable of fulfilling its responsibilities in connection with the Project.

§ 3.5 Warranty

§ 3.5.1 The Contractor warrants to the Owner, Construction Manager, and Architect that materials and equipment furnished under the Contract will be of good quality and new unless the Contract Documents require or permit otherwise. The Contractor further warrants that the Work will conform to the requirements of the Contract Documents and will be free from defects. Work, materials, or equipment not conforming to these requirements may be considered defective. The Contractor's warranty excludes remedy for damage or defect caused by abuse, alterations to the Work not executed by the Contractor, improper or insufficient maintenance, improper operation, or normal wear and tear and normal usage. If required by the Construction Manager or Architect, the Contractor shall furnish satisfactory evidence as to the kind and quality of materials and equipment.

§ 3.5.2 All material, equipment, or other special warranties required by the Contract Documents shall be issued in the name of the Owner, or shall be transferable to the Owner, and shall commence in accordance with Section 9.8.4.

§ 3.6 Taxes

§ 3.6.1 Owner is exempt from payment of federal, state, and local Sales and Compensation Use Taxes on all supplies and materials incorporated into and becoming an integral component part of the structures, buildings, or real property pursuant to this Contract. Such taxes are therefore not to be included in the Contractor's bid or Contract Sum. Owner shall deliver to Contractor the appropriate exemption certificate required to be supplied by the Owner, and Contractor and its Subcontractors and materialmen shall be solely responsible for obtaining and delivering any and all exemption or other certificates and for furnishing a Contractor Exempt Purchase Certificate or other appropriate certificates to all persons, firms, or corporations from whom they purchase supplies, materials, and equipment for the performance of the Work.

§ 3.7 Permits, Fees, Notices, and Compliance with Laws

§ 3.7.1 Unless otherwise provided in the Contract Documents, the Owner, assisted by the Construction Manager, shall secure and pay for the building permit. The Contractor shall secure and pay for other permits, fees, licenses, and inspections by government agencies necessary for proper execution and completion of the Work that are customarily secured after execution of the Contract and legally required at the time bids are received or negotiations concluded.

- .1 The Contractor shall promptly deliver copies of such documents to the Owner.
- .2 If in connection with the Project, the Owner has obtained certain permits, licenses or agreements for the Project, the Owner will furnish copies of these documents to the Contractor. It is the Contractor's responsibility to comply with any conditions or limitations placed on the Project by these permits. The Contractor shall fully cooperate with the Owner in meeting the permit requirements and accommodations of regulatory inspections / directives.

(Paragraph deleted)

§ 3.7.2 The Contractor shall comply with and give notices required by applicable laws, statutes, ordinances, codes, rules and regulations, and lawful orders of public authorities applicable to performance of the Work. If the Contractor fails to give such notices as applicable to the performance of the Work, the Contractor shall be liable for and shall indemnify and hold harmless the Owner against any and all resulting fines, penalties, judgments or damages, including

Init.

reasonable attorney fees, imposed on or incurred by the parties indemnified, as a result of such failure by the Contractor.

§ 3.7.3 If the Contractor performs Work knowing it to be contrary to applicable laws, statutes, ordinances, codes, rules and regulations, or lawful orders of public authorities, the Contractor shall assume appropriate responsibility for such Work and shall bear the costs attributable to correction.

§ 3.7.4 Concealed or Unknown Conditions. If the Contractor encounters conditions at the site that are (1) subsurface or otherwise concealed physical conditions that differ materially from those indicated in the Contract Documents or (2) unknown physical conditions of an unusual nature that differ materially from those ordinarily found to exist and generally recognized as inherent in construction activities of the character provided for in the Contract Documents, the Contractor shall promptly provide written notice to the Owner, Construction Manager, and the Architect before conditions are disturbed and in no event later than 14 days after first observance of the conditions. The Architect and Construction Manager will promptly investigate such conditions and, if the Architect, in consultation with the Construction Manager, determines that they differ materially and cause an increase or decrease in the Contractor's cost of, or time required for, performance of any part of the Work, will recommend that an equitable adjustment be made in the Contract Sum or Contract Time, or both. If the Architect, in consultation with the Construction Manager, determines that the conditions at the site are not materially different from those indicated in the Contract Documents and that no change in the terms of the Contract is justified, the Architect shall promptly notify the Owner, Construction Manager, and Contractor, stating the reasons. If the Owner or Contractor disputes the Architect's determination or recommendation, either party may submit a Claim as provided in Article 15.

§ 3.7.5 If, in the course of the Work, the Contractor encounters human remains or recognizes the existence of burial markers, archaeological sites or wetlands not indicated in the Contract Documents, the Contractor shall immediately suspend any operations that would affect them and shall notify in writing, the Owner, Construction Manager, and Architect. Upon receipt of such written notice, the Owner shall promptly take any action necessary to obtain governmental authorization required to resume the operations. The Contractor shall continue to suspend such operations until otherwise instructed by the Owner, but shall continue with all other operations that do not affect those remains or features. Requests for adjustments in the Contract Sum and Contract Time arising from the existence of such remains or features may be made as provided in Article 15.

§ 3.7.6 Upon completion of the Work, the Contractor shall deliver to the Construction Manager original copies of all required final certificates of inspection, the Certificate of Occupancy, the other documents evidencing that inspections required by authorities having jurisdiction over the Work have been performed

§ 3.8 Allowances

§ 3.8.1 The Contractor shall include in the Contract Sum all allowances stated in the Contract Documents

- .1 Contingency Allowances shall cover the direct cost to the Contractor for labor, materials and equipment, including delivery, unloading, storage, handling and installation. They do not include the Contractor's overhead and profit, including the costs of bonds, insurance, administration and supervision, which costs shall be included as part of the Contract Sum, but not in the allowance.

§ 3.8.2

(Paragraphs deleted)

Materials and equipment under an allowance shall be selected by the Owner with reasonable promptness.

(Paragraph deleted)

§ 3.9 Superintendent

§ 3.9.1 The Contractor shall employ a competent superintendent and necessary assistants who shall be in attendance at the Project site full-time during performance of the Work. The superintendent shall be the same individual throughout the duration of the project. The superintendent shall represent the Contractor, and communications given to the superintendent shall be as binding as if given to the Contractor.

The Contractor's superintendent shall not be removed from this Project until the Project punch list has been completed and the Project has been accepted by the Owner. Unless approved otherwise by the Owner in advance, the

Contractor's superintendent shall be assigned solely to this Project and shall not perform any duties or superintendence on any other Project until completion of this Project.

§ 3.9.2 The Contractor, as soon as practicable after award of the Contract, shall notify the Owner and Architect, through the Construction Manager, of the name and qualifications of a proposed superintendent. Within 14 days of receipt of the information, the Construction Manager may notify the Contractor, stating whether the Owner, the Construction Manager, or the Architect (1) has reasonable objection to the proposed superintendent or (2) require additional time for review. Failure of the Construction Manager to provide notice within the 14-day period shall constitute notice of no reasonable objection.

§ 3.9.3 The Contractor shall not employ a proposed superintendent to whom the Owner, Construction Manager, or Architect has made reasonable and timely objection. The Contractor shall not change the superintendent without the Owner's consent, which shall not unreasonably be withheld or delayed.

§ 3.10 Contractor's Construction and Submittal Schedules

§ 3.10.1 The Contractor, promptly after being awarded the Contract, shall submit for the Owner's and Architect's information, and the Construction Manager's use in developing the Project schedule, a Contractor's construction schedule for the Work. The schedule shall contain detail appropriate for the Project, including (1) the date of commencement of the Work, interim schedule milestone dates, and the date of Substantial Completion; (2) an apportionment of the Work by construction activity; and (3) the time required for completion of each portion of the Work. The schedule shall provide for the orderly progression of the Work to completion and shall not exceed time limits current under the Contract Documents. The schedule shall be revised at appropriate intervals as required by the conditions of the Work and Project. The Contractor shall cooperate with the Construction Manager in scheduling and performing the Contractor's Work to avoid conflict with, and as to cause no delay in, the work or activities of other Contractors, or the construction or operations of the Owner's own forces or Separate Contractors and so as not to interfere with the Owner's operations.

§ 3.10.1.1 The Construction Schedule shall be a Critical Path Method (CPM) type of schedule, consisting of: (1) a single critical path delineation and other sequencing, and early and late start, float, and completion dates for each activity; and (2) milestones, interrelationships, and restraints for all activities, including Owner-awarded contracts through the date of Project completion. The Construction Schedule must show all activities necessary for Substantial and Final Completion as defined in Section 9.8, Section 9.10, and elsewhere in the Contract Documents.

§ 3.10.1.2 When the Construction Schedule is complete, the Contractor, after consultation with all Subcontractors and material suppliers, shall confirm in writing to the Architect that the Construction Schedule is reasonable and achievable by the Contractor, subject to any extensions of time as provided for elsewhere in the Contract Documents. The Contractor shall thereafter give prompt specific notice to the Owner and the Architect of any change in the logic of the Construction Schedule or any part thereof, the removal of any restraints, or the reduction of any durations.

§ 3.10.1.3 Periodic meetings will be held at least monthly or at more frequent times, as required by the Work, to assess the state of the completion of the Project and to update the Construction Schedule as necessary. In advance of each such meeting, Contractor shall provide the Construction Manager, Architect and the Owner a written status report identifying whether the Work is on schedule in accordance with the Construction Schedule or whether there are anticipated or potential delays to any critical path elements in the construction of the Work (in which event Contractor shall provide notice and an analysis as reasonably requested by the Construction Manager, Architect or the Owner).

§ 3.10.1.4 The Construction Schedule shall be revised at least monthly or at more frequent times as required by conditions of the Work, and shall provide for expeditious and practicable execution of the Work consistent with the Contract Time. The Architect, Construction Manager and Owner shall be provided copies of the Construction Schedule as periodically updated and in electronic format, as maintained by the Contractor.

§ 3.10.1.5 In the event that any updated Construction Schedule indicates a projected Substantial Completion date that is more than thirty (30) days after the required Substantial Completion date (as the same may be extended by Change Order for Excusable Delay), the Owner shall have the right to direct the Contractor to take corrective measures necessary to expedite the progress of construction, including, without limitation, (1) working additional shifts or overtime, (2) supplying additional manpower, equipment, facilities, (3) rescheduling activities, and (4) other similar measures (hereinafter referred to collectively as "Recovery Measures"). Such Recovery Measures shall continue until

the progress of the Work complies with the state of completion required by the Construction Schedule. The Owner's right to require Recovery Measures is solely for the purpose of ensuring the Contractor's compliance with the Construction Schedule.

- .1 The Contractor shall not be entitled to seek an adjustment in the Contract Sum in connection with Recovery Measures required by the Owner, unless they are incurred by Contractor as directed in writing by the Owner to mitigate or offset an Excusable Delay.
- .2 The Owner may exercise the rights furnished to the Owner under or pursuant to this Subparagraph 3.10.1.5 as frequently as is reasonably necessary to ensure that the Contractor's performance of the Work will comply with any milestone date or completion date set forth in the Construction Schedule.

§ 3.10.1.6 The Contractor is solely responsible for the timing, sequencing coordination, and supervision of the work in accordance with the approved Construction Schedule. Review or approval of the initial Construction Schedule and subsequent reviews of the Construction Schedule by the Architect, Construction Manager, and Owner do not operate to imply agreement by the Architect, Construction Manager or Owner that the means and methods of planning of the Work utilized by the Contractor are adequate or will accomplish the Work in the time shown on the Construction Schedule. The Contractor shall take all actions necessary to ensure the Work's successful planning and execution within the stipulated Contract Time. Additionally, review or approval of the Construction Schedule by the Owner or its consultants shall not make the Owner or its consultants responsible for Contractor's scheduling obligations or the accuracy of the Construction Schedule prepared by the Contractor.

§ 3.10.1.7 The Contractor represents to the Owner that the initial Construction Schedule and all subsequent Construction Schedules (including updates and amendments) have been prepared in good faith and are accurate to the best of the Contractor's knowledge.

§ 3.10.2 The Contractor, promptly after being awarded the Contract and thereafter as necessary to maintain a current submittal schedule, shall submit a submittal schedule for the Construction Manager's and Architect's approval. The Architect and Construction Manager's approval shall not be unreasonably delayed or withheld. The submittal schedule shall (1) be coordinated with the Contractor's construction schedule, and (2) allow the Construction Manager and Architect reasonable time to review submittals. If the Contractor fails to submit a submittal schedule, or fails to provide submittals in accordance with the approved submittal schedule, the Contractor shall not be entitled to any increase in the Contract Sum or extension of Contract Time based on the time required for review of submittals.

§ 3.10.3 The Contractor shall participate with other Contractors, the Construction Manager, Architect and the Owner in reviewing and coordinating all schedules for incorporation into the Project schedule that is prepared by the Construction Manager. The Contractor shall make revisions to the construction schedule and submittal schedule as deemed necessary by the Construction Manager, Architect and the Owner to conform to the Project schedule.

§ 3.10.4 The Contractor shall perform the Work in general accordance with the most recent schedules submitted to the Owner, Construction Manager, and Architect, and incorporated into the approved Project schedule.

§ 3.10.5 The Owner shall have the reasonable right to direct rescheduling of any date or time for the performance of any part of the Work that may interfere with the operation of the Owner's premises or any tenants or invitees, thereof. The Contractor shall, upon the Owner's reasonable request, reschedule any portion of the Work affecting operation of the premises during hours when the premises are not in operation.

§ 3.11 Documents and Samples at the Site

The Contractor shall make available, at the Project site, the Contract Documents, including Change Orders, Construction Change Directives, and other Modifications, in good order and marked currently to indicate field changes and selections made during construction, and the approved Shop Drawings, Product Data, Samples, and similar required submittals. These shall be in electronic form or paper copy, available to the Construction Manager, Architect, and Owner, and delivered to the Construction Manager for submittal to the Owner upon completion of the Work as a record of the Work as constructed.

§ 3.12 Shop Drawings, Product Data, and Samples

§ 3.12.1 Shop Drawings are drawings, diagrams, schedules, and other data specially prepared for the Work by the Contractor or a Subcontractor, Sub-subcontractor, manufacturer, supplier, or distributor to illustrate some portion of the Work.

§ 3.12.2 Product Data are illustrations, standard schedules, performance charts, instructions, brochures, diagrams, and other information furnished by the Contractor to illustrate materials or equipment for some portion of the Work.

§ 3.12.3 Samples are physical examples that illustrate materials, equipment, or workmanship, and establish standards by which the Work will be judged. Contractor shall submit samples requiring color or finish selection in a single, coordinated submittal. The Architect will issue no color or finish schedule until all samples and other data necessary for making complete color selections for the project are received.

§ 3.12.4 Shop Drawings, Product Data, Samples, and similar submittals are not Contract Documents. Their purpose is to demonstrate how the Contractor proposes to conform to the information given and the design concept expressed in the Contract Documents for those portions of the Work for which the Contract Documents require submittals. Review by the Architect and Construction Manager is subject to the limitations of Sections 4.2.10 through 4.2.12.

Informational submittals upon which the Construction Manager and Architect are not expected to take responsive action may be so identified in the Contract Documents. Submittals that are not required by the Contract Documents may be returned by the Construction Manager or Architect without action.

§ 3.12.5 The Contractor shall review for compliance with the Contract Documents, approve, and submit to the Construction Manager, Shop Drawings, Product Data, Samples, and similar submittals required by the Contract Documents, in accordance with the Project submittal schedule approved by the Construction Manager and Architect or, in the absence of an approved Project submittal schedule, with reasonable promptness and in such sequence as to cause no delay in the Work or in the activities of other Contractors, Separate Contractors, or the Owner's own forces or Separate Contractors, or interfere with the Owner's operations. The Contractor shall cooperate with the Construction Manager in the coordination of the Contractor's Shop Drawings, Product Data, Samples, and similar submittals with related documents submitted by other Contractors.

The Architect shall have no responsibility to review any Shop Drawings, Product Data, Samples or similar submittals unless and until the Contractor has submitted and received back from the Construction Manager and Architect approved reviewed submittal schedule as required under Section 3.10.2. In addition, it is not the Architect's responsibility to ensure that all required Shop Drawings, Product Data, Samples or similar submittals that are required to be submitted and reviewed under the Contract Documents are submitted by the Contractor. Submissions of Shop Drawings, Product Data, Samples or similar submittals is solely the Contractor's responsibility.

§ 3.12.6 By submitting Shop Drawings, Product Data, Samples, and similar submittals, the Contractor represents to the Owner, Construction Manager, and Architect, that the Contractor has (1) reviewed and approved them, (2) determined and verified materials, field measurements and field construction criteria related thereto, or will do so, and (3) checked and coordinated the information contained within such submittals with the requirements of the Work and of the Contract Documents.

§ 3.12.7 The Contractor shall perform no portion of the Work for which the Contract Documents require submittal and review of Shop Drawings, Product Data, Samples, or similar submittals, until the respective submittal has been reviewed and commented on by the Architect.

§ 3.12.8 The Work shall be in accordance with the reviewed submittals except that the Contractor shall not be relieved of responsibility for deviations from the requirements of the Contract Documents by the Architect's review of Shop Drawings, Product Data, Samples, or similar submittals, unless the Contractor has specifically notified the Construction Manager and Architect of such deviation at the time of submittal and (1) the Architect has indicated in writing that there is no exception to the specific deviation as a minor change in the Work, or (2) a Change Order or Construction Change Directive has been issued authorizing the deviation. The Contractor shall not be relieved of responsibility for errors or omissions in Shop Drawings, Product Data, Samples, or similar submittals, by the Architect's review thereof.

§ 3.12.9 The Contractor shall direct specific attention, in writing or on resubmitted Shop Drawings, Product Data, Samples, or similar submittals, to revisions other than those requested by the Construction Manager and Architect on previous submittals. In the absence of such notice, the Architect's action of a resubmission shall not apply to such revisions.

§ 3.12.10 The Contractor shall not be required to provide professional services that constitute the practice of architecture or engineering unless such services are specifically required by the Contract Documents for a portion of

the Work or unless the Contractor needs to provide such services in order to carry out the Contractor's responsibilities for construction means, methods, techniques, sequences, and procedures. The Contractor shall not be required to provide professional services in violation of applicable law.

§ 3.12.10.1 If professional design services or certifications by a design professional related to systems, materials, or equipment are specifically required of the Contractor by the Contract Documents, the Owner and the Architect will specify all performance and design criteria that such services must satisfy. The Contractor shall cause such services or certifications to be provided by an appropriately licensed design professional, whose signature and seal shall appear on all drawings, calculations, specifications, certifications, Shop Drawings, and other submittals prepared by such professional. Shop Drawings, and other submittals related to the Work, designed or certified by such professional, if prepared by others, shall bear such professional's written approval when submitted to the Architect. The Owner, the Architect, and the Construction Manager shall be entitled to rely upon the adequacy, accuracy and completeness of the services, certifications, and approvals performed or provided by such design professionals, provided the Owner and Architect have specified to the Contractor the performance and design criteria that such services must satisfy. Pursuant to this Section 3.12.10, the Architect will review and take other appropriate action on submittals only for the limited purpose of checking for conformance with information given and the design concept expressed in the Contract Documents. The Construction Manager shall review submittals for sequencing, constructability, and coordination impacts on other Contractors.

§ 3.12.10.2 If the Contract Documents require the Contractor's design professional to certify that the Work has been performed in accordance with the design criteria, the Contractor shall furnish such certifications to the Construction Manager and Architect at the time and in the form specified by the Architect.

§ 3.12.11 The Architect's review of the Contractor's submittals will be limited to examination of an initial submittal and one (1) resubmittal. The Owner is entitled to obtain reimbursement from the Contractor for amounts paid to the Architect for evaluation of additional resubmittals.

§ 3.13 Use of Site

§ 3.13.1 The Contractor shall confine operations at the site to areas permitted by applicable laws, statutes, ordinances, codes, rules and regulations, lawful orders of public authorities, and the Contract Documents and shall not unreasonably encumber the site with materials or equipment.

- .1** Due to the site constraints, only materials and equipment that are to be used in the Work shall be brought to and stored on the Project site by the Contractor in areas designated and approved by the Owner. The Contractor is prohibited from storing hazardous material at the site, including but not limited to fuel, oil and other products. After materials and equipment are no longer required for the Work, they shall be promptly removed from the Project site and the Project site shall be broom cleaned and restored to the condition that existed prior to Contractor's use of the Project site for storage. Protection of materials and equipment stored at the Project site from weather, theft, damage, and all other adversity, including the safe storage of such materials and equipment is solely the responsibility and liability of the Contractor. The Contractor shall ensure that the Work, at all times, is performed in a manner that affords reasonable access, both vehicular and pedestrian, to the site of the Work and adjacent areas..
- .2** The Contractor shall not permit any workers to use existing facilities at the Project site, including, without limitation, lavatories, entrances and parking areas other than those designated and approved by the Owner.
- .3** The Contractor shall comply with all rules and regulations promulgated by the Owner or any state federal or local laws rules and regulations in connection with the use and occupancy of the Project site and the Building, as amended from time to time. The Contractor shall immediately notify the Owner in writing if during the performance of the Work, the Contractor finds compliance with any portion of such rules and regulations to be impracticable, setting forth the problems of such compliance and suggesting alternatives through which the same results intended by such portions of the rules and regulations can be achieved. The Owner may, in the Owner's sole discretion, adopt such suggestions, develop new alternatives, or require compliance with the existing requirements of the rules and regulations.
- .4** In the event that the Contractor violates the restrictions policies rules, laws regulations regarding the use of the Owner's site and buildings, the Owner can rescind the approval for the Contractor to store materials and equipment on the site. Upon such rescission, the Contractor must immediately remove such material and equipment from the Owner's site.

§ 3.13.2 The Contractor shall coordinate the Contractor's operations with, and secure the approval of, the Construction Manager before using any portion of the site.

§ 3.14 Cutting and Patching

§ 3.14.1 The Contractor shall be responsible for cutting, fitting, or patching required to complete the Work or to make its parts fit together properly. All areas requiring cutting, fitting, or patching shall be restored to the condition existing prior to the cutting, fitting, or patching, unless otherwise required by the Contract Documents.

§ 3.14.2 The Contractor shall not damage or endanger a portion of the Work or fully or partially completed construction of the Owner, Separate Contractors, or of other Contractors by cutting, patching, or otherwise altering such construction, or by excavation. The Contractor shall not cut or otherwise alter construction by the Owner, Separate Contractors, or by other Contractors except with written consent of the Construction Manager, Owner, and such other Contractors or Separate Contractors. Consent shall not be unreasonably withheld. The Contractor shall not unreasonably withhold, from the Separate Contractors, other Contractors, or the Owner, its consent to cutting or otherwise altering the Work.

§ 3.14.3 All cutting and patching work shall be done by the Contractor (or through the appropriate Subcontractor). Patches in finish surfaces shall match the adjacent surfaces in material, finish, detail, and quality. Patches in fire rated construction or construction required to be smoke tight shall be made in conformance with assemblies designed and tested by agencies recognized by governing codes. Any UL rated fire safety materials, flanges, or other materials required by Code, the Contract Documents, or manufacturers installation instructions for devices penetrating the work affected shall be applied and installed by an approved firestop subcontractor or qualified personnel from the applicable trade.

§ 3.15 Cleaning Up

§ 3.15.1 The Contractor shall keep the premises and surrounding area free from accumulation of waste materials and rubbish caused by operations under the Contract and the Contractor shall maintain its tools, construction equipment, machinery, and surplus materials from and about the Project in a neat and orderly fashion. At completion of the Work, the Contractor shall remove waste materials, rubbish, the Contractor's tools, construction equipment, machinery, and surplus materials from and about the Project and return the site to the condition that existed before the work commenced.

§ 3.15.2 If the Contractor fails to clean up as provided in the Contract Documents, the Owner, or Construction Manager with the Owner's approval, may do so and the Owner shall be entitled to reimbursement from the Contractor.

§ 3.16 Access to Work

The Contractor shall provide the Owner, Construction Manager, and Architect with access to the Work in preparation and progress wherever located.

§ 3.17 Royalties, Patents and Copyrights

The Contractor shall pay all royalties and license fees. The Contractor shall defend suits or claims for infringement of copyrights and patent rights and shall hold the Owner, Construction Manager, and Architect harmless from loss on account thereof, but shall not be responsible for defense or loss when a particular design, process, or product of a particular manufacturer or manufacturers is required by the Contract Documents, or where the copyright violations are contained in Drawings, Specifications, or other documents prepared by the Owner, Architect, or Construction Manager. However, if an infringement of a copyright or patent is discovered by, or made known to, the Contractor, the Contractor shall be responsible for the loss unless the information is promptly furnished to the Architect through the Construction Manager.

§ 3.18 Indemnification

§ 3.18.1 To the fullest extent permitted by law, the Contractor shall indemnify and hold harmless the Owner, Construction Manager, Architect, Construction Manager's and Architect's consultants, and agents and employees of any of them from and against claims, damages, losses, and expenses, including but not limited to attorneys' fees, arising out of or resulting from performance of the Work, provided that such claim, damage, loss, or expense is attributable to bodily injury, sickness, disease or death, or to injury to or destruction of tangible property (other than the Work itself), but only to the extent caused by the negligent acts or omissions of the Contractor, a Subcontractor, anyone directly or indirectly employed by them, or anyone for whose acts they may be liable, regardless of whether or

not such claim, damage, loss, or expense is caused in part by a party indemnified hereunder. Such obligation shall not be construed to negate, abridge, or reduce other rights or obligations of indemnity that would otherwise exist as to a party or person described in this Section 3.18.

§ 3.18.2 In claims against any person or entity indemnified under this Section 3.18 by an employee of the Contractor, a Subcontractor, anyone directly or indirectly employed by them, or anyone for whose acts they may be liable, the indemnification obligation under Section 3.18.1 shall not be limited by a limitation on amount or type of damages, compensation, or benefits payable by or for the Contractor or a Subcontractor under workers' compensation acts, disability benefit acts, or other employee benefit acts.

ARTICLE 4 ARCHITECT AND CONSTRUCTION MANAGER

§ 4.1 General

§ 4.1.1 The Architect is the person or entity retained by the Owner pursuant to Section 2.3.2 and identified as such in the Agreement.

§ 4.1.2 The Construction Manager is the person or entity retained by the Owner pursuant to Section 2.3.3 and identified as such in the Agreement.

(Paragraph deleted)

§ 4.2 Administration of the Contract

§ 4.2.1 The Construction Manager and Architect will provide administration of the Contract as described in the Contract Documents and will be the Owner's representatives during construction until (1) 90 days after issuance of the State Education Department's Certificate of Substantial Completion or issuance of the Final Project Certificate for Payment, whichever is later, and (3) with the Owner's concurrence, from time to time during the one-year period for correction of Work described in Section 12.2.. t. The Construction Manager and Architect will have authority to act on behalf of the Owner only to the extent provided in the Contract Documents.

§ 4.2.2 The Architect will visit the site at intervals appropriate to the stage of construction, or as otherwise agreed with the Owner, to become generally familiar with the progress and quality of the portion of the Work completed, and to determine in general if the Work observed is being performed in a manner indicating that the Work, when fully completed, will be in accordance with the Contract Documents. However, the Architect will not be required to make exhaustive or continuous on-site inspections to check the quality or quantity of the Work. On the basis of the site visits, the Architect will keep the Owner and the Construction Manager reasonably informed about the progress and quality of the portion of the Work completed, and promptly report to the Owner and Construction Manager known deviations from the Contract Documents and defects and deficiencies observed in the Work.

§ 4.2.2.1 The Owner is entitled to reimbursement from the Contractor for amounts paid to the Architect for site visits made necessary by the fault of the Contractor to maintain the Project Schedule or for defects and deficiencies in the Work. The Owner may seek reimbursement pursuant to the procedures set forth in § 9.5.1.

§ 4.2.3 The Construction Manager shall provide one or more representatives who shall be in attendance at the Project site whenever the Work is being performed. The Construction Manager will determine in general if the Work observed is being performed in accordance with the Contract Documents, will keep the Owner and Architect reasonably informed of the progress of the Work, and will promptly report to the Owner and Architect known deviations from the Contract Documents and the most recent Project schedule, and defects and deficiencies observed in the Work.

§ 4.2.4 The Construction Manager will schedule and coordinate the activities of the Contractor and other Contractors in accordance with the latest approved Project schedule.

§ 4.2.5 The Construction Manager, except to the extent required by Section 4.2.4, and Architect will not have control over, charge of, or responsibility for, the construction means, methods, techniques, sequences or procedures, or for the safety precautions and programs in connection with the Work, since these are solely the Contractor's rights and responsibilities under the Contract Documents, and neither will be responsible for the Contractor's failure to perform the Work in accordance with the requirements of the Contract Documents. Neither the Construction Manager nor the

Architect will have control over or charge of, or be responsible for acts or omissions of, the Contractor, Subcontractors, or their agents or employees, or of any other persons or entities performing portions of the Work.

§ 4.2.6 Communications. The Owner shall communicate with the Contractor and the Construction Manager's consultants through the Construction Manager about matters arising out of or relating to the Contract Documents. The Owner and Construction Manager shall include the Architect in all communications that relate to or affect the Architect's services or professional responsibilities. The Owner shall promptly notify the Architect of the substance of any direct communications between the Owner and the Construction Manager otherwise relating to the Project. Communications by and with the Architect's consultants shall be through the Architect. Communications by and with Subcontractors and suppliers shall be through the Contractor. Communications by and with other Contractors shall be through the Construction Manager. Communications by and with the Owner's own forces and Separate Contractors shall be through the Owner. The Contract Documents may specify other communication protocols.

§ 4.2.7 The Construction Manager and Architect will review and certify all Applications for Payment by the Contractor, in accordance with the provisions of Article 9.

§ 4.2.8 The Architect and Construction Manager have authority to reject Work that does not conform to the Contract Documents, and will notify each other in writing about the rejection. Whenever the Construction Manager considers it necessary or advisable, the Construction Manager will have authority to require inspection or testing of the Work in accordance with Sections 13.4.2 and 13.4.3, upon written authorization of the Owner, whether or not the Work is fabricated, installed or completed. The foregoing authority of the Construction Manager will be subject to the provisions of Sections 4.2.18 through 4.2.20 inclusive, with respect to interpretations and decisions of the Architect. However, neither the Architect's nor the Construction Manager's authority to act under this Section 4.2.8 nor a decision made by either of them in good faith either to exercise or not to exercise such authority shall give rise to a duty or responsibility of the Architect or the Construction Manager to the Contractor, Subcontractors, suppliers, their agents or employees, or other persons performing any of the Work.

§ 4.2.9 Utilizing the submittal schedule provided by the Contractor, the Construction Manager shall prepare, and revise as necessary, a Project submittal schedule incorporating information from other Contractors, the Owner, Owner's consultants, Owner's Separate Contractors and vendors, governmental agencies, and participants in the Project under the management of the Construction Manager. The Project submittal schedule and any revisions shall be submitted to the Architect for approval.

§ 4.2.10 The Construction Manager will receive and promptly review for conformance with the submittal requirements of the Contract Documents, all submittals from the Contractor such as Shop Drawings, Product Data, and Samples. Where there are other Contractors, the Construction Manager will also check and coordinate the information contained within each submittal received from the Contractor and other Contractors, and transmit to the Architect those recommended for approval. By submitting Shop Drawings, Product Data, Samples, and similar submittals, the Construction Manager represents to the Owner and Architect that the Construction Manager has reviewed and recommended them for approval. The Construction Manager's actions will be taken in accordance with the Project submittal schedule approved by the Architect or, in the absence of an approved Project submittal schedule, with reasonable promptness while allowing sufficient time to permit adequate review by the Architect.

§ 4.2.11 The Architect will review the Contractor's submittals such as Shop Drawings, Product Data, and Samples, but only for the limited purpose of checking for conformance with information given and the design concept expressed in the Contract Documents. The Architect's action will be taken in accordance with the submittal schedule approved by the Architect or, in the absence of an approved submittal schedule, with reasonable promptness while allowing sufficient time in the Architect's professional judgment to permit adequate review. Upon the Architect's completed review, the Architect shall transmit its submittal review to the Construction Manager.

§ 4.2.12 Review of the Contractor's submittals by the Construction Manager and Architect is not conducted for the purpose of determining the accuracy and completeness of other details such as dimensions and quantities, or for substantiating instructions for installation or performance of equipment or systems, all of which remain the responsibility of the Contractor as required by the Contract Documents. The Construction Manager and Architect's review of the Contractor's submittals shall not relieve the Contractor of the obligations under Sections 3.3, 3.5, and 3.12. The Construction Manager and Architect's review shall not constitute approval of safety precautions or of

any construction means, methods, techniques, sequences, or procedures. The Architect's review of a specific item shall not indicate approval of an assembly of which the item is a component.

§ 4.2.13 The Construction Manager, with the assistance of the Architect, will prepare Change Orders and Construction Change Directives.

§ 4.2.14 The Construction Manager and the Architect will take appropriate action on Change Orders or Construction Change Directives in accordance with Article 7, and the Architect will have authority to order minor changes in the Work as provided in Section 7.4. The Architect, in consultation with the Construction Manager, will investigate and make determinations and recommendations regarding concealed and unknown conditions as provided in Section 3.7.4.

§ 4.2.15 Utilizing the documents provided by the Contractor, the Construction Manager will maintain at the site for the Owner one copy of all Contract Documents, approved Shop Drawings, Product Data, Samples, and similar required submittals, in good order and marked currently to record all changes and selections made during construction. These will be available to the Architect and the Contractor, and will be delivered to the Owner upon completion of the Project.

§ 4.2.16 The Construction Manager will assist the Architect in conducting site visits to determine the date or dates of Substantial Completion and the date of final completion; issue Certificates of Substantial Completion in conjunction with the Architect pursuant to Section 9.8; and receive and forward to the Owner for the Owner's review and records, written warranties and related documents required by the Contract and assembled by the Contractor pursuant to Section 9.10. The Construction Manager will forward to the Architect a final Application and Certificate for Payment or final Project Application and Project Certificate for Payment upon the Contractor's compliance with the requirements of the Contract Documents.

(Paragraph deleted)

§ 4.2.18 The Architect will interpret and decide matters concerning performance under, and requirements of, the Contract Documents on written request of the Construction Manager, Owner, or Contractor through the Construction Manager. The Architect's response to such requests will be made in writing within any time limits agreed upon or otherwise with reasonable promptness.

§ 4.2.19 Interpretations and decisions of the Architect will be consistent with the intent of, and reasonably inferable from, the Contract Documents and will be in writing or in the form of drawings. When making such interpretations and decisions, the Architect will endeavor to secure faithful performance by both Owner and Contractor, will not show partiality to either, and will not be liable for results of interpretations or decisions so rendered in good faith.

(Paragraph deleted)

§ 4.2.21 The Construction Manager will receive and review requests for information from the Contractor, and forward each request for information to the Architect, with the Construction Manager's recommendation. The Architect will review and respond in writing, through the Construction Manager, to requests for information about the Contract Documents. The Construction Manager's recommendation and the Architect's response to each request will be made in writing within any time limits agreed upon or otherwise with reasonable promptness. If appropriate, the Architect will prepare and issue supplemental Drawings and Specifications in response to the requests for information.

- .1 The Contractor's request for information shall be prepared and submitted in accordance with the General Requirements (Division 01 of the Specifications) on the form included therein or as otherwise approved in advance. The Construction Manager will return requests for information that do not conform to requirements of the Contract Documents.
- .2 The Architect's response to a request for information (RFI), or issuance of a clarification or interpretation shall be considered an interpretation, clarification, supplemental information or an order for a minor change in the Work not involving an adjustment in Contract Sum or extension of Contract Time and not inconsistent with the intent of the Contract Documents, and shall be binding, unless indicated otherwise in the Architect's response to the RFI.

Init.

§ 4.2.22. The Architect will not be responsible for the Contractor's failure to perform the Work in accordance with the requirements of the Contract Documents. The Architect will not have control over or charge of, and will not be responsible for acts or omissions of, the Contractor, Subcontractors, or their agents or employees, or any other persons or entities performing portions of the Work.

ARTICLE 5 SUBCONTRACTORS

§ 5.1 Definitions

§ 5.1.1 A Subcontractor is a person or entity who has a direct contract with the Contractor to perform a portion of the Work at the site. The term "Subcontractor" is referred to throughout the Contract Documents as if singular in number and means a Subcontractor or an authorized representative of the Subcontractor. The term "Subcontractor" does not include other Contractors or Separate Contractors or the subcontractors of other Contractors or Separate Contractors.

§ 5.1.2 A Sub-subcontractor is a person or entity who has a direct or indirect contract with a Subcontractor to perform a portion of the Work at the site. The term "Sub-subcontractor" is referred to throughout the Contract Documents as if singular in number and means a Sub-subcontractor or an authorized representative of the Sub-subcontractor.

§ 5.2 Award of Subcontracts and Other Contracts for Portions of the Work

§ 5.2.1 Unless otherwise stated in the Contract Documents, the Contractor, as soon as practicable after award of the Contract, but prior to the first Application for Payment, shall notify the Construction Manager, for review by the Owner, Construction Manager and Architect, of the persons or entities proposed for each principal portion of the Work, including those who are to furnish materials or equipment fabricated to a special design. Within 14 days of receipt of the information, the Construction Manager may notify the Contractor whether the Owner, the Construction Manager or the Architect (1) has reasonable objection to any such proposed person or entity or, (2) requires additional time for review. Failure of the Construction Manager to provide notice within the 14-day period shall constitute notice of no reasonable objection.

The listing required by this Section shall be submitted to the Construction Manager no later than 30 days from the date of the Agreement. This list shall include the names of manufacturers, suppliers, and installers proposed for each of the products, equipment, and materials to be incorporated into the project.

The Contractor shall furnish upon request adequate data on any named entity on the list in order to permit the Construction Manager, Architect and the Owner to conduct a proper evaluation. Failure to object to a manufacturer shall not constitute a waiver of any of the requirements of the Contract Documents and all products furnished by the listed manufacturer must conform to such requirements.

§ 5.2.2 The Contractor shall not contract with a proposed person or entity to whom the Owner, Construction Manager or Architect has made reasonable and timely objection. The Contractor shall not be required to contract with anyone to whom the Contractor has made reasonable objection.

§ 5.2.3 If the Owner, Construction Manager or Architect has reasonable objection to a person or entity proposed by the Contractor, the Contractor shall propose another to whom the Owner, Construction Manager or Architect has no reasonable objection. If the proposed but rejected Subcontractor was reasonably capable of performing the Work, the Contract Sum and Contract Time shall be increased or decreased by the difference, if any, occasioned by such change, and an appropriate Change Order shall be issued before commencement of the substitute Subcontractor's Work. However, no increase in the Contract Sum or Contract Time shall be allowed for such change unless the Contractor has acted promptly and responsively in submitting names as required.

§ 5.2.4 The Contractor shall not substitute a Subcontractor, person, or entity for one previously selected if the Owner, Construction Manager or Architect makes reasonable objection to such substitution.

§ 5.3 Subcontractual Relations

By appropriate written agreement, the Contractor shall require each Subcontractor, to the extent of the Work to be performed by the Subcontractor, to be bound to the Contractor by terms of the Contract Documents, and to assume toward the Contractor all the obligations and responsibilities, including the responsibility for safety of the Subcontractor's Work, that the Contractor, by these Contract Documents, assumes toward the Owner, Construction Manager and Architect. Each subcontract agreement shall preserve and protect the rights of the Owner, Construction Manager and Architect under the Contract Documents with respect to the Work to be performed by the Subcontractor

Init.

so that subcontracting thereof will not prejudice such rights, and shall allow to the Subcontractor, unless specifically provided otherwise in the subcontract agreement, the benefit of all rights, remedies, and redress against the Contractor that the Contractor, by the Contract Documents, has against the Owner. Where appropriate, the Contractor shall require each Subcontractor to enter into similar agreements with Sub-subcontractors. The Contractor shall make available to each proposed Subcontractor, prior to the execution of the subcontract agreement, copies of the Contract Documents to which the Subcontractor will be bound, and, upon written request of the Subcontractor, identify to the Subcontractor terms and conditions of the proposed subcontract agreement that may be at variance with the Contract Documents. Subcontractors will similarly make copies of applicable portions of such documents available to their respective proposed Sub-subcontractors.

§ 5.3.1 The division of the Specifications into sections is not intended to control the Contractor in dividing the work among subcontractors nor to limit the scope of work performed by any trade under a given section. The Architect will not undertake to settle any differences between the Contractor and its Subcontractors as to the responsibility for completing all Work in the Specifications. It shall be entirely the Contractor's responsibility to properly coordinate and complete all the Work described in the Specifications whether performed by the Contractor or its Subcontractors.

§ 5.4 Contingent Assignment of Subcontracts

§ 5.4.1 Each subcontract agreement for a portion of the Work is assigned by the Contractor to the Owner, provided that

- .1 assignment is effective only after termination of the Contract by the Owner for cause pursuant to Section 14.2 and only for those subcontract agreements that the Owner accepts by notifying the Subcontractor and Contractor; and
- .2 assignment is subject to the prior rights of the surety, if any, obligated under bond relating to the Contract.

When the Owner accepts the assignment of a subcontract agreement, the Owner assumes the Contractor's rights and obligations under the subcontract, provided that the Owner shall not be under any obligation to compensate the Subcontractor with respect to amounts that the Owner has already paid to the Contractor for such Subcontractor's work.

§ 5.4.2 Upon such assignment, if the Work has been suspended for more than 30 days, the Subcontractor's compensation may be equitably adjusted for increases in cost resulting from the suspension.

§ 5.4.3 Upon assignment to the Owner under this Section 5.4, the Owner may further assign the subcontract to a successor Contractor or other entity. If the Owner assigns the subcontract to a successor Contractor or other entity, the Owner shall nevertheless remain legally responsible for all of the successor Contractor's obligations under the subcontract.

§ 5.4.4 Nothing in the Contract Documents shall be deemed to create any contractual relationship between any Subcontractor of any tier and the Owner, or between the General Contractor or Subcontractor of any tier and the Architect.

ARTICLE 6 CONSTRUCTION BY OWNER OR BY SEPARATE CONTRACTORS

§ 6.1 Owner's Right to Perform Construction with Own Forces and to Award Other Contracts

§ 6.1.1 The Owner reserves the right to perform construction or operations related to the Project with the Owner's own forces, which include persons or entities under separate contracts not administered by the Construction Manager, and to award other contracts in connection with other portions of the Project or other construction or operations on the site under Conditions of the Contract substantially similar to those of this Contract, including those provisions of the Conditions of the Contract related to insurance and waiver of subrogation.

§ 6.1.2 The Owner shall provide for coordination of the activities of the Owner's own forces and of each Separate Contractor with the Work of the Contractor, who shall cooperate with them. The Contractor shall participate with any Separate Contractors and the Owner in reviewing their construction schedules. The Contractor shall make any revisions to its construction schedule deemed necessary after a joint review and mutual agreement. The construction schedules shall then constitute the schedules to be used by the Contractor, Separate Contractors, and the Owner until subsequently revised.

§ 6.1.3 Unless otherwise provided in the Contract Documents, when the Owner performs construction or operations related to the Project with the Owner's own forces or with Separate Contractors, the Owner or its Separate Contractors shall have the same obligations and rights that the Contractor has under the Conditions of the Contract, including, without excluding others, those stated in Article 3, this Article 6, and Articles 10, 11, and 12.

§ 6.2 Mutual Responsibility

§ 6.2.1 The Contractor shall afford the Owner's own forces, Separate Contractors, Construction Manager and other Contractors opportunity for introduction and storage of their materials and equipment and performance of their activities, and shall connect and coordinate the Contractor's construction and operations with theirs as required by the Contract Documents.

§ 6.2.2 If part of the Contractor's Work depends for proper execution or results upon construction or operations by the Owner's own forces, Separate Contractors or other Contractors, the Contractor shall, prior to proceeding with that portion of the Work, promptly notify the Construction Manager and Architect of apparent discrepancies or defects in the construction or operations by the Owner or Separate Contractor or other Contractors that would render it unsuitable for proper execution and results of the Contractor's Work. Failure of the Contractor to notify the Construction Manager and the Architect of apparent discrepancies or defects prior to proceeding with the Work shall constitute an acknowledgment that the Owner's or Separate Contractor's or other Contractors' completed or partially completed construction is fit and proper to receive the Contractor's Work. The Contractor shall not be responsible for discrepancies or defects in the construction or operations by the Owner or Separate Contractors or other Contractors that are not apparent.

§ 6.2.3 The Contractor shall reimburse the Owner for costs the Owner incurs, including costs that are payable to a Separate Contractors or to other Contractors, because of the Contractor's delays, improperly timed activities or defective construction. The Owner shall be responsible to the Contractor for costs the Contractor incurs because of delays, improperly timed activities, damage to the Work or defective construction by the Owner's own forces, Separate Contractors, or other Contractors.

§ 6.2.4 The Contractor shall promptly remedy damage that the Contractor wrongfully causes to completed or partially completed construction, or to property of the Owner, Separate Contractors, or other Contractors as provided in Section 10.2.5.

§ 6.2.5 The Owner, Separate Contractors, and other Contractors shall have the same responsibilities for cutting and patching as are described for the Contractor in Section 3.14.

§ 6.3 Owner's Right to Clean Up

If a dispute arises among the Contractor, Separate Contractors, other Contractors, and the Owner as to the responsibility under their respective contracts for maintaining the premises and surrounding area free from waste materials and rubbish, the Owner may clean up and the Construction Manager, with notice to the Architect, will allocate the cost among those responsible.

ARTICLE 7 CHANGES IN THE WORK

§ 7.1 General

§ 7.1.1 Changes in the Work may be accomplished after execution of the Contract, and without invalidating the Contract, by Change Order, Construction Change Directive or order for a minor change in the Work, subject to the limitations stated in this Article 7 and elsewhere in the Contract Documents.

§ 7.1.2 A Change Order shall be based upon agreement among the Owner, Construction Manager, Architect and Contractor. A Construction Change Directive requires agreement by the Owner, Construction Manager and Architect and may or may not be agreed to by the Contractor. An order for a minor change in the Work may be issued by the Architect alone.

§ 7.1.3 Changes in the Work shall be performed under applicable provisions of the Contract Documents. The Contractor shall proceed promptly with changes in the Work, unless otherwise provided in the Change Order, Construction Change Directive, or order for a minor change in the Work.

§ 7.1.4 Unless otherwise agreed to in writing by the Owner and the Contractor, the combined overhead and profit that shall be included in the total cost (or credit) to the Owner for a Change in the Work shall be based on the following schedule:

- .1 For the Contractor, for Work performed by the Contractor's own forces:
 - a. 15% on the first \$25,000 of the change order direct cost of self-performed work,
 - b. 10% on the portion of the change order direct cost of self-performed work between \$25,000 and \$50,000 and
 - c. 7.5% on the portion of the change order direct cost of self-performed work between \$50,000 and \$200,000 and
 - d. 5% on the portion of the change order direct cost of self-performed work greater than \$200,000.
- .2 For the Contractor, for Work performed by the Contractor's Subcontractor five percent (5%) of the amount due the Subcontractor.
- .3 For each Subcontractor involved, for Work performed by that Subcontractor's own forces, fifteen percent (10%) of the cost.
- .4 For each Subcontractor involved, for Work performed by the Subcontractor's Sub-subcontractors, five percent (5%) of the amount due the Sub-subcontractor.
- .5 Cost to which overhead and profit is to be applied shall be determined in accordance with Section 7.3.7 and shall be itemized (including labor costs).

§ 7.2 Change Orders

§ 7.2.1 A Change Order is a written instrument prepared by the Construction Manager and signed by the Owner, Construction Manager, Architect, and Contractor, stating their agreement upon all of the following:

- .1 The change in the Work;
- .2 The amount of the adjustment, if any, in the Contract Sum; and
- .3 The extent of the adjustment, if any, in the Contract Time.

§ 7.2.2 A Change Order, when issued, shall be full compensation, or credit, for the extra Work performed, omitted, or substituted. It shall show on its face, any adjustment in time for completion of the Project as a result of the Change in the Work. Each Change Order shall include all costs related thereto, including all overhead, miscellaneous expenses, and incidentals.

§ 7.3 Construction Change Directives

§ 7.3.1 A Construction Change Directive is a written order prepared by the Construction Manager and signed by the Owner, Construction Manager and Architect, directing a change in the Work prior to agreement on adjustment, if any, in the Contract Sum or Contract Time, or both. The Owner may by Construction Change Directive, without invalidating the Contract, order changes in the Work within the general scope of the Contract consisting of additions, deletions, or other revisions, the Contract Sum and Contract Time being adjusted accordingly.

§ 7.3.2 A Construction Change Directive shall be used in the absence of total agreement on the terms of a Change Order.

§ 7.3.3 If the Construction Change Directive provides for an adjustment to the Contract Sum, the adjustment shall be based on one of the following methods:

- .1 Mutual acceptance of a lump sum properly itemized and supported by sufficient substantiating data to permit evaluation;
- .2 Unit prices stated in the Contract Documents or subsequently agreed upon;
- .3 Cost to be determined in a manner agreed upon by the parties and a mutually acceptable fixed or percentage fee; or
- .4 As provided in Section 7.3.4.
- .5 Calculation of overhead and profit shall be consistent with Section 7.1.4.

§ 7.3.4 If the Contractor does not respond promptly or disagrees with the method for adjustment in the Contract Sum, the Construction Manager shall determine the adjustment on the basis of reasonable expenditures and savings of those performing the Work attributable to the change, including, in case of an increase in the Contract Sum, an amount for overhead and profit as set forth in the Agreement, or if no such amount is set forth in the Agreement, a reasonable amount. In such case, and also under Section 7.3.3.3, the Contractor shall keep and present, in such form as the Construction Manager may prescribe, an itemized accounting together with appropriate supporting data. Unless

otherwise provided in the Contract Documents, costs for the purposes of this Section 7.3.4 shall be limited to the following:

- .1 Costs of labor, including applicable payroll taxes, fringe benefits required by agreement or custom, workers' compensation insurance, and other employee costs approved by the Construction Manager and Architect directly related to the work;
- .2 Costs of materials, supplies, and equipment, including cost of transportation (which does not include transportation for the normal commute to work) to the Project site, and directly related to the Work,, whether incorporated or consumed;
- .3 Rental costs of machinery and equipment, exclusive of hand tools, whether rented from the Contractor or others and equipment normally encumbered to perform the work;
- .4 Costs of premiums for all bonds and insurance, permit fees, and sales, use, or similar taxes, directly related to the change; and
- .5 Costs of supervision by the Site Superintendent directly attributable to the change, if the change requires an extension of time beyond that time indicated in the Contract.

§ 7.3.5 If the Contractor disagrees with the adjustment in the Contract Time, the Contractor may make a Claim in accordance with applicable provisions of Article 15.

§ 7.3.6 Upon receipt of a Construction Change Directive, the Contractor shall promptly proceed with the change in the Work involved and advise the Construction Manager of the Contractor's agreement or disagreement with the method, if any, provided in the Construction Change Directive for determining the proposed adjustment in the Contract Sum and/or Contract Time.

§ 7.3.7 A Construction Change Directive signed by the Contractor indicates the Contractor's agreement therewith, including adjustment in Contract Sum and/or Contract Time or the method for determining them. Such agreement shall be effective immediately and shall be recorded as a Change Order.

§ 7.3.8 The amount of credit to be allowed by the Contractor to the Owner for a deletion or change that results in a net decrease in the Contract Sum shall be actual net cost as confirmed by the Construction Manager and Architect. When both additions and credits covering related Work or substitutions are involved in a change, the allowance for overhead and profit shall be figured in accordance with Section 7.1.4.

§ 7.3.9 Pending final determination of the total cost of a Construction Change Directive to the Owner, the Contractor may request payment for Work completed under the Construction Change Directive in Applications for Payment. The Construction Manager and Architect will make an interim determination for purposes of monthly certification for payment for those costs and certify for payment the amount that the Construction Manager and Architect determine to be reasonably justified. The interim determination of cost shall adjust the Contract Sum on the same basis as a Change Order, subject to the right of either party to disagree and assert a Claim in accordance with Article 15.

§ 7.3.10 When the Owner and Contractor agree with a determination made by the Construction Manager and Architect concerning the adjustments in the Contract Sum and Contract Time, or otherwise reach agreement upon the adjustments, such agreement shall be effective immediately and the Construction Manager shall prepare a Change Order. Change Orders may be issued for all or any part of a Construction Change Directive.

§ 7.4 Minor Changes in the Work

The Architect may order minor changes in the Work that are consistent with the intent of the Contract Documents and do not involve an adjustment in the Contract Sum or an extension of the Contract Time. The Architect's order for minor changes shall be in writing. If the Contractor believes that the proposed minor change in the Work will affect the Contract Sum or Contract Time, the Contractor shall notify the Construction Manager and shall not proceed to implement the change in the Work. If the Contractor performs the Work set forth in the Architect's order for a minor change without prior notice to the Construction Manager that such change will affect the Contract Sum or Contract Time, the Contractor waives any adjustment to the Contract Sum or extension of the Contract Time.

ARTICLE 8 TIME

§ 8.1 Definitions

§ 8.1.1 Unless otherwise provided, Contract Time is the period of time, including authorized adjustments, allotted in the Contract Documents for Substantial Completion of the Work.

§ 8.1.2 The date of commencement of the Work is the date established in the Agreement.

§ 8.1.3 The date of Substantial Completion is the date certified by the Architect in accordance with Section 9.8. The Work of this Project shall be substantially complete on or before the dates indicated in Milestone Construction Schedule for those portions of the Work so stipulated. Actual damages may be assessed by the Owner, including additional fees assessed by the Architect and Construction Manager, if specified completion dates are not adhered to by the Contractor.

§ 8.1.4 The term "day" as used in the Contract Documents shall mean calendar day unless otherwise specifically defined.

§ 8.2 Progress and Completion

§ 8.2.1 Time limits stated in the Contract Documents are of the essence of the Contract. By executing the Agreement, the Contractor confirms that the Contract Time is a reasonable period for performing the Work.

§ 8.2.2 The Contractor shall not knowingly, except by agreement or instruction of the Owner in writing, commence the Work prior to the effective date of the bonds and the insurance required to be furnished by the Contractor and Owner. The date of commencement of the Work shall not be changed by the effective date of such bonds and insurance.

§ 8.2.3 The Contractor shall proceed expeditiously with adequate forces and shall achieve Substantial Completion within the Contract Time.

§ 8.3 Delays and Extensions of Time

§ 8.3.1 If the Contractor is delayed at any time in the commencement or progress of the Work by (1) an act or neglect of the Owner, Architect, Construction Manager, or an employee of any of them, or of the Owner's own forces, Separate Contractors, or other Contractors; (2) by changes ordered in the Work; (3) by labor disputes, fire, unusual delay in deliveries, unavoidable casualties, adverse weather conditions documented in accordance with Section 15.1.6.2, or other causes beyond the Contractor's control; (4) by delay authorized by the; or (5) by other causes that the Contractor asserts and the Architect, based on the recommendation of the Construction Manager, determines justify delay, then the Contract Time shall be extended for such reasonable time as the Architect may determine.

(Paragraphs deleted)

§ 8.3.2 Claims relating to time shall be made in accordance with applicable provisions of Article 15; however, The Contractor's Claims, if any, for any increase in Contract Time must be made in accordance with the time requirements of this Section. Claims for an increase in Contract Time must be made in writing to the Initial Decision Maker with a copy sent to the Architect, if the Architect is not serving as the Initial Decision Maker. Claims must be initiated within seven (7) days after the Contractor has notice of the delay (initial notice). Thereafter, the Contractor must provide full details and support documentation with regard to the cause of the delay within twenty-one (21) days of the initial notice of the delay. If either the initial notice or the supporting documentation is not submitted to the Initial Decision Maker with a copy to the Architect, if the Architect is not the Initial Decision maker, in writing within the time periods prescribed in this Section, the Claim for an increase in Contract Time shall be waived. If the cause for the delay is a continuing one then only one Claim is necessary. The Contractor's supporting documentation to the Initial Decision Maker and/or Architect shall include an estimate of cost, if any, and of the probable effect of the delay on the progress of the Work and the Project Schedule.

§ 8.3.3. The Owner shall not be liable to the Contractor and/or any subcontractor for claims or damages of any nature caused by or arising out of delays. Unless expressly provided otherwise in the Contract Documents, an extension of the Contract Time, to the extent permitted under Subparagraph 8.3.1 shall be the sole remedy of the contractor and/or any subcontractor for any (1) delay in the commencement, prosecution, or completion of the Work, (2) hindrance or obstruction in the performance of the work, (3) loss of productivity, or (4) other similar claims (collectively referred to in this Subparagraph 8.3.3 as "Delays") whether or not such Delays are foreseeable. The sole remedy against the Owner for delays shall be the allowance of additional time for completion of the Work, the amount of which shall be subject to the claims procedure set forth herein. Except to the extent, if any, expressly prohibited by law, the Contractor expressly agrees not to make and hereby waives any claim for damages for delay, including, but not limited

Init.

to, those resulting from increased labor or material costs; directions given or not given by the Owner, Construction Manager or Architect, including scheduling and coordination of the Work; the Architect's preparation of drawings and specifications or review of shop drawings and requests for instruction(s); or, on account of any delay, obstruction or hindrance for any cause whatsoever by the Owner, Construction Manager, Architect, or any other contractor on the project, whether or not foreseeable or anticipated. The Contractor agrees that its sole right and remedy therefor shall be an extension of time, if appropriate.

IT IS EMPHASIZED THAT NO MONETARY RECOVERY MAY BE OBTAINED BY THE CONTRACTOR FOR DELAY AGAINST THE OWNER, CONSTRUCTION MANAGER, OR ARCHITECT BASED ON ANY REASON AND THAT THE CONTRACTOR'S SOLE REMEDY, IF APPROPRIATE, IS ADDITIONAL TIME.

ARTICLE 9 PAYMENTS AND COMPLETION

§ 9.1 Contract Sum

§ 9.1.1 The Contract Sum is stated in the Agreement and, including authorized adjustments, is the total amount payable by the Owner to the Contractor for performance of the Work under the Contract Documents.

§ 9.1.2 If unit prices are stated in the Contract Documents or subsequently agreed upon, and if quantities originally contemplated are materially changed so that application of such unit prices to the actual quantities causes substantial inequity to the Owner or Contractor, the applicable unit prices shall be equitably adjusted.

§ 9.2 Schedule of Values

The Contractor shall submit a schedule of values to the Construction Manager, before the first Application for Payment, allocating the entire Contract Sum to the various portions of the Work. The schedule of values shall be prepared in the form, and supported by the data to substantiate its accuracy, required by the Construction Manager and the Architect. This schedule, unless objected to by the Construction Manager or Architect, shall be used as a basis for reviewing the Contractor's Applications for Payment. The Construction Manager shall forward to the Architect the Contractor's schedule of values. Any changes to the schedule of values shall be submitted to the Construction Manager and supported by such data to substantiate its accuracy as the Construction Manager and the Architect may require, and unless objected to by the Construction Manager or the Architect, shall be used as a basis for reviewing the Contractor's subsequent Applications for Payment.

§ 9.2.1 The Contractor and each Subcontractor shall prepare a trade payment breakdown for the work for which it is responsible, such breakdown being submitted on a uniform standardized form reasonably approved by the Architect and Owner (AIA G703). The form shall be divided in detail sufficient to exhibit area, floors, and/or sections of the Work, and/or by convenient units and shall be updated as required by either the Owner or the Architect as necessary to reflect (1) description of Work (listing labor and material separately), (2) total value, (3) percent of the work completed to date, (4) value of the work completed to date, (5) percent of previous amount billed, (6) previous amount billed, (7) current percent completed, and (8) value of Work completed to date. Any trade breakdown that unreasonably fails to include sufficient funds shall be withheld from future Applications for Payment to ensure an adequate reserve (including of normal retainage) to complete the Work.

§ 9.3 Applications for Payment

§ 9.3.1 At least fifteen days before the date established for each progress payment, the Contractor shall submit to the Construction Manager an itemized Application for Payment prepared in accordance with the schedule of values, if required under Section 9.2, for completed portions of the Work. The application shall be notarized, if required, and supported by all data substantiating the Contractor's right to payment that the Owner, Construction Manager or Architect require, such as copies of requisitions, and releases of waivers of lien from Subcontractors and suppliers, and shall reflect retainage if provided for in the Contract Documents.

The form Application for Payment, duly notarized, shall be the most recent authorized edition of AIA Document G732, Application and Certificate for Payment, supported by the most recent authorized edition of AIA Document G703, Continuation Sheet.

§ 9.3.1.1 As provided in Section 7.3.9, such applications may include requests for payment on account of changes in the Work that have been properly authorized by Construction Change Directives, or by interim determinations of the Construction Manager and Architect, but not yet included in Change Orders.

Init.

§ 9.3.1.2 Applications for Payment shall not include requests for payment for portions of the Work for which the Contractor does not intend to pay a Subcontractor or supplier, unless such Work has been performed by others whom the Contractor intends to pay.

§ 9.3.1.3 Each Application for Payment shall be submitted electronically and in four (4) hard copies and shall be accompanied by the following, in all form and substance reasonably satisfactory to the Owner; (1) a current conditional Contractor's waiver of claims and liens, and duly executed an acknowledged sworn statement showing all Subcontractors and material suppliers with whom the Contractor has entered into subcontracts, the amount of each such subcontract, the amount requested for any Subcontractor and material supplier in the requested progress payment, and the amount to be paid to the Contractor from such progress payment together with similar sworn statements from all such subcontractors and material suppliers; (2) duly executed unconditional waivers of claims and liens from all Subcontractors and, when appropriate, from material suppliers and lower tier Subcontractors establishing payment or satisfaction of payment of all amounts requested by the Contractor on behalf of such entities or information and materials required to comply with the requirements Contract Documents or reasonably requested by the Owner or the Architect or required by the Owner's title insurer.

§ 9.3.1.4 Until Substantial Completion, the Owner shall pay the Contractor ninety five percent (95%) of the amount due the Contractor on account of progress payments less an amount necessary to satisfy any claims, liens or judgments against the Contractor, which have not been suitably discharged as determined by the Architect in conjunction with the Construction Manager. Any claims, liens or judgments referred to in this clause shall pertain to the Project and shall be filed in accordance with the terms of the Contract, and applicable laws

§ 9.3.1.5 When the work or major portions thereof as contemplated by the terms of the Contract are substantially complete, the Contractor shall submit to the Construction Manager and Architect a requisition for payment of the remaining amount of the Contract balance. Upon receipt of such requisition, the Owner shall approve and promptly pay the remaining amount of the Contract less two times the value of any remaining items to be completed and an amount necessary to satisfy any claims, liens or judgments against the Contractor, which have not been suitably discharged, as determined by the Architect in conjunction with the Construction Manager. Any claims, liens or judgments referred to in this clause shall pertain to the Project and shall be filed in accordance with the terms of the Contract, and applicable laws

§ 9.3.2 Unless otherwise provided in the Contract Documents, payments shall be made on account of materials and equipment delivered and suitably stored at the site for subsequent incorporation in the Work. If approved in advance by the Owner, payment may similarly be made for materials and equipment suitably stored off the site at a location agreed upon in writing. Payment for materials and equipment stored on or off the site shall be conditioned upon compliance by the Contractor with procedures satisfactory to the Owner to establish the Owner's title to such materials and equipment or otherwise protect the Owner's interest, and shall include the costs of applicable insurance, storage, and transportation to the site, for such materials and equipment stored off the site. Such payment by the Owner for materials, equipment, fixtures and supplies stored on or off the Site shall not relieve the Contractor of its responsibility to provide reasonable protection of said materials, equipment, fixtures and supplies until their incorporation into the Work. The Owner shall have the right, at any time on reasonable notice to inspect materials and equipment which have been stored off the site in accordance with this paragraph.

§ 9.3.2.1 Proof of insurance for items stored off site and copies of invoices are to be provided with Applications for Payment requesting payment for stored materials.

§ 9.3.3 The Contractor warrants that title to all Work covered by an Application for Payment will pass to the Owner no later than the time of payment. The Contractor further warrants that upon submittal of an Application for Payment all Work for which Certificates for Payment have been previously issued and payments received from the Owner shall, to the best of the Contractor's knowledge, information, and belief, be free and clear of liens, claims, security interests, or encumbrances, in favor of the Contractor, Subcontractors, suppliers, or other persons or entities that provided labor, materials and equipment relating to the Work.

§ 9.3.3.1 The Contractor further expressly undertakes to defend the Owner, against any actions, lawsuits, or proceedings brought against the Owner as a result of liens related to the Work. The Contractor hereby agrees to indemnify and hold the Owner harmless against any such liens or claims of liens and agrees to pay any final judgment or lien if the reason for the judgment or lien is the nonpayment by the Owner to Contractor in accordance with the Contract Documents.

§ 9.3.3.2 The Owner shall release any payments withheld due to a lien or claim of lien if the Contractor obtains security acceptable to the Owner or a lien discharge bond that is (1) issued by a surety acceptable to the Owner; (2) in form and substance satisfactory to the Owner, and (3) in an amount required by law to release such lien claim. By posting a lien discharge bond or other acceptable security, however, the Contractor shall not be relieved of any responsibilities or obligations under Subparagraph 9.3.3.1 including without limitation, the duty to defend and indemnify the Owner. The cost of any premiums incurred in connection with such bonds and security shall be the responsibility of the Contractor and shall not be part of, or cause any adjustment to, the Contract Sum.

§ 9.4 Certificates for Payment

§ 9.4.1 Where there is only one Contractor, the Construction Manager will, within seven days after the Construction Manager's receipt of the Contractor's Application for Payment, review the Application, certify the amount the Construction Manager determines is due the Contractor, and forward the Contractor's Application and Certificate for Payment to the Architect. Within seven days after the Architect receives the Contractor's Application for Payment from the Construction Manager, the Architect will either (1) issue to the Owner a Certificate for Payment, in the full amount of the Application for Payment, with a copy to the Construction Manager; or (2) issue to the Owner a Certificate for Payment for such amount as the Architect determines is properly due, and notify the Construction Manager and Owner of the Architect's reasons for withholding certification in part as provided in Section 9.5.1; or (3) withhold certification of the entire Application for Payment, and notify the Construction Manager and Owner of the Architect's reason for withholding certification in whole as provided in Section 9.5.1. The Construction Manager will promptly forward to the Contractor the Architect's notice of withholding certification.

§ 9.4.2 Where there is more than one Contractor performing portions of the Project, the Construction Manager will, within seven days after the Construction Manager receives all of the Contractors' Applications for Payment: (1) review the Applications and certify the amount the Construction Manager determines is due each of the Contractors; (2) prepare a Summary of Contractors' Applications for Payment by combining information from each Contractor's application with information from similar applications for progress payments from the other Contractors; (3) prepare a Project Application and Certificate for Payment; (4) certify the amount the Construction Manager determines is due all Contractors; and (5) forward the Summary of Contractors' Applications for Payment and Project Application and Certificate for Payment to the Architect.

§ 9.4.2.1 Within seven days after the Architect receives the Project Application and Project Certificate for Payment and the Summary of Contractors' Applications for Payment from the Construction Manager, the Architect will either (1) issue to the Owner a Project Certificate for Payment, with a copy to the Construction Manager; or (2) issue to the Owner a Project Certificate for Payment for such amount as the Architect determines is properly due, and notify the Construction Manager and Owner of the Architect's reasons for withholding certification in part as provided in Section 9.5.1; or (3) withhold certification of the entire Project Application for Payment, and notify the Construction Manager and Owner of the Architect's reason for withholding certification in whole as provided in Section 9.5.1. The Construction Manager will promptly forward the Architect's notice of withholding certification to the Contractors.

§ 9.4.3 The Construction Manager's certification of an Application for Payment or, in the case of more than one Contractor, a Project Application and Certificate for Payment, shall be based upon the Construction Manager's evaluation of the Work and the data in the Application or Applications for Payment. The Construction Manager's certification will constitute a representation that, to the best of the Construction Manager's knowledge, information, and belief, the Work has progressed to the point indicated, the quality of the Work is in accordance with the Contract Documents, and that the Contractor is, or Contractors are, entitled to payment in the amount certified.

§ 9.4.4 The Architect's issuance of a Certificate for Payment or, in the case of more than one Contractor, Project Application and Certificate for Payment, shall be based upon the Architect's evaluation of the Work, the recommendation of the Construction Manager, and data in the Application for Payment or Project Application for Payment. The Architect's certification will constitute a representation that, to the best of the Architect's knowledge, information, and belief, the Work

has progressed to the point indicated, the quality of the Work is in accordance with the Contract Documents, and that the Contractor is, or Contractors are, entitled to payment in the amount certified.

§ 9.4.5 The representations made pursuant to Sections 9.4.3 and 9.4.4 are subject to an evaluation of the Work for conformance with the Contract Documents upon Substantial Completion, to results of subsequent tests and inspections, to correction of minor deviations from the Contract Documents prior to completion, and to specific qualifications expressed by the Construction Manager or Architect.

§ 9.4.6 The issuance of a Certificate for Payment or a Project Certificate for Payment will not be a representation that the Construction Manager or Architect has (1) made exhaustive or continuous on-site inspections to check the quality or quantity of the Work; (2) reviewed construction means, methods, techniques, sequences, or procedures; (3) reviewed copies of requisitions received from Subcontractors and suppliers and other data requested by the Owner to substantiate the Contractor's right to payment; or (4) made examination to ascertain how or for what purpose the Contractor has used money previously paid on account of the Contract Sum.

§ 9.5 Decisions to Withhold Certification

§ 9.5.1 The Construction Manager or Architect may withhold a Certificate for Payment or Project Certificate for Payment in whole or in part, to the extent reasonably necessary to protect the Owner, if in the Construction Manager's or Architect's opinion the representations to the Owner required by Section 9.4.3 and 9.4.4 cannot be made. If the Construction Manager or Architect is unable to certify payment in the amount of the Application, the Construction Manager will notify the Contractor and Owner as provided in Section 9.4.1 and 9.4.2. If the Contractor, Construction Manager and Architect cannot agree on a revised amount, the Architect will promptly issue a Certificate for Payment or a Project Certificate for Payment for the amount for which the Architect is able to make such representations to the Owner. The Construction Manager or Architect may also withhold a Certificate for Payment or, because of subsequently discovered evidence, may nullify the whole or a part of a Certificate for Payment or Project Certificate for Payment previously issued, to such extent as may be necessary in the Construction Manager's or Architect's opinion to protect the Owner from loss for which the Contractor is responsible, including loss resulting from the acts and omissions described in Section 3.3.2 because of

- .1 defective Work not remedied;
- .2 third party claims filed or reasonable evidence indicating probable filing of such claims, unless security acceptable to the Owner is provided by the Contractor;
- .3 failure of the Contractor to make payments properly to Subcontractors or suppliers for labor, materials or equipment;
- .4 reasonable evidence that the Work cannot be completed for the unpaid balance of the Contract Sum;
- .5 damage to the Owner or a Separate Contractor or other Contractor;
- .6 reasonable evidence that the Work will not be completed within the Contract Time, and that the unpaid balance would not be adequate to cover actual or liquidated damages for the anticipated delay;
- .7 repeated failure to carry out the Work in accordance with the Contract Documents; or
- .8 any other reasonable grounds for objection or withholding as provided in the agreement or as permitted by the law.

§ 9.5.2 Omitted

§ 9.5.3 When the reasons for withholding certification are removed, certification will be made for amounts previously withheld. The Owner shall not be deemed in default by reason of withholding payment while any conditions described in 9.5.1 remain.

§ 9.5.4 If the Architect or Construction Manager withholds certification for payment under Section 9.5.1, the Owner may, at its sole option, issue joint checks to the Contractor and to any Subcontractor or supplier to whom the Contractor failed to make payment for Work properly performed or material or equipment suitably delivered. If the Owner makes payments by joint check, the Owner shall notify the Architect and the Construction Manager, and both will reflect such payment on the next Certificate for Payment.

§ 9.6 Progress Payments

§ 9.6.1 After the Architect has issued a Certificate for Payment or Project Certificate for Payment, the Owner shall make payment in the manner and within the time provided in the Contract Documents, and shall so notify the Construction Manager and Architect.

§ 9.6.2 The Contractor shall pay each Subcontractor, no later than seven days after receipt of payment from the Owner, the amount to which the Subcontractor is entitled, reflecting percentages actually retained from payments to the Contractor on account of the Subcontractor's portion of the Work. The Contractor shall, by appropriate agreement with each Subcontractor, require each Subcontractor to make payments to Sub-subcontractors in a similar manner.

§ 9.6.2.1 The Contractor shall indemnify and hold the Owner harmless from laborers, mechanics and materialmen liens upon the Owner's properties or the premises upon which the work is located, arising out of the work performed or materials furnished by the Contractor or any of its Subcontractors or any material suppliers under the Contract.

§ 9.6.3 The Construction Manager will, on request, furnish to a Subcontractor, if practicable, information regarding percentages of completion or amounts applied for by the Contractor and action taken thereon by the Owner, Construction Manager and Architect on account of portions of the Work done by such Subcontractor.

§ 9.6.4 The Owner has the right to request written evidence from the Contractor that the Contractor has properly paid Subcontractors and suppliers amounts paid by the Owner to the Contractor for subcontracted Work. If the Contractor fails to furnish such evidence within seven days, the Owner shall have the right to contact Subcontractors and suppliers to ascertain whether they have been properly paid. Neither the Owner, Construction Manager nor Architect shall have an obligation to pay, or to see to the payment of money to, a Subcontractor or supplier, except as may otherwise be required by law.

§ 9.6.5 The Contractor's payments to suppliers shall be treated in a manner similar to that provided in Sections 9.6.2, 9.6.3 and 9.6.4. The Owner shall have no obligation to pay or reimburse a Contractor for payments to material and equipment suppliers until materials and supplies have been delivered on site or to an offsite storage facility which is bonded and secured.

§ 9.6.6 A Certificate for Payment, a progress payment, or partial or entire use or occupancy of the Project by the Owner shall not constitute acceptance of Work not in accordance with the Contract Documents.

§ 9.6.7 Unless the Contractor provides the Owner with a payment bond in the full penal sum of the Contract Sum, payments received by the Contractor for Work properly performed by Subcontractors or provided by suppliers shall be held by the Contractor for those Subcontractors or suppliers who performed Work or furnished materials, or both, under contract with the Contractor for which payment was made by the Owner. Nothing contained herein shall require money to be placed in a separate account and not commingled with money of the Contractor, create any fiduciary liability or tort liability on the part of the Contractor for breach of trust, or entitle any person or entity to an award of punitive damages against the Contractor for breach of the requirements of this provision.

§ 9.6.8 Provided the Owner has fulfilled its payment obligations under the Contract Documents, the Contractor shall defend and indemnify the Owner from all loss, liability, damage or expense, including reasonable attorney's fees and litigation expenses, arising out of any lien claim or other claim for payment by any Subcontractor or supplier of any tier. Upon receipt of notice of a lien claim or other claim for payment, the Owner shall notify the Contractor. If approved by the applicable court, when required, the Contractor may substitute a surety bond for the property against which the lien or other claim for payment has been asserted.

(Paragraphs deleted)

§ 9.8 Substantial Completion

(Paragraph deleted)

§ 9.8.1 Substantial Completion is the stage in the progress of the Work when the Work or designated portion thereof is sufficiently complete in accordance with the Contract Documents so that the Owner can occupy or utilize the Work for its intended use, and shall require that: (1) the Work is operational and usable for the purposes intended; and (2) all required governmental permits, approvals and temporary or permanent certificates of occupancy have been properly and validly issued. Substantial completion shall not be withheld due to Owner's failure to occupy or use based on any reason that is not the responsibility of the Contractor under the Contract Documents or is caused by circumstances beyond Contractor's control.

§ 9.8.2 When the Contractor considers that the Work, or a portion thereof which the Owner agrees to accept separately, is substantially complete, the Contractor shall notify the Construction Manager, and the Contractor and Construction Manager shall jointly prepare and submit to the Architect a comprehensive written list of items to be completed or corrected prior to the Architect's first (1st) inspection. Failure to include an item on such list does not alter the responsibility of the Contractor to complete all Work in accordance with the Contract Documents.

§ 9.8.3 Upon receipt of the Contractor's punch list, the Architect, assisted by the Construction Manager, will make an inspection to determine whether the Work or designated portion thereof is substantially complete. If the Architect's inspection discloses any item, whether or not included on the Contractor's punch list, which is not sufficiently complete in accordance with the Contract Documents so that the Owner can occupy or utilize the Work or designated portion thereof for its intended use, the Contractor shall, before issuance of the Certificate of Substantial Completion, complete or correct such item upon notification by the Architect. In such case, the Contractor shall then submit a request for another inspection by the Architect, assisted by the Construction Manager, to determine Substantial Completion.

- .1 The Architect will perform no more than two (2) inspections to determine whether the Work or a designated portion thereof has attained Substantial Completion in accordance with the Contract Documents and will also include any follow-up inspection to confirm *all* open punch list items have been completed for that specific item.. The Owner is entitled to reimbursement from the Contractor for amounts paid to the Architect for any additional inspections pursuant to Section 9.5.1.

§ 9.8.4 When the Architect, assisted by the Construction Manager, determines that the Work of all of the Contractors, or designated portion thereof, is substantially complete, the Construction Manager will prepare, and the Construction Manager and Architect shall execute, a Certificate of Substantial Completion that shall establish the date of Substantial Completion; establish responsibilities of the Owner and Contractor for security, maintenance, heat, utilities, damage to the Work and insurance; and fix the time within which the Contractor shall finish all items on the list accompanying the Certificate. Warranties required by the Contract Documents shall commence on the date of Substantial Completion of the Work or designated portion thereof unless otherwise provided in the Certificate of Substantial Completion. The Certificate of Substantial Completion will not be issued until after the Construction Manager, Architect and Owner have determined that: (1) the Work and all systems are operational and otherwise complete and ready for unobstructed, lawful use and occupancy by the Owner; (2) the governmental agency that issued the building permit has issued a certificate of occupancy; (3) all testing (including but not limited to TAB, Envelope, Commissioning, etc.) are completed and required corrections revealed by these tests are completed; (4) the Project has been accepted by each regulatory body having jurisdiction, and (5) the only items of Work remaining to be completed are of a minor nature such as touch-up, adjustments, testing, corrections, and omissions to be remedied, as may appear on the final list made during site visit by the Construction Manager, Architect and Owner.

§ 9.8.5 The Certificate of Substantial Completion shall be submitted to the Owner and Contractor for their written acceptance of responsibilities assigned to them in the Certificate. Upon such acceptance, and consent of surety if any, the Owner shall make payment of retainage applying to the Work or designated portion thereof. Such payment shall be adjusted for Work that is incomplete or not in accordance with the requirements of the Contract Documents. The payment shall be sufficient to increase the total payments to one-hundred percent (100%) of the Contract Sum, less two times the value of any remaining items to be completed and any amount necessary to satisfy claims, liens or judgments against the Contractor which have not been suitably discharged, as determined by the Architect assisted by the Construction Manager.

§ 9.8.6 In the event the Contractor does not achieve final completion within one hundred and twenty (120) days after the date of Substantial Completion, allowing for any approved extensions of the Contract time, Contractor shall not be entitled to any further payment and Contractor agrees that such failure to complete the work within the time set forth above shall constitute a waiver of all claims by the Contractor to any money that may be due. This provision shall not operate as a waiver by the Owner of any claims or remedies of any nature against the Contractor arising out of the Contract.

§ 9.9 Partial Occupancy or Use

§ 9.9.1 The Owner may occupy or use any completed or partially completed portion of the Work at any stage when such portion is designated by separate agreement with the Contractor, provided such occupancy or use is consented to

Init.

by the insurer and authorized by public authorities having jurisdiction over the Project. Such partial occupancy or use may commence whether or not the portion is substantially complete, provided the Owner and Contractor have accepted in writing the responsibilities assigned to each of them for payments, retainage if any, security, maintenance, heat, utilities, damage to the Work and insurance, and have agreed in writing concerning the period for correction of the Work and commencement of warranties required by the Contract Documents. When the Contractor considers a portion substantially complete, the Contractor and Construction Manager shall jointly prepare and submit a written list to the Architect as provided under Section 9.8.2. Consent of the Contractor to partial occupancy or use shall not be unreasonably withheld. The stage of the progress of the Work shall be determined by written agreement between the Owner and Contractor or, if no agreement is reached, by decision of the Architect after consultation with the Construction Manager.

§ 9.9.2 Immediately prior to such partial occupancy or use, the Owner, Construction Manager, Contractor, and Architect shall jointly inspect the area to be occupied or portion of the Work to be used in order to determine and record the condition of the Work.

§ 9.9.3 Unless otherwise agreed upon, partial occupancy or use of a portion or portions of the Work shall not constitute acceptance of Work not complying with the requirements of the Contract Documents.

§ 9.10 Final Completion and Final Payment

§ 9.10.1 Upon completion of the Work, the Contractor shall forward to the Construction Manager a notice that the Work is ready for final inspection and acceptance, and shall also forward to the Construction Manager a final Contractor's Application for Payment. Upon receipt, the Construction Manager shall perform an inspection to confirm the completion of Work of the Contractor. The Construction Manager shall make recommendations to the Architect when the Work of all of the Contractors is ready for final inspection, and shall then forward the Contractors' notices and Application for Payment or Project Application for Payment, to the Architect, who will promptly make such inspection. When the Architect finds the Work acceptable under the Contract Documents and the Contract fully performed, the Construction Manager and Architect will promptly issue a final Certificate for Payment or Project Certificate for Payment stating that to the best of their knowledge, information and belief, and on the basis of their on-site visits and inspections, the Work has been completed in accordance with the Contract Documents and that the entire balance found to be due the Contractor and noted in the final Certificate is due and payable. The Construction Manager's and Architect's final Certificate for Payment or Project Certificate for Payment will constitute a further representation that conditions listed in Section 9.10.2 as precedent to the Contractor's being entitled to final payment have been fulfilled.

§ 9.10.1.1 Except with the consent of the Owner and the Contractor's signed agreement to pay for the additional site visits, the Architect will perform no more than two (2) site visits to determine whether the Work or a designated portion thereof has attained Final Completion in accordance with the Contract Documents. The Owner is entitled to reimbursement from the Contractor for amounts paid to the Architect for any additional site visits. The Owner may seek reimbursement pursuant to Section 9.5.1.

§ 9.10.1.2 Neither the final payment nor any remaining retained amount due the Contractor on account of the Contract shall not become due until the Contractor has furnished to the Owner, through the Architect and Construction Manager, completion documents as enumerated below, or as otherwise required in the Contract Documents.

- .1 One (1) hard copy and one electronic Record Set of Drawings showing actual construction of all portions of the Work and incorporating all changes and amendments thereto, as redlined against the 100% Construction Drawings.
- .2 Guarantees and Warranties required by specific Sections of the Specifications.
- .3 Release and Waiver of Claims, conditioned upon Final Payment, by the General Contractor, Subcontractors, Sub-subcontractors and materials suppliers.
- .4 All mechanical and electrical installation, operating and maintenance manuals called for under the Specifications.
- .5 All test reports and certifications required under the mechanical and electrical specifications.
- .6 All forms required to be completed by the Contractor by regulatory governmental agencies with two copies delivered to the Architect.
- .7 Shop Drawing submittals in accordance with Article 3.
- .8 A copy of the unconditional Occupancy Permit or Certificate of Compliance issued by the local Building Inspection Department have Jurisdiction, unless such is not issued for any reason that is

Init.

not the responsibility of the Contractor under the Contract Documents or is caused by circumstances beyond Contractor's control.

- .9 Manufacturer's current detailed installation instructions for fire dampers, ceiling radiation dampers, smoke dampers, and duct smoke detectors as applicable to the Project
- .10 One (1) copy of the equipment operational and maintenance manuals.

§ 9.10.2 Neither final payment nor any remaining retained percentage shall become due until the Contractor submits to the Architect through the Construction Manager (1) an affidavit that payrolls, bills for materials and equipment, and other indebtedness connected with the Work for which the Owner or the Owner's property might be responsible or encumbered (less amounts withheld by Owner) have been paid or otherwise satisfied, (2) a certificate evidencing that insurance required by the Contract Documents to remain in force after final payment is currently in effect, (3) a written statement that the Contractor knows of no reason that the insurance will not be renewable to cover the period required by the Contract Documents, (4) consent of surety, if any, to final payment (5) documentation of any special warranties, such as manufacturers' warranties or specific Subcontractor warranties, (6), if required by the Owner, other data establishing payment or satisfaction of obligations, such as receipts and releases and waivers of liens, claims, security interests, or encumbrances arising out of the Contract, to the extent and in such form as may be designated by the Owner and (7) all Project closeout documents per the General Requirements of the Contract. If a Subcontractor refuses to furnish a release or waiver required by the Owner, the Contractor may furnish a bond satisfactory to the Owner to indemnify the Owner against such lien, claim, security interest, or encumbrance. If a lien, claim, security interest, or encumbrance remains unsatisfied after payments are made, the Contractor shall refund to the Owner all money that the Owner may be compelled to pay in discharging the lien, claim, security interest, or encumbrance, including all costs and reasonable attorneys' fees.

§ 9.10.3 If, after Substantial Completion of the Work, final completion thereof is materially delayed through no fault of the Contractor or by issuance of Change Orders affecting final completion, and the Construction Manager and Architect so confirm, the Owner shall, upon application by the Contractor and certification by the Construction Manager and Architect, and without terminating the Contract, make payment of the balance due for that portion of the Work fully completed, corrected, and accepted. If the remaining balance for Work not fully completed or corrected is less than retainage stipulated in the Contract Documents, and if bonds have been furnished, the written consent of the surety to payment of the balance due for that portion of the Work fully completed and accepted shall be submitted by the Contractor to the Architect through the Construction Manager prior to certification of such payment. Such payment shall be made under terms and conditions governing final payment, except that it shall not constitute a waiver of Claims.

§ 9.10.4 The making of final payment shall constitute a waiver of Claims by the Owner except those arising from

- .1 liens, Claims, security interests, or encumbrances arising out of the Contract and unsettled;
- .2 failure of the Work to comply with the requirements of the Contract Documents;
- .3 terms of warranties required by the Contract Documents;
- .4 audits performed by the Owner, if permitted by the Contract Documents, after final payment; or
- .5 any claims by the Owner in response to claims previously made in writing by the Contractor and remain unsettled at the time of Final Application for Payment.

§ 9.10.5 Acceptance of final payment by the Contractor, a Subcontractor, or a supplier, shall constitute a waiver of all claims by that payee except those previously made in writing and identified by that payee as unsettled at the time of final Application for Payment.

ARTICLE 10 PROTECTION OF PERSONS AND PROPERTY

§ 10.1 Safety Precautions and Programs

The Contractor shall be responsible for initiating, maintaining, and supervising all safety precautions and programs in connection with the performance of the Contract, including but not limited to any safety protocols required by any local, state or federal laws, rules and regulations, including those necessary to address a pandemic. The Contractor shall submit the Contractor's safety program to the Construction Manager for review and coordination with the safety programs of other Contractors. The Construction Manager's responsibilities for review and coordination of safety programs shall not extend to direct control over or charge of the acts or omissions of the Contractors, Subcontractors, agents or employees of the Contractors or Subcontractors, or any other persons performing portions of the Work and not directly employed by the Construction Manager. The Contractors shall provide the Construction Manager with copies of all of its safety protocols. Failure of the Contractor its employees agents and subcontractors to adhere to the

Init.

safety protocols, including local, state or federal agency laws, rules and regulations, including those necessary to address a pandemic shall constitute a breach of contract and could result in the shutdown of the job until such violations are remedied. The Contractor shall not be entitled to recover any damages for a shutdown of the work due to said violations.

§ 10.2 Safety of Persons and Property

§ 10.2.1 The Contractor shall take precautions for safety of, and shall provide protection to prevent damage, injury, or loss to

- .1 employees on the Work and other persons who may be affected thereby, including the Owner's employees, staff, students and agents;
- .2 the Work and materials and equipment to be incorporated therein, whether in storage on or off the site, under care, custody, or control of the Contractor, a Subcontractor, or a Sub-subcontractor;
- .3 other property at the site or adjacent thereto, such as trees, shrubs, lawns, walks, pavements, roadways, structures, and utilities not designated for removal, relocation, or replacement in the course of construction; and
- .4 construction or operations by the Owner, Separate Contractors, or other Contractors.

§ 10.2.2 The Contractor shall comply with, and give notices required by applicable laws, statutes, ordinances, codes, rules and regulations, and lawful orders of public authorities, bearing on safety of persons or property or their protection from damage, injury, or loss.

§ 10.2.2.1 In the event that review, inspection or other action by regulatory agencies or other parties results in the imposition of fines, fees, or other costs due to the failure of the Contractor to comply with said applicable laws, ordinance, rules, regulations and lawful orders, the Contractor shall hold harmless the Owner, owner's Consultants, the Construction Manager, Architect, and Owner's separate contractors, if any, from all consequences arising from the Contractor's non-compliance.

§ 10.2.3 The Contractor shall implement, erect, and maintain, as required by existing conditions and performance of the Contract, reasonable safeguards for safety and protection, including posting danger signs and other warnings against hazards; providing employees personal protective equipment, promulgating safety regulations; and notifying the owners and users of adjacent sites and utilities of the safeguards.

§ 10.2.4 When use or storage of explosives or other hazardous materials or equipment or unusual methods are necessary for execution of the Work, the Contractor shall exercise utmost care and carry on such activities under supervision of properly trained, certified and qualified personnel.

§ 10.2.5 The Contractor shall promptly remedy damage and loss (other than damage or loss insured under property insurance required by the Contract Documents) to property referred to in Sections 10.2.1.2, 10.2.1.3 and 10.2.1.4 caused in whole or in part by the Contractor, a Subcontractor, a Sub-subcontractor, or anyone directly or indirectly employed by any of them, or by anyone for whose acts they may be liable and for which the Contractor is responsible under Sections 10.2.1.2, 10.2.1.3 and 10.2.1.4. The foregoing obligations of the Contractor are in addition to the Contractor's obligations under Section 3.18.

§ 10.2.6 The Contractor shall designate a responsible member of the Contractor's organization at the site whose duty shall be the prevention of accidents. This person shall be the Contractor's superintendent unless otherwise designated by the Contractor in writing to the Owner, Construction Manager and Architect.

§ 10.2.7 The Contractor shall not permit any part of the construction or site to be loaded so as to cause damage or create an unsafe condition.

§ 10.2.8 Injury or Damage to Person or Property

If either party suffers injury or damage to person or property because of an act or omission of the other party, or of others for whose acts such party is legally responsible, notice of the injury or damage, whether or not insured, shall be given to the other party within a reasonable time not exceeding 21 days after discovery. The notice shall provide sufficient detail to enable the other party to investigate the matter.

§ 10.3 Hazardous Materials

§ 10.3.1 The Contractor is responsible for compliance with any requirements included in the Contract Documents regarding hazardous materials or substances. If the Contractor encounters a hazardous material or substance not addressed in the Contract Documents and if reasonable precautions will be inadequate to prevent foreseeable bodily injury or death to persons resulting from a material or substance, including but not limited to asbestos or polychlorinated biphenyl (PCB), encountered on the site by the Contractor, the Contractor shall, upon recognizing the condition, immediately stop Work in the affected area and notify the Owner, Construction Manager and Architect of the condition.

§ 10.3.2 Upon receipt of the Contractor's notice, the Owner shall obtain the services of a licensed laboratory to verify the presence or absence of the material or substance reported by the Contractor and, in the event such material or substance is found to be present, to cause it to be rendered harmless. Unless otherwise required by the Contract Documents, the Owner shall furnish in writing to the Contractor, Construction Manager and Architect the names and qualifications of persons or entities who are to perform tests verifying the presence or absence of the material or substance or who are to perform the task of removal or safe containment of the material or substance. The Contractor, the Construction Manager and the Architect will promptly reply to the Owner in writing stating whether or not any of them has reasonable objection to the persons or entities proposed by the Owner. If the Contractor, Construction Manager or Architect has an objection to a person or entity proposed by the Owner, the Owner shall propose another to whom the Contractor, the Construction Manager and the Architect have no reasonable objection. When the material or substance has been rendered harmless, Work in the affected area shall resume upon written agreement of the Owner and Contractor.

(Paragraph deleted)

§ 10.3.4 The Owner shall not be responsible under this Section 10.3 for hazardous materials or substances the Contractor brings to the site.

§ 10.3.5 The Contractor shall reimburse the Owner for the cost and expense the Owner incurs (1) for remediation of hazardous materials or substances the Contractor brings to the site and negligently handles, or (2) where the Contractor fails to perform its obligations under Section 10.3.1, except to the extent that the cost and expense are due to the Owner's fault or negligence.

(Paragraph deleted)

§ 10.4 Emergencies

In an emergency affecting safety of persons or property, the Contractor shall act, at the Contractor's discretion, to prevent threatened damage, injury, or loss. Additional compensation or extension of time claimed by the Contractor on account of an emergency shall be determined as provided in Article 15 and Article 7.

ARTICLE 11 INSURANCE AND BONDS

(SEE ATTACHED SCHEDULE C – STANDARD CONTRACT INSURANCE REQUIREMENTS)

§ 11.1 Contractor's Insurance and Bonds

(Paragraphs deleted)

§ 11.1.1 The Contractor shall purchase from and maintain in a company or companies lawfully authorized to do business in the jurisdiction in which the Project is located such insurance as will protect the Contractor from claims set forth below (and such insurance shall be from a company that is A rated or better by A.M Best Company) which may arise out of or result from the Contractor's operations and completed operations under the Contract and for which the Contractor may be legally liable, whether such operations be by the Contractor or by a Subcontractor or by anyone directly or indirectly employed by any of them, or by anyone for whose acts any of them may be liable:

- .1 Claims under workers' compensation, disability benefit and other similar employee benefit acts that are applicable to the Work to be performed.
- .2 Claims for damages because of bodily injury, occupational sickness or disease, or death of the Contractor's employees;
- .3 Claims for damages because of bodily injury, sickness or disease, or death of any person other than the Contractor's employees;
- .4 Claims for damages insured by usual personal injury liability coverage;
- .5 Claims for damages, other than to the Work itself, because of injury to or destruction of tangible property, including loss of use resulting therefrom;

- .6 Claims for damages because of bodily injury, death or a person or property damage arising out of ownership, maintenance or use of a motor vehicle.
- .7 Claims for bodily injury or property damage arising out of completed operations; and
- .8 Claims involving contractual liability insurance applicable to the Contractor's obligations under Section 3.18.

§ 11.1.2 The insurance required by Section 11.1.1 (or other corresponding Exhibit setting forth the specific insurance requirements) shall be written for not less than limits of liability specified by the Owner or required by law, whichever coverage is greater. Coverages, whether written on an occurrence or claims-made basis, shall be maintained without interruption from the date of commencement of the Work until the date of final payment and termination of any coverage required to be maintained after final payment, and, with respect to the Contractor's completed operations coverage, until the expiration of the period for correction of Work or for such other period for maintenance of completed operations coverage as specified in the Contract Documents.

§ 11.1.3 Certificates of insurance acceptable to the Owner shall be filed with the Owner prior to the signing of the Contract and thereafter upon renewal or replacement of each required policy of insurance. These certificates and the insurance policies required by this Section 11.1 shall contain a provision that coverages afforded under the policies will not be canceled or allowed to expire until at least 30 days prior written notice has been given to the Owner. An additional certificate evidencing continuation of liability coverage, including coverage for completed operations, shall be submitted with the final Application for Payment as required by Section 9.10.2 and thereafter upon renewal or replacement of such coverage on account of revised limits or claims paid under the General Aggregate, or both, shall be furnished by the Contractor with reasonable promptness. The Contractor shall be responsible to assume the cost for all deductibles.

§ 11.1.4 Notice of Cancellation or Expiration of Contractor's Required Insurance. Within not less than three (3) business days of the date the Contractor becomes aware of an impending or actual cancellation or expiration of any insurance required by the Contract Documents, the Contractor shall provide notice to the Owner of such impending or actual cancellation or expiration. Upon receipt of notice from the Contractor, the Owner shall, unless the lapse in coverage arises from an act or omission of the Owner, have the right to stop the Work until the lapse in coverage has been cured by the procurement of replacement coverage by the Contractor. The furnishing of notice by the Contractor shall not relieve the Contractor of any contractual obligation to provide any required coverage.

§ 11.1.5 The Contractor shall cause the commercial liability coverage required by the Contract Documents to include (1) the Owner, the Construction Manager, the Architect and the Architect's consultants as additional insureds for claims caused in whole or in part by the Contractor's negligent acts or omissions during the Contractor's operations; and (2) the Owner, the Construction Manager and Architect as an additional insured for claims caused in whole or in part by the Contractor's negligent acts or omissions during the Contractor's completed operations.

§ 11.1.6 See Section 00 7250 for additional requirements.

§ 11.2 Owner's Insurance

§ 11.2.1 The Owner shall purchase and maintain insurance of the types and limits of liability, containing the endorsements, and subject to the terms and conditions, as described in the Agreement or elsewhere in the Contract Documents. The Owner shall purchase and maintain the required insurance from an insurance company or insurance companies lawfully authorized to issue insurance in the jurisdiction where the Project is located.

§ 11.2.2 Failure to Purchase Required Property Insurance. If the Owner fails to purchase and maintain the required property insurance, with all of the coverages and in the amounts described in the Agreement or elsewhere in the Contract Documents, the Owner shall inform both the Contractor and the Construction Manager, separately and in writing, prior to commencement of the Work. Upon receipt of notice from the Owner, the Contractor may delay commencement of the Work and may obtain insurance that will protect the interests of the Contractor, Subcontractors, and Sub-Subcontractors in the Work. When the failure to provide coverage has been cured or resolved, the Contract Sum and Contract Time shall be equitably adjusted. In the event the Owner fails to procure coverage, the Owner waives all rights against the Contractor, Subcontractors, and Sub-subcontractors to the extent the loss to the Owner would have been covered by the insurance to have been procured by the Owner. The cost of the insurance shall be charged to the Owner by a Change Order. If the Owner does not provide written notice, and the Contractor is damaged

by the failure or neglect of the Owner to purchase or maintain the required insurance, the Owner shall reimburse the Contractor for all reasonable costs and damages attributable thereto.

§ 11.2.3 Notice of Cancellation or Expiration of Owner's Required Property Insurance. Within three (3) business days of the date the Owner becomes aware of an impending or actual cancellation or expiration of any property insurance required by the Contract Documents, the Owner shall provide notice directly to the Contractor, and separately to the Construction Manager, of such impending or actual cancellation or expiration. Unless the lapse in coverage arises from an act or omission of the Contractor: (1) the Contractor, upon receipt of notice from the Owner, shall have the right to stop the Work until the lapse in coverage has been cured by the procurement of replacement coverage by either the Owner or the Contractor; (2) the Contract Time and Contract Sum shall be equitably adjusted; and (3) the Owner waives all rights against the Contractor, Subcontractors, and Sub-subcontractors to the extent any loss to the Owner would have been covered by the insurance had it not expired or been cancelled. If the Contractor purchases replacement coverage, the cost of the insurance shall be charged to the Owner by an appropriate Change Order. The furnishing of notice by the Owner shall not relieve the Owner of any contractual obligation to provide required insurance.

§ 11.3 Waivers of Subrogation

§ 11.3.1 The Owner and Contractor waive all rights against (1) each other and any of their subcontractors, sub-subcontractors, agents, and employees, each of the other; (2) the Construction Manager and Construction Manager's consultants; (3) the Architect and Architect's consultants; (4) other Contractors and any of their subcontractors, sub-subcontractors, agents, and employees; and (5) Separate Contractors, if any, and any of their subcontractors, sub-subcontractors, agents, and employees, for damages caused by fire, or other causes of loss, to the extent those losses are covered by property insurance required by the Agreement or other property insurance applicable to the Project, except such rights as they have to proceeds of such insurance. The Owner or Contractor, as appropriate, shall require similar written waivers in favor of the individuals and entities identified above from the Construction Manager, Construction Manager's consultants, Architect, Architect's consultants, other Contractors, Separate Contractors, subcontractors, and sub-subcontractors. The policies of insurance purchased and maintained by each person or entity agreeing to waive claims pursuant to this Section 11.3.1 shall not prohibit this waiver of subrogation. This waiver of subrogation shall be effective as to a person or entity (1) even though that person or entity would otherwise have a duty of indemnification, contractual or otherwise, (2) even though that person or entity did not pay the insurance premium directly or indirectly, or (3) whether or not the person or entity had an insurable interest in the damaged property.

§ 11.3.2 If during the Project construction period the Owner insures properties, real or personal or both, at or adjacent to the site by property insurance under policies separate from those insuring the Project, or if after final payment property insurance is to be provided on the completed Project through a policy or policies other than those insuring the Project during the construction period, to the extent permissible by such policies, the Owner waives all rights in accordance with the terms of Section 11.3.1 for damages caused by fire or other causes of loss covered by this separate property insurance.

§ 11.4 Omitted.

§ 11.5 Adjustment and Settlement of Insured Loss

§ 11.5.1 A loss insured under the property insurance required by the Agreement shall be adjusted by the Owner as fiduciary and made payable to the Owner as fiduciary for the insureds, as their interests may appear, subject to requirements of any applicable mortgagee clause and of Section 11.5.2. The Owner shall pay the Construction Manager, Architect and Contractor their just shares of insurance proceeds received by the Owner, and by appropriate agreements the Construction Manager, Architect and Contractor shall make payments to their consultants and Subcontractors in similar manner.

§ 11.5.2 Prior to settlement of an insured loss, the Owner shall notify the Contractor of the terms of the proposed settlement as well as the proposed allocation of the insurance proceeds. The Contractor shall have 14 days from receipt of notice to object to the proposed settlement or allocation of the proceeds. If the Contractor does not object, the Owner shall settle the loss and the Contractor shall be bound by the settlement and allocation. Upon receipt, the Owner shall deposit the insurance proceeds in a separate account and make the appropriate distributions. Thereafter, if no other agreement is made or the Owner does not terminate the Contract for convenience, the Owner and Contractor shall execute a Change Order for reconstruction of the damaged or destroyed Work in the amount allocated for that

purpose. If the Contractor timely objects to either the terms of the proposed settlement or the allocation of the proceeds, the Owner may proceed to settle the insured loss, and any dispute between the Owner and Contractor arising out of the settlement or allocation of the proceeds shall be resolved pursuant to Article 15. Pending resolution of any dispute, the Owner may issue a Construction Change Directive for the reconstruction of the damaged or destroyed Work.

§ 11.6 Performance Bond and Payment Bond

§ 11.6.1 The Owner shall require the Contractor to furnish bonds covering faithful performance of the Contract and payment of obligations arising thereunder as stipulated in bidding requirements or specifically required in the Contract Documents on the date of execution of the Contract.

§ 11.6.1.1 The Contractor shall furnish bonds covering faithful performance of the contract and payment of obligations arising thereunder. The value of each bond shall be for one-hundred percent (100%) of the Contract Sum. Bonds shall be issued by a bonding company licensed in the State of New York, on AIA Document A312, Performance and Payment Bond.

§ 11.6.1.2 Contractor shall deliver bonds in prior to the execution of the Agreement and they shall be dated the same date as the Agreement.

§ 11.6.1.3 The attorney in fact who executes the required bonds on behalf of the surety, shall affix thereto a certified and current copy of the power of attorney.

§ 11.6.1.4 Status Reports issued by a Bonding Company shall be sent to and completed by the Owner and then returned to the Bonding Company by the Owner.

§ 11.6.1.5 Any additional cost for bonding premium shall not be itemized within individual Change Orders. Adjustments for Contractor's bonding cost shall be adjusted at the end of the Project based on approved executed changes in the Work and the Bonding Company's final adjusted premium at project closeout.

§ 11.6.2 Upon the request of any person or entity appearing to be a potential beneficiary of bonds covering payment of obligations arising under the Contract, the Contractor shall promptly furnish a copy of the bonds or shall authorize a copy to be furnished.

ARTICLE 12 UNCOVERING AND CORRECTION OF WORK

§ 12.1 Uncovering of Work

§ 12.1.1 If a portion of the Work is covered contrary to the Construction Manager's or Architect's request or to requirements specifically expressed in the Contract Documents, it must, if requested in writing by either, be uncovered for their examination and be replaced at the Contractor's expense without change in the Contract Time.

§ 12.1.2 If a portion of the Work has been covered that the Construction Manager or Architect has not specifically requested to examine prior to its being covered, the Construction Manager or Architect may request to see such Work and it shall be uncovered by the Contractor. If such Work is in accordance with the Contract Documents, the Contractor shall be entitled to an equitable adjustment to the Contract Sum and Contract Time as may be appropriate. If such Work is not in accordance with the Contract Documents, the costs of uncovering the Work, and the cost of correction, shall be at the Contractor's expense.

§ 12.2 Correction of Work

§ 12.2.1 Before Substantial Completion

The Contractor shall promptly correct Work rejected by the Construction Manager or Architect or failing to conform to the requirements of the Contract Documents, discovered before Substantial Completion, and whether or not fabricated, installed or completed. Costs of correcting such rejected Work, including additional testing and inspections, the cost of uncovering and replacement, and compensation for the Construction Manager's and Architect's services and expenses made necessary thereby, shall be at the Contractor's expense.

§ 12.2.2 After Substantial Completion

§ 12.2.2.1 In addition to the Contractor's obligations under Section 3.5, if, within one year after the date of Substantial Completion of the Work or designated portion thereof, or after the date for commencement of warranties established under Section 9.9.1, or by terms of any applicable special warranty required by the Contract Documents, any of the Work is found to be not in accordance with the requirements of the Contract Documents, the Contractor shall correct it promptly after receipt of notice from the Owner to do so, unless the Owner has previously given the Contractor a written acceptance of such condition. The Owner shall give such notice promptly after discovery of the condition. If the Contractor fails to correct nonconforming Work within a reasonable time during that period after receipt of notice from the Owner, Construction Manager or Architect, the Owner may correct it in accordance with Section 2.5.

§ 12.2.2.2 The one-year period for correction of Work shall be extended with respect to portions of Work first performed after Substantial Completion by the period of time between Substantial Completion and the actual completion of that portion of the Work.

§ 12.2.2.3 The one-year period for correction of Work shall not be extended by corrective Work performed by the Contractor pursuant to this Section 12.2.

§ 12.2.3 The Contractor shall remove from the site portions of the Work that are not in accordance with the requirements of the Contract Documents and are neither corrected by the Contractor nor accepted by the Owner.

§ 12.2.4 The Contractor shall bear the cost of correcting destroyed or damaged construction of the Owner, Separate Contractors, or other Contractors, whether completed or partially completed, caused by the Contractor's correction or removal of Work that is not in accordance with the requirements of the Contract Documents.

§ 12.2.5 Nothing contained in this Section 12.2 shall be construed to establish a period of limitation with respect to other obligations the Contractor has under the Contract Documents. Establishment of the one-year period for correction of Work as described in Section 12.2.2 relates only to the specific obligation of the Contractor to correct the Work, and has no relationship to the time within which the obligation to comply with the Contract Documents may be sought to be enforced, nor to the time within which proceedings may be commenced to establish the Contractor's liability with respect to the Contractor's obligations other than specifically to correct the Work.

§ 12.3 Acceptance of Nonconforming Work

If the Owner prefers to accept Work that is not in accordance with the requirements of the Contract Documents, the Owner may do so instead of requiring its removal and correction, in which case the Contract Sum will be reduced as appropriate and equitable. Such adjustment shall be effected whether or not final payment has been made.

ARTICLE 13 MISCELLANEOUS PROVISIONS

§ 13.1 Governing Law

The Contract shall be governed by the laws of the State of New York. The parties expressly agree that any claim, dispute or other controversy of any nature arising out of the Contract or performance of the Work shall be commenced and maintained in New York State Supreme Court located in Orange County .

§ 13.1.2 The Contractor shall at all times observe and comply with all federal and state laws, and all laws, ordinances, policies and regulations of the Owner, in any manner affecting the work, and all such orders decreed as exist at present and those which may be enacted later, by bodies or tribunals having jurisdiction or authority over the Work, and the Contractor shall indemnify and save harmless the Owner and all its officers, agents or servants against any claim or liability arising from, or based on, a violation of any such law, ordinances, regulation or order, whether by himself or by his employee or agents.

§ 13.1.3 The Contractor specifically agrees as required by Labor Law, Sections 220 and 220-d, as amended that:

1. No laborer, workman or mechanic in the employ of the Contractor, subcontractor or other person doing contracting or contracting to do the whole or any part of the work contemplated by the Contract, shall be permitted or required to work more than eight hours in one calendar day or more than five days in one week, except in the emergencies set forth in the Labor Law.
2. The wages paid for a legal day's work shall not be less than the prevailing rate of wages as defined by law, and

Init.

3. The minimum hourly rate of wages to be paid shall not be less than that stated in the Specifications, and any re-determination of the prevailing rate of wages after the Contract is approved shall be deemed to be incorporated herein by reference as of the effective date of re-determination and shall form a part of this Contract. The Labor Law provides that the Contract may be forfeited and no sum paid for any work done thereunder on a second conviction of willfully paying less than:
 - a. the stipulated wage scale as provided in Labor Law, Section 220, Sub-division 3, as amended; or
 - b. the stipulated minimum hourly wage scale as provided in Labor Law, 220-d, as amended.

§ 13.1.4 The Contractor specifically agrees as required by the provisions of Labor Law, Section 220-e, as amended that:

1. In hiring of employees for the performance of work under this Contract or any subcontract hereunder or for the manufacture, sale, or distribution of materials, equipment or supplies, hereunder, no Contractor or Subcontractor nor any person acting on behalf of such Contractor or Subcontractor, shall by reason of race, creed, color, disability, sex, or national origin discriminate against any citizen of the State of New York who is qualified and available to perform the work to which the employment relates.
2. No Contractor, Subcontractor, nor any person on his behalf shall, in any manner, discriminate against or intimidate any employee under this Contract on account of race, creed, color, disability, sex, or national origin.

§ 13.1.5 During the performance of this Contract, the Contractor agrees as follows:

1. The Contractor will not discriminate against any employee or applicant for employment because of age, race, creed, color, national origin, sexual orientation, military status, sex, disability, predisposing genetic characteristics, marital status, or domestic violence victim status.
2. If directed to do so by the Owner or the State Commissioner of Human Rights, the Contractor will send to each labor union or representative of workers which with the Contractor has or is bound by a collective bargaining or other agreement or understanding, a notice, to be provided by the State Commissioner of Human Rights, advising such labor union or representative of the Contractor's agreement under clauses (1) through (6) (hereinafter called "non-discrimination clauses"). If the Contractor was directed to do so by the Owner as part of the bid or negation of this Contract, the Contractor shall request such labor union or representative to furnish a written statement that such a labor union representative will not discriminate because of age, race, creed, color, national origin, sexual orientation, military status, sex, disability, predisposing genetic characteristics, or marital status, and that such labor union or representative will cooperate, within the limits of its legal contractual authority, in the implementation of the policy and provisions of these non-discrimination clauses and that it consents and agrees that the recruitment, employment and the terms and conditions of employment under this Contract shall be in accordance with the purposes and provision of these non-discrimination clauses. If such labor union or representative fails or refuses to comply with such a request that it furnish such a statement, the Contractor shall promptly notify the Owner and the State Commissioner of Human Rights of such failure or refusal.
3. If directed to do so by the Owner or the Commissioner of Human Rights, the Contractor will post and keep posted in conspicuous places, available to employees and applicants for employment, notices to be provided by the State Commissioner of Human Rights setting forth the substance of provisions of clauses (1) and (2) and such provision of the State's law against discrimination as the State Commissioner of Human Rights shall determine.
4. The Contractor will state in all solicitations or advertisements for employees placed by or on behalf of the Contractor, that all qualified applicants will be afforded equal employment opportunities without discrimination because of age, race, creed, color, national origin, sexual orientation, military status, sex, disability, predisposing genetic characteristics, marital status, or domestic violence victim status.
5. The Contractor will comply with the provisions of Sections 290-299 of the Executive Law, and with the Civil Rights Law, will furnish all information and reports deemed necessary by the State Commissioner of Human Rights under these non-discrimination clauses and such section of the Executive Law, and will permit access to the Contractor's books, records, and accounts by the Owner, the State Commissioner of Human Rights, the Attorney General and the Industrial Commissioner for the purposes of investigation to ascertain compliance with the non-discrimination clauses and such sections of the Executive Law Civil Rights Law.

6. This Contract may be forthwith cancelled, terminated or suspended, in whole or in part, by the Owner upon the basis of a finding made by the State Commissioner of Human Rights that the Contractor has not complied with the non-discrimination clauses, and that the Contractor may be declared ineligible for future contracts made by or on behalf of the Owner, the State or a public authority or agency of the State, until the Contractor satisfies the State Commissioner of Human Rights that the Contractor has established and is carrying out a program in conformity with the provisions of these non-discrimination clauses. Such findings may be made by the State Commissioner of the Human Rights after conciliation efforts by the Commissioner have failed to achieve compliance with these non-discrimination clauses and after a verified complaint has been filed with the Commissioner, notice thereof has been given to the Contractor to be heard publicly in accordance with the Executive Law. Such sanctions may be imposed and remedies invoked independently of or in addition to sanctions and remedies otherwise provided by law,
7. The Contractor shall be responsible to provide sexual harassment and discrimination training to its employees and notify the owner immediately if its staff or employees or those of its subcontractors experience sexual harassment by the Owner's staff.

The Contractor will include the provisions of clauses .1 through .7 in every subcontract or purchase order in such a manner that such provisions will be binding upon each subcontractor or vendor as to operations to be performed within the State of New York. The Contractor will take action in enforcing such provisions of such subcontract or purchase order as the State Commissioner of Human Rights or the Owner may direct, including sanctions or remedies for non-compliance. If the Contractor becomes involved or is threatened with litigation with a subcontractor or vendor as a result of such directions by the State Commissioner of Human Rights or the Owner, the Contractor shall promptly so notify the Owner and the Attorney General requesting the Attorney General to intervene and protect the interests of the State of New York.

§ 13.2 Successors and Assigns

§ 13.2.1 The Owner and Contractor respectively bind themselves, their partners, successors, assigns, and legal representatives to covenants, agreements, and obligations contained in the Contract Documents. Except as provided in Section 13.2.2, neither party to the Contract shall assign the Contract as a whole without written consent of the other. If either party attempts to make an assignment without such consent, that party shall nevertheless remain legally responsible for all obligations under the Contract.

§ 13.2.2 The Owner may, without consent of the Contractor, assign the Contract to a lender providing construction financing for the Project, if the lender assumes the Owner's rights and obligations under the Contract Documents. The Contractor shall execute all consents reasonably required to facilitate the assignment.

§ 13.3 Rights and Remedies

§ 13.3.1 Duties and obligations imposed by the Contract Documents and rights and remedies available thereunder shall be in addition to and not a limitation of duties, obligations, rights, and remedies otherwise imposed or available by law.

§ 13.3.2 No action or failure to act by the Owner, Construction Manager, Architect, or Contractor shall constitute a waiver of a right or duty afforded them under the Contract, nor shall such action or failure to act constitute approval of or acquiescence in a breach thereunder, except as may be specifically agreed upon in writing.

§ 13.4 Tests and Inspections

§ 13.4.1 Tests, inspections, and approvals of portions of the Work shall be made as required by the Contract Documents and by applicable laws, statutes, ordinances, codes, rules, and regulations or lawful orders of public authorities. Unless otherwise provided, the Contractor shall make arrangements for such tests, inspections, and approvals with an independent testing laboratory or entity acceptable to the Owner, or with the appropriate public authority, and shall bear all related costs of tests, inspections, and approvals. The Contractor shall give the Construction Manager and Architect timely notice of when and where tests and inspections are to be made so that the Construction Manager and Architect may be present for such procedures. The Owner shall bear costs of tests, inspections, or approvals that do not become requirements until after bids are received or negotiations concluded. The Owner shall directly arrange and pay for tests, inspections, or approvals where building codes or applicable laws or regulations so require.

§ 13.4.2 If the Construction Manager, Architect, Owner, or public authorities having jurisdiction determine that portions of the Work require additional testing, inspection, or approval not included under Section 13.4.1, the Construction Manager and Architect will, upon written authorization from the Owner, instruct the Contractor to make arrangements for such additional testing, inspection, or approval, by an entity acceptable to the Owner, and the Contractor shall give timely notice to the Construction Manager and Architect of when and where tests and inspections are to be made so that the Construction Manager and Architect may be present for such procedures. Such costs, except as provided in Section 13.4.3, shall be at the Owner's expense.

§ 13.4.3 If procedures for testing, inspection, or approval under Sections 13.4.1 and 13.4.2 reveal failure of the portions of the Work to comply with requirements established by the Contract Documents, all costs made necessary by such failure, including those of repeated procedures and compensation for the Construction Manager's and Architect's services and expenses, shall be at the Contractor's expense.

§ 13.4.4 Required certificates of testing, inspection, or approval shall, unless otherwise required by the Contract Documents, be secured by the Contractor and promptly delivered to the Construction Manager for transmittal to the Architect.

§ 13.4.5 If the Construction Manager or Architect is to observe tests, inspections, or approvals required by the Contract Documents, the Construction Manager or Architect will do so promptly and, where practicable, at the normal place of testing.

§ 13.4.6 Tests or inspections conducted pursuant to the Contract Documents shall be made promptly to avoid unreasonable delay in the Work.

(Paragraphs deleted)

ARTICLE 14 TERMINATION OR SUSPENSION OF THE CONTRACT

§ 14.1 Termination by the Contractor

§ 14.1.1 The Contractor may terminate the Contract if the Work is stopped for a period of 30 consecutive days through no act or fault of the Contractor, a Subcontractor, a Sub-subcontractor, their agents or employees, or any other persons or entities performing portions of the Work, for any of the following reasons:

- .1 Issuance of an order of a court or other public authority having jurisdiction that requires all Work to be stopped;
- .2 An act of government, such as a declaration of national emergency, that requires all Work to be stopped;

(Paragraph deleted)

§ 14.1.2 The Contractor may terminate the Contract if, through no act or fault of the Contractor, a Subcontractor, a Sub-subcontractor, their agents or employees, or any other persons or entities performing portions of the Work, repeated suspensions, delays, or interruptions of the entire Work by the Owner as described in Section 14.3, constitute in the aggregate more than 100 percent of the total number of days scheduled for completion, or 120 days in any 365-day period, whichever is less.

§ 14.1.3 If one of the reasons described in Section 14.1.1 or 14.1.2 exists, the Contractor may, upon thirty days' written notice to the Owner, Construction Manager and Architect, terminate the Contract and recover from the Owner payment for Work properly executed.

§ 14.1.4 If the Work is stopped for a period of 90 consecutive days through no act or fault of the Contractor, a Subcontractor, a Sub-subcontractor, or their agents or employees, or any other persons performing portions of the Work because the Owner has repeatedly failed to fulfill the Owner's obligations under the Contract Documents with respect to matters important to the progress of the Work, the Contractor may, upon thirty additional days' notice to the Owner, Construction Manager and Architect, terminate the Contract and recover from the Owner as provided in Section 14.1.3.

§ 14.2 Termination by the Owner for Cause

§ 14.2.1 The Owner may terminate the Contract if the Contractor

- .1 refuses or fails to supply enough properly skilled workers or proper materials;

- .2 fails to make payment to Subcontractors or suppliers in accordance with the respective agreements between the Contractor and the Subcontractors or suppliers;
- .3 disregards applicable laws, statutes, ordinances, codes, rules and regulations, or lawful orders of a public authority;
- .4 otherwise is guilty of substantial breach of a provision of the Contract Documents.
- .5 fails to implement measures that will bring the work into conformity with the approved Project Schedule.
- .6 breaches any warranty made by the Contractor under or pursuant to the Contract Documents; or
- .7 fails to furnish the Owner with assurances satisfactory to the Owner evidencing the Contractor's ability to complete the Work in compliance with all of the requirements of the Contract Documents.

§ 14.2.2 When any of the reasons described in Section 14.2.1 exist, the Owner may, without prejudice to any other rights or remedies of the Owner and after giving the Contractor and the Contractor's surety, if any, seven days' notice, terminate employment of the Contractor and may, subject to any prior rights of the surety:

- .1 Exclude the Contractor from the site and take possession of all materials, equipment, tools, and construction equipment and machinery thereon owned by the Contractor;
- .2 Accept assignment of subcontracts pursuant to Section 5.4; and
- .3 Finish the Work by whatever reasonable method the Owner may deem expedient. Upon written request of the Contractor, the Owner shall furnish to the Contractor a detailed accounting of the costs incurred by the Owner in finishing the Work. The costs of finishing the Work include, without limitations, all reasonable attorney's fees, additional Architect/Engineering and Construction Manager costs, insurance, additional interest because of any delay in completing the Work, and all other direct and indirect and consequential damages incurred by the Owner by reason of the termination of the Contractors stated herein.

§ 14.2.3 When the Owner terminates the Contract for one of the reasons stated in Section 14.2.1, the Contractor shall not be entitled to receive further payment until the Work is finished.

§ 14.2.4 If the unpaid balance of the Contract Sum exceeds costs of finishing the Work, including compensation for the Construction Manager's and Architect's services and expenses made necessary thereby, and other damages incurred by the Owner and not expressly waived, including the Owner's reasonable attorney fees, such excess shall be paid to the Contractor. If such costs and damages exceed the unpaid balance, the Contractor shall pay the difference to the Owner. The amount to be paid to the Contractor or Owner, as the case may be, shall, upon application, be certified by the Initial Decision Maker after consultation with the Construction Manager, and this obligation for payment shall survive termination of the Contract.

§ 14.3 Suspension by the Owner for Convenience

§ 14.3.1 The Owner may, without cause, order the Contractor in writing to suspend, delay or interrupt the Work, in whole or in part for such period of time as the Owner may determine.

§ 14.3.2 The Contract Sum and the Contract Time may be adjusted for increases in the cost and time caused by suspension, delay, or interruption under Section 14.3.1.. No adjustment shall be made to the extent:

- .1 that performance is, was, or would have been, so suspended, delayed, or interrupted, by another cause for which the Contractor is responsible; or
- .2 that an equitable adjustment is made or denied under another provision of this Contract.

§ 14.4 Termination by the Owner for Convenience

§ 14.4.1

Notwithstanding any other provision to the contrary in this Agreement, the Owner reserves the right at any time and in its absolute discretion to terminate the services of the Contractor and/or the Work for the Owner's convenience and without cause by giving written notice to the Contractor. This termination for the convenience of the Owner provision allows and authorizes the Owner to terminate this Agreement at any time and for any reason whatsoever. This right may be exercised by the Owner in its complete discretion.

§ 14.4.2 Upon receipt of notice from the Owner of such termination for the Owner's convenience, the Contractor shall

- .1 cease operations as directed by the Owner in the notice;
- .2 take actions necessary, or that the Owner may direct, for the protection and preservation of the Work; and
- .3 except for Work directed to be performed prior to the effective date of termination stated in the notice, terminate all existing subcontracts and purchase orders and enter into no further subcontracts and purchase orders.

§ 14.4.3 In the case of such termination for the Owner's convenience, the Contractor shall be entitled to, and the Owner shall reimburse the Contractor for, an equitable portion of the Contractor's fee based on the portion of the Work properly completed before the effective date of termination and for any other reasonable costs attributable to such termination. Contractor's entitlement to payment for all such work shall be predicated on its performance of such work in accordance with the Contract Documents as certified by the Architect and Construction Manager. Contractor shall be entitled to no other payment and waives any claim for damages..

§ 14.4.4 The Contractor shall include in each of its subcontracts a clause, similar in effect to the provisions in Paragraph 14.4, allowing the Contractor to terminate the subcontract for its sole convenience, subject only to the payment obligations set forth in Paragraph 14.4.3.

ARTICLE 15 CLAIMS AND DISPUTES

§ 15.1 Claims

§ 15.1.1 **Definition.** A Claim is a demand or assertion by one of the parties seeking, as a matter of right, payment of money, a change in the Contract Time, or other relief with respect to the terms of the Contract. The term "Claim" also includes other disputes and matters in question between the Owner and Contractor arising out of or relating to the Contract. The responsibility to substantiate Claims shall rest with the party making the Claim. This Section 15.1.1 does not require the Owner to file a Claim in order to impose liquidated damages in accordance with the Contract Documents. The Owner may refer a claim to the Construction Manager and or the Architect for their review and assistance; however, such is not required by this Agreement.

§ 15.1.2 Time Limits on Claims

The Owner and Contractor shall commence all Claims and causes of action against the other and arising out of or related to the Contract, whether in contract, tort, breach of warranty or otherwise, in accordance with the requirements of the binding dispute resolution method selected in the Agreement and within the period specified by applicable law, but in any case not more than 10 years after the date of Substantial Completion of the Work. The Owner and Contractor waive all Claims and causes of action not commenced in accordance with this Section 15.1.2.

§ 15.1.3 Notice of Claims

§ 15.1.3.1 Claims by the Contractor must be initiated by written notice to the Owner with a copy sent to the Construction Manager and Architect. Claims by the Contractor must be initiated within twenty-one (21) days after the occurrence of the event giving rise to such Claim or within twenty-one (21) days after the Contractor should have been aware of the condition giving rise to the Claim, whichever is later

§ 15.1.3.2 Claims by either the Owner or Contractor, where the condition giving rise to the Claim is first discovered after expiration of the period for correction of the Work set forth in Section 12.2.2, shall be initiated by notice to the other party. In such event, no decision by the Initial Decision Maker is required.

§ 15.1.3.3 Claims by the Contractor must be made by written notice in accordance with the following procedures.

- .1 the Contractor may submit a claim concerning a matter properly noticed in accordance with the time requirements of this Contract set forth in paragraph 15.1.2 and elsewhere;
- .2 failure by the Contractor to furnish the required claim documentation within the time set forth above shall constitute waiver of the Contractor's right to compensation for such claim.
- .3 Contractor shall furnish three (3) certified copies of the required claim documentation. The claim documentation shall be complete when furnished. The evaluation of the Contractor's claim will be based, among other things, upon the Owner's Project Records and the Contractor's furnished claim documentation

Init.

- .4 claim documentation shall conform to Generally Accepted Accounting Principles and shall be in the following format:
- a. general introduction;
 - b. general background discussion
 - c. issues
 - i. index of issues (listed numerically);
 - ii. for each issue:
 - (1) background
 - (2) chronology
 - (3) Contractor's position (reason for Owner's potential liability)
 - (4) supporting documentation of merit or entitlement
 - (5) supporting documentation of damages
 - (6) begin each issue on a new page
 - d. all critical path method schedules (as-planned, monthly updates, schedule revisions and as-built, along with computer disks of all schedules related to the claim;
 - e. productivity exhibits (if appropriate); and
 - f. summary of issues and damages.
- .5 supporting documentation of merit for each issue shall be cited by reference, photocopies or explanation. Supporting documentation may include, but shall not be limited to General Conditions, General Requirements, technical specifications, drawings, correspondence, conference notes, shop drawings and submittals, shop drawing logs, survey books, inspection reports, delivery schedules, test reports, daily reports, subcontracts, fragmentary CPM schedules or time impact analyses, photographs, technical reports, requests for information, field instructions and all other related records necessary to support the Contractor's claim.
- .6 supporting documentation of damages for each issue shall be cited, photocopied or explained. Supporting documentation may include, but shall not be limited to, any or all documents related to the preparation and submission of the bid; certified, detailed labor records including labor distribution reports; material and equipment procurement records; construction equipment ownership, cost records or rental records; subcontractor or vendor files and cost records; service cost records; purchase orders; invoices; Project as-planned and as-built cost records; general ledger records; variance reports; accounting adjustment records, and any other accounting material necessary to support the Contractor's claims.
- .7 each copy of the claim documentation shall be certified by a responsible officer of the Contractor in accordance with the requirements of these Contract Documents.

§ 15.1.4 Continuing Contract Performance

§ 15.1.4.1 Pending final resolution of a Claim, except as otherwise agreed in writing or as provided in Article 14, the Contractor shall proceed diligently with performance of the Contract and the Owner shall continue to make payments in accordance with the Contract Documents.

§ 15.1.4.2 The Contract Sum and Contract Time shall be adjusted in accordance with the Initial Decision Maker's decision, subject to the right of either party to proceed in accordance with this Article 15. The Architect will issue Certificates for Payment in accordance with the decision of the Initial Decision Maker.

§ 15.1.5 Claims for Additional Cost. If the Contractor wishes to make a Claim for an increase in the Contract Sum, notice as provided in Section 15.1.3 shall be given before proceeding to execute the portion of the Work that is the subject of the Claim. Prior notice is not required for Claims relating to an emergency endangering life or property arising under Section 10.4.

§ 15.1.6 Claims for Additional Time

(Paragraphs deleted)

§ 15.1.6.1 If the Contractor wishes to make a Claim for an increase in the Contract Time, notice as provided in Section 15.1.3 shall be given. The Contractor's Claim shall include an estimate of cost and of probable effect of delay on progress of the Work. In the case of a continuing delay, only one Claim is necessary. The Contractor shall accompany the Claim with a written analysis with a proposed revision to the Schedule illustrating the claimed influence of the basis for delay on the critical path of the Work and the applicable deadlines that may be impacted. Contractor will

exercise reasonable efforts to mitigate the potential impact of any delay but shall be compensated for any costs associated therewith.

§ 15.1.6.2 If adverse weather conditions are the basis for a Claim for additional time, such Claim shall be documented by data substantiating that weather conditions were abnormal for the period of time, could not have been reasonably anticipated, and had an adverse effect on the scheduled construction. The time for performance of this Contract, as set forth in the Construction Schedule, shall include an allowance for delays due to reasonably anticipated adverse weather for the area where the Work is located. For the purpose of establishing that abnormal adverse weather conditions have caused a delay, and determining the extent of delay attributed to such weather conditions, the Contractor shall furnish with its claim, National Oceanic and Atmospheric Administration (NOAA) National Weather Service records of climatic conditions during the same time interval for the previous five (5) years for the locality of the Work; the Contractor's daily job site logs/daily construction reports showing weather, job activities, and the effect of weather on the progress of the Work; and an impact schedule showing the effects of the weather event on the critical path of the Contractor's Construction Schedule. Time extensions for weather delays and related impact do not entitle the Contractor to extended overhead recovery or to any other monetary compensation associated with that claim unless approved in writing by the Owner.

§ 15.1.6.3 Claims for increase in the Contract Time shall set forth in detail the circumstances that form the basis for the Claim, the date upon which each cause of delay began to affect the progress of Work, the date upon which each cause of delay ceased to affect the progress of the Work and the number of days increased in the Contract Time claimed as a consequence of each such cause of delay. The Contractor shall provide such supporting documentation as the Owner may require including, where appropriate, a revised construction schedule indicating all the activities affected by the circumstances forming the basis of the Claim.

§ 15.1.6.4 The Contractor shall not be entitled to a separate increase in the Contract Time for each one of the number of causes of delay which have concurrent or interrelated effects on the progress of the Work, or for concurrent delays due to the fault of the Contractor.

§ 15.1.7 Waiver of Claims for Consequential Damages. The Contractor and Owner waive Claims against each other for consequential damages arising out of or relating to this Contract. This mutual waiver includes

- .1 damages incurred by the Owner for rental expenses, for losses of use, income, profit, financing, business and reputation, and for loss of management or employee productivity or of the services of such persons; and
- .2 damages incurred by the Contractor for principal office expenses including the compensation of personnel stationed there, for losses of financing, business and reputation, and for loss of profit except anticipated profit arising directly from the Work.

This mutual waiver is applicable, without limitation, to all consequential damages due to either party's termination in accordance with Article 14. Nothing contained in this Section 15.1.7 shall be deemed to preclude assessment of liquidated damages, when applicable, in accordance with the requirements of the Contract Documents.

§15.1.8 Claims and Actions Thereon. No claim against the Owner for damages for breach of contract or compensation for extra work shall be made or asserted in any action or proceeding at law, or in equity, unless the Contractor shall have strictly complied with all the requirements relating to the giving of notice and of information with respect to such claims all as provided in this Agreement.

§15.1.9 No Estoppel. Neither the Owner nor any department officer, agent or employees thereof, shall be bound, precluded or estopped by any determination, decision, approval, order, letter, payment or certificate made or given under or in connection with this Contract by the Owner, or any officer, agent or employee of the Owner, either before or after the final completion and acceptance of the Work and payment therefor: (1) from showing the true and correct classification, amount, quality or character of the Work actually done; or that any such termination, decision, order, letter, payment or certificate was untrue, incorrect or improperly made in any particular matter, or that the Work or any part thereof does not in fact conform to the requirements of this Contract; or (2) from demanding and recovering from the Contractor any overpayments made to him, or such damages as it may sustain by reason of his failure to perform each and every part of this Contract in strict accordance with its terms; or (3) both (1) and (2) hereto.

§ 15.2 Initial Decision

§ 15.2.1 Claims by the Contractor, excluding those where the condition giving rise to the Claim is first discovered after expiration of the period for correction of the Work set forth in Section 12.2.2 or arising under Sections 10.3, 10.4, and 11.5, shall be referred to the Initial Decision Maker for initial decision. The Architect will serve as the Initial Decision Maker, unless otherwise indicated in the Agreement. Except for those Claims excluded by this Section 15.2.1, an initial decision shall be required as a condition precedent to mediation of any Claim by the Contractor against the Owner. If an initial decision has not been rendered within 30 days after the Claim has been referred to the Initial Decision Maker, the party asserting the Claim may demand mediation and binding dispute resolution without a decision having been rendered. Unless the Initial Decision Maker and all affected parties agree, the Initial Decision Maker will not decide disputes between the Contractor and persons or entities other than the Owner.

§ 15.2.2 The Initial Decision Maker will review Claims and within ten days of the receipt of a Claim take one or more of the following actions: (1) request additional supporting data from the claimant or a response with supporting data from the other party, (2) reject the Claim in whole or in part, (3) approve the Claim, (4) suggest a compromise, or (5) advise the parties that the Initial Decision Maker is unable to resolve the Claim if the Initial Decision Maker lacks sufficient information to evaluate the merits of the Claim or if the Initial Decision Maker concludes that, in the Initial Decision Maker's sole discretion, it would be inappropriate for the Initial Decision Maker to resolve the Claim.

§ 15.2.3 In evaluating Claims, the Initial Decision Maker may, but shall not be obligated to, consult with or seek information from either party or from persons with special knowledge or expertise who may assist the Initial Decision Maker in rendering a decision. The Initial Decision Maker may request the Owner to authorize retention of such persons at the Owner's expense.

§ 15.2.4 If the Initial Decision Maker requests a party to provide a response to a Claim or to furnish additional supporting data, such party shall respond, within ten days after receipt of the request, and shall either (1) provide a response on the requested supporting data, (2) advise the Initial Decision Maker when the response or supporting data will be furnished, or (3) advise the Initial Decision Maker that no supporting data will be furnished. Upon receipt of the response or supporting data, if any, the Initial Decision Maker will either reject or approve the Claim in whole or in part.

§ 15.2.5 If a Claim has not been resolved after consideration of the foregoing and of further evidence presented by the parties or requested by the Architect, the Architect will render to the parties the Architect's written recommendation relative to the Claim, including any recommended change in the Contract Sum or Contract Time or both. If there is a surety and there appears to be a possibility of a Contractor's default, the Architect may, but is not obligated to, notify the surety and request the surety's assistance in resolving the controversy

(Paragraphs deleted)

§ 15.2.7 In the event of a Claim against the Contractor, the Owner may, but is not obligated to, notify the surety, if any, of the nature and amount of the Claim. If the Claim relates to a possibility of a Contractor's default, the Owner may, but is not obligated to, notify the surety and request the surety's assistance in resolving the controversy.

§ 15.2.8 If a Claim relates to or is the subject of a mechanic's lien, the party asserting such Claim may proceed in accordance with applicable law to comply with the lien notice or filing deadlines.

(Paragraphs deleted)

§ 15.2.9 Nothing contained in this Agreement is intended to alter or replace any provisions of the laws of the state of New York relating to claims made against the Owner or to relieve Contractor from any obligations thereunder

PLEASE BRING THESE INSURANCE REQUIREMENTS TO YOUR INSURANCE AGENT TO ASSURE PROPER COVERAGE AND LIMITS ARE IN PLACE. FAILURE TO PROVIDE CERTIFICATE(S) OF INSURANCE EVIDENCING REQUIREMENTS BELOW, SHALL RESULT IN DELAY OF CONTRACT EXECUTION.

SCHEDULE C

Pine Bush Central School District

STANDARD CONTRACT INSURANCE REQUIREMENTS

CONDITIONS OF INSURANCE

Unless otherwise authorized by Pine Bush Central School District, strict adherence to this schedule is required. Any deviation without prior authorization from Pine Bush Central School District will result in a delay in the finalization of this Agreement.

The VENDOR shall submit copies of any or all required insurance policies as and when requested by Pine Bush Central School District.

INSURANCE CARRIER

The types of insurance and minimum policy limits specified shall be maintained in a form and from insurers acceptable to VENDOR as set forth below. All insurers shall have at least an A- (excellent) rating by A.M. Best and be qualified and admitted to conduct business in the state of New York.

USE OF SUBCONTRACTORS

VENDOR is required to disclose to Pine Bush Central School District if it uses subcontractors and how it screens the subcontractors. VENDOR must also provide proof that subcontractors are properly insured. VENDOR will verify that there are written agreements in place between the VENDOR and the subcontractors, with proper indemnification agreements and insurance clauses. The subcontractors should name Pine Bush Central School District as additional insureds on their liability policies on a primary and non-contributory basis.

WORKSITE SAFETY & RISK MANAGEMENT

VENDOR is responsible for worksite safety and for having a safety-and-employee training program in place. Contractor will notify Pine Bush Central School District of any pending Occupational Safety and Health Administration (OSHA) Law violations.

CERTIFICATES OF INSURANCE

The VENDOR shall file with Pine Bush Central School District, prior to commencing work under this Agreement, all proper Certificates of Insurance.

The Certificates of Insurance shall include:

- a. Name and address of Insured
- b. Issue date of certificate
- c. Insurance company name
- d. Type of coverage in effect
- e. Policy number
- f. Inception and expiration dates of policies included on the certificate
- g. Limits of liability for all policies included on the certificate
- h. "Certificate Holder" shall be the Pine Bush Central School District, 156 Route 302, Pine Bush, NY 12566.

If the VENDOR'S insurance policies should be non-renewed or canceled, or should expire during the life of this Agreement, Pine Bush Central School District shall be provided with a new certificate indicating the replacement policy information as requested above. Pine Bush Central School District requires thirty (30) days prior written notice of cancellation [fifteen (15) days for non-payment of premium] from the Insurer, its agents or representatives.

The contractor/vendor agrees to indemnify the Pine Bush Central School District for any applicable deductibles and self-insured retentions.

WORKERS' COMPENSATION AND DISABILITY INSURANCE

The VENDOR shall take out and maintain during the life of this Agreement, Workers' Compensation (WC) Insurance and Disability Benefits (DB) Insurance, for all of its employees employed at the site of the project, and shall provide Certificates of Insurance evidencing this coverage to Pine Bush Central School District.

If the VENDOR is not required to carry such insurance, the VENDOR must submit form CE-200 attesting to the fact that it is exempt from providing WC and/or DB Insurance coverage for all of its employees.

The manner of proof related to WC and DB Insurance is controlled by New York State Laws, Rules and Regulations. "ACORD" forms are not acceptable proof of WC and/or DB Insurance.

WORKERS' COMPENSATION REQUIREMENTS

To assist the State of New York and municipal entities in enforcing WCL Section 57, a business entity (the VENDOR) seeking to enter into a contract with a municipality (Pine Bush Central School District) must provide one of the following forms to the municipal entity it is entering into a contract with along with a waiver of subrogation. The VENDOR should contact their insurance agent to obtain acceptable proof of WC coverage:

- Form C-105.2 – "Certificate of NYS Workers' Compensation Insurance" or
- Form U-26.3 – "Certificate of Workers' Compensation Insurance" issued by the New York State Insurance Fund or
- Form SI-12 – "Affidavit Certifying that Compensation has Been Secured" issued by the Self-Insurance Office of the Workers' Compensation Board if the VENDOR is self-insured or
- Form GSI-105.2 – "Certificate of Participation in Workers' Compensation Group Self-Insurance" issued by the Self-Insurance administrator of the group or
- Form GSI-12 – "Certificate of Group Workers' Compensation Group Self-Insurance" issued by the Self-Insurance Office of the Workers' Compensation Board if the VENDOR is self-insured.

If the VENDOR is not required to carry WC coverage, it must submit Form CE-200, "Certificate of Attestation of Exemption" from New York State Workers' Compensation and/or Disability Benefits Insurance Coverage. This form and the instructions for completing it are available at <http://www.wcb.ny.gov>

DISABILITY BENEFITS REQUIREMENTS

To assist the State of New York and municipal entities in enforcing WCL Section 220(8), a business entity (the VENDOR) seeking to enter into a contract with a municipality (Pine Bush Central School District) must provide one of the following forms to the municipal entity it is entering into a contract with. The VENDOR should contact their insurance agent to obtain acceptable proof of DB Insurance Coverage:

- Form DB-120.1 – "Certificate of Insurance Coverage Under the NYS Disability Benefits Law" or
- Form DB-155 – "Compliance with Disability Benefits Law" issued by the Self-Insurance Office of the Workers' Compensation Board if the Vendor is self-insured.

If the Vendor is not required to carry DB Insurance coverage, it must submit Form CE-200, "Certificate of Attestation of Exemption" from New York State Workers' Compensation and/or Disability Benefits Insurance Coverage. This form and the instructions for completing it are available at <http://www.wcb.ny.gov>

COMMERCIAL GENERAL LIABILITY INSURANCE:

The VENDOR shall take out and maintain during the life of this Agreement, such bodily injury liability and property damage liability insurance as shall protect it and Pine Bush Central School District from claims for damages for bodily injury including accidental death, as well as from claims for property damage that may arise from operations under this Agreement, whether such operations be by the VENDOR, by any subcontractor, or by anyone directly or indirectly employed by either of them.

It shall be the responsibility of the VENDOR to maintain such insurance in amounts sufficient to fully protect itself and Pine Bush Central School District, but in no instance shall amounts be less than the minimum acceptable levels of coverage set forth below:

- Bodily Injury Liability and Property Damage Liability Insurance in an amount not less than **ONE MILLION AND 00/100 (\$1,000,000.00) DOLLARS** for each occurrence, and in an amount not less than **TWO MILLION AND 00/100 (\$2,000,000.00) DOLLARS** general aggregate.

Other Conditions of Commercial General Liability Insurance:

- a. Coverage shall be written on Commercial General Liability form.

- b. Coverage shall include:
 - 1. Contractual Liability
 - 2. Independent Contractors
 - 3. Products and Completed Operations
- c. "Additional Insured" status shall be granted to "Pine Bush Central School District, 156 Route 302, Pine Bush, NY 12566.", shown on the Commercial General Liability policy, further stating that this insurance shall be **primary and non-contributory** with any other valid and collectable insurance. There should be an endorsement or policy language stating that there is a **waiver of subrogation** included in the policy. In addition, a **30-day notice of cancellation** should be added for the certificate holder.

UMBRELLA LIABILITY OR EXCESS LIABILITY INSURANCE:

Umbrella Liability or Excess Liability Insurance in an amount not less than **FIVE MILLION AND 00/100 (\$5,000,000.00) DOLLARS**.

NOTE: As long as all minimum underlying limits have been met, insurance limits may be a total combined limit of the Umbrella/Excess Liability limits and the underlying liability insurance limits.

The Umbrella/Excess Liability coverage **MUST** be written on a follow-form basis to the underlying insurance coverage with no additional exclusions.

"Additional Insured" status shall be granted to Pine Bush Central School District, 156 Route 302, Pine Bush, NY 12566.", shown on the Umbrella policy, further stating that this insurance shall be primary and non-contributory with any other valid and collectable insurance. There should be an endorsement or policy language stating that there is a **waiver of subrogation** included in the policy. In addition, a **30-day notice of cancellation** should be added for the certificate holder.

AUTOMOBILE LIABILITY INSURANCE

Automobile Bodily Injury Liability and Property Damage Liability Insurance shall be provided by the **VENDOR**, with a minimum Combined Single Limit (CSL) of **ONE MILLION AND 00/100 (\$1,000,000.00) DOLLARS**.

Coverage shall include:

- a. All owned vehicles
- b. Any hired automobile
- c. Any non-owned automobile
- d. "Additional Insured" status shall be granted to "Pine Bush Central School District, 156 Route 302, Pine Bush, NY 12566.", shown on the Auto Liability policy, further stating that this insurance shall be primary and non-contributory with any other valid and collectable insurance. There should be an endorsement or policy language stating that there is a **waiver of subrogation** included in the policy. In addition, a **30-day notice of cancellation** should be added for the certificate holder.

SECTION 00 7343-WAGE RATE REQUIREMENTS

PART 1 - GENERAL

1.1 SUMMARY

- A. Wage rates shall apply as shown in the Prevailing Wage Schedule prepared by the New York State Department of Labor for this project (the Prevailing Wage Case Number (PRC#) assigned to this project is (PRC# **2020010342** - 2019 CIP Phase II) The Schedule can be viewed at the following web site:

<http://apps.labor.ny.gov/wpp/publicViewProject.do?method=showIt&id=1504411>

Upon award of the Contract to the successful bidder, a hard copy of the Schedule will be provided, if requested.

- B. The Contractor shall be responsible for completing one copy of Notice of Contract Award (Form PW-16). Upon completion of the form, the Contractor shall submit the form to the Architect. Architect will forward a copy to the New York State Department of Labor.

PART 2 - PRODUCTS (Not Applicable)

PART 3 - EXECUTION (Not Applicable)

END OF SECTION 00 7343

SECTION 01 1000 - SUMMARY

PART 1 - GENERAL

1.1 SUMMARY

- A. Section includes:
 - 1. Project information.
 - 2. Work covered by Contract Documents.
 - 3. Access to site.
 - 4. Work restrictions.
 - 5. Coordination with occupants
 - 6. Miscellaneous provisions.
 - 7. Specification and drawing conventions.
- B. Related Sections:
 - 1. Division 01 Section "Temporary Facilities and Controls" for limitations and procedures governing temporary use of Owner's facilities.

1.2 PROJECT INFORMATION

- A. Project Identification: **Pine Bush Central School District – 2019 Capital Bond Project – Phase 2**
- B. Project Locations:
 - 1. **Pine Bush High School (PBHS)** 118 NY-302, Pine Bush, NY 12566
 - 2. **Circleville Elementary School (CES)** 2000 NY-302, Circleville, NY 10919
 - 3. **Circleville Middle School (CVMS)** 1951 NY-302, Circleville, NY 10919
 - 4. **Pakanasink Elementary School (PAK)** 1953 NY-302, Circleville, NY 10919
- C. Owner: **Pine Bush Central School District** (156 NY-302 Pine Bush, NY 12566)
- D. Architect: **CPL** (50 Front Street, Suite 202, Newburgh, New York 12550)

1.3 WORK COVERED BY CONTRACT DOCUMENTS

- A. The Work of the Project is defined by the Contract Documents includes, but is not limited to, the following:
 - 1. Site Construction Work
 - 2. General Construction Work
 - 3. Mechanical Construction Work
 - 4. Electrical Construction Work
 - 5. Plumbing Construction Work
 - 6. Other work as indicated in the Contract Documents.
- B. Type of Contract:
 - 1. Project will be constructed under coordinated, concurrent multiple contracts. See Division 01 Section "Multiple Contract Summary" for a description of work included under each of the multiple contracts and for the responsibilities of the Project coordinator.

1.4 ACCESS TO SITE

- A. General: Contractor shall have limited use of Project site for construction operations as indicated on Drawings by the Contract limits and as indicated by requirements of this Section.
- B. Cooperate with Owner during construction operations to minimize conflicts and facilitate Owner usage. Coordinate with other contractors working within the School District, related and not related to this construction project.

- C. Use of Site: Limit use of Project site to work in areas indicated. Do not disturb portions of Project site beyond areas in which the Work is indicated.
1. Driveways, Walkways and Entrances: Keep driveways, parking, loading areas, and entrances serving premises clear and available to Owner, Owner's employees, and emergency vehicles at all times. Do not use these areas for parking or storage of materials.
 - a. Schedule deliveries to minimize use of driveways and entrances by construction operations.
 - b. Schedule deliveries to minimize space and time requirements for storage of materials and equipment on-site.
- D. Condition of Existing Building: Maintain portions of existing building affected by construction operations in a weathertight condition throughout construction period. Repair damage caused by construction operations.

1.5 WORK RESTRICTIONS

- A. Work Restrictions, General: Comply with restrictions on construction operations.
1. Comply with limitations on use of public streets and other requirements of authorities having jurisdiction.
- B. On-Site Work Hours: Limit work in the existing building to normal business working hours of 7:00 a.m. to 4:30 p.m., Monday through Friday, except as otherwise indicated.
1. School Vacations and Holidays: Work may occur at any times, as approved.
 2. Weekend Hours: Work may occur at any times, as approved.
 3. Hours for Utility Shutdowns: Only on weekends, holidays and school vacations as approved.
 4. Hours for Noisy Activity: For core drilling, powder-activated fasteners, and other disruptive activities, 3:30 p.m. to 11:00 p.m., or as otherwise approved.
 5. Special Events: The Owner will provide dates and times of special events that will restrict construction operations.
- C. Existing Utility Interruptions: Do not interrupt utilities serving facilities occupied by Owner or others unless permitted under the following conditions and then only after providing temporary utility services according to requirements indicated:
1. Notify Construction Manager not less than **five** days in advance of proposed utility interruptions.
 2. Obtain Construction Manager's written permission before proceeding with utility interruptions.
- D. Noise, Vibration, and Odors: Coordinate operations that may result in high levels of noise and vibration, odors, or other disruption to Owner occupancy with Owner.
1. Notify Construction Manager not less than **five** days in advance of proposed disruptive operations.
 2. Obtain Construction Manager's written permission before proceeding with disruptive operations.
- E. Nonsmoking Building: Smoking is not permitted within the building or grounds

1.6 COORDINATION WITH OCCUPANTS

- A. Full Owner Occupancy: Owner will occupy site and existing building(s) during entire construction period. Cooperate with Owner during construction operations to minimize conflicts and facilitate Owner usage. Perform the Work so as not to interfere with Owner's day-to-day operations. Maintain existing exits unless otherwise indicated.
1. Maintain access to existing walkways, corridors, and other adjacent occupied or used facilities. Do not close or obstruct walkways, corridors, or other occupied or used

- facilities without written permission from Owner and approval of authorities having jurisdiction.
2. Notify the Owner not less than 72 hours in advance of activities that will affect Owner's operations.
- B. Owner Limited Occupancy of Completed Areas of Construction: Owner reserves the right to occupy and to place and install equipment in completed portions of the Work, prior to Substantial Completion of the Work, provided such occupancy does not interfere with completion of the Work. Such placement of equipment and limited occupancy shall not constitute acceptance of the total Work.
1. Architect will prepare a Certificate of Substantial Completion for each specific portion of the Work to be occupied prior to Owner acceptance of the completed Work.
 2. Obtain a Certificate of Occupancy from authorities having jurisdiction before limited Owner occupancy.
 3. Before limited Owner occupancy, mechanical and electrical systems shall be fully operational, and required tests and inspections shall be successfully completed. On occupancy, Owner will operate and maintain mechanical and electrical systems serving occupied portions of Work.
 4. On occupancy, Owner will assume responsibility for maintenance and custodial service for occupied portions of Work.

1.7 SPECIFICATION AND DRAWING CONVENTIONS

- A. Specification Content: The Specifications use certain conventions for the style of language and the intended meaning of certain terms, words, and phrases when used in particular situations. These conventions are as follows:
1. Imperative mood and streamlined language are generally used in the Specifications. The words "shall," "shall be," or "shall comply with," depending on the context, are implied where a colon (:) is used within a sentence or phrase.
 2. Specification requirements are to be performed by Contractor unless specifically stated otherwise.
 3. Division 01 General Requirements: Requirements of Sections in Division 01 apply to the Work of all Sections in the Specifications.
 4. Drawing Coordination: Requirements for materials and products identified on the Drawings are described in detail in the Specifications. One or more of the following are used on the Drawings to identify materials and products:
- B. Terminology: Materials and products are identified by the typical generic terms used in the individual Specifications Sections.

PART 2 - PRODUCTS (NOT APPLICABLE)

PART 3 - EXECUTION (NOT APPLICABLE)

END OF SECTION 01 1000

SECTION 011200 - MULTIPLE CONTRACT SUMMARY

PART 1 - GENERAL

1.1 SUMMARY

- A. This Section includes a summary of each contract, including responsibilities for coordination and temporary facilities and controls.
- B. Specific requirements of each contract are also indicated in individual Specification Sections and on Drawings.
- C. Related Drawings and Sections include the following:
 - 1. Division 01 Section "Summary" for the Work covered by the Contract Documents, restrictions on use of the premises, phasing, Owner-occupancy requirements, and work restrictions.
 - 2. Division 01 Section "Temporary Facilities and Controls" for specific requirements for temporary facilities and controls.
 - 3. Drawings and general provisions of the Contract, including General and Supplementary Conditions and other Division 01 Specification Sections, apply to this Section.

1.2 PROJECT DESCRIPTION

- A. Project consists of additions and alterations to several buildings owned by the **Pine Bush CSD**, in or near **Pine Bush, New York**, as shown on Contract Documents prepared by CPL Architecture Engineering Planning.
- B. The project affects (4) four main buildings:
 - 1. Pine Bush High School
 - 2. Circleville Middle School
 - 3. Circleville Elementary School
 - 4. Pakanasink Elementary School

1.3 PRIME CONTRACTS

- C. The work of the project is separated into a number of Prime Contracts, as follows:
 - 1.Contract 1 GENERAL CONSTRUCTION WORK (GC)
 - 2.Contract 2 MECHANICAL (HVAC) WORK (MC)
 - 3.Contract 3 ELECTRICAL WORK (EC)
 - 4.Contract 4 PLUMBING WORK (PC)
- D. Prime Contractors shall perform the work under separate lump sum Contracts with the Owner. Provide all labor, material, tools, supports, plant, scaffolding, rigging, dumping, equipment, supervision, layout, delivery, trucking, shop drawings, samples, submittals, bonds, insurance, etc., necessary to complete the work in a safe, timely and workmanlike manner as described in the Contract Documents, and in compliance with all applicable codes and regulations.

1.4 GENERAL REQUIREMENTS OF CONTRACTS

- E. The following requirements apply to all Prime Contracts. These must be included in bidding any or all the Prime Contracts. The plans included are diagrammatic in nature, and do not necessarily indicate or describe all of the work required for complete and full performance

of the work of this contract. The drawings indicate approximate arrangement for piping, conduit, and the work of the contractors. work shall be installed as it results from the coordination between the Prime Contractors at no additional costs to the Owner.

1. Each contractor shall furnish and install all miscellaneous materials, supports, devices, temporary construction, appurtenances or any other work or services required or obviously necessary to affect the full installation of the work.
2. Contractors are responsible for all their work shown on Contract Documents, including drawings of other trade disciplines.
3. Decisions required from the Owner, Construction Manager, Architect and/or Engineer, shall be anticipated by the Contractors to provide ample time for inspection, investigation or detailed drawings.
4. Full cooperation with all firms performing testing and inspection work is expected from all Contractor personnel. Provide complete data and material for required reports.
5. Work of this project will be performed in and adjacent to an active school. No interaction between workers and school staff or students will be allowed. No unauthorized access into the school will be allowed. All workers entering the school will be required to pass through the security check point and must wear ID badges at all times. No parking permitted on school premises while school is in session. All personnel shall use public off campus street parking. Any worker or supervisor violating this policy will be removed from the project.
6. The School facilities are in operation, any work that may possibly disrupt the School facility must be approved in writing by the Construction Manager beforehand.
7. At the time of drop off and pick up of students in all schools, access to the sites will be interrupted. This interruption is to be expected and adhered to without consequence to the Owner.
8. Contractors are performing work near and in an operating school facility. All precautions are to be taken to minimize dust, dirt, debris, fumes, noise, vibrations, etc. There may be times when the construction work will be shut down or relocated due to the disruption of school operations. Contractors are to recognize this situation and will not be paid additional monies for minor shut downs and relocations. Contractors must submit a "Means and Methods" plan to the Construction Manager prior to the start of work.
9. Contractors understand that time is of the essence and that they will adequately staff the Project to successfully complete the Contract work in accordance with the Project Milestone Schedule.
10. Contractors must participate in the preparation of a group master project schedule which will be compiled by the Construction Manager. Contractors shall prepare overall project schedules for their work including activity durations, manpower and relationships to other activities including those of other contractors and submit them to the Construction Manager within 14 days of notice of Contract award. Include attendance at schedule development meetings.
11. Normal work hours will be 7:00am – 4:30pm Monday through Friday excluding holidays during the school year in areas not occupied by school personnel, and 7:00am – 4:30pm during school vacation periods, unless noted otherwise. Second Shift work, when required by NYSED 155 including but not limited to, dust, noise, vibrations, fumes, dirt, debris, etc. will be from 3:00 p.m. to 11:00 p.m. Monday through Friday excluding holidays during the school year in areas occupied by school personnel. Authorization for Contractors requiring work outside of these hours and on the major holidays will be given at the sole discretion of the Construction Manager, and contractor must provide advanced request of at least 10 days. Contractors will be responsible for all Owner's staff costs associated with the work outside of the stated hours.

12. Contractors shall submit a three-week "Look Ahead" schedule (man loaded by work activity and area) to Construction Manager each week. Contractors' representatives shall attend a weekly (or more or less frequent, as determined by the Construction Manager) meeting with all contractors, chaired by Construction Manager, for the purposes of job coordination and sequencing. Contractors are responsible to coordinate the job with other trades and Construction Manager, and to cooperate with other trades in the pursuit of the overall project's success. Contractors shall review other trades' shop drawings, and actively participate in resolving discrepancies, conflicts, interferences, etc.
13. Contractors' proposed schedule must meet the dates established by the Project Milestone Schedule and allow the other Prime Contractors to meet their dates. Each Contractor must submit a proposed schedule for approval by the Construction Manager prior to the start of their work. Contractor shall indicate significant events such as submittals, shop drawings, material ordering, fabrication, delivery, coordination precedents, installation, substantial completion, punch list, testing and turnover by area or system as agreed with Construction Manager. This schedule shall be updated monthly, showing progress and problems, and shall be submitted in reproducible form to the Construction Manager by the last working day of the month.
14. The intention of the work is to follow a logical sequence; however, when so directed by the Construction Manager, the Contractor shall temporarily omit certain portions of the work, or perform them outside of the normal sequence, in order to accommodate coordination requirements. All such out of sequence work and come back time to these areas is to be anticipated and as such shall be performed at no additional cost. Contractors' requests for performing Out of Sequence work must be submitted in advance and approved by the Construction Manager in coordination with other Prime Contractors. Costs associated with the out of sequence request will be borne by the requesting Contractor.
15. Contractors shall submit for review by the Construction Manager updated progress drawings when requested by Owner or Construction Manager. Contractor progress drawings are to be highlighted to show installed work to date and shall be reviewed with the Construction Manager on the last working day of each month.
16. All work must conform to applicable codes including state laws, local ordinances, OSHA, and requirements of governmental agencies having jurisdiction for all work performed. Each Contractor is responsible to temporarily or permanently protect and immediately correct all safety hazards, violations or otherwise unsafe conditions created by the performance of their work. For example, the contractor that creates an opening anywhere on the project, such as in the ground or in the structure of the buildings, must also provide fall protection for that opening until the opening is permanently closed. Any subsequent contractor needing access through the protection must modify or replace the protection.
17. Contractors shall comply with Federal, State and local laws regarding noise control, traffic control and housekeeping, etc.
18. Contractors shall comply with all applicable Federal, State, County and Municipal laws concerning pollution of surrounding public waters. All work shall be performed in such a manner that objectionable conditions will not be created in public waters through or adjacent to the Project areas.
19. Prime Contractors, and their Subcontractors, shall not allow any chemical or liquid construction waste to enter the Owner's sanitary waste water system. Any cost associated with damage to the Owner's sanitary waste water system will be charged to the Contractor creating the waste.
20. The Building Permit will be issued, prior to Bid Date, by the New York State Education Department, at no cost to Contractors.
21. The Owner is exempt from payment of Federal, State, and local taxes including sales and compensating use taxes on all materials and supplies incorporated into the

- completed work. These taxes are not to be included in the bids. This exemption does not apply to tools, machinery, equipment or other property leased by or to the Contractor or Subcontractor, or to supplies and materials which, even though they are consumed, are not incorporated into the completed work, and the Contractor and Subcontractors shall be responsible for and pay any and all applicable taxes, including sales and compensating use taxes on said leased tools, machinery, equipment or other property and upon all said unincorporated supplies and materials.
22. Contractors shall submit hourly rate sheets that would apply to time and material work for all pertinent trades upon Award of Contract.
 23. All Contractor price quotes for additional work must be submitted to the Construction Manager. Each quote must be broken down into labor, material and equipment for each Prime Contractor and all sub-contractors and suppliers. Each quote must be further itemized into the number of man-hours by labor rate, equipment hours by equipment rate, and material quantities by material unit cost. No Contractor price quote will be processed without this information, and the Prime Contractor will be held responsible for all related schedule delays due to non-compliant submission of cost change proposals. Furthermore, all quotes shall be broken down to indicate which specific building(s) they apply to.
 24. All existing conditions must be verified in the field. The Owner takes no responsibility for actual conditions found deviating from the drawings. If existing conditions interfere with Contract work, Contractor is responsible to eliminate these conditions in a manner acceptable to the Construction Manager and Architect.
 25. Contractors are responsible for familiarizing themselves with jobsite logistics both inside and outside the building. A preliminary search for obstructions (underground and above ground) is required.
 26. Contractors shall examine surfaces and conditions prior to start of work. Report unacceptable conditions to the Construction Manager. Do not proceed until unacceptable conditions are corrected and acceptable. Starting of work implies acceptance.
 27. Contractors are responsible for layout and elevations for all their work, and are required to carry up all the lines and grades to correctly perform all their work.
 28. The buildings' existing security systems must be maintained operational at all times. Any damage to any security system will be the responsibility of the Contractor causing the damage, and daily charges will be accrued for safety personnel costs if the security system is not immediately repaired.
 29. In addition to notices to Utilities and others required elsewhere herein, Contractors shall give written notice of their proposed construction operations to the owner of all public and private utilities and notify underground utility locating service for the area at least seven days in advance of breaking ground in any area involved in the Project. Copies of each such notice shall be simultaneously sent to the Construction Manager.
 30. Wherever there is any possibility of existing utilities being located within limits of the work, Contractors shall notify both the Construction Manager and the Utility before disturbing same. Any work of realignment, relocations, removal or extension of the utilities shall be done as mutually agreed by the Utility, the Construction Manager and the Architect. Contractors shall maintain satisfactory drainage of the excavation at all times from exposure of the structure until completion of its realignment. Interruption of service by utilities shall be kept to a minimum.
 31. Each Contractor is responsible for their own office trailer, storage trailers, telephone, power, internet and water hookups. Limited space will be provided on the jobsite and coordinated by the Construction Manager. A small staging area on Edmunds Lane in Pine Bush, NY will be provided for temporary field offices. Space is limited. Each contractor is responsible for their own utilities if necessary. Each contractor is responsible to restore to the original condition the areas used for this purpose at the completion of their work.

32. All Contractors may use temporary toilet facilities as provided on the jobsite by the General Construction Contractor. Contractors' personnel will not be permitted to use the existing school facilities (including toilet, telephone, food services, dumpsters, etc.) for their own benefit. No clean-up of equipment or disposal of excess material will be allowed in the school buildings. Contractors' superintendents must explain this to all their field forces.
33. Contractors shall assume full responsibility for the protection and safekeeping of products under their Contract stored on the site and shall cooperate with the Construction Manager to insure security for the Owner's property. Contractors shall provide weatherproof storage. No material is to be left unprotected from the weather.
34. Contractors must plan, provide and maintain their own access, ramping, and egress as required into and out of the site, staging of trailer(s), materials, machinery, and equipment in agreement with the Construction Manager. Maintain free and safe access on the jobsite for other related Project personnel. Maintain safe pedestrian traffic outside work area. Any operation interfering with pedestrian or vehicular traffic must be regulated by a flagman. Trucking and delivery operation shall be coordinated with Construction Manager's Field Manager and all other trades.
35. Contractors shall limit their operations, including storage of materials and prefabrication, to areas within the Contract Limit Lines unless otherwise permitted by the Construction Manager at the Owner's sole discretion. No storage will be allowed in the buildings, unless specifically authorized in advance by the Construction Manager. If necessary, Contractors shall obtain and pay for the use of additional off-site storage or work areas needed for their operations.
36. Modifications to the construction fence to better accommodate the Contract work must be discussed with the Construction Manager. These changes shall then be handled by the Contractor requiring the change, at his expense, in accordance with the project specifications, and as accepted by the Construction Manager. Any costs for removal and replacement, relocations, and additional gates will be by this contractor. Any cost incurred as a result of damages shall be charged to this Contractor. All construction fencing is to be secured at the end of each day and all gates closed and locked.
37. When required for additional safety, each Contractor shall provide and maintain fences at their own expense, along the roadways and around the grounds occupied by them for the protection of adjoining property and all persons lawfully using same. Fences shall as specified, or be of materials and construction suitable in the opinion of the Construction Manager for their intended purpose.
38. The Owner and Construction Manager will not accept any deliveries. Material is not to be shipped to the Owner's attention. The Owner and Construction Manager will not be held responsible for material left by delivery services.
39. There is no guarantee that there will be enough parking spaces available for all of Contractor's employees. Contractor's employees may have to park off-site and provide transportation for workers to the site at no additional cost or consequence to the Owner.
40. Contractors shall coordinate the use of premises with the Owner and Construction Manager and shall move, at their own expense, any stored products under Contractors' control, including excavated material, which interfere with operations of the Owner or separate Contractors.
41. Contractors shall employ the appropriate tradespeople for their work as required. These people shall be experienced in their trades. Sufficient manpower, equipment, and supervision shall be provided at all times to maintain progress of the job and at each site. A shortage of labor in the industry shall not be accepted as an excuse for not properly manning the job or performing the work.
42. Full time, on-site supervision at each building site is a mandatory requirement for each Prime Contractor from Project commencement until such time as determined by the Construction Manager. The on-site Superintendent(s) must remain for the full term of the Project unless the replacement is pre-approved by the Construction Manager, and

- be a non-working Superintendent(s). Full time supervision will be required for all shift work including the work of subcontractors.
43. Insubordination, unsafe practices, horseplay, abusive behavior or language, wanton destruction of property, use of drugs or alcohol, possession of firearms, smoking in or on school property, and solicitation shall not be tolerated. There will be no warnings, and Contractors shall designate a responsible on-site supervisor to handle any situations that may arise, including termination.
44. Union business shall not be conducted on site. Any union representatives that visit the site must declare which Contractor's personnel they represent, and must be escorted by that Contractor's union steward at all times. No visitors, sales representative or non-working personnel shall be permitted on site without prior consent of the Construction Manager. No photographs shall be taken without the Construction Manager's prior approval.
45. Cutting and patching covers adjustments to, and necessary reworking of, elements of construction in both new and existing work. The following definitions for cutting and patching apply to this Contract.
- a. Cutting: Physical modification of construction work, both new and existing, or removal of existing or installed materials, including excavating and earthwork.
 - b. Patching: Restoration or replacement and installation of construction material, both new and existing, including finishing, patching, excavations and compaction of backfilling. Each prime contractor is responsible for his own cutting and patching as required to perform his work.
 - c. Patching shall be done by tradesmen qualified in performing the type of work required for the patching.
46. Each Contractor shall seal all penetrations and sleeves of the work of their contract passing through fire- or sound-rated barriers. See drawings for rated walls and ceilings. U.L. approved systems, i.e.: 1, 2, and 4-hour ratings, shall be submitted and approved prior to application.
47. Contractors shall provide protection from damage to adjacent and adjoining work and/or structures. Contractors shall clean, repair and/or replace any damage for which they are deemed responsible. Contractors are responsible for any damage caused by them or their subs to any building area or system within the contract limits as well as the adjoining school campus.
48. The General Construction Work Contractor is responsible for furnishing and maintaining dumpsters or other such containers as required for collection, storage and legal disposal of all debris and rubbish resultant from all operations, except asbestos, lead abatement waste and other hazardous waste. Hazardous waste collection, storage and legal disposal is the responsibility of each individual Prime Contractor as it relates to the scope of each Prime Contractor's work. The General Construction Work Contractor (and each Contractor in the case of hazardous waste) shall locate, maintain and move such containers as necessary and as directed by Construction Manager, and legally dispose of waste as containers are filled. Contractors shall separate and recycle waste as required by all regulations and all authorities having jurisdiction.
49. The General Construction Work Contractor is responsible for removing, storing and re-installing of all weight room equipment in the High School. The old weight room is in the lower level, two rooms 013. The weight room equipment will be re-installed in the new weight room and fitness center room 107. See schedule for timing and sequence.
50. The General Construction Work Contractor is responsible for removing, storing and re-installing the High School HAAS technology (Room 012 Metal Shop) equipment in order to complete the work shown on the contract documents. The moving shall be performed by a qualified mover to prevent damage. Any recalibration of the equipment will be at the expense of the General Construction Contractor. Each Prime contractor shall be responsible for disconnect and reconnect of the new and existing equipment.

51. Each Prime Contractor shall properly and legally dispose of items removed and not specified for reuse or for turnover to the Owner.
52. Contractors shall organize daily clean ups, and participate in a weekly joint clean up involving all Prime Contractors. Clean-up shall be considered a safety issue. Any Contractors that do not participate in a clean-up will be back charged.
53. Any vehicle leaving the jobsite that provides materials or manpower shall be cleaned by the relevant Prime Contractor prior to re-entry on access roads or public streets to remove mud and concrete from wheels and undercarriages.
54. Lead Paint Abatement: Lead paint abatement shall be the responsibility of Each Prime Contractor as required to perform the work of their contract, unless otherwise noted on the documents.
55. Contractors shall take special care in verifying that their equipment matches the characteristics of the power being supplied.
56. Prior to any cutting, soldering or welding operations, each Contractor must obtain a daily open flame permit through a procedure established by the Construction Manager and Owner. No open flame, welding, soldering will be allowed in the occupied school facility during school hours. Contractors shall be responsible for taking all safeguards necessary for fire protection and prevention due to the work. Contractors shall maintain a fire watch during all open flame operations using only qualified personnel. The fire watch shall be maintained at least 30 minutes following the completion of the work. Each Contractor shall provide and maintain sufficient fire protection equipment as required by law in each area being worked by the Contractor's forces.
57. All Contractors are required to provide 48 hours notification for 3rd party testing and special inspections, coordinated with the Construction Manager.

1.5 GENERAL CONSTRUCTION CONTRACT

- F. Work in the General Construction Contract includes, but is not limited to, the following:
1. Foundations, including footings, foundation and retaining walls for Site related components.
 2. Concrete walks, including earthwork
 3. Supply and install all structural components required for roof and wall openings for all trades.
 4. Excavation and backfill of building foundation and structure.
 5. Site Stairs, including railings and finishes.
 6. Asbestos Abatement.
 7. Selective demolition.
 8. Shoring bracing and underpinning related to the General Construction work.
 9. Slabs-on-grade, including earthwork, sub drainage systems, and insulation.
 10. Below-grade building construction, including excavation, backfill, and thermal and moisture protection.
 11. Superstructure, including floor and roof construction and fire-resistive materials.
 12. Exterior closure, including walls, doors and windows.
 13. Roofing, including coverings, flashings roof specialties and glazed openings.
 14. Interior construction, including partitions, walls, doors, ceilings and interior glazed openings.
 15. Fire-protection specialties.
 16. Stairs, including railings and finishes.
 17. Interior finishes finish carpentry architectural woodwork and built-in casework.
 18. Professional cleaning upon substantial completion including window washing and vacuuming of carpeting.

1.6 MECHANICAL CONTRACT

G. Work of the HVAC Contract includes, but is not limited to, the following:

1. Site hydronic distribution.
2. Energy supply, including oil gas steam hot- and chilled-water supply systems.
3. HVAC systems and equipment.
4. Pool Equipment
5. HVAC instrumentation and controls.
6. HVAC testing, adjusting, and balancing.
7. Building automation system.
8. Mechanical connections to equipment furnished by the General Construction Contract, Plumbing Contract, HVAC Contract, Electrical Contract.

1.7 ELECTRICAL CONTRACT

H. Work of the Electrical Contract includes, but is not limited to, the following:

1. Site electrical distribution.
2. Site lighting.
3. Site communications and security.
4. Electrical service and distribution.
5. Exterior and interior lighting and light pole bases.
6. Communication, security and Fire Alarm.
7. Special electrical systems
8. Electrical connections to equipment furnished by the General Construction Contract, Site Contract, Plumbing Contract, HVAC Contract and Mechanical Contract
9. Temporary facilities and controls in the Electrical Contract include, but are not limited to, the following:
 - a. Power supply and install to the CM Office trailer.

Electrical connections to existing systems and temporary facilities and controls furnished by the General Construction Contract, Site Contract, Plumbing Contract and Mechanical Contract.

1.8 PLUMBING CONTRACT

I. Work of the Plumbing Contract includes, but is not limited to, the following:

1. Plumbing fixtures.
2. Domestic water distribution.
3. Sanitary waste.
4. Stormwater drainage.
5. Special plumbing systems, including the following:
 - a. Pool equipment.
6. Plumbing connections to equipment furnished by the General Construction Contract, Mechanical Contract, HVAC Contract and Electrical Contract.

PART 2 - DIVISION OF WORK

2.1 PRIMARY AND PARTIAL RESPONSIBILITIES

- J. In addition to responsibilities listed in PART 1 above, and in other Sections of this Manual, the Scope of work for each Contract includes, but is not limited to, items listed in the following table. The number

“one” (1) indicates primary responsibility. The number “two” (2) indicates partial responsibility. Contractors are required to familiarize themselves with all aspects of the project.

Description	1	2	
Relevant requirements on General Drawings (“G” series), including cover sheets, u.n.o.	ALL		
Relevant requirements on Code Compliance Drawings (“CC” series), u.n.o.	ALL		
Relevant requirements on Phasing and Logistics Drawings, unless otherwise indicated	ALL		
Relevant information on Site Survey Drawings, unless otherwise indicated	ALL		
ALL WORK on Architectural Drawings, u.n.o.	GC		
ALL WORK on Structural Drawings, u.n.o.	GC		
ALL WORK on Hazardous Materials Abatement Drawings, u.n.o.	GC		
ALL WORK on Civil/Landscape Drawings, u.n.o.	SC	EC	
ALL WORK on Mechanical Drawings, u.n.o.	MC	EC	
ALL WORK on Plumbing Drawings, u.n.o.	PC		
ALL WORK on Electrical Drawings, u.n.o.	EC		
ALL ROOFING WORK, u.n.o.	GC		
ALL WORK on Photovoltaics Drawings (“PV” series), u.n.o.	NA		
ALL DIVISION 00 REQUIREMENTS, as related to this Contract’s work, u.n.o.	ALL		
ALL DIVISION 01 REQUIREMENTS, as related to this Contract’s work, u.n.o.	ALL		
Provide dumpsters and portable toilets as specified in Division 01 Section TEMPORARY FACILITIES AND CONTROLS	GC		
Daily cleanup of the work areas. Remove and dispose of all demolition items in dumpsters, except for hazardous waste materials generated by each Contract’s work, if any, which shall be collected and legally disposed of by the relevant Contract. Include the proper and legal removal from the building of all abandoned piping, ductwork, conduit, wiring, fixtures and equipment.	ALL	GC	
Sweeping of all floors in construction areas daily	ALL		
Sweeping of mechanical rooms daily.	ALL		
Sweeping of electrical rooms daily.	ALL		
Final cleaning of all of the work prior to occupancy by the owner. Include the interior and exterior surfaces of the window system, all flooring, counters, cabinets, bathrooms, bathroom fixtures, toilet accessories, sills, etc.	GC	ALL	
Provide the final connections of HVAC systems to equipment provided by others.	MC	ALL	
Final cleaning for all work performed, including boiler rooms, pump room, duct shafts, piping chases etc. and wherever HVAC work has been performed.	ALL		
Provide final connections of the work of this contract to work of other Prime Contracts and/or tie-ins to existing utilities.	ALL		
Final cleaning and service of the electrical switchgear at the end of the project, before final payment.	EC		
Chlorination of the domestic water system for all new distribution piping in new and existing facilities, performed per the Contract Documents and the local authorities having jurisdiction. Certified reports to be issued on completion. Disposal of the chlorine/water solution is the responsibility of this Contractor. A method of disposal must be submitted and approved prior to the chlorination procedure.	PC		
Snow and ice removal at all Construction Staging and Access areas, including traction control, sanding, etc.	GC	ALL	
Each Prime Contractor is responsible for its own snow removal at its own work areas.	ALL		
MEP Contractors shall take part in the coordination of their work with the other trades in all areas. Coordination drawings with all trades’ work overlaid on them shall be the basis for this coordination process. Contractors shall install their work in strict accordance with these drawings. No additional compensation will be made for extra offsets, conduit or piping required due to this coordination process.	ALL		
Start the coordination drawings by producing ductwork drawings with pipe runs overlaid. Drawings shall indicate ductwork drawn to scale with top of duct and bottom of duct dimensions indicated. Include equipment locations, sizes and the required service clearances on the drawings. These drawings shall be passed onto the other contractors to overlay their work.	MC	ALL	
Indicate plumbing and fire protection piping sizes and elevations.	PC	ALL	
Overlay lighting, major conduit runs and panel locations.	EC	ALL	
Incorporate all trades’ overlays into a final coordination drawing and distribute copies to all contractors, Construction Manager and Architect.	MC	ALL	
Maintain emergency access around the building and from building exits at all times.	GC	ALL	
Maintain the existing power and lighting during the duration of the Project. Provide temporary power and lighting during gaps in service, shutdowns etc.	EC	ALL	
Provide all temporary power/lighting for construction areas where working outlets do not exist now, in accordance with Division 01 Section TEMPORARY FACILITIES AND CONTROLS	EC		

Description	1	2	
Provide Snow and ice removal for the work, CM trailer area, staging, access, and parking areas when 2" or more of snowfall occurs or ice is present in areas of the field trailers, staging areas, and internal site access.	GC		
Provide all types of temporary construction fencing systems, including gates, hardware, etc., in accordance with Division 01 Section TEMPORARY FACILITIES AND CONTROLS and Division 32 Sections.	ALL		
Provide and maintain level, stable, non-tracking Site Contractor Staging Areas as indicated on Staging Drawings.	ALL		
Site Contractor to provide snow and ice removal for their access, staging, and associate work areas	SC		
Maintain construction area secure with locked temporary doors, barricades, etc. during construction. Provide combination locks on all gates and construction access doors.	GC	ALL	
Provide temporary perimeter fall protection cables at all work areas where floor or grade elevation changes exceed allowable limits by code or law. Include a top rail or cable, mid rail or cable and 4-inch toe board around the perimeter of each floor level. Provide temporary fall protection around all duct shafts, elevator shafts and other floor openings. Fall protection must meet OSHA standards. Maintain fall protection on a daily basis until the permanent walls are completed. Remove the fall protection upon completion of the permanent work.	GC	ALL	
Provide temporary, insulated weather protection and building enclosure to maintain the progress of the work and protect the work until permanent enclosure is achieved.	GC	ALL	
Provide temporary partitions, doors, and ceilings as required to separate work areas, in accordance with Division 01 Section TEMPORARY FACILITIES AND CONTROL. Locate partitions as shown on Drawings; if not shown on Drawings, review location of partitions with Construction Manager, Architect and Owner before beginning installation.	GC		
Provide temporary heat and humidity control systems in accordance with Division 01 Section TEMPORARY FACILITIES AND CONTROL	MC	ALL	
Each Contractor requiring temporary water shall, at their own expense, provide hoses containers and other devices required to deliver water to the point of that Contractor's work.	ALL		
Temporary electric service for the contractor staging area: in accordance with Division 01 Section TEMPORARY FACILITIES AND CONTROL.	EC		
The building power system cannot be shut down during normal school working hours. Include all temporary wiring, panels, distribution, off hours' labor, overtime, premium time, generators, etc. required to energize the electrical panels and systems to meet the milestone schedule dates.	EC		
Provide portable generators during power shutdowns / switchovers exceeding four hours during any scheduled shift. Any contractor requiring power during any scheduled shutdown less than 4 hours must provide their own means for temporary electric.	EC	ALL	
Maintain the existing and new electrical, security, phone, data, intercom and Fire Alarm systems operational during all construction phases. Provide independent support, relocation, temporary wiring, protection of devices, daily covering of devices, uncovering devices for off hours, cleaning, maintenance and replacement of damaged devices in areas where ceiling demolition is scheduled. This will be maintained on a daily basis. If Fire Alarm system is to be shut down temporarily, notify the Construction Manager immediately.	EC	ALL	
Provide temporary tie-ins, devices, equipment, etc. (operational fire alarm, intercom, telephone, security, power, data systems) as required to allow renovated areas to become occupied by the Owner prior to the final overall system replacement. See PROJECT MILESTONE SCHEDULE for turnover dates.	EC		
Maintain the integrity and operation of the existing and new heating and control system during all construction phases. Provide all temporary tie-ins, valves, controls, pumps, equipment protection, second shift work, etc. required to perform the construction, as well as keeping the existing building operational and to meet the requirements for phased occupancy prior to final overall system completion. See the PROJECT MILESTONE SCHEDULE and phasing drawings for phases, completion and occupancy dates.	MC		
Pay particular attention to the existing temperature control system lines scheduled to remain. Proper cutting, capping, terminating and protection shall be provided to keep the system active as required.	MC		
ALL WORK OF DIVISION 02, u.n.o.	GC		
When permanent lighting is required to be removed for the work of other contractors, provide temporary lighting, store and protect the permanent fixtures, and later remove temporary fixtures and reinstall permanent lighting.	EC		
Provide complete all work of Mechanical Demolition - applicable to this scope.	MC		
Provide complete all work of Plumbing Demolition - applicable to this scope.	PC		
Provide complete all work of Electrical Demolition - applicable to this scope.	EC		
Coordinate Hazardous Materials Abatement with Demolition Drawings for all contracts.	GC	ALL	
Asbestos, PCB and lead abatement work indicated in the Contract Documents.	GC	ALL	
Hazardous material abatement on roofs.	GC		
Remove/disconnect existing rooftop mechanical equipment as indicated or required.	MC	GC	
Remove/disconnect existing rooftop electrical equipment as indicated or required.	EC	GC	
Remove/disconnect existing rooftop plumbing / gas equipment as indicated or required.	PC	GC	

Description	1	2	
HVAC demolition in accordance with the contract documents. Include demolition of all existing HVAC systems and components indicated for removal or required to be removed for the completion of new work. Coordinate removals with the other trades. Provide temporary weather protection after removal. Where partial systems are removed, provide temporary caps on systems to remain until they are reconnected, or a permanent cap on systems to be abandoned.	MC	ALL	
Cut, backfill and patch trenches required.	ALL		
Remove and replace all ceilings as shown on the contract documents, for installation of all new work. In areas not receiving a new ceiling, the contractor requiring the access above the ceiling shall include all removals and replacement needed for the work of this Contract. This shall include all ceiling types.	GC	ALL	
Installation of new distribution panels and feeders shall be performed and scheduled to minimize the shut-down time. Coordinate with other trades and District operations with their activities for these areas.	EC	ALL	
Independently support and protect existing wall and ceiling mounted electrical items, panels and equipment on walls and ceilings scheduled to be replaced.	EC		
ALL WORK OF DIVISION 03, u.n.o.	GC		
Provide all loose leveling and setting plates, including grouting, anchor bolts, embedded angles and metal shapes, inserts, sleeves, etc. required for the work which may or may not be shown, unless indicated as provided by other contractors.	GC		
Provide the drilling and grouting of rebar into existing structure as indicated in the documents.	GC		
Flash patching and floor leveling of floors after demolition and existing flooring removals, including the flash patching and leveling of existing slabs scheduled to receive new floor finishes, concrete in-fill where existing walls were removed, and in areas where old thick set tile or terrazzo are scheduled for removal. Include flash patching of cracks and uneven surfaces as required to provide an acceptable substrate for any new finishes.	GC		
Concrete for the work required, such as equipment pads, curbs, thrust blocks, light pole bases, conduit duct banks, etc. Each Prime Contractor shall provide their own demo and install as required for their work.	ALL		
ALL WORK OF DIVISION 04, u.n.o.	GC		
ALL WORK OF DIVISION 05, u.n.o.	GC	ALL	
Provide welding tarps and/or shields to protect the adjacent occupied school and construction workers from weld flash.	ALL		
ALL WORK OF DIVISION 06, u.n.o.	GC		
Provide all blocking for the installation of the work, including in-wall and above ceiling blocking for toilet partitions, lockers, casework, etc.	GC		
Each Prime Contractor shall provide wood blocking and plywood panels required for the work of its contract.	ALL		
Provide wood blocking for the roofing systems and roof top curbs installed on all roofs.	GC		
ALL WORK OF DIVISION 07, u.n.o.	GC	ALL	
Provide roofing and flashing work as required at all roof penetrations of any kind in existing and new roofs as indicated on the Drawings, including penetrations from demolition of existing rooftop equipment. Provide all roofing work in accordance with the existing and new roofing manufacturers' requirements to provide and/or maintain existing and new roof warranties.	GC		
Roof penetrations required by other trades but not indicated on the Roof Drawings shall be the work of the Contractor who requires the penetration.	ALL	GC	
ALL WORK OF DIVISION 07 related to the work to be performed under each contract such as sealants, fire stopping, and sheet metal flashing and trim specified or required.	ALL		
Thru-wall flashing.	GC		
Counter-flashing at roofs.	GC		
Caulking and sealing of all exterior areas (i.e.: brick to brick, brick to roof coping or flashing, brick to existing) and all interior areas (i.e.: window stools to windows, interior drywall to window at the head and jamb, etc.	GC		
Each Contractor shall seal all penetrations and electrical boxes made in fire and sound rated partitions, floors, ceilings and exterior walls. Contractors will provide sleeves for their penetrations through rated walls and will seal the inside and outside of the sleeves.	ALL		
Provide all required support framing indicated in the Documents for work of all other Prime Contracts, such as openings for roof hatches, roof vents, skylights, HVAC and plumbing equipment, etc. in existing and new roof decks and interior and exterior walls. Include the cutting and removal of the existing and new roof deck within the opening when the support has been installed, and include the infill of existing openings that are abandoned. Support framing required but not shown in the Documents for work of other Contracts, such as HVAC / Plumbing / Electrical openings in existing structures, is by the Contract requiring the work.	GC	ALL	
Provide the cutting of all roof openings in the existing and new roof structure and roof membrane as required for new MEP equipment, piping and ductwork, including all necessary structural support framing, wood blocking, flashing and roof patching, to provide a complete and watertight final product, compatible with the existing roof system. MEP Contractors shall provide all cutting and patching otherwise required.	GC	ALL	
MEP Contractors shall provide all equipment roof curbs, equipment supports, duct and piping supports, roof mounted equipment supports, sleeves, etc. Include support frame and block under deck in all areas where support is not indicated on the Drawings as pertaining to the Roofing work.	MEP	GC	
ALL WORK OF DIVISION 08, u.n.o.	GC		

Description	1	2	
Each Prime Contractor shall provide access doors, as specified in Division 08, required by the work performed under their contracts.	ALL		
Each Prime is responsible to furnish access doors, coordinate the exact size and location of access doors prior to wall and ceiling installation. GC to install all access doors.	ALL	GC	
Furnish and install electric door hardware, except for wiring and final connections.	GC	EC	
Wire and connect the electric door hardware as applicable.	EC	GC	
Provide work related to skylights and curbs.	GC		
All interior trim and finishes related to skylight work.	GC		
ALL WORK OF DIVISION 09, u.n.o.	GC		
Each Prime Contractor shall be responsible for work of Division 09 as it relates to the work performed under their contracts, such as floor, wall and ceiling patching, painting, plastering, etc., unless indicated as work of another Prime Contractor.	ALL		
Paint all MEP items exposed in finished, occupiable spaces.	GC		
ALL WORK OF DIVISION 10, u.n.o., except for related Electrical work by EC.	GC	EC	
ALL WORK OF DIVISION 11, u.n.o., except for related work by MEP.	GC	MEP	
ALL WORK OF DIVISION 12, u.n.o., except for related work by MEP.	GC	MEP	
Provide casework cut outs for work of other contracts, including cabinet sinks, cabinet access doors, outlets, data ports, grommets, grilles, etc.	GC	MEP	
ALL WORK OF DIVISION 13, u.n.o.	ALL		
ALL WORK OF DIVISION 14, u.n.o., except for related Electrical work by EC.	GC	EC	
ALL WORK OF DIVISION 22, u.n.o.	PC		
Provide all Plumbing equipment, equipment supports, piping supports, roof mounted equipment supports, sleeves and flashing / counter flashing. Include support frame and blocking under deck in all areas where support is not indicated on the structural drawings.	PC	GC	
ALL WORK OF DIVISION 23, u.n.o.	MC		
Furnish exterior louvers and brick vents.	MC		
Install exterior louvers and brick vents.	MC		
ALL WORK OF DIVISION 26, u.n.o.	EC		
Provide typed panel directories using the Owner's final room numbering system.	EC		
ALL WORK OF DIVISION 27, u.n.o.	EC		
ALL WORK OF DIVISION 28, u.n.o.	EC		
ALL WORK OF DIVISION 31, u.n.o.	ALL		
Each Prime Contractor shall be responsible for the excavation and backfill of utility work installed by them, such as electric service and site lighting, u.n.o. on the drawings or in the specifications.	ALL	SC	
Provide all erosion and sediment control necessary to prevent the contamination and pollution of adjacent areas whether or not shown on the drawings. The erosion control measures shown on the drawings should be considered minimum requirements.	ALL		
Coordinate the location of stockpiled topsoil with the Construction Manager on site. Strip, stockpile and surround all topsoil piles with silt fence.	ALL		
Cutting, patching and restoration of existing site finishes, including site preparation, demolition, excavation, dewatering and backfill to subgrade as required for the work of their contracts.	ALL		
ALL WORK OF DIVISION 32, u.n.o.	ALL		
Cutting, patching and restoration of existing site finishes, including site preparation, demolition, excavation, dewatering and backfill to subgrade as required for the work of their contracts.	ALL		
Provide the lawn restoration to all areas upon removal of the contractor temporary office trailers, storage units, temporary fencing, and disturbances.	ALL		
ALL WORK OF DIVISION 33, u.n.o.	ALL		
Provide all underground utilities noted on the Utility Plans except for underground electric and plumbing.	SC		
Provide underground electric and plumbing utilities noted on the Utility Plans.	EC PC		
Division 31, 32 and 33 work required for the work of each contractor, u.n.o. on the drawings or in the specifications.	ALL	SC	

PART 3 - PRODUCTS (Not Used)

PART 4 - EXECUTION (Not Used)

END OF SECTION 011200

SECTION 01 2100 - ALLOWANCES

PART 1 - GENERAL

1.1 SUMMARY

- A. Section includes administrative and procedural requirements governing allowances.
- B. Types of allowances include the following:
 - 1. Quantity allowances.
 - 2. Contingency allowances.
- C. Related Sections:
 - 1. Division 01 Section "Unit Prices" for procedures for using unit prices.

1.2 SELECTION AND PURCHASE

- A. At the earliest practical date after award of the Contract, advise Architect of the date when final selection and purchase of each product or system described by an allowance must be completed to avoid delaying the Work.
- B. At Architect's request, obtain proposals for each allowance for use in making final selections. Include recommendations that are relevant to performing the Work.
- C. Purchase products and systems selected by Architect from the designated supplier.

1.3 ACTION SUBMITTALS

- A. Submit proposals for purchase of products or systems included in allowances, in the form specified for Change Orders.

1.4 INFORMATIONAL SUBMITTALS

- A. Submit invoices or delivery slips to show actual quantities of materials delivered to the site for use in fulfillment of each allowance.
- B. Submit time sheets and other documentation to show labor time and cost for installation of allowance items that include installation as part of the allowance.
- C. Coordinate and process submittals for allowance items in same manner as for other portions of the Work.

1.5 COORDINATION

- A. Coordinate allowance items with other portions of the Work. Furnish templates as required to coordinate installation.

1.6 QUANTITY ALLOWANCES

- A. Allowance shall include cost to Contractor for products and materials required under the Allowance, and shall also include freight, delivery, receiving, handling, installation, overhead and profit.

1.7 CONTINGENCY ALLOWANCES

- A. Use the contingency allowance only as directed by Construction Manager for Owner's purposes and only by Change Orders that indicate amounts to be charged to the allowance.
- B. Allowance shall include cost to Contractor for products and materials required under the Allowance, and shall also include freight, delivery, receiving, handling, installation, overhead and profit.

- C. The "ALLOWANCE DISBURSEMENT FORM" authorizing use of funds from the contingency allowance will be used.
- D. At Project closeout, unused amounts remaining in the Contingency Allowance will be credited to the Owner via Change Order.

PART 2 - PRODUCTS (Not Applicable)

PART 3 - EXECUTION

3.1 EXAMINATION

- A. Examine products covered by an allowance promptly on delivery for damage or defects. Return damaged or defective products to manufacturer for replacement.

3.2 PREPARATION

- A. Coordinate materials and their installation for each allowance with related materials and installations to ensure that each allowance item is completely integrated and interfaced with related work.

3.3 SCHEDULE OF ALLOWANCES

- A. **CONTRACT 1: GENERAL CONSTRUCTION WORK**
 - 1. Allowance GC-1 (Contingency Allowance): Include a Contingency Allowance of **\$180,000.00** for use according to the Owner's instructions.
- B. **CONTRACT 1: MECHANICAL CONSTRUCTION WORK**
 - 1. Allowance MC-1 (Contingency Allowance): Include a Contingency Allowance of **\$100,000.00** for use according to the Owner's instructions.
- C. **CONTRACT 1: ELECTRICAL CONSTRUCTION WORK**
 - 1. Allowance EC-1 (Contingency Allowance): Include a Contingency Allowance of **\$50,000.00** for use according to the Owner's instructions.
- D. **CONTRACT 1: PLUMBING CONSTRUCTION WORK**
 - 1. Allowance PC-1 (Contingency Allowance): Include a Contingency Allowance of **\$25,000.00** for use according to the Owner's instructions.

END OF SECTION 01 2100

SECTION 01 2300 - ALTERNATES

PART 1 - GENERAL

1.1 SUMMARY

- A. This Section includes administrative and procedural requirements for Alternates.

1.2 DEFINITIONS

- A. Alternate: An amount proposed by bidders and stated on the Bid Form for certain work defined in the Bidding Documents that may be added to, or deducted from, the Base Bid amount if Owner decides to accept a corresponding change either in the amount of construction to be completed or in the products, materials, equipment, systems, or installation methods described in the Contract Documents.
1. The cost or credit for each Alternate is the net addition to, or deduction from, the Contract Sum to incorporate the Alternate into the Work. No other adjustments are made to the Contract Sum.

1.3 PROCEDURES

- A. Coordination: Modify or adjust affected adjacent work as necessary to completely integrate work of the Alternate into the Project.
1. Include as part of each Alternate, miscellaneous devices, accessory objects, and similar items incidental to or required for a complete installation whether or not indicated as part of the Alternate.
- B. Notification: Immediately following award of the Contract, notify each party involved, in writing, of the status of each Alternate. Indicate if Alternates have been accepted, rejected, or deferred for later consideration. Include a complete description of negotiated modifications to Alternates.
- C. Execute accepted Alternates under the same conditions as other work of the Contract.
- D. List of Alternates: Alternates, if any, are included on the Form of Proposal.

PART 2 - PRODUCTS (Not Used)

PART 3 - EXECUTION (Not Used)

END OF SECTION 01 2300

SECTION 01 2500 - SUBSTITUTION PROCEDURES

PART 1 - GENERAL

1.1 GENERAL

- A. Should the Contractor desire to substitute other articles, materials, apparatus, products or processes than those specified or approved as equal, the Contractor shall apply to the Architect in writing for approval of such substitution. It should be noted that the bid shall not be based on a substituted article, material, apparatus, product or process. With the application shall be furnished such information as required by the Architect to demonstrate that the article, material, apparatus, product or process he wishes to use is the equivalent of that specified in quality, finish, design, efficiency and durability and has been elsewhere demonstrated to be equally serviceable for the purpose for which it is intended. The Contractor shall set forth the reasons for desiring to make the substitution and shall further state what difference, if any, will be made in the construction schedule and the contract price for such substitution should it be accepted; it being the intent hereunder that any savings shall accrue to the benefit of the Owner.
- B. The Architect shall reject any such desired substitution as not being specifically named in the contract, or if he shall determine that the adjustment in price in favor of the Owner is insufficient, the Contractor shall immediately proceed to furnish the designated article, material, apparatus, product or process.
- C. Request for substitutes shall conform to the requirements of this Article.
- D. Requests for substitutions shall, include full information concerning differences in cost, and any savings in cost resulting from such substitutions shall be passed on to the Owner.
- E. Requests for utilization of substitutes will be reviewed during the project. The impact on the project and the timeliness of submission will be of key consideration.
- F. The approval of utilization of a substitute is subject to the sole and final discretion of the Architect.

1.2 SUMMARY

- A. Section includes administrative and procedural requirements for substitutions.
- B. Related Sections:
 - 1. Division 01 Section "Allowances" for products selected under an allowance.
 - 2. Division 01 Section "Product Requirements" for requirements for submitting comparable product submittals for products by listed manufacturers.
 - 3. Division 01 Section "Submittals" for submittal procedures.
 - 4. Divisions 02 through 49 Sections for specific requirements and limitations for substitutions.

1.3 DEFINITIONS

- A. Substitutions: Changes in products, materials, equipment, and methods of construction from those required by the Contract Documents and proposed by Contractor.
 - 1. Substitutions for Cause: Changes proposed by Contractor that are required due to changed Project conditions, such as unavailability of product, regulatory changes, or unavailability of required warranty terms.
 - 2. Substitutions for Convenience: Changes proposed by Contractor or Owner that are not required in order to meet other Project requirements but may offer advantage to Contractor or Owner.

- B. Substitute Items (Or Equal): If in Architect/Engineer's sole discretion an item of material or equipment proposed by Contractor does not qualify as an "or-equal" item it will be considered a proposed substitute item.

1.4 ACTION SUBMITTALS

- A. Substitution Requests: Submit three copies of each request for consideration. Identify product or fabrication or installation method to be replaced. Include Specification Section number and title and Drawing numbers and titles.
1. Substitution Request Form: Use CSI Form 13.1A.
 2. Documentation: Show compliance with requirements for substitutions and the following, as applicable:
 - a. Statement indicating why specified product or fabrication, or installation cannot be provided, if applicable.
 - b. Coordination information, including a list of changes or revisions needed to other parts of the Work and to construction performed by Owner and separate contractors that will be necessary to accommodate proposed substitution.
 - c. Detailed comparison of significant qualities of proposed substitution with those of the Work specified. Include annotated copy of applicable Specification Section. Significant qualities may include attributes such as performance, weight, size, durability, visual effect, sustainable design characteristics, warranties, and specific features and requirements indicated. Indicate deviations, if any, from the Work specified.
 - d. Product Data, including drawings and descriptions of products and fabrication and installation procedures.
 - e. Samples, where applicable or requested.
 - f. Certificates and qualification data, where applicable or requested.
 - g. List of similar installations for completed projects with project names and addresses and names and addresses of architects and owners.
 - h. Material test reports from a qualified testing agency indicating and interpreting test results for compliance with requirements indicated.
 - i. Research reports evidencing compliance with building code in effect for Project, from ICC-ES.
 - j. Detailed comparison of Contractor's construction schedule using proposed substitution with products specified for the Work, including effect on the overall Contract Time. If specified product or method of construction cannot be provided within the Contract Time, include letter from manufacturer, on manufacturer's letterhead, stating date of receipt of purchase order, lack of availability, or delays in delivery.
 - k. Cost information, including a proposal of change, if any, in the Contract Sum.
 - l. Contractor's certification that proposed substitution complies with requirements in the Contract Documents except as indicated in substitution request, is compatible with related materials, and is appropriate for applications indicated.
 - m. Contractor's waiver of rights to additional payment or time that may subsequently become necessary because of failure of proposed substitution to produce indicated results.
 - n. See additional requirements in Article 2.3 DETAILED SUBSTITUTION PROCEDURES
 3. Architect's Action: If necessary, Architect will request additional information or documentation for evaluation within five days of receipt of a request for substitution. Architect will notify Contractor through Construction Manager of acceptance or rejection of proposed substitution within 10 days of receipt of request, or five days of receipt of additional information or documentation, whichever is later.

- a. Forms of Acceptance: Change Order, Construction Change Directive, or Architect's Supplemental Instructions for minor changes in the Work.
- b. Use product specified if Architect does not issue a decision on use of a proposed substitution within time allocated.

1.5 QUALITY ASSURANCE

- A. Compatibility of Substitutions: Investigate and document compatibility of proposed substitution with related products and materials. Engage qualified testing agency to perform compatibility tests recommended by manufacturers.

PART 2 - PRODUCTS

2.1 SUBSTITUTION PROCEDURES (GENERAL)

- A. Conditions: After the 'Notice of Award' and prior to the Contractor entering into a Formal Contract with the Owner, the Architect will consider Contractor's request for substitution when the following conditions are satisfied. If the following conditions are not satisfied, Architect will return requests without action, except to record noncompliance with these requirements:
 1. Requested substitution is consistent with the Contract Documents and will produce indicated results.
 2. Substitution results in substantial cost savings to the Owner or substantial performance improvements.
 3. Substitution request is fully documented and properly submitted.
 4. Requested substitution will not adversely affect Contractor's construction schedule.
 5. Requested substitution has received necessary approvals of authorities having jurisdiction.
 6. Requested substitution is compatible with other portions of the Work.
 7. Requested substitution has been coordinated with other portions of the Work.
 8. Requested substitution provides specified warranty.
 9. If requested substitution involves more than one contractor, requested substitution has been coordinated with other portions of the Work, is uniform and consistent, is compatible with other products, and is acceptable to all contractors involved.
 10. The substitution is submitted in compliance with Article 2.3 DETAILED SUBSTITUTION PROCEDURES
- B. If the Contractor does not present 'Substitutions' in the time frame noted above any future requests to substitute products will not be considered, unless the substitution is for cause.
- C. Coordination: Modify or adjust affected work as necessary to integrate work of the approved substitutions.

2.2 SUBSTITUTIONS

- A. Substitutions for Cause: Submit requests for substitution immediately upon discovery of need for change, but not later than 20 days prior to time required for preparation and review of related submittals.
 1. Architect will consider Contractor's request for substitution when the following conditions are present.
 - a. The specified product is not available
 - b. The specified product cannot be delivered in the time frame required under the Project Schedule.
 2. Conditions: Architect will consider Contractor's request for substitution when the following conditions are satisfied. If the following conditions are not satisfied, Architect

will return requests without action, except to record noncompliance with these requirements:

- a. Requested substitution is consistent with the Contract Documents and will produce indicated results.
- b. Substitution request is fully documented and properly submitted.
- c. Requested substitution will not adversely affect Contractor's construction schedule.
- d. Requested substitution has received necessary approvals of authorities having jurisdiction.
- e. Requested substitution is compatible with other portions of the Work.
- f. Requested substitution has been coordinated with other portions of the Work.
- g. Requested substitution provides specified warranty.
- h. If requested substitution involves more than one contractor, requested substitution has been coordinated with other portions of the Work, is uniform and consistent, is compatible with other products, and is acceptable to all contractors involved.

B. Substitutions for Convenience: Architect will consider requests for substitution if received within 60 days after the Notice of Award and based on the following

1. The proposed product substitution will result in a significant cost savings to the Owner.
2. The proposed product has substantial performance improvements.
3. The proposed product can be provided much earlier in the schedule enhancing the project completion date.
4. The proposed product warranty is superior to the specified item.

2.3 DETAILED SUBSTITUTION REVIEW PROCEDURES

A. The Architect in addition to the requirements listed above will require compliance with the following requirements and procedures.

1. Requests for approval of substitutions will be received and considered from Prime Contractors only and not from manufacturers, suppliers, Subcontractors, or other third parties.
2. If the materials and equipment submitted are offered as substitutions to the Contract Documents or approved equal, the Contractor shall advise the Owner and the Architect of the requested substitutions and comply with the requirements hereinafter specified in this Article.
3. Where the acceptability of substitution is conditioned upon a record of and the proposed substitution does not fulfill this requirement, the Architect, at the Architect's sole discretion, may accept the substitution if the Contractor provides a bond or cash deposit which guarantees replacement at no cost to the Owner for any failure occurring within a specified time. The substitution item must meet all other technical requirements contained in the Specification.
4. The Contractor shall furnish such information as required by the Architect to demonstrate that the equal article, material, apparatus, product or process is the equivalent of that specified in quality, finish, design, efficiency and durability and has been elsewhere demonstrated to be equally serviceable for the purpose for which it is intended and/or that it offers substantial benefits to the Owner in saving of time and/or cost. The Contractor shall set forth the reasons for desiring to make this substitution.
5. Contractor shall submit:
 - a. For each proposed request for approved substitute sufficient details, complete descriptive literature and performance data together with samples of the materials, where feasible, to enable the Architect to determine if the proposed

- request for approval should be granted, including manufacturer's brand or trade names, model numbers, description of specification of item, performance data, test reports, samples, history of service, and other data as applicable.
 - b. Certified tests, where applicable, by an independent laboratory attesting to the performance of the substitute.
 - c. A list of installations where the proposed substitute equipment or materials is performing under similar conditions as specified.
 - d. A list of installations where the proposed substitute equipment or materials is performing under similar conditions as specified.
- 6. Where the approval of a substitute requires revision or redesign of any part of Work, including that of other Contracts, all such revision and redesign, and all new drawings and details required therefore, shall be provided by the Contractor at its own cost and expense, and shall be subject to the approval of the Architect.
- 7. In the event that the Architect is required to provide additional services, then the Architect's charges for such additional services shall be paid by the Contractor to the Owner.
- 8. Any modifications in the Work required under other contracts to accommodate the changed design will be incorporated in the appropriate contracts and any resulting increases in contract prices will be charged to the Contractor by the Owner who initiated the changed design.
- 9. In all cases, the Architect shall be the judge as to whether a proposed substitute is to be approved. The Contractor shall be bound by the Architect's decision. No substitute items shall be used in the Work without written approval of the Architect.
- 10. In making request for approval of substitute, Contractor represents that:
 - a. Contractor has investigated proposed substitute, and determined that it is equal to or superior in all respects to the product, manufacturer or method specified or offers other specified advantages to the Owner.
 - b. Contractor will provide the same or better warranties or bonds for proposed substitute as for product, manufacturer or method specified.
 - c. Contractor waives all claims for additional costs or extension of time related to proposed substitute that subsequently may become apparent.
 - d. Contractor shall have and make no claim for an extension of time or for damages by reason of the time taken by the Architect in considering a substitute proposed by the Contractor or by reason of failure of the Architect to approve a substitute proposed by the Contractor. Any delays arising out of consideration, approval, or utilization of a substitute shall be the sole responsibility of the Contractor requesting the substitute and it shall arrange its operations to make up the time lost.
- 11. Proposed substitute will not be accepted if:
 - a. Acceptance will require substantial revision of Contract Documents.
 - b. Acceptance will substantially change design concepts or Technical Specifications.
 - c. Acceptance will delay completion of the Work, or the Work of other Contractors.
 - d. If the Substitute item is not accompanied by formal request for approval of substitute from Contractor.
- 12. The Architect reserves the right to disapprove, for aesthetic reasons, any material or equipment on the basis of design or color considerations alone, without prejudice to the

quality of the material or equipment, if the manufacturer cannot meet the required colors or design.

13. All requests for approval of substitutes of materials or other changes from the contract requirements shall be accompanied by an itemized list of all other items affected by such substitution or change. The Architect shall have the right, if such is not done, to rescind any approvals for substitutions and to order such Work removed and replaced with Work conforming to the specified requirements of the contract, all at the Contractor's expense, or to assess all additional costs resulting from the substitution to the Contractor.
 14. Approval of a substitute will not relieve Contractor from the requirement to submit Shop Drawings or any of the provisions of the Contract Documents.
 15. In the event that the Architect is required to provide additional services as a result of a request for approval of a substitute results in changes by the Contractor in dimension, weight, power requirements, etc., of the equipment and accessories furnished, or as a result of Contractor's errors, omissions or failure to conform to the requirements of the Contract Documents or if the Architect is required to examine and evaluate any changes proposed by the Contractor solely for the convenience of the Contractor, or for evaluation of deviations from Contract Documents, then the Architect's charges in connection with such additional services shall be paid by the Contractor.
 16. Structural design shown on the Drawings is based upon the configuration of and maximum loading for major items of equipment as indicated on the Drawings and as specified. If the substituted equipment furnished differs from said features, the Contractor shall pay to the Owner all costs of redesign and for any construction changes required to accommodate the equipment furnished, including the Architect's charges in connection therewith.
- B. The Contractor shall respond to required submittals with complete information and with a degree of accuracy to achieve approvals within two (2) submissions. All costs to the Architect involved with subsequent submissions of Shop Drawings, Samples or other items requiring approval, will be paid by the Contractor to the Owner, by deducting such costs from payments due for Work completed. In the event an approved item is requested by the Contractor to be changed or substituted for, all costs involved in the reviewing and approval process will likewise be backcharged to the Contractor unless determined by the Architect that the need for such substitution and/or deviation from Contract Documents is beyond the control of the Contractor.

PART 3 - EXECUTION (Not Applicable)

END OF SECTION 012500

SECTION 012519 - EQUIVALENTS

PART 1 - GENERAL

1.1 SUMMARY:

- A. Requirements set forth herein pertain to products specified in divisions included in project manual.

1.2 DEFINITIONS:

- A. For the purpose of this contract, the words "similar", "equal to", "or equal", "equivalent" and such other words of similar content and meaning, shall be deemed to mean similar and equal to one of named products.
- B. For the purpose of bidding documents, the word "products" shall be deemed to include the words "articles", "materials", "items", "equipment" and "methods". Whenever in contract documents one or more products are specified, words "similar, equivalent, and equal to" shall be deemed inserted.

1.3 EQUIVALENTS:

- A. Where, in these specifications or on drawings, certain kinds, types, brands, or manufacturers of materials are named, they shall be regarded as required standard of quality. Where two or more are named these are presumed to be equal, and Contractor may select one of those items.
- B. If Contractor desires to use any kind, type, brand, or manufacturer of material other than those named in specification, he may submit the request for approval to the Architect well in advance of the bid date.
- C. Requests for approval of proposed equivalents will be received by Architect only from the Contractor.
- D. If the Architect approves a proposed equivalent prior to receipt of Bids, such approval will be set forth in an Addendum.
- E. After the bid opening the apparent low bidder or bidders will be notified by the Architect or Owner and shall submit to the Architect in writing, within ten (10) calendar days what equivalent kind, type, brand, or manufacture is included in bid in lieu of specified items. No equivalents will be considered after this submission.
- F. Contractor shall have burden of proving, at Contractor's own cost and expense, to satisfaction of Owner/Architect, that proposed product is similar and equal to named product. In making such determination Owner/Architect will be sole judge of objective and appearance criteria that proposed product must meet in order for it to be approved.
 - 1. Supporting data on equivalency is responsibility of bidder. For each equivalent to base specification, included in products list, submit information describing in specific detail -
 - a. Wherein it differs from quality and performance required by base specification.
 - b. Changes required in other elements of work because of equivalent.
 - c. Effect on construction schedule.
 - d. Any required license fees or royalties.
 - e. Availability of maintenance service, and source of replacement materials.
 - f. Such other information as may be required by Owner.

- G. Owner, through Architect, shall be judge of acceptability of proposed equivalents. Risk of whether bid equivalents will be accepted is borne by Contractor.

1.4 CONTRACTOR'S REPRESENTATION:

- A. Submission of an equivalent product and/or material constitutes a representation that Contractor:
1. Has investigated proposed product and determined it is equal to or superior in all respects to that specified.
 2. Will provide same warranties or bonds for equivalent as for product specified.
 3. Will coordinate installation of an accepted equivalent into work and make such other changes as may be required to make work complete in all respects.
 4. Waives all claims for additional costs, under his responsibility, which may subsequently become apparent.
 5. Will provide, at own cost and expense, any different quantity and/or arrangement of ductwork, piping, wiring, conduit or any part of work from that specified, detailed or indicated in Contract Documents if required for proper installation of an approved equivalent.
 6. Will provide, at own cost and expense, all such revision and redesign and all new drawings and details required by Architect for approval if proposed equivalent product requires a revision or redesign of any part of work covered by this contract.

1.5 EQUIVALENT CERTIFICATION:

- A. Contractor must sign the "Equivalent Certification" following this specification section and deliver it to the Architect along with a complete list of proposed equivalents within ten (10) calendar days after notification from the Architect or Owner. This is mandatory and must be done prior to award of contracts.

END OF SECTION 012519

EQUIVALENT CERTIFICATION

Project Name - Pine Bush Central School District – 2019 Capital Improvement Project – Phase II

Project Address- 156 NY-302, Pine Bush, NY 12566 (District Offices)

PROJECT NO: 14533.05

Reviewed Material: AIA A701 – 2007 or 2018 Instructions to Bidders:

AIA A201 General Conditions of the Contract

Specification Section: 012519 – Equivalents

Specification Section: 016000 – Product Requirements

Check the following box that applies:

☐

No equivalents are proposed.

☐

Proposed equivalents are attached with supporting data as per Section 012519.

All equivalents are hereby presented to Architect and Owner for approval. No future equivalents will be considered.

Signature of Contractor

Date

Printed Name of Contractor

Approved as Noted
Signature of Reviewer

Date

Printed Name of Reviewer

SECTION 01 2600 - CONTRACT MODIFICATION PROCEDURES

PART 1 - GENERAL

1.1 SUMMARY

- A. Section includes administrative and procedural requirements for handling and processing Contract modifications.
- B. Related Sections:
 - 1. Division 01 Section "Product Requirements" for administrative procedures for handling requests for substitutions made after Contract award.

1.2 MINOR CHANGES IN THE WORK

- A. Architect will issue through Construction Manager supplemental instructions authorizing minor changes in the Work, not involving adjustment to the Contract Sum or the Contract Time, on the Information Bulletin bound in the Project Forms Section of Project Manual

1.3 PROPOSAL REQUESTS

- A. Owner-Initiated Proposal Requests: Architect through Construction Manager will issue a detailed description of proposed changes in the Work that may require adjustment to the Contract Sum or the Contract Time. If necessary, the description will include supplemental or revised Drawings and Specifications.
 - 1. Proposal Requests issued by Architect are not instructions either to stop work in progress or to execute the proposed change.
 - 2. Within time specified in Proposal Request or 10 days, when not otherwise specified, after receipt of Proposal Request, submit a quotation estimating cost adjustments to the Contract Sum and the Contract Time necessary to execute the change.
 - a. Include a list of quantities of products required or eliminated and unit costs, with total amount of purchases and credits to be made. If requested, furnish survey data to substantiate quantities.
 - b. Indicate applicable taxes, delivery charges, equipment rental, and amounts of trade discounts.
 - c. Include costs of labor and supervision directly attributable to the change.
 - d. Include an updated Contractor's construction schedule that indicates the effect of the change, including, but not limited to, changes in activity duration, start and finish times, and activity relationship. Use available total float before requesting an extension of the Contract Time.
- B. Contractor-Initiated Proposals: If latent or changed conditions require modifications to the Contract, Contractor may initiate a claim by submitting a request for a change to Construction Manager.
 - 1. Include a statement outlining reasons for the change and the effect of the change on the Work. Provide a complete description of the proposed change. Indicate the effect of the proposed change on the Contract Sum and the Contract Time.
 - 2. Include a list of quantities of products required or eliminated and unit costs, with total amount of purchases and credits to be made. If requested, furnish survey data to substantiate quantities.
 - 3. Indicate applicable taxes, delivery charges, equipment rental, and amounts of trade discounts.
 - 4. Include costs of labor and supervision directly attributable to the change.
 - 5. Include an updated Contractor's construction schedule that indicates the effect of the change, including, but not limited to, changes in activity duration, start and finish times, and activity relationship. Use available total float before requesting an extension of the Contract Time.

6. Comply with requirements in Division 01 Section "Substitution Procedures" if the proposed change requires substitution of one product or system for product or system specified.

1.4 ALLOWANCES

- A. Allowance Adjustment: To adjust allowance amounts, base each Change Order proposal on the difference between purchase amount and the allowance, multiplied by final measurement of work-in-place. If applicable, include reasonable allowances for cutting losses, tolerances, mixing wastes, normal product imperfections, and similar margins.
 1. Include installation costs in purchase amount only where indicated as part of the allowance.
 2. If requested, prepare explanation and documentation to substantiate distribution of overhead costs and other margins claimed.
 3. Submit substantiation of a change in scope of work, if any, claimed in Change Orders related to unit-cost allowances.
 4. Owner reserves the right to establish the quantity of work-in-place by independent quantity survey, measure, or count.
- B. Submit claims for increased costs because of a change in scope or nature of the allowance described in the Contract Documents, whether for the Purchase Order amount or Contractor's handling, labor, installation, overhead, and profit. Submit claims within 5 days of receipt of the Change Order or Construction Change Directive authorizing work to proceed. Owner will reject claims submitted later than 5 days after such authorization.
 1. Do not include Contractor's or subcontractor's indirect expense in the Change Order cost amount unless it is clearly shown that the nature or extent of work has changed from what could have been foreseen from information in the Contract Documents.
 2. No change to Contractor's indirect expense is permitted for selection of higher- or lower-priced materials or systems of the same scope and nature as originally indicated.

1.5 ADMINISTRATIVE CHANGE ORDERS

- A. Allowance Adjustment: Refer to Division 01 Section "Allowances" for administrative procedures for preparation of Change Order Proposal for adjusting the Contract Sum to reflect actual costs of allowances.
- B. Unit Price Adjustment: Refer to Division 01 Section "Unit Prices" for administrative procedures for preparation of Change Order Proposal for adjusting the Contract Sum to reflect measured scope of unit price work.

1.6 CHANGE ORDER PROCEDURES

- A. On Owner's approval of a Proposal Request, Architect through Construction Manager will issue a Change Order for signatures of Owner and Contractor on the Information Bulletin bound in the Project Forms Section of Project Manual.

1.7 CONSTRUCTION CHANGE DIRECTIVE

- A. Construction Change Directive: Architect through Construction Manager may issue a Construction Change Directive on the Information Bulletin bound in the Project Forms Section of Project Manual.
- B. Construction Change Directive instructs Contractor to proceed with a change in the Work, for subsequent inclusion in a Change Order.
 1. Construction Change Directive contains a complete description of change in the Work. It also designates method to be followed to determine change in the Contract Sum or the Contract Time.

- C. Documentation: Maintain detailed records on a time and material basis of work required by the Construction Change Directive.
1. After completion of change, submit an itemized account and supporting data necessary to substantiate cost and time adjustments to the Contract.

PART 2 - PRODUCTS (Not Applicable)

PART 3 - EXECUTION (Not Applicable)

END OF SECTION 01 2600

SECTION 01 2900 - PAYMENT PROCEDURES

PART 1 - GENERAL

1.1 SUMMARY

- A. This Section specifies administrative and procedural requirements necessary to prepare and process Applications for Payment.

1.2 SCHEDULE OF VALUES

- A. Coordination: Correlate line items in the schedule of values with other required administrative forms and schedules, including the following:
1. Application for Payment forms with continuation sheets.
 2. Submittal schedule.
 3. Submit the schedule of values to Architect through Construction Manager at earliest possible date but no later than seven days before the date scheduled for submittal of initial Applications for Payment.
- B. Format and Content: Use the Project Manual table of contents as a guide to establish line items for the schedule of values.
1. Identification: Include the following Project identification on the schedule of values:
 - a. Project name and location.
 - b. Name of Architect and Construction Manager.
 - c. Architect's project number.
 - d. Contractor's name and address.
 - e. Date of submittal.
 2. Arrange the schedule of values in tabular form with separate columns to indicate the following for each item listed:
 - a. Related Specification Section or Division.
 - b. Description of the Work.
 - c. Name of subcontractor.
 - d. Name of manufacturer or fabricator.
 - e. Name of supplier.
 - f. Change Orders (numbers) that affect value.
 - g. Dollar value of the following, as a percentage of the Contract Sum to nearest one-hundredth percent, adjusted to total 100 percent.
 - 1) Labor.
 - 2) Materials.
 - 3) Equipment.
 3. Provide a breakdown of the Contract Sum in enough detail to facilitate continued evaluation of Applications for Payment and progress reports. Provide multiple line items for principal subcontract amounts where appropriate.
 4. For New York State School facilities each school shall be separately broken down and detailed.
 5. The following line items must be included on the continuation sheet.
 - a. Project Bonds and Insurances
 - b. Mobilization
 - c. Shop Drawings
 - d. Project Meetings
 - e. Temporary Heat (where applicable)
 - f. Progress Cleaning
 - g. Lawn and Tree Watering (where applicable to establish new lawns and trees)
 - h. Punch List
 - i. Final Cleaning

- j. Close Out documents and Warranties
- 6. Round amounts to nearest whole dollar; total shall equal the Contract Sum.
- 7. Submit draft of AIA Document G703 Continuation Sheets.
- 8. Allowances: Provide a separate line item in the schedule of values for each allowance. Show line-item value of unit-cost allowances, as a product of the unit cost, multiplied by measured quantity. Use information indicated in the Contract Documents to determine quantities.
- 9. Each item in the schedule of values and Applications for Payment shall be complete. Include total cost and proportionate share of general overhead and profit for each item.
 - a. Temporary facilities and other major cost items that are not direct cost of actual work-in-place may be shown either as separate line items in the schedule of values or distributed as general overhead expense, at Contractor's option.
- 10. Schedule Updating: Update and resubmit the schedule of values before the next Applications for Payment when Change Orders or Construction Change Directives result in a change in the Contract Sum.

1.3 APPLICATIONS FOR PAYMENT

- A. Each Application for Payment shall be consistent with previous applications and payments as certified by Architect and Construction Manager and paid for by Owner.
 - 1. Initial Application for Payment, Application for Payment at time of Substantial Completion, and final Application for Payment involve additional requirements.
- B. Payment Application Times: Submit Application for Payment to Construction Manager by the 25th of the month. The period covered by each Application for Payment is one month, ending on the last day of the month.
 - 1. Submit draft copy of Application for Payment five days prior to due date for review by Architect. (Work to be projected out to the end of the pay period).
- C. Application for Payment Forms: Use AIA Document G702/CMA and AIA Document G703 as form for Applications for Payment.
- D. Application Preparation: Complete every entry on form. Notarize and execute by a person authorized to sign legal documents on behalf of Contractor. Construction Manager will return incomplete applications without action.
 - 1. Entries shall match data on the schedule of values and Contractor's construction schedule. Use updated schedules if revisions were made.
 - 2. Include amounts for work completed following previous Application for Payment, whether or not payment has been received. Include only amounts for work completed at time of Application for Payment.
 - 3. Include amounts of Change Orders and Construction Change Directives issued before last day of construction period covered by application.
 - 4. The OWNER shall retain five percent (5%) of the amount due on each Application for both the work completed and materials stored. The OWNER reserves the right to retain a greater percentage in the event the CONTRACTOR fails to make satisfactory progress or in the event there is other specific cause for greater withholding.
- E. Stored Materials: Include in Application for Payment amounts applied for materials or equipment purchased or fabricated and stored, but not yet installed. Differentiate between items stored on-site and items stored off-site.
 - 1. Provide certificate of insurance, evidence of transfer of title to Owner, and consent of surety to payment, for stored materials.
 - 2. Provide supporting documentation that verifies amount requested, such as paid invoices. Match amount requested with amounts indicated on documentation; do not include overhead and profit on stored materials.

- F. Provide copies of payrolls (including subcontractors) that are signed and notarized, documenting compliance with prevailing wage requirements.
1. Per NYS Workman's Compensation Board copies of all payroll records for all out of state contractors shall be retained on the worksite for inspection is required by the Labor Dept.
- G. Transmittal: Submit three signed and notarized original copies of each Application for Payment to Construction Manager by a method ensuring receipt. One copy shall include waivers of lien and similar attachments if required.
- H. Waivers of Mechanic's Lien: With each Application for Payment, submit waivers of mechanic's liens from subcontractors, sub-subcontractors, and suppliers for construction period covered by the previous application.
1. Submit partial waivers on each item for amount requested in previous application, after deduction for retainage, on each item.
 2. When an application shows completion of an item, submit conditional final or full waivers.
 3. Owner reserves the right to designate which entities involved in the Work must submit waivers.
 4. Waiver Forms: Submit waivers of lien on forms, executed in a manner acceptable to Owner.
- I. Initial Application for Payment: Administrative actions and submittals that must precede submittal of first Application for Payment include the following:
1. List of Substitutions
 2. Contract or Notice to Proceed.
 3. Performance and Payment bonds.
 4. Liability, Auto, and Umbrella Insurance
 5. Worker Compensation certificates
- J. Initial Application for Payment: Administrative actions and submittals that must coincide submittal of first Application for Payment include the following:
1. Schedule of values.
 2. List of subcontractors
 3. Contractors Safety Program
 4. Contractor's construction schedule (preliminary if not final).
 5. Submittal schedule (preliminary if not final).
 - a. First Payment **WILL NOT** be processed without a Submittal Schedule.
 6. Emergency Contacts List
 7. Certified Payroll
 8. Schedule of unit prices.
 9. List of Contractor's staff assignments.
 10. List of Contractor's principal consultants.
 11. Copies of authorizations and licenses from authorities having jurisdiction for performance of the Work.
 12. Report of preconstruction conference.
- K. Application for Payment at Substantial Completion: After issuing the Certificate of Substantial Completion, submit an Application for Payment showing 100 percent completion for portion of the Work claimed as substantially complete.
1. Administrative actions and submittals that shall precede or coincide with this application include:
 - a. Occupancy permits and similar approvals
 - b. List of incomplete Work, recognized as exceptions to Architect's Certificate of Substantial Completion
 - c. Record Drawings and Specifications

- d. Operations and Maintenance Manuals
 - e. Maintenance Instructions and Training
 - f. Start-up performance reports
 - g. Test/adjust/balance records
 - h. Warranties (guarantees) and maintenance agreements
 - i. Final cleaning
 - j. Change-over information related to Owner's occupancy, use, operation and maintenance
 - k. Application for reduction of retainage and consent of surety
 2. Include documentation supporting claim that the Work is substantially complete and a statement showing an accounting of changes to the Contract Sum.
 3. This application shall reflect Certificates of Partial Substantial Completion issued previously for Owner occupancy of designated portions of the Work.
- L. Final Payment Application: Submit final Application for Payment with releases and supporting documentation not previously submitted and accepted, including, but not limited, to the following:
1. Ensure that incomplete Work is not accepted and will be completed without undue delay.
 2. Submit final Application for Payment with or preceded by conditional final waivers from every entity involved with performance of the Work covered by the application who is lawfully entitled to a lien.
 3. Evidence of completion of Project closeout requirements.
 4. Insurance certificates for products and completed operations where required and proof that taxes, fees, and similar obligations were paid.
 5. Updated final statement, accounting for final changes to the Contract Sum.
 6. AIA Document G706, "Contractor's Affidavit of Payment of Debts and Claims."
 7. AIA Document G706A, "Contractor's Affidavit of Release of Liens."
 8. AIA Document G707, "Consent of Surety to Final Payment."
 9. Removal of temporary facilities and services
 10. Removal of surplus materials, rubbish, and similar elements

PART 2 - PRODUCTS (Not Applicable)

PART 3 - EXECUTION (Not Applicable)

END OF SECTION 01 2900

SECTION 01 3100 - PROJECT MANAGEMENT AND COORDINATION

PART 1 - GENERAL

1.1 SUMMARY

- A. Section includes administrative provisions for coordinating construction operations on Project including, but not limited to, the following:
 - 1. General project coordination procedures.
 - 2. Administrative and supervisory personnel.
 - 3. Coordination drawings.
 - 4. Requests for Information (RFIs).
 - 5. Project meetings.
- B. Each contractor shall participate in coordination requirements. Certain areas of responsibility are assigned to a specific contractor.
- C. Related Sections:
 - 1. Division 01 Section "Multiple Contract Summary" for a description of the division of work among separate contracts and responsibility for coordination activities not in this Section.
 - 2. Division 01 Section "Construction Progress Documentation" for preparing and submitting Contractor's construction schedule.
 - 3. Division 01 Section "Execution" for procedures for coordinating general installation and field-engineering services, including establishment of benchmarks and control points.
 - 4. Division 01 Section "Closeout Procedures" for coordinating closeout of the Contract.

1.2 DEFINITIONS

- A. RFI: Request from Owner, Construction Manager, Architect, or Contractor seeking information from each other during construction.

1.3 INFORMATIONAL SUBMITTALS

- A. Subcontract list is required by AIA Document A201 to be submitted as soon as practical prior to award of the Contract. Coordinate with submittal requirements for subcontract list in Procurement Requirements and Contracting Requirements if any.
- B. Subcontract List: Prepare a written summary identifying individuals or firms proposed for each portion of the Work, including those who are to furnish products or equipment fabricated to a special design. Use form provided in specification section 003310 of the Project Manual Include the following information in tabular form:
 - 1. Name, address, and telephone number of entity performing subcontract or supplying products.
 - 2. Number and title of related Specification Section(s) covered by subcontract.
 - 3. Drawing number and detail references, as appropriate, covered by subcontract.
- C. Key Personnel Names: Within 15 days of starting construction operations, submit a list of key personnel assignments, including superintendent and other personnel in attendance at Project site. Identify individuals and their duties and responsibilities; list addresses and telephone numbers, including home, office, and cellular telephone numbers and e-mail addresses. Provide names, addresses, and telephone numbers of individuals assigned as alternates in the absence of individuals assigned to Project.
 - 1. Post copies of list in project meeting room, in temporary field office, and by each temporary telephone. Keep list current at all times.

1.4 COORDINATION

1. Schedule construction operations in sequence required to obtain the best results where installation of one part of the Work depends on installation of other components, before or after its own installation.
 2. Coordinate installation of different components to ensure maximum performance and accessibility for required maintenance, service, and repair.
 3. Make adequate provisions to accommodate items scheduled for later installation.
- B. Coordination: Each contractor shall coordinate its construction operations with those of other contractors and entities to ensure efficient and orderly installation of each part of the Work. Each contractor shall coordinate its operations with operations, included in different Sections that depend on each other for proper installation, connection, and operation.
1. Schedule construction operations in sequence required to obtain the best results where installation of one part of the Work depends on installation of other components, before or after its own installation.
 2. Coordinate installation of different components with other contractors to ensure maximum performance and accessibility for required maintenance, service, and repair.
 3. Make adequate provisions to accommodate items scheduled for later installation.
- C. Prepare memoranda for distribution to each party involved, outlining special procedures required for coordination. Include such items as required notices, reports, and list of attendees at meetings.
1. Prepare similar memoranda for Owner and separate contractors if coordination of their Work is required.
- D. Administrative Procedures: Coordinate scheduling and timing of required administrative procedures with other construction activities and activities of other contractors to avoid conflicts and to ensure orderly progress of the Work. Such administrative activities include, but are not limited to, the following:
1. Preparation of Contractor's construction schedule.
 2. Preparation of the schedule of values.
 3. Installation and removal of temporary facilities and controls.
 4. Delivery and processing of submittals.
 5. Progress meetings.
 6. Pre installation conferences.
 7. Project closeout activities.
 8. Startup and adjustment of systems.
 9. Project closeout activities.
- E. Conservation: Coordinate construction activities to ensure that operations are carried out with consideration given to conservation of energy, water, and materials. Coordinate use of temporary utilities to minimize waste.
1. Salvage materials and equipment involved in performance of, but not actually incorporated into, the Work.

1.5 COORDINATION DRAWINGS

- A. Coordination Drawings, General: Prepare coordination drawings in accordance with requirements in individual Sections, where installation is not completely shown on Shop Drawings, where limited space availability necessitates coordination, or if coordination is required to facilitate integration of products and materials fabricated or installed by more than one entity.
1. Content: Project-specific information, drawn accurately to a scale large enough to indicate and resolve conflicts. Do not base coordination drawings on standard printed data. Include the following information, as applicable:

- a. Use applicable Drawings as a basis for preparation of coordination drawings. Prepare sections, elevations, and details as needed to describe relationship of various systems and components.
 - b. Coordinate the addition of trade-specific information to the coordination drawings by multiple contractors in a sequence that best provides for coordination of the information and resolution of conflicts between installed components before submitting for review.
 - c. Indicate functional and spatial relationships of components of architectural, structural, civil, mechanical, and electrical systems.
 - d. Indicate space requirements for routine maintenance and for anticipated replacement of components during the life of the installation.
 - e. Show location and size of access doors required for access to concealed dampers, valves, and other controls.
 - f. Indicate required installation sequences.
 - g. Indicate dimensions shown on the Drawings. Specifically note dimensions that appear to be in conflict with submitted equipment and minimum clearance requirements. Provide alternate sketches to Architect indicating proposed resolution of such conflicts. Minor dimension changes and difficult installations will not be considered changes to the Contract.
- B. Coordination Drawing Organization: Organize coordination drawings as follows:
1. Floor Plans and Reflected Ceiling Plans: Show architectural and structural elements, and mechanical, plumbing, fire protection, fire alarm, and electrical Work. Show locations of visible ceiling-mounted devices relative to acoustical ceiling grid. Supplement plan drawings with section drawings where required to adequately represent the Work.
 2. Plenum Space: Indicate sub framing for support of ceiling and wall systems, mechanical and electrical equipment, and related Work. Locate components within ceiling plenum to accommodate layout of light fixtures indicated on Drawings. Indicate areas of conflict between light fixtures and other components.
 3. Mechanical Rooms: Provide coordination drawings for mechanical rooms showing plans and elevations of mechanical, plumbing, fire protection, fire alarm, and electrical equipment.
 4. Structural Penetrations: Indicate penetrations and openings required for all disciplines.
 5. Slab Edge and Embedded Items: Indicate slab edge locations and sizes and locations of embedded items for metal fabrications, sleeves, anchor bolts, bearing plates, angles, door floor closers, slab depressions for floor finishes, curbs and housekeeping pads, and similar items.
 6. Mechanical and Plumbing Work: Show the following:
 - a. Sizes and bottom elevations of ductwork, piping, and conduit runs, including insulation, bracing, flanges, and support systems.
 - b. Dimensions of major components, such as dampers, valves, diffusers, access doors, cleanouts and electrical distribution equipment.
 - c. Fire-rated enclosures around ductwork.
 7. Electrical Work: Show the following:
 - a. Runs of vertical and horizontal conduit 1-1/4 inch diameter and larger.
 - b. Light fixture, exit light, emergency battery pack, smoke detector, and other fire alarm locations.
 - c. Panel board, switch board, switchgear, transformer, busway, generator, and motor control center locations.
 - d. Location of pull boxes and junction boxes, dimensioned from column center lines.
 8. Fire Protection System: Show the following:
 - a. Locations of standpipes, mains piping, branch lines, pipe drops, and sprinkler heads.

9. Review: Architect will review coordination drawings to confirm that the Work is being coordinated, but not for the details of the coordination, which are the Contractor's responsibility. If the Architect determines that the coordination drawings are not being prepared in sufficient scope or detail, or are otherwise deficient, the Architect will so inform the Contractor, who shall make changes as directed and resubmit.
10. Coordination Drawing Prints: Prepare coordination drawing prints in accordance with requirements of Division 01 Section "Submittal Procedures."

1.6 KEY PERSONNEL

- A. Key Personnel Names: Within 5 days of starting construction operations, submit a list of key personnel assignments, including superintendent and other personnel in attendance at Project site. Identify individuals and their duties and responsibilities; list addresses and telephone numbers, including home, office, and cellular telephone numbers and email addresses. Provide names, addresses, and telephone numbers of individuals assigned as standbys in the absence of individuals assigned to Project.
 1. Post copies of list in project meeting room, in temporary field office, and by each temporary telephone. Keep list current at all times.

1.7 REQUESTS FOR INFORMATION (RFIs)

- A. General: Immediately on discovery of the need for additional information or interpretation of the Contract Documents, Contractor shall prepare and submit an RFI in the form specified.
 1. Do not submit an RFI if information is readily available in the contract documents. Verify by contacting and questioning the Architect prior to submitting an RFI.
 2. Architect will return RFIs submitted to Architect by other entities controlled by Contractor with no response.
 3. Coordinate and submit RFIs in a prompt manner so as to avoid delays in Contractor's work or work of subcontractors.
- B. Content of the RFI: Include a detailed, legible description of item needing information or interpretation and the following:
 1. Project name.
 2. Project number.
 3. Date.
 4. Name of Contractor.
 5. Name of Architect and Construction Manager.
 6. RFI number, numbered sequentially.
 7. RFI subject.
 8. Specification Section number and title and related paragraphs, as appropriate.
 9. Drawing number and detail references, as appropriate.
 10. Field dimensions and conditions, as appropriate.
 11. Contractor's suggested resolution. If Contractor's solution(s) impacts the Contract Time or the Contract Sum, Contractor shall state impact in the RFI.
 12. Contractor's signature.
 13. Attachments: Include sketches, descriptions, measurements, photos, Product Data, Shop Drawings, coordination drawings, and other information necessary to fully describe items needing interpretation.
 - a. Include dimensions, thicknesses, structural grid references, and details of affected materials, assemblies, and attachments on attached sketches.
- C. RFI Forms: Form provided in specification section 006000 of the Project Manual or Software-generated form with substantially the same content as indicated above, acceptable to Architect.
- D. Architect's and Construction Manager's Action: Architect and Construction Manager will review each RFI, determine action required, and respond. Allow **five** working days for Architect's

response for each RFI. RFIs received by Architect or Construction Manager after 1:00 p.m. will be considered as received the following working day.

1. The following RFIs will be returned without action:
 - a. Requests for approval of submittals.
 - b. Requests for approval of substitutions.
 - c. Requests for coordination information already indicated in the Contract Documents.
 - d. Requests for adjustments in the Contract Time or the Contract Sum.
 - e. Requests for interpretation of Architect's actions on submittals.
 - f. Incomplete RFIs or inaccurately prepared RFIs.
 2. Architect's action may include a request for additional information, in which case Architect's time for response will date from time of receipt of additional information.
 3. Architect's action on RFIs that may result in a change to the Contract Time or the Contract Sum may be eligible for Contractor to submit Change Proposal according to Division 01 Section "Contract Modification Procedures."
 - a. If Contractor believes the RFI response warrants change in the Contract Time or the Contract Sum, notify Architect and Construction Manager in writing within **seven** days of receipt of the RFI response.
- E. RFI Log: Prepare, maintain, and submit a tabular log of RFIs organized by the RFI number. Submit log weekly. Use CSI Log Form 13.2B. Include the following:
1. Project name.
 2. Name and address of Contractor.
 3. Name and address of Architect and Construction Manager.
 4. RFI number including RFIs that were dropped and not submitted.
 5. RFI description.
 6. Date the RFI was submitted.
 7. Date Architect's and Construction Manager's response was received.
 8. Identification of related Minor Change in the Work, Construction Change Directive, and Proposal Request, as appropriate.
 9. Identification of related Field Order, Work Change Directive, and Proposal Request, as appropriate.
- F. On receipt of Architect's action, update the RFI log and immediately distribute the RFI response to affected parties. Review response and notify Architect and Construction Manager within seven days if Contractor disagrees with response.
1. Identification of related Minor Change in the Work, Construction Change Directive, and Proposal Request, as appropriate.
 2. Identification of related Field Order, Work Change Directive, and Proposal Request, as appropriate.

1.8 PROJECT WEB SITE

- A. Use Architect's Project Web site for purposes of hosting and managing project communication and documentation until Final Completion. Project Web site shall include the following functions:
1. Project directory.
 2. Project correspondence.
 3. Meeting minutes.
 4. Contract modifications forms and logs.
 5. RFI forms and logs.
 6. Submittals forms and logs.
 7. Payment application forms.

1.9 PROJECT MEETINGS

- A. General: Construction Manager will schedule and conduct meetings and conferences at Project site, unless otherwise indicated.
1. Attendees: Inform participants and others involved, and individuals whose presence is required, of date and time of each meeting. Notify Owner and Architect of scheduled meeting dates and times.
 2. Agenda: Prepare the meeting agenda. Distribute the agenda to all invited attendees.
 3. Minutes: **Construction Manager** will record significant discussions and agreements achieved. Distribute the meeting minutes to everyone concerned, including Owner and Architect, within three days of the meeting.
- B. Preconstruction Conference: Construction Manager will schedule and conduct a preconstruction conference before starting construction, at a time convenient to Owner and Architect, but no later than 15 days after execution of the Agreement.
1. Conduct the conference to review responsibilities and personnel assignments.
 2. Attendees: Authorized representatives of Owner, Construction Manager, Architect, and their consultants; Contractor and its superintendent; major subcontractors; suppliers; and other concerned parties shall attend the conference. Participants at the conference shall be familiar with Project and authorized to conclude matters relating to the Work.
 3. Agenda: Discuss items of significance that could affect progress, including the following:
 - a. Tentative construction schedule.
 - b. Phasing.
 - c. Critical work sequencing and long-lead items.
 - d. Designation of key personnel and their duties.
 - e. Lines of communications.
 - f. Procedures for processing field decisions and Change Orders.
 - g. Procedures for RFIs.
 - h. Procedures for testing and inspecting.
 - i. Procedures for processing Applications for Payment.
 - j. Distribution of the Contract Documents.
 - k. Submittal procedures.
 - l. Preparation of record documents.
 - m. Use of the premises and existing building.
 - n. Work restrictions.
 - o. Working hours.
 - p. Owner's occupancy requirements.
 - q. Responsibility for temporary facilities and controls.
 - r. Procedures for moisture and mold control.
 - s. Procedures for disruptions and shutdowns.
 - t. Construction waste management.
 - u. Parking availability.
 - v. Office, work, and storage areas.
 - w. Equipment deliveries and priorities.
 - x. First aid.
 - y. Security.
 - z. Progress cleaning.
 4. Minutes: **Construction Manager** will record and distribute meeting minutes.
- C. Preinstallation Conferences: Conduct a preinstallation conference at Project site before each construction activity that requires coordination with other construction.
1. Attendees: Installer and representatives of manufacturers and fabricators involved in or affected by the installation and its coordination or integration with other materials and

- installations that have preceded or will follow, shall attend the meeting. Advise Architect, Construction Manager of scheduled meeting dates.
2. Agenda: Review progress of other construction activities and preparations for the particular activity under consideration, including requirements for the following:
 - a. Contract Documents.
 - b. Options.
 - c. Related RFIs.
 - d. Related Change Orders.
 - e. Purchases.
 - f. Deliveries.
 - g. Submittals.
 - h. Review of mockups.
 - i. Possible conflicts.
 - j. Compatibility problems.
 - k. Time schedules.
 - l. Weather limitations.
 - m. Manufacturer's written recommendations.
 - n. Warranty requirements.
 - o. Compatibility of materials.
 - p. Acceptability of substrates.
 - q. Temporary facilities and controls.
 - r. Space and access limitations.
 - s. Regulations of authorities having jurisdiction.
 - t. Testing and inspecting requirements.
 - u. Installation procedures.
 - v. Coordination with other work.
 - w. Required performance results.
 - x. Protection of adjacent work.
 - y. Protection of construction and personnel.
 3. Record significant conference discussions, agreements, and disagreements, including required corrective measures and actions.
 4. Reporting: Distribute minutes of the meeting to each party present and to other parties requiring information.
 5. Do not proceed with installation if the conference cannot be successfully concluded. Initiate whatever actions are necessary to resolve impediments to performance of the Work and reconvene the conference at earliest feasible date.
- D. Progress Meetings: Construction Manager will conduct progress meetings at biweekly intervals.
1. Coordinate dates of meetings with preparation of payment requests.
 2. Attendees: In addition to representatives of Owner, Construction Manager, and Architect, each contractor, subcontractor, supplier, and other entity concerned with current progress or involved in planning, coordination, or performance of future activities shall be represented at these meetings. All participants at the meeting shall be familiar with Project and authorized to conclude matters relating to the Work.
 3. Agenda: Review and correct or approve minutes of previous progress meeting. Review other items of significance that could affect progress. Include topics for discussion as appropriate to status of Project.
 - a. Contractor's Construction Schedule: Review progress since the last meeting. Determine whether each activity is on time, ahead of schedule, or behind schedule, in relation to Contractor's construction schedule. Determine how construction behind schedule will be expedited; secure commitments from parties involved to do so. Discuss whether schedule revisions are required to ensure that current and subsequent activities will be completed within the Contract Time.
 - 1) Review schedule for next period.

- b. Review present and future needs of each entity present, including the following:
 - 1) Interface requirements.
 - 2) Sequence of operations.
 - 3) Status of submittals.
 - 4) Deliveries.
 - 5) Off-site fabrication.
 - 6) Access.
 - 7) Site utilization.
 - 8) Temporary facilities and controls.
 - 9) Progress cleaning.
 - 10) Quality and work standards.
 - 11) Status of correction of deficient items.
 - 12) Field observations.
 - 13) Status of RFIs.
 - 14) Status of proposal requests.
 - 15) Pending changes.
 - 16) Status of Change Orders.
 - 17) Documentation of information for payment requests.
- 4. Minutes: **Construction Manager** will record and distribute the meeting minutes to each party present and to parties requiring information.
 - a. Schedule Updating: Revise Contractor's construction schedule after each progress meeting where revisions to the schedule have been made or recognized. Issue revised schedule concurrently with the report of each meeting.
- E. Coordination Meetings: Construction Manager will conduct Project coordination meetings at weekly intervals. Project coordination meetings are in addition to specific meetings held for other purposes, such as progress meetings and preinstallation conferences.
 - 1. Attendees: In addition to representatives **Construction Manager**, each contractor, subcontractor, supplier, and other entity concerned with current progress or involved in planning, coordination, or performance of future activities shall be represented at these meetings. All participants at the meetings shall be familiar with Project and authorized to conclude matters relating to the Work.
 - 2. Agenda: Review and correct or approve minutes of the previous coordination meeting. Review other items of significance that could affect progress. Include topics for discussion as appropriate to status of Project.
 - a. Combined Contractor's Construction Schedule: Review progress since the last coordination meeting. Determine whether each contract is on time, ahead of schedule, or behind schedule, in relation to combined Contractor's construction schedule. Determine how construction behind schedule will be expedited; secure commitments from parties involved to do so. Discuss whether schedule revisions are required to ensure that current and subsequent activities will be completed within the Contract Time.
 - b. Schedule Updating: Revise combined Contractor's construction schedule after each coordination meeting where revisions to the schedule have been made or recognized. Issue revised schedule concurrently with report of each meeting.
 - c. Review present and future needs of each contractor present, including the following:
 - 1) Interface requirements.
 - 2) Sequence of operations.
 - 3) Status of submittals.
 - 4) Deliveries.
 - 5) Off-site fabrication.
 - 6) Access.
 - 7) Site utilization.

- 8) Temporary facilities and controls.
 - 9) Work hours.
 - 10) Hazards and risks.
 - 11) Progress cleaning.
 - 12) Quality and work standards.
 - 13) Change Orders.
 3. Reporting: Record meeting results and distribute copies to everyone in attendance and to others affected by decisions or actions resulting from each meeting.
- F. Project Closeout Conference: Construction Manager will schedule and conduct a Project closeout conference, at a time convenient to Owner and Architect, but no later than 60 days prior to the scheduled date of Substantial Completion.
 1. Conduct the conference to review requirements and responsibilities related to Project closeout.
 2. Attendees: Authorized representatives of Owner, Construction Manager, Architect, and their consultants; Contractor and its superintendent; major subcontractors; suppliers; and other concerned parties shall attend the meeting. Participants at the meeting shall be familiar with Project and authorized to conclude matters relating to the Work.
 3. Agenda: Discuss items of significance that could affect or delay Project closeout, including the following:
 - a. Procedures required prior to inspection for Substantial Completion and for final inspection for acceptance.
 - b. Procedures for processing Applications for Payment at Substantial Completion and for final payment.
 - c. Preparation of Contractor's punch list.
 - d. Responsibility for removing temporary facilities and controls.
 - e. Requirements for preparing operations and maintenance data.
 - f. Requirements for the Submittal of written warranties.
 - g. Requirements for demonstration and training.
 - h. Requirements for submission of record documents, record specifications and record submittals.
 - i. Owner's partial occupancy requirements.
 - j. Coordination of separate contracts for owner related work prior to occupancy.
 - k. Installation of Owner's furniture, fixtures, and equipment.
 - l. Responsibility and schedule for final cleaning
 4. Minutes: Entity conducting meeting will record and distribute meeting minutes.

PART 2 - PRODUCTS (Not Applicable)

PART 3 - EXECUTION (Not Applicable)

END OF SECTION 01 3100

SECTION 01 3200 - CONSTRUCTION PROGRESS DOCUMENTATION

PART 1 - GENERAL

1.1 SUMMARY

- A. Section includes administrative and procedural requirements for documenting the progress of construction during performance of the Work, including the following:
 - 1. Start-up construction schedule.
 - 2. Contractor's construction schedule.
 - 3. Daily construction reports.
 - 4. Material location reports.
 - 5. Field condition reports.
 - 6. Special reports.
- B. Related Sections:
 - 1. Division 01 Section "Multiple Contract Summary" for preparing a combined Contractor's Construction Schedule.
 - 2. Division 01 Section "Submittal Procedures" for submitting schedules and reports.
 - 3. Division 01 Section "Quality Requirements" for submitting a schedule of tests and inspections.

1.2 DEFINITIONS

- A. Activity: A discrete part of a project that can be identified for planning, scheduling, monitoring, and controlling the construction project. Activities included in a construction schedule consume time and resources.
 - 1. Critical Activity: An activity on the critical path that must start and finish on the planned early start and finish times.
 - 2. Predecessor Activity: An activity that precedes another activity in the network.
 - 3. Successor Activity: An activity that follows another activity in the network.
- B. Cost Loading: The allocation of the schedule of values for the completion of an activity as scheduled. The sum of costs for all activities must equal the total Contract Sum unless otherwise approved by Architect.
- C. CPM: Critical path method, which is a method of planning and scheduling a construction project where activities are arranged based on activity relationships. Network calculations determine when activities can be performed and the critical path of Project.
- D. Critical Path: The longest connected chain of interdependent activities through the network schedule that establishes the minimum overall Project duration and contains no float.
- E. Event: The starting or ending point of an activity.
- F. Float: The measure of leeway in starting and completing an activity.
 - 1. Float time is not for the exclusive use or benefit of either Owner or Contractor, but is a jointly owned, expiring Project resource available to both parties as needed to meet schedule milestones and Contract completion date.
 - 2. Free float is the amount of time an activity can be delayed without adversely affecting the early start of the successor activity.
 - 3. Total float is the measure of leeway in starting or completing an activity without adversely affecting the planned Project completion date.
- G. Resource Loading: The allocation of manpower and equipment necessary for the completion of an activity as scheduled.

1.3 INFORMATIONAL SUBMITTALS

- A. Format for Submittals: Submit required submittals in the following format:
 - 1. PDF electronic file
- B. Start-up construction schedule.
- C. Contractor's Construction Schedule: Initial schedule, of size required to display entire schedule for entire construction period.
- D. Daily Construction Reports: Submit at weekly intervals.
- E. Field Condition Reports: Submit at time of discovery of differing conditions.
- F. Special Reports: Submit at time of unusual event.

1.4 QUALITY ASSURANCE

- A. Prescheduling Conference: Conduct conference at Project site to comply with requirements in Division 01 Section "Project Management and Coordination." Review methods and procedures related to the preliminary construction schedule and Contractor's construction schedule, including, but not limited to, the following:
 - 1. Review software limitations and content and format for reports.
 - 2. Verify availability of qualified personnel needed to develop and update schedule.
 - 3. Discuss constraints, including work stages area separations interim milestones and partial Owner occupancy.
 - 4. Review delivery dates for Owner-furnished products.
 - 5. Review schedule for work of Owner's separate contracts.
 - 6. Review time required for review of submittals and resubmittals.
 - 7. Review requirements for tests and inspections by independent testing and inspecting agencies.
 - 8. Review time required for completion and startup procedures.
 - 9. Review and finalize list of construction activities to be included in schedule.
 - 10. Review submittal requirements and procedures.
 - 11. Review procedures for updating schedule.

1.5 COORDINATION

- A. Coordinate preparation and processing of schedules and reports with performance of construction activities and with scheduling and reporting of separate contractors.
 - 1. Secure time commitments for performing critical elements of the Work from entities involved.
 - 2. Coordinate each construction activity in the network with other activities and schedule them in proper sequence.

PART 2 - PRODUCTS

2.1 CONTRACTOR'S CONSTRUCTION SCHEDULE, GENERAL

- A. Time Frame: Extend schedule from date established for the Notice of Award to date of final completion.
 - 1. Contract completion date shall not be changed by submission of a schedule that shows an early completion date, unless specifically authorized by Change Order.
- B. Activities: Treat each story or separate area as a separate numbered activity for each principal element of the Work. Comply with the following:
 - 1. Activity Duration: Define activities so no activity is longer than 20 days, unless specifically allowed by Architect.

2. Procurement Activities: Include procurement process activities for long lead items and major items, requiring a cycle of more than 60 days, as separate activities in schedule. Procurement cycle activities include, but are not limited to, submittals, approvals, purchasing, fabrication, and delivery.
 3. Submittal Review Time: Include review and resubmittal times indicated in Division 01 Section "Submittal Procedures" in schedule. Coordinate submittal review times in Contractor's construction schedule with submittal schedule.
 4. Startup and Testing Time: Include not less than 15 days for startup and testing.
 5. Substantial Completion: Indicate completion in advance of date established for Substantial Completion, and allow time for Architect's and Construction Manager's administrative procedures necessary for certification of Substantial Completion.
 6. Punch List and Final Completion: Include not more than 30 days for punch list and final completion.
- C. Constraints: Include constraints and work restrictions indicated in the Contract Documents and as follows in schedule, and show how the sequence of the Work is affected.
1. Phasing: Arrange list of activities on schedule by phase.
 2. Work under More Than One Contract: Include a separate activity for each contract.
 3. Work by Owner: Include a separate activity for each portion of the Work performed by Owner.
 4. Products Ordered in Advance: Include a separate activity for each product. Include delivery date indicated in Division 01 Section "Summary." Delivery dates indicated stipulate the earliest possible delivery date.
 5. Owner-Furnished Products: Include a separate activity for each product. Include delivery date indicated in Division 01 Section "Summary." Delivery dates indicated stipulate the earliest possible delivery date.
 6. Work Restrictions: Show the effect of the following items on the schedule:
 - a. Coordination with existing construction.
 - b. Limitations of continued occupancies.
 - c. Uninterruptible services.
 - d. Partial occupancy before Substantial Completion.
 - e. Use of premises restrictions.
 - f. Provisions for future construction.
 - g. Seasonal variations.
 - h. Environmental control.
 7. Work Stages: Indicate important stages of construction for each major portion of the Work, including, but not limited to, the following:
 - a. Subcontract awards.
 - b. Submittals.
 - c. Purchases.
 - d. Mockups.
 - e. Fabrication.
 - f. Sample testing.
 - g. Deliveries.
 - h. Installation.
 - i. Tests and inspections.
 - j. Adjusting.
 - k. Curing.
 - l. Startup and placement into final use and operation.
 8. Construction Areas: Identify each major area of construction for each major portion of the Work. Indicate where each construction activity within a major area must be sequenced or integrated with other construction activities to provide for the following:
 - a. Structural completion.
 - b. Permanent space enclosure.
 - c. Completion of mechanical installation.

- d. Completion of electrical installation.
 - e. Substantial Completion.
- D. Milestones: Include milestones indicated in the Contract Documents in schedule, including, but not limited to, the Notice to Proceed, Substantial Completion, and final completion.
- E. Cost Correlation: Superimpose a cost correlation timeline, indicating planned and actual costs. On the line, show planned and actual dollar volume of the Work performed as of planned and actual dates used for preparation of payment requests.
 - 1. See Division 01 "Payment Procedures" for cost reporting and payment procedures.
- F. Upcoming Work Summary: Prepare summary report indicating activities scheduled to occur or commence prior to submittal of next schedule update. Summarize the following issues:
 - 1. Unresolved issues.
 - 2. Unanswered RFIs.
 - 3. Rejected or unreturned submittals.
 - 4. Notations on returned submittals.
- G. Recovery Schedule: When periodic update indicates the Work is 14 or more calendar days behind the current approved schedule, submit a separate recovery schedule indicating means by which Contractor intends to regain compliance with the schedule. Indicate changes to working hours, working days, crew sizes, and equipment required to achieve compliance, and date by which recovery will be accomplished.
- H. Computer Scheduling Software: Prepare schedules using current version of a program that has been developed specifically to manage construction schedules.

2.2 START-UP CONSTRUCTION SCHEDULE

- A. Bar-Chart Schedule: Submit start-up horizontal bar-chart-type construction schedule within seven days of date established for the Notice of Award.
- B. Preparation: Indicate each significant construction activity separately. Identify first workday of each week with a continuous vertical line. Outline significant construction activities for first 90 days of construction. Include skeleton diagram for the remainder of the Work and a cash requirement prediction based on indicated activities.

2.3 CONTRACTOR'S CONSTRUCTION SCHEDULE (GANTT CHART)

- A. Gantt-chart schedule in this article is adequate for many projects. Delete this article if Project size and complexity justify CPM construction schedule.
- B. Gantt-Chart Schedule: Submit a comprehensive, fully developed, horizontal, Gantt-chart-type, Contractor's construction schedule within 15 days of date established for the Notice of Award. Base schedule on the startup construction schedule and additional information received since the start of Project.
- C. Preparation: Indicate each significant construction activity separately. Identify first workday of each week with a continuous vertical line.
 - 1. For construction activities that require three months or longer to complete, indicate an estimated completion percentage in 10 percent increments within time bar.

2.4 CONTRACTOR'S CONSTRUCTION SCHEDULE (CPM SCHEDULE)

- A. General: Prepare network diagrams using AON (activity-on-node) format.
- B. Startup Network Diagram: Submit diagram within 14 days of date established for the Notice of Award. Outline significant construction activities for the first 90 days of construction. Include

skeleton diagram for the remainder of the Work and a cash requirement prediction based on indicated activities.

- C. CPM Schedule: Prepare Contractor's construction schedule using a cost- and resource-loaded, time-scaled CPM network analysis diagram for the Work.
1. Develop network diagram in sufficient time to submit CPM schedule so it can be accepted for use no later than 60 days after date established for the Notice of Award.
 - a. Failure to include any work item required for performance of this Contract shall not excuse Contractor from completing all work within applicable completion dates, regardless of Architect's approval of the schedule.
 2. Conduct educational workshops to train and inform key Project personnel, including subcontractors' personnel, in proper methods of providing data and using CPM schedule information.
 3. Establish procedures for monitoring and updating CPM schedule and for reporting progress. Coordinate procedures with progress meeting and payment request dates.
 4. Use "one workday" as the unit of time for individual activities. Indicate nonworking days and holidays incorporated into the schedule in order to coordinate with the Contract Time.
- D. CPM Schedule Preparation: Prepare a list of all activities required to complete the Work. Using the startup network diagram, prepare a skeleton network to identify probable critical paths.
1. Activities: Indicate the estimated time duration, sequence requirements, and relationship of each activity in relation to other activities. Include estimated time frames for the following activities:
 - a. Preparation and processing of submittals.
 - b. Mobilization and demobilization.
 - c. Purchase of materials.
 - d. Delivery.
 - e. Fabrication.
 - f. Utility interruptions.
 - g. Installation.
 - h. Work by Owner that may affect or be affected by Contractor's activities.
 - i. Testing.
 - j. Punch list and final completion.
 - k. Activities occurring following final completion.
 2. Critical Path Activities: Identify critical path activities, including those for interim completion dates. Scheduled start and completion dates shall be consistent with Contract milestone dates.
 3. Processing: Process data to produce output data on a computer-drawn, time-scaled network. Revise data, reorganize activity sequences, and reproduce as often as necessary to produce the CPM schedule within the limitations of the Contract Time.
 4. Format: Mark the critical path. Locate the critical path near center of network; locate paths with most float near the edges.
 - a. Subnetworks on separate sheets are permissible for activities clearly off the critical path.
 5. Cost- and Resource-Loading of CPM Schedule: Assign cost to construction activities on the CPM schedule. Do not assign costs to submittal activities. Obtain Architect's approval prior to assigning costs to fabrication and delivery activities. Assign costs under main subcontracts for testing and commissioning activities, operation and maintenance manuals, punch list activities, Project record documents, and demonstration and training (if applicable), in the amount of 5 percent of the Contract Sum.
 - a. Each activity cost shall reflect an appropriate value subject to approval by Architect.
 - b. Total cost assigned to activities shall equal the total Contract Sum.

- E. Contract Modifications: For each proposed contract modification and concurrent with its submission, prepare a time-impact analysis using a network fragment to demonstrate the effect of the proposed change on the overall project schedule.
- F. Initial Issue of Schedule: Prepare initial network diagram from a sorted activity list indicating straight "early start-total float." Identify critical activities. Prepare tabulated reports showing the following:
 - 1. Contractor or subcontractor and the Work or activity.
 - 2. Description of activity.
 - 3. Main events of activity.
 - 4. Immediate preceding and succeeding activities.
 - 5. Early and late start dates.
 - 6. Early and late finish dates.
 - 7. Activity duration in workdays.
 - 8. Total float or slack time.
 - 9. Average size of workforce.
 - 10. Dollar value of activity (coordinated with the schedule of values).
- G. Schedule Updating: Concurrent with making revisions to schedule, prepare tabulated reports showing the following:
 - 1. Identification of activities that have changed.
 - 2. Changes in early and late start dates.
 - 3. Changes in early and late finish dates.
 - 4. Changes in activity durations in workdays.
 - 5. Changes in the critical path.
 - 6. Changes in total float or slack time.
 - 7. Changes in the Contract Time.

2.5 REPORTS

- A. Daily Construction Reports: Prepare a daily construction report recording the following information concerning events at Project site:
 - 1. List of subcontractors at Project site.
 - 2. List of separate contractors at Project site.
 - 3. Approximate count of personnel at Project site.
 - 4. Equipment at Project site.
 - 5. Material deliveries.
 - 6. High and low temperatures and general weather conditions, including presence of rain or snow.
 - 7. Accidents.
 - 8. Meetings and significant decisions.
 - 9. Unusual events (refer to special reports).
 - 10. Stoppages, delays, shortages, and losses.
 - 11. Meter readings and similar recordings.
 - 12. Emergency procedures.
 - 13. Orders and requests of authorities having jurisdiction.
 - 14. Change Orders received and implemented.
 - 15. Construction Change Directives received and implemented.
 - 16. Services connected and disconnected.
 - 17. Equipment or system tests and startups.
 - 18. Partial completions and occupancies.
 - 19. Substantial Completions authorized.
- B. Field Condition Reports: Immediately on discovery of a difference between field conditions and the Contract Documents, prepare and submit a detailed report. Submit with a Request for

Information. Include a detailed description of the differing conditions, together with recommendations for changing the Contract Documents.

2.6 SPECIAL REPORTS

- A. General: Submit special reports directly to Owner within one day(s) of an occurrence. Distribute copies of report to parties affected by the occurrence.
- B. Reporting Unusual Events: When an event of an unusual and significant nature occurs at Project site, whether or not related directly to the Work, prepare and submit a special report. List chain of events, persons participating, response by Contractor's personnel, evaluation of results or effects, and similar pertinent information. Advise Owner in advance when these events are known or predictable.

PART 3 - EXECUTION

3.1 CONTRACTOR'S CONSTRUCTION SCHEDULE

- A. Contractor's Construction Schedule Updating: At monthly intervals, update schedule to reflect actual construction progress and activities. Issue schedule one week before each regularly scheduled progress meeting.
 - 1. Revise schedule immediately after each meeting or other activity where revisions have been recognized or made. Issue updated schedule concurrently with the report of each such meeting.
 - 2. Include a report with updated schedule that indicates every change, including, but not limited to, changes in logic, durations, actual starts and finishes, and activity durations.
 - 3. As the Work progresses, indicate final completion percentage for each activity.
- B. Distribution: Distribute copies of approved schedule to **Construction Manager**, Owner, separate contractors, testing and inspecting agencies, and other parties identified by Contractor with a need-to-know schedule responsibility.
 - 1. Post copies in Project meeting rooms and temporary field offices.
 - 2. When revisions are made, distribute updated schedules to the same parties and post in the same locations. Delete parties from distribution when they have completed their assigned portion of the Work and are no longer involved in performance of construction activities.

END OF SECTION 01 3200

SECTION 00 3216 – CONSTRUCTION SCHEDULE

PART 1 - GENERAL

1.1 CONSTRUCTION SCHEDULE

- A. Contractor shall complete work of their Contract per the following Construction Schedule:

Contract / Work	Start Date	Substantial Completion Date
All Contracts (Submittals to begin upon award of Contract and/or receipt of Notice to Proceed Letter. Submittal schedule to be coordinated promptly after being awarded the contract)	Award of Contract and/or receipt of Notice to Proceed Letter	See attached

PART 2 - PRODUCTS (Not Used)

PART 3 - EXECUTION (Not Used)

END OF SECTION 00 3216



Pine Bush Central School District

Building	Description of Activity	2021												2022											
		1	2	3	4	5	6	7	8	9	10	11	12	1	2	3	4	5	6	7	8	9	10	11	12
PBHS	Fitness Center				x	x	x	x	x																
	Security Vestibule / ADA / BCS / Code						x	x	x																
	Masonry Repointing						x	x	x																
	Windows									x	x	x													
	Pool Lockers 004 & 006																x	x	x	x					
	Pool HVAC & Exterior Windows																x	x	x	x					
	Pool Equipment Room Pump						x																		
	Lockers 001, 002											x	x	x	x	x									
	Lockers 110, 111									x	x	x	x												
	HAAS Center (7 classrooms)						x	x	x	x															
	Clocks, Speakers, FA & Exit Signs						x	x	x																
CVES	Security Vestibule / ADA / BCS / Code						x	x	x																
	Windows									x	x	x													
	Music Room Truss						x	x	x																
	17 Classroom Clg Replacement						x	x	x																
	Three new Boilers									x	x	x													
	Refeed 15 Electrical Panels																		x	x	x				
	Replace 12 Electrical Panels																		x	x	x				
	Switchgear Replacement																		x	x	x				
	Gym AHU 1 & 2																		x	x	x				
CVMS	Security Vestibule / ADA / BCS / Code						x	x	x																



Pine Bush Central School District

Building	Description of Activity	2021												2022											
		1	2	3	4	5	6	7	8	9	10	11	12	1	2	3	4	5	6	7	8	9	10	11	12
	Windows									X	X	X													
	Faculty Bathroom												X	X											
	Boys & Girls Locker Rooms 75 & 85														X	X	X	X							
	Toilets 61 & 62 Reno								X	X	X	X													
	34 Classroom Clg Replacement																								
	Four New Boilers																	X	X	X	X	X			
	Cafeteria RTU																		X	X	X				
	Replace 30 Electrical Panels / 2 Transformers / 7 Disconnects / MDP																		X	X	X				
PAK	Security Vestibule / ADA / BCS / Code						X	X	X																
	Windows									X	X	X													
	Boys & Girls Locker Rooms					X	X	X	X																
	Student Toilets 136 & 137 Reno									X	X														
	Staff Toilets 141 & 143 Reno											X	X												
	Pool Equipment Room						X																		
	Gym RTU																X								

SECTION 013233 - PHOTOGRAPHIC DOCUMENTATION

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

- A. Drawings and general provisions of the Contract, including General and Supplementary Conditions and other Division 01 Specification Sections, apply to this Section.

1.2 SUMMARY

- A. Section includes administrative and procedural requirements for the following:
1. Preconstruction photographs.
 2. Concealed Work photographs.
 3. Periodic construction photographs.
 4. Final Completion construction photographs.
- B. Related Requirements:
1. Section 017700 "Closeout Procedures" for submitting photographic documentation as Project Record Documents at Project closeout.
 2. Section 017900 "Demonstration and Training" for submitting video recordings of demonstration of equipment and training of Owner's personnel.
 3. Section 024116 "Structure Demolition" for photographic documentation before building demolition operations commence.
 4. Section 024119 "Selective Demolition" for photographic documentation before selective demolition operations commence.
 5. Section 311000 "Site Clearing" for photographic documentation before site clearing operations commence.

1.3 INFORMATIONAL SUBMITTALS

- A. Key Plan: Submit key plan of Project site and building with notation of vantage points marked for location and direction of each photograph. Indicate elevation or story of construction. Include same information as corresponding photographic documentation.
- B. Digital Photographs: Submit image files/photographs at bi-weekly construction progress meetings.
1. Submit photos on thumb-drive or by uploading to web-based Project management software site. Include copy of key plan indicating each photograph's location and direction.
 2. Identification: Provide the following information with each image description in file metadata tag and/or in web-based Project management software site:
 - a. Name of Project.
 - b. Name and contact information for photographer.
 - c. Name of Architect and Construction Manager.
 - d. Name of Contractor.
 - e. Date photograph was taken.
 - f. Description of location, vantage point, and direction.
 - g. Unique sequential identifier keyed to accompanying key plan.

1.4 QUALITY ASSURANCE

- A. Photographer Qualifications: An individual who has been regularly engaged as a professional photographer of construction projects for not less than three years.
- B. Construction Webcam Service Provider: A firm specializing in providing photographic equipment, web-based software, and related services for construction projects, with a record of providing satisfactory services similar to those required for Project.

1.5 FORMATS AND MEDIA

- A. Digital Photographs: Provide color images in JPG format with High Resolution, produced by a digital camera. Use flash in low light levels or backlit conditions.
- B. Digital Video Recordings: Provide high-resolution, digital video in MPEG format, produced by a digital camera. Provide supplemental lighting in low light levels or backlit conditions.
- C. Digital Images: Submit digital media as originally recorded in the digital camera, without alteration, manipulation, editing, or modifications using image-editing software.
- D. Metadata: Record accurate date and time from camera.
- E. File Names: Name media files with date and Project area and sequential numbering suffix.

1.6 CONSTRUCTION PHOTOGRAPHS

- A. Photographer: Engage a qualified photographer to take construction photographs.
- B. General: Take photographs with maximum depth of field and in focus.
 - 1. Maintain key plan with each set of construction photographs that identifies each photographic location.
- C. Preconstruction Photographs: Before commencement of the Work, take photographs of Project site and surrounding properties, including existing items to remain during construction, from different vantage points, as directed by Architect and Construction Manager.
 - 1. Flag excavation areas and construction limits before taking construction photographs.
 - 2. Take photographs to show existing conditions adjacent to property before starting the Work.
 - 3. Take photographs of existing buildings either on or adjoining property, to accurately record physical conditions at start of construction.
 - 4. Take additional photographs as required to record settlement or cracking of adjacent structures, pavements, and improvements.
- D. Concealed Work Photographs: Before proceeding with installing work that will conceal other work, take photographs sufficient in number, with annotated descriptions, to record nature and location of concealed Work, including, but not limited to, the following:
 - 1. Underground utilities.
 - 2. Underslab services.
 - 3. Piping.
 - 4. Electrical conduit.
 - 5. Waterproofing and weather-resistant barriers.

- E. Periodic Construction Photographs: Take photographs weekly (coinciding with the cutoff date associated with each Application for Payment). Select vantage points to show status of construction and progress since last photographs were taken.
- F. Time-Lapse Sequence Construction Photographs: Take photographs as indicated, to show status of construction and progress since last photographs were taken.
 - 1. Frequency: Take photographs weekly and at pivotal construction milestones and before covering up work performed.
 - 2. Vantage Points: Following suggestions by Architect and/or Construction Manager and Contractor, photographer shall select vantage points. During each of the following construction phases, take required shots from same vantage point each time, to create a time-lapse sequence as follows:
 - a. Commencement of the Work, through completion of subgrade construction.
 - b. Above-grade structural framing.
 - c. Exterior building enclosure.
 - d. Interior Work, through date of Substantial Completion.
- G. Final Completion Construction Photographs: Take photographs after date of Substantial Completion for submission as Project Record Documents. Architect and/or Construction Manager will inform photographer of desired vantage points.

PART 2 - PRODUCTS (Not Used)

PART 3 - EXECUTION (Not Used)

END OF SECTION 013233

SECTION 013300 - SUBMITTAL PROCEDURES

PART 1 - GENERAL

1.1 SUMMARY

- A. Section includes requirements for the submittal schedule and administrative and procedural requirements for submitting Shop Drawings, Product Data, Samples, and other submittals.
- B. This specification describes the procedures for submission of submittals and shop drawings using Newforma Info Exchange.
 - 1. The Contractor will be required to use the Newforma Info Exchange for the transfer of Submittals, Shop Drawings and RFI's. There will be no exceptions to this requirement. The contractor will be given a login and password free of charge. For more information follow the procedure below.
 - a. Information and instructions for use are available for review by the contractor by contacting CPL. The Contractor is to provide an email address for the file to be sent. A PDF file will be emailed to the requesting contractor.
- C. Related Requirements:
 - 1. Section 012900 "Payment Procedures" for submitting Applications for Payment and the schedule of values.
 - 2. Section 013100 "Project Management and Coordination" for submitting coordination drawings and subcontract list and for requirements for web-based Project software.
 - 3. Section 013200 "Construction Progress Documentation" for submitting schedules and reports, including Contractor's construction schedule.
 - 4. Section 013233 "Photographic Documentation" for submitting preconstruction photographs, periodic construction photographs, and Final Completion construction photographs.
 - 5. Section 014000 "Quality Requirements" for submitting test and inspection reports, and schedule of tests and inspections.
 - 6. Section 017700 "Closeout Procedures" for submitting closeout submittals and maintenance material submittals.
 - 7. Section 017823 "Operation and Maintenance Data" for submitting operation and maintenance manuals.
 - 8. Section 017839 "Project Record Documents" for submitting record Drawings, record Specifications, and record Product Data.

1.2 DEFINITIONS

- A. Action Submittals: Written and graphic information and physical samples that require Architect's responsive action. Action submittals are those submittals indicated in individual Specification Sections as "action submittals."
- B. Informational Submittals: Written and graphic information and physical samples that do not require Architect's responsive action. Submittals may be rejected for not complying with requirements. Informational submittals are those submittals indicated in individual Specification Sections as "informational submittals."
- C. Portable Document Format (PDF): An open standard file format licensed by Adobe Systems used for representing documents in a device-independent and display resolution-independent fixed-layout document format.

1.3 DELEGATED-DESIGN SERVICES

- A. Performance and Design Criteria: Where professional design services or certifications by a design professional are specifically required of Contractor by the Contract Documents, provide products and systems complying with specific performance and design criteria indicated.
 - 1. If criteria indicated are insufficient to perform services or certification required, submit a written request for additional information to Architect.
- B. Delegated-Design Services Certification: In addition to Shop Drawings, Product Data, and other required submittals, submit digitally signed PDF file of certificate, signed and sealed by the responsible design professional, for each product and system specifically assigned to Contractor to be designed or certified by a design professional.
 - 1. Indicate that products and systems comply with performance and design criteria in the Contract Documents. Include list of codes, loads, and other factors used in performing these services.

1.4 SUBMITTAL GENERAL ADMINISTRATIVE REQUIREMENTS

- A. The Contractor shall prepare a Submittal Log containing the information required to be submitted under the Submittal article from each respective Specification Section. With each item listed the Contractor shall provide anticipated dates for submission to the Architect. The Architect will review and accept or request that corrections be made for subsequent acceptance. This acceptance will constitute an approval for the submittal, shop drawings and sample submissions to commence. **No Submittals or Shop Drawings will be reviewed by the Architect until an approved Submittal Schedule is in place.**
- B. The contractor shall prepare expected submittals in Newforma that correspond to all submittals listed on the submittal schedule at the time of submission of the submittal log. These expected submittals are to follow the naming conventions laid out in section “1.5 submittal schedule” and “1.6 submittal identification”
- C. The Contractor is responsible for all costs for creating electronic files for the submittal process. The Architect will not provide this service.
 - 1. The Submittal Cover Sheet located in Specification Section 006000 Project Forms shall be used for all Submittals.
 - a. An electronic form of the submittal cover is available from the Architect.
 - 2. The Submittal Cover sheet when scanned to a .PDF shall be the first page viewed in the individual file.
 - a. Each product submitted within a specification section shall have a Submittal Cover sheet attached. Combined submittals with one cover page will not be accepted
 - b. Each Submittal Cover sheet shall be filled in completely. **Files that are sent with the Submittal Cover Sheet missing or not filled in correctly will not be reviewed.** The Architect will send a notice that the submittal is missing information. If the Contractor fails to correct or provide the proper submittal within 15 days, notice will be provided, and the submittal will be REJECTED.
 - 3. The Contractor(s) will be provided with a link to upload files to the **Newforma Info Exchange**. The site address and a “log in” will be provided to the Contractor(s) free of charge.

4. A read only Record Submittal Log and RFI Log will be available from the Newforma Info Exchange for the Contractors reference in checking the status of the submittals and shop drawings.
- D. Coordination: Coordinate preparation and processing of submittals with performance of construction activities.
1. Coordinate each submittal with fabrication, purchasing, testing, delivery, other submittals, and related activities that require sequential activity.
 2. Submit all submittal items required for each Specification Section concurrently unless partial submittals for portions of the Work are indicated on approved submittal schedule.
 3. Submit action submittals and informational submittals required by the same Specification Section as separate packages under separate transmittals.
 4. Coordinate transmittals of different types of submittals from related section for parts of the work so processing will not be delayed because of need to review submittals concurrently for coordination.
 - a. Architect reserves the right to withhold action on a submittal requiring coordination with other submittals until all related submittals are received. Delays associated with the above are the not the Architects responsibility and rests solely with the Contractor.

1.5 SUBMITTAL SCHEDULE

- A. Submittal Schedule: Submit, as an action submittal, a list of submittals, arranged in chronological order by dates required by construction schedule. Include time required for review, ordering, manufacturing, fabrication, and delivery when establishing dates. Include additional time required for making corrections or revisions to submittals noted by Architect and Construction Manager and additional time for handling and reviewing submittals required by those corrections.
- a. Submit a preliminary if not final Submittal Schedule for approval a minimum of 15 days after award of contract. **Failure to submit a submittal schedule within the required time frame will result in the refusal by the Architect to review any submittals. Delays associated with failure to receive the Submittal Schedule are the not the Architects responsibly and rest solely with the Contractor.**
- B. The information is required to be submitted under the Submittal article from each respective Specification Section. With each item listed the Contractor shall provide anticipated dates for submission to the Architect. The Architect will review and accept or request that corrections be made for subsequent acceptance. This acceptance will constitute a review for the submittal, shop drawings and sample submissions may commence. **No Submittals or Shop Drawings will be reviewed by the Architect until an approved Submittal Schedule is in place.**
1. The Submittal Schedule shall be coordinated with the overall Project Schedule to ensure that submittals are submitted and reviewed so as not to delay the Project Schedule.
 2. The Architect will not be responsible for ensuring that all required Shop Drawings, Product Data, Samples or similar submittals that are required to be submitted and reviewed under the Contract Documents are submitted by the Contractor. Submissions of Shop Drawings, Product Data, Samples or similar submittals are the Contractor's sole responsibility. Delays associated with the contractor's failure to provide the required submittals are the Contractors responsibility.

3. Coordinate submittal schedule with list of subcontracts, the schedule of values, and Contractor's construction schedule.
4. Initial Submittal Schedule: Submit concurrently with startup construction schedule. Include submittals required during the first 30 days of construction. List those submittals required to maintain orderly progress of the Work and those required early because of long lead time for manufacture or fabrication.
5. Final Submittal Schedule: Submit concurrently with the first complete submittal of Contractor's construction schedule.
 - a. Submit revised submittal schedule as required to reflect changes in current status and timing for submittals.
6. Format: Arrange the following information in a tabular format:
 - a. Scheduled date for first submittal.
 - b. Specification Section number and title.
 - c. Submittal Category: Action; informational.
 - d. Name of subcontractor.
 - e. Description of the Work covered.
 - f. Scheduled date for Architect's and Construction Manager's final release or approval.
 - g. Scheduled dates for purchasing.
 - h. Scheduled date of fabrication.
 - i. Scheduled dates for installation.

1.6 SUBMITTAL IDENTIFICATION

- A. Submittal Cover Sheet: Attach one cover sheet for each product, shop drawing or sample. DO NOT combine submittals together with one cover sheet for multiple items. They will not be reviewed.
- B. Submittal Information: Include the following information in each submittal. Use the submittal cover form found in specification section 060000 Project Forms. An electronic form can be sent to the contractor upon request
 1. Contractor, Address, Phone/fax and or Email
 2. Contractors Submittal Number.
 3. Architects Project Number.
 4. Project Name (if not filled in by the Architect)
 5. Type of submittal being sent (select box)
 6. Product Identification including the following: Provide one submittal cover sheet for each product within a specification section
 - a. Specification Section Number
 - b. Contract Drawing Number
 - c. Product Name
 - d. Specification Reference: Part/Paragraph
 - e. Detail Reference
 - f. Manufacturer
 7. Contractors Approval: The contractor must acknowledge that they have reviewed the submittal for conformance with the Contract Documents and must sign and date the approval.

8. Deviation from the Contract Documents: Where the submittal may not meet all of the requirements of the specified item. The contractor must indicate how the submitted item differs from the specified item.
 9. Contractor Comments: Any additional comments by the contractor should be indicated in this space. (Provide an attachment sheet for any other information required that will not fit on the cover sheet.)
- C. Deviations and Additional Information: On each individual submittal, clearly indicate deviations from requirements in the Contract Documents, including minor variations and limitations; include relevant additional information, revisions, line by line comparison and other information requested by Architect and Construction Manager. Indicate by highlighting on each submittal or noting on attached separate sheet. Identify options requiring selection by Architect.
- D. File Naming (for uploading): Each submittal or shop drawing file uploaded to the project on the **Newforma Info Exchange**, shall have in the file name, the specification section number followed by the submittal number, the submittal abbreviation and the specification section name. For re-submissions an R1 would be added following submittal number. The file name must include the following information:

Example:

081416 001 PD Flush Wood Doors

Specification Section Submittal no. Submittal Abbr. Specification Name

File to read: 081416-001 PD - Flush Wood Doors

Re-submission File to Read: 081416-001-R1-Flush Wood Doors

Submittal Abbreviations required to be used in the file name on submittals are as follows:

CD	Coordination Drawings
CERT	Certification(s)
CLC	Calculations
DD	Design Data
EJ	Engineer's Judgement
LEED	LEED or PD/LEED
O&M	Operations and Maintenance Manuals
PD	Product Data
PHOTO	Photo
QD	Qualification Data
RPT	Report
SAMP	Sample
SCH	Schedule
SEL	Make A Selection

SD	Shop Drawing(s)
STDY	Study
TR	Test Results
WAR	Warranty

- E. When uploading submittals or RFI's to the Newforma Info Exchange, complete the online transmittal. The information required is derived from the contractor's submittal cover sheet or RFI. Instructions using the Newforma Info Exchange are available from CPL. These instructions can be emailed to the contractor.

1.7 SUBMITTAL DATA AND TESTING REQUIREMENTS

- A. Product Data: Collect information into a single submittal for each element of construction and type of product or equipment. Each product within a specification section shall have a separate submittal cover.
1. If information must be specially prepared for submittal because standard published data are unsuitable for use, submit as Shop Drawings, not as Product Data.
 2. Mark each copy of each submittal to show which products and options are applicable. Send full submittals for each product. **Partial submittals will not be reviewed until all required submittal information is received. The architect will not be responsible for project delays due to the contractor's failure to submit the required submittal information in a complete package.**
 3. Include the following information, as applicable:
 - a. Manufacturer's catalog cuts.
 - b. Manufacturer's product specifications.
 - c. Standard color charts.
 - d. Statement of compliance with specified referenced standards.
 - e. Testing by recognized testing agency.
 - f. Application of testing agency labels and seals.
 - g. Notation of coordination requirements.
 - h. Availability and delivery time information.
 4. For equipment, include the following in addition to the above, as applicable:
 - a. Wiring diagrams that show factory-installed wiring.
 - b. Printed performance curves.
 - c. Operational range diagrams.
 - d. Clearances required to other construction, if not indicated on accompanying Shop Drawings.
 5. Submit Product Data before Shop Drawings, and before or concurrently with Samples.
- B. Shop Drawings: Prepare project-specific information for each shop drawing. Do not base Shop Drawings on reproductions of the Contract Documents or standard printed data [unless submittal based on Architect's digital data drawing files is otherwise permitted].
1. Preparation: Fully illustrate requirements in the Contract Documents. Include the following information, as applicable:

- a. Identification of products.
 - b. Schedules.
 - c. Compliance with specified standards.
 - d. Notation of coordination requirements.
 - e. Notation of dimensions established by field measurement.
 - f. Relationship and attachment to adjoining construction clearly indicated.
 - g. Description any conflicts with other trades.
 - h. Seal and signature of professional engineer if specified.
- C. Samples: Submit Samples for review of type, color, pattern, and texture for a check of these characteristics with other materials.
 - 1. Transmit Samples that contain multiple, related components, such as accessories together in one submittal package. If samples are delivered with product data, only the samples will be reviewed. The Product Data must be uploaded to the Newforma Info Exchange. A duplicate submittal cover sheet is to be uploaded to the Newforma Info exchange as a record of sample delivery.
 - a. The Product Data is to be loaded concurrent with the delivery of samples. Samples may be delivered/given to the Architect. In the remarks column of the transmittal place "given to the Architect"
 - 2. Identification: Permanently attach label on unexposed side of Samples that includes the following:
 - a. Project name and submittal number.
 - b. Generic description of Sample.
 - c. Product name and name of manufacturer.
 - d. Sample source.
 - e. Number and title of applicable Specification Section.
 - f. Specification paragraph number and generic name of each item.
 - g. In addition to all hard copy and physical samples submitted, duplicate digital submittal is to be produced for review, record and tracking purposes through Newforma Info Exchange. Include same information as above as well as a high resolution, color, digital image of all samples with labeled information clearly visible for each physical sample.
 - 3. Disposition: Maintain sets of approved Samples at Project site, available for quality-control comparisons throughout the course of construction activity. Sample sets may be used to determine final acceptance of construction associated with each set.
 - a. Samples that may be incorporated into the Work are indicated in individual Specification Sections. Such Samples must be in an undamaged condition at time of use.
 - b. Samples not incorporated into the Work, or otherwise designated as Owner's property, are the property of Contractor.
 - 4. Samples for Initial Selection: Submit manufacturer's color charts consisting of units or sections of units, showing the full range of colors, textures, and patterns available.
 - a. Number of Samples: Submit one full set(s) of available choices where color, pattern, texture, or similar characteristics are required to be selected from

manufacturer's product line through Construction Manager. will return submittal with options selected.

5. Samples for Verification: Submit full-size units or Samples of size indicated, prepared from same material to be used for the Work, cured and finished in manner specified, and physically identical with material or product proposed for use, and that show full range of color and texture variations expected. Samples include, but are not limited to, the following: partial sections of manufactured or fabricated components; small cuts or containers of materials; complete units of repetitively used materials; swatches showing color, texture, and pattern; color range sets; and components used for independent testing and inspection.
 - a. Number of Samples: Submit three sets of Samples. Architect and Construction Manager will retain two Sample sets; remainder will be returned. Mark up and retain one returned Sample set as a project record Sample.
 - 1) Submit a single Sample where assembly details, workmanship, fabrication techniques, connections, operation, and other similar characteristics are to be demonstrated.
 - 2) If variation in color, pattern, texture, or other characteristic is inherent in material or product represented by a Sample, submit at least three sets of paired units that show approximate limits of variations.
- D. Information requirements for each submittal: Where submittal is requiring Schedules, Product Data, Qualification Data, Design Data, Certificates and Tests use the following protocol.
 1. Schedules: As required in individual Specification Sections, prepare a written summary indicating types of products required for the Work and their intended location. Include the following information in tabular form:
 2. Product Data. Include unique identifier for each product indicated in the Contract Documents or assigned by Contractor if none is indicated.
 - a. Manufacturer and product name, and model number if applicable.
 - b. Number and name of room or space.
 - c. Location within room or space.
 3. Qualification Data: Prepare written information that demonstrates capabilities and experience of firm or person. Include lists of completed projects with project names and addresses, contact information of architects and owners, and other information specified.
 4. Design Data: Prepare and submit written and graphic information indicating compliance with indicated performance and design criteria in individual Specification Sections. Include list of assumptions and summary of loads. Include load diagrams if applicable. Provide name and version of software, if any, used for calculations. Number each page of submittal.
 5. Certificates:
 - a. Certificates and Certifications Submittals: Submit a statement that includes signature of entity responsible for preparing certification. Certificates and certifications shall be signed by an officer or other individual authorized to sign documents on behalf of that entity. Provide a notarized signature where indicated.
 - b. Insert definition of Contractor certificates here if required by individual Specification Sections. See the Evaluations.

- c. Installer Certificates: Submit written statements on manufacturer's letterhead, certifying that Installer complies with requirements in the Contract Documents and, where required, is authorized by manufacturer for this specific Project.
 - d. Manufacturer Certificates: Submit written statements on manufacturer's letterhead, certifying that manufacturer complies with requirements in the Contract Documents. Include evidence of manufacturing experience where required.
 - e. Material Certificates: Submit written statements on manufacturer's letterhead, certifying that material complies with requirements in the Contract Documents.
 - f. Product Certificates: Submit written statements on manufacturer's letterhead, certifying that product complies with requirements in the Contract Documents.
 - g. Welding Certificates: Prepare written certification that welding procedures and personnel comply with requirements in the Contract Documents. Submit record of AWS B2.1/B2.1M on AWS forms. Include names of firms and personnel certified.
 - h. Installer Certificates: Submit written statements on manufacturer's letterhead certifying that Installer complies with requirements in the Contract Documents and, where required, is authorized by manufacturer for this specific Project.
 - i. Manufacturer Certificates: Submit written statements on manufacturer's letterhead certifying that manufacturer complies with requirements in the Contract Documents. Include evidence of manufacturing experience where required.
 - j. Product Certificates: Submit written statements on manufacturer's letterhead certifying that product complies with requirements in the Contract Documents.
 - k. Material Certificates: Submit written statements on manufacturer's letterhead certifying that material complies with requirements in the Contract Documents.
6. Test and Research Reports:
- a. Compatibility Test Reports: Submit reports written by a qualified testing agency, on testing agency's standard form, indicating and interpreting results of compatibility tests performed before installation of product. Include written recommendations for substrate preparation and primers required.
 - b. Field Test Reports: Submit written reports indicating and interpreting results of field tests performed either during installation of product or after product is installed in its final location, for compliance with requirements in the Contract Documents.
 - c. Material Test Reports: Submit reports written by a qualified testing agency, on testing agency's standard form, indicating and interpreting test results of material for compliance with requirements in the Contract Documents.
 - d. Preconstruction Test Reports: Submit reports written by a qualified testing agency, on testing agency's standard form, indicating and interpreting results of tests performed before installation of product, for compliance with performance requirements in the Contract Documents.
 - e. Product Test Reports: Submit written reports indicating that current product produced by manufacturer complies with requirements in the Contract Documents. Base reports on evaluation of tests performed by manufacturer and witnessed by a qualified testing agency, or on comprehensive tests performed by a qualified testing agency.
 - f. Research Reports: Submit written evidence, from a model code organization acceptable to authorities having jurisdiction, that product complies with building code in effect for Project. Include the following information:
 - 1) Name of evaluation organization.
 - 2) Date of evaluation.
 - 3) Time period when report is in effect.

- 4) Product and manufacturers' names.
 - 5) Description of product.
 - 6) Test procedures and results.
 - 7) Limitations of use.
- E. Submit the following submittals: Within 15 days of contract award.
 1. Submittal Schedule including dates of anticipated review and approval.
 - a. **No submittals will be reviewed without an approved Submittal Schedule in place.**
 2. Subcontractor List: Prepare a written summary identifying individuals or firms proposed for each portion of the Work, including those who are to furnish products or equipment fabricated to a special design. Include the following information in tabular form:
 - a. Name, address, telephone number and email address of entities performing subcontract or supplying products.
 - b. Number and title of related Specification Section(s) covered by subcontract.
 3. Contractor's Construction Schedule: Comply with requirements specified in Section 013200 "Construction Progress Documentation."
 4. Schedule of Values: Comply with requirements specified in Section 012900 "Payment Procedures."
- F. Submit with in the first 30 days after Contract Award
 1. Test and Inspection Reports and Schedule of Tests and Inspections Submittals: Comply with requirements specified in Section 014329 "Special Inspections."
 2. Preconstruction Test Reports: Submit reports written by a qualified testing agency, on testing agency's standard form, indicating and interpreting results of tests performed before installation of product, for compliance with performance requirements in the Contract Documents.
 3. Compatibility Test Reports: Submit reports written by a qualified testing agency, on testing agency's standard form, indicating and interpreting results of compatibility tests performed before installation of product. Include written recommendations for primers and substrate preparation needed for adhesion.
- G. Submit Field Test Reports during construction within 15 days of the testing date and as follows:
 1. Submit written reports indicating and interpreting results of field tests performed either during installation of product or after product is installed in its final location, for compliance with requirements in the Contract Documents.
- H. Submit a minimum 30 days prior to Project Closeout:
 1. Closeout Submittals and Maintenance Material Submittals: Comply with requirements specified in Section 017700 "Closeout Procedures."
 2. Maintenance Data: Comply with requirements specified in Division 01 Section 017823 "Operation and Maintenance Data."

1.8 SUBMITTAL PROCESSING

- A. Processing Time: Allow time for submittal review, including time for re-submittals, as follows. Time for review shall commence on Architect's receipt of submittal. No extension of the Contract Time will be authorized because of failure to transmit submittals enough in advance of the Work to permit processing, including re-submittals.
- B. The architect will not be responsible for project delays due to the contractor's failure to submit the required submittal information in time to allow for review based on the stipulated review time and to meet the project schedule.

- C. Initial Review: Allow 10 Calendar days for initial review of each submittal. Allow additional time if coordination with subsequent submittals is required. Architect will advise Contractor when a submittal being processed must be delayed for coordination.
- D. Intermediate Review: If intermediate submittal is necessary, process it in same manner as initial submittal.
- E. Re-submittal Review: Allow 10 Calendar days for review of each re-submittal.
- F. Sequential Review: Where sequential review of submittals by Architect's consultants, Owner, or other parties is indicated, allow 21 Calendar days for initial review of each submittal.
- G. Concurrent Consultant Review: Where the Contract Documents indicate that submittals may be transmitted simultaneously to Architect and to Architect's consultants, allow 15 Calendar days for review of each submittal. Submittal will be returned to Architect before being returned to Contractor.
- H. Where submittal are required to be approved that are part of an assembly or for items such as finishes where color selections are required. The submittal will be retained until all of the information related to these systems and color selections is provided and accepted.
- I. Products with multiple submittals may be held until all necessary information has been submitted for architect to make a complete review. Submittals dependent on coordinating information from related or dependent products; or products with critical interface with other products may be held until all information is submitted for architect to make a complete review and coordinate all required information. (example door frames will not be reviewed without door hardware)
- J. Resubmittals: Make resubmittals in same form and number of copies as initial submittal.
 - 1. Note date and content of previous submittal.
 - 2. Note date and content of revision in label or title block, and clearly indicate extent of revision.
 - 3. Resubmit submittals until they are marked with reviewed notation from Architect's and Construction Manager's action stamp.
- K. Deviations and Additional Information: On an attached separate sheet, prepared on Contractor's letterhead, record relevant information, requests for data, revisions other than those requested by Architect on previous submittals, and deviations from requirements in the Contract Documents, including minor variations and limitations. Include same identification information as related submittal.

1.9 SUBMITTAL PROCEDURES

- A. Qualification Data: Prepare written information that demonstrates capabilities and experience of firm or person. Include lists of completed projects with project names and addresses, contact information of architects and owners, and other information specified.
- B. Welding Certificates: Prepare written certification that welding procedures and personnel comply with requirements in the Contract Documents. Submit record of Welding Procedure Specification and Procedure Qualification Record on AWS forms. Include names of firms and personnel certified.
- C. Installer Certificates: Submit written statements on manufacturer's letterhead certifying that Installer complies with requirements in the Contract Documents and, where required, is authorized by manufacturer for this specific Project.

- D. **Manufacturer Certificates:** Submit written statements on manufacturer's letterhead certifying that manufacturer complies with requirements in the Contract Documents. Include evidence of manufacturing experience where required.
- E. **Product Certificates:** Submit written statements on manufacturer's letterhead certifying that product complies with requirements in the Contract Documents.
- F. **Material Certificates:** Submit written statements on manufacturer's letterhead certifying that material complies with requirements in the Contract Documents.
- G. **Material Test Reports:** Submit reports written by a qualified testing agency, on testing agency's standard form, indicating and interpreting test results of material for compliance with requirements in the Contract Documents.
- H. **Product Test Reports:** Submit written reports indicating that current product produced by manufacturer complies with requirements in the Contract Documents. Base reports on evaluation of tests performed by manufacturer and witnessed by a qualified testing agency, or on comprehensive tests performed by a qualified testing agency.
- I. **Research Reports:** Submit written evidence, from a model code organization acceptable to authorities having jurisdiction, that product complies with building code in effect for Project. Include the following information:
 - 1. Name of evaluation organization.
 - 2. Date of evaluation.
 - 3. Time period when report is in effect.
 - 4. Product and manufacturers' names.
 - 5. Description of product.
 - 6. Test procedures and results.
 - 7. Limitations of use.
- J. **Schedule of Tests and Inspections:** Comply with requirements specified in Division 01 Section "Quality Requirements."
- K. **Preconstruction Test Reports:** Submit reports written by a qualified testing agency, on testing agency's standard form, indicating and interpreting results of tests performed before installation of product, for compliance with performance requirements in the Contract Documents.
- L. **Compatibility Test Reports:** Submit reports written by a qualified testing agency, on testing agency's standard form, indicating and interpreting results of compatibility tests performed before installation of product. Include written recommendations for primers and substrate preparation needed for adhesion.
- M. **Field Test Reports:** Submit written reports indicating and interpreting results of field tests performed either during installation of product or after product is installed in its final location, for compliance with requirements in the Contract Documents.
- N. **Maintenance Data:** Comply with requirements specified in Division 01 Section "Operation and Maintenance Data."
- O. **Design Data:** Prepare and submit written and graphic information, including, but not limited to, performance and design criteria, list of applicable codes and regulations, and calculations. Include list of assumptions and other performance and design criteria and a summary of loads. Include load diagrams if applicable. Provide name and version of software, if any, used for calculations. Include page numbers.

1.10 CONTRACTOR'S REVIEW

- A. Action and Informational Submittals: Review each submittal and check for coordination with other Work of the Contract and for compliance with the Contract Documents. Note corrections and field dimensions. Mark with approval stamp before submitting to Architect.
- B. Contractors Approval: Provide Contractor's approval signature and date on the Submittal Cover sheet certifying that submittal has been reviewed, checked, and approved for compliance with the Contract Documents.

1.11 ARCHITECT'S ACTION

- A. Submittals: Architect will review each submittal, make marks to indicate corrections or revisions required, and return it. Architect will respond to each submittal indicating one of the following actions required:
 - 1. **No Exceptions Taken:** Architect takes no exception to the submittal. This part of the Work covered by the submittal may proceed provided it complies with requirements of the Contract Documents; final acceptance will depend upon that compliance.
 - 2. **Furnish as Corrected:** No exceptions taken except what is identified by the Architect. The part of the Work covered by the submittal may proceed provided it complies with notations or corrections on the submittal and requirements of the Contract Documents; final acceptance will depend on that compliance. Furnish any additional related information as requested.
 - 3. **Revise and Re-Submit:** Revise the submittal based on the Architects comments and resubmit the submittal. Do not proceed with that part of the Work covered by the submittal, including purchasing, fabrication, delivery, or other activity. Revise or prepare a new submittal in accordance with the notations; resubmit without delay. Repeat if necessary to obtain a different action mark.
 - a. Do not permit submittals marked "Revise and Resubmit" to be used at the Project Site, or elsewhere where Work is in progress.
 - 4. **Rejected:** The submittal is rejected. See Architects comments on why submittal was rejected.
 - a. Submittal has not been reviewed by the Contractor and so noted.
 - b. Submittal has been prepared without due regard for information called for or logically implied by the Contract Documents.
 - c. Information is not sufficiently complete or accurate to verify that work represented is in accordance with the Contract Documents.
 - d. Do not permit submittals marked "Rejected" to be used at the Project Site, or elsewhere where Work is in progress.
 - 5. **No Action Taken:** The submittal is not required and will not be reviewed.
- B. Submittals by Newforma Info Exchange: Architect and Construction Manager will indicate, on Newforma Info Exchange, the appropriate action.
- C. Informational Submittals: Architect will review each submittal and will not return it or will return it if it does not comply with requirements. The Architects action will be noted in the Newforma Info Exchange.

- D. Partial submittals prepared for a portion of the Work will be reviewed when use of partial submittals has received prior approval from Architect. The Architects action will be noted in the Newforma Info Exchange and noted as a **partial review** until a full submittal can be received.
- E. Incomplete submittals are unacceptable, will be considered nonresponsive, and will be returned for re-submittal without review.
- F. Submittals not required by the Contract Documents will not be reviewed and will receive no action.

PART 2 - PRODUCTS

PART 3 - EXECUTION

END OF SECTION 013300

SECTION 01 3500 CONTRACTOR SAFETY REQUIREMENTS

PART 1 – GENERAL

1.1 SUMMARY

The Contractor and any tier subcontractors thereafter, performing construction or construction related activities are required to comply with this safety program as outlined below; all Occupational Safety and Health Administration (OSHA) standards; all requirements of state and local authorities having jurisdiction; and manufacturer's recommendations where applicable, and are Directly Responsible for the safety of their employees. References in these Safety Responsibilities to "Contractor" or "Subcontractor" shall mean and include not only the General Contractor and first-tier subcontractor(s) to which the Subcontract is issued but also all persons at any tier who are responsible to such subcontractor, directly or indirectly, including but not limited to employees, sub-subcontractors, suppliers, and vendors. Contractor shall also be responsible for any visitors it invites or allows to have access to the site, in line with site specific requirements.

1.2 SAFETY PROGRAM

1. Contractor shall comply with all applicable laws and changes as they occur (including but not limited to legally binding codes, standards, and regulations, regarding environmental, safety and/or health matters, whether at the federal, state, and/or local level). Contractor shall comply in addition with these Safety Responsibilities and all other safety-related provisions of the Subcontract, even if they are more strict or burdensome than the applicable laws. In the event of conflict between provisions of applicable laws and/or other provisions of these Safety Responsibilities, the more stringent requirement, as determined by the Construction Manager, shall govern.
2. Contractor shall perform and execute the work of the contract while complying with these Safety Responsibilities and any special or additional requirements communicated by the Construction Manager. Contractor will be directly responsible for assuring communication, compliance and accountability by all lower-tier sub-subcontractors, suppliers, vendors, and their employees.
3. Contractor shall maintain documentation (original or duplicates) at the site of work execution verifying compliance with all provisions of these Safety Responsibilities. All such documentation shall be made available upon request by the Construction Manager.
4. A defined "flow down" strategy will be developed by Contractor to ensure program adherence and consistency by all lower tier subcontractors, vendors, suppliers, and delivery drivers.
5. A formal incident review will be required in response to all serious or potentially serious incidents. Contractor and any Subcontractor involved will participate and be represented by site and corporate management during any scheduled incident review sessions. The injured party and any applicable witnesses to the incident may also be required to attend.
6. Contractor shall prepare a Site Specific Safety Plan (SSSP) encompassing all of its work activities and submit to Construction Manager prior to the start of work. The SSSP shall include a written Safety and Health Program, written Hazard Communication Program and

procedures, policies and controls for all hazards in the Contractor's scope of work. Note: Contractor may use an alternative SSSP format only if it meets or exceeds Construction Manager's SSSP and program.

7. Contractor shall submit to Construction Manager and appropriately post emergency contacts, including work and mobile telephone numbers for all applicable Operations and Safety Management personnel.
8. Contractor shall appoint and submit in writing to Construction Manager the name of all competent or qualified person(s) who by training and experience are able to recognize and anticipate hazards. The qualifications of all competent and qualified individuals shall be made available to Construction Manager upon request. Such persons shall have authority to take prompt corrective action to abate hazards. Such persons will also have stop work authority and will also have the authority to alter, modify or stop work plans in the process of hazard review or abatement.
9. In accordance with Contractor's program, all Subcontractor employees will be actively engaged in the Stop Work Authority (SWA) program. This program will be highlighted during orientation and each employee will be granted the authority to pause or stop work to ask questions or to verify that conditions are safe
10. Contractor shall adhere to and enforce all requirements established by this safety plan. The Progressive Discipline Warning System shall be utilized for all safety infractions (1st Violation – Verbal Warning, 2nd Violation – Written Warning, 3rd Violation – Termination and/or Removal from Project). Documented violations shall be completed, submitted and distributed per procedural requirements.
11. At the discretion of Construction Manager, all serious safety and imminent danger violations shall warrant immediate termination and/or removal from the project. Any supervisor or manager who knowingly exposes employees to imminent danger situations is subject to immediate termination. Imminent danger situations include, but are not limited to, the following:
 - a. Violation of the Stored Energy and Lockout/Tagout Procedure, including removing another employee's lockout sign or tag without authorization and working on equipment or circuits that could be accidentally or unintentionally energized. In all cases, failure to develop, submit or follow a pipe/vessel pressure test plan will be considered an imminent danger violation and grounds for termination or removal from site.
 - b. Violation of the Fall Protection Program, including standing on the top or first rung of a step ladder of any height.
 - c. Violation of the Cranes and Rigging Procedure, including operating a crane (lifting, swinging or loading) adjacent to an energized power line less than 10 feet away and using rigging equipment in excess of the recommended safe workload capacity.
 - d. Violation of the Confined Space Procedure, including unauthorized entry to a confined space.
 - e. Violation of the Excavation or Trenching Procedure, including working in or authorizing work in unsloped, unshored and unprotected trenches or excavations.
 - f. Violation of procedures related to mobile equipment, (forklifts and skid steers for example) including operating mobile equipment without appropriate certification,

- training, authorization or inspection.
 - g. Violation of procedures related to caught-in/struck-by hazards, including entering the line of fire (i.e. walking under a suspended load).
 - h. Violation of the Drug and Alcohol Policy, including distribution or working under the influence of mind- altering substances.
 - i. Accessing exclusion zones/red barricaded areas without authorization.
 - j. Conscious disregard of a “DO NOT OPERATE”, “DANGER”, or “WARNING” sign.
 - k. Intentionally removing a guard or safety mechanism designed for employee safety. Additional items that warrant immediate removal or termination include: fighting and verbal abuse, exhibiting open disregard for Contractor/Subcontractor safety or the project safety program, theft, sabotage, firearms, smoking in non-designated areas and falsifying a company document (i.e. accident investigation, testimony, equipment inspection, certifications, etc.)
12. Contractor shall plan and execute all work operations to comply with its written SSSP and these Contractor Safety Responsibilities.
13. Contractor shall ensure that employees remain 100% tied off while operating/working from aerial work platforms.
14. Contractor will ensure that employees remain 100% tied off in scissor lifts to manufacturer-provided anchor points.
15. Contractor will ensure that any utilized scissors lift has manufacturer-provided anchor points.
16. Standing on mid-rails and hand-rails of aerial/scissor lifts is strictly prohibited and considered an imminent danger violation. Blocks or steps are not permitted in lifts to gain access to a higher elevation or stepping.
17. Contractor will utilize a 100% 6-foot fall protection policy and program. This means that each person on a walking or working surface with an unprotected side or edge which is 6 feet or more above the next lower level shall be protected from falling by the use of guardrails, safety nets, or a personal fall arrest system (PFAS). All personnel and all tiers will comply with this requirement, including Roofers, Ironworkers, Erectors, and Connectors, regardless of any exemptions that might otherwise be available under OSHA, trade agreement or other applicable laws.
18. The following exceptions to the 100% 6 foot fall requirement may exist, depending on site specific requirements:
- a. Proper use of a step ladder (up to 12 feet) on a stable and level foundation and away from wall/window openings, mezzanines or other fall hazards.
 - b. Proper use of an approved and inspected extension ladder (up to 24 feet) for movement between levels (not as a working platform).
 - c. All ladders must be rated for 300 lbs. minimum.
 - d. For all activities, including roofing, on low-slope roofs (pitch less than or equal to 4 in 12), employees, including roofers, will be tied off 100% of the time when 6 feet or closer to an unprotected edge with a fall to a lower level of 6 feet or more. Safety Monitors are not allowed, unless approved in advance by the Construction Manager.
 - e. Other extraordinary circumstances only if: (i) Construction Manager provides prior

approval in writing; and (ii) the method of proceeding complies with all applicable laws.

19. Job made ladders shall be built in accordance with ANSI A14.4 and OSHA and only after an alternate fall protection plan has been submitted and reviewed by the Construction Manager.
20. Contractor shall provide an initial safety orientation to each new employee, including all sub-tier employees prior to the start of work at the site. At a minimum, the orientations shall include training on general safety hazards, site-specific safety policies and procedures, personal protective equipment, fall protection, cranes and rigging, stored energy, injury reporting and protocols, emergency evacuation, and preferred medical providers. All orientations shall be documented by the Contractor and verifiable by the Construction Manager. Content of orientation shall be approved by the Construction Manager.
21. Contractor's employees and all sub-tier contractors shall participate in job-wide safety stand-downs on a monthly basis, or as deemed necessary by Construction Manager, for the duration of the project.
22. The Task Hazard Analysis (THA) program is a pre-task planning tool and process. Contractor shall utilize the THA process as a planning and mitigation tool prior to all separate work task and activities. An initial THA will be developed for each work activity prior to the start of work on each shift. As a minimum, each employee will start each shift with a THA. Task or condition change will warrant a new THA. Any activity assigned to employees by a supervisor will be considered appropriate for this THA tool. Contractor will complete THA form (or a Construction Manager-approved alternative form) for each task. A copy of each THA will be submitted to Construction Manager for review. All impacted employees shall participate in developing the THA or pre-task plan.
23. Contractor shall adhere to and comply with any and all Construction Manager Substance Abuse programs and policies.
24. Contractor management shall attend safety meetings as scheduled by the Construction Manager. Contractor's employees and all sub-tier Subcontractors shall participate in daily sunrise huddles.
25. Contractor shall schedule and conduct weekly Toolbox safety meetings for all employees under its direct or indirect supervision. A copy of the Toolbox topics including sign-off sheets must be maintained and submitted to Construction Manager upon request.
26. Contractor shall implement immediate corrective action to eliminate unsafe practices and conditions as they are observed or reported. In cases where immediate or "On the Spot" actions are not taken, Construction Manager reserves the option to abate the condition at the expense of the Contractor.
27. Contractor shall notify Construction Manager within one (1) hour of any incident involving injury (or near miss of injury/damage) to any person or property. In addition, each Contractor shall investigate and document all such incidents. Findings shall be documented in an incident report and submitted to Construction Manager within 24 hours of the incident. All such incident reports will contain, but not be limited to;
 - a. Date of event
 - b. Chain of events leading to incident
 - c. Impacted or injured parties (i.e., name, craft, position)
 - d. Impacted property and estimated damage costs

- e. Primary and contributing causes of incident
 - f. Contributing causes of incident
 - g. Immediate corrective measures taken
 - h. Lessons learned for wider application by Subcontractor or Contractor
 - i. Other items as requested by the Construction Manager
28. Contractor shall provide adequate safety measures and controls to address potential occupational exposures such as gases, fumes, silica, dusts, chemicals, noise, and confined spaces.
29. Contractor shall provide Personal Protective Equipment (PPE) to all employees as needed and required per Construction Manager policy/procedure or regulatory requirements. Contractor and all tiers shall take immediate corrective action for non-compliance up to and including removal from the work site. Furthermore, Construction Manager reserves the right to take appropriate actions to remedy any Contractor non-compliance at the Contractor's expense. Construction Manager also reserves the right to withhold payment pending correction and abatement of all noted or discussed hazards.
30. Construction Manager reserves the right to remove any party or employee from the site at any time and for any reason.
31. Contractor shall implement an aggressive Return to Work and Modified Work policy and procedure. The procedure will include but not be limited to a.) The use of a local preferred medical provider. b.) Contractor approved work assignment for any and all injured parties who are provided a physician's restricted duty diagnosis. c.) Light Duty work options for all employees, as required.
32. Contractor will inspect all hand tools and extension cords prior to their use. Tools and extension cords found to be defective will to be taken out of service immediately and removed from the site. Other equipment, such as scaffolding and ladders, shall be inspected for defects by the Contractor's competent person prior to use. Any equipment found to be defective or unserviceable will be immediately brought to the attention of the Contractors supervision, taken out of service and removed from the site.
33. All equipment and tools shall be used per the manufacturer's recommendations and equipped with manufacturer-provided handles.
34. Contractor shall ensure that no power tools have a positive locking trigger. Each power tool shall be equipped with a constant pressure trigger.
35. In addition to specific requirements set out elsewhere in OSHA §1926.304, .304(f), Construction Manager requires that all Contractor woodworking tools and machinery meet other applicable requirements of ANSI 01.1- 1961. Section 3.1.3(c) of the ANSI standard. On applications where injury to the operator might result if motors were to restart after power failures, provisions shall be made to prevent machines from automatically restarting upon restoration of power. This is a "performance" standard -- where injury can occur in this type of situation, the Contractor must incorporate an effective means of preventing the machine from automatically restarting.
36. Contractor shall ensure that all power tools and cords are protected by an operable Ground Fault Circuit Interrupter (GFCI) plugged in at the power source or GFCI circuit breaker or

GFCI "pigtail". Above 110 V, all cord sets and plug sets shall be protected via GFCI or Assured Equipment Grounding Conductor Program (AEGCP).

37. Contractor shall ensure that all work on live electrical components is performed only if and when all other alternatives have been deemed infeasible and with the written approval and consent from the Construction Manager Superintendent, Contractor ESH, Contractor Senior Management and the owner (if required) – no exceptions.
38. All electrical tasks will be carried out in compliance with NFPA 70E, OSHA and Construction Managers Stored Energy program. Additionally, Contractor will only handle or engage de-energized wiring or circuits only after appropriate Lock and Tag and secondary confirmation of source isolation via a working voltage detector or like instrument." Any and all work on live/energized sources requires advance notice and approval by Construction Managers site management team.
39. Contractor shall ensure that all permanent and temporary electrical panels are locked and labeled with controlled access. All de-energized electrical and power systems will be locked out in accordance with appropriate lock and tagging guidelines.
40. Contractor shall maintain all required and appropriate OSHA documentation related to injuries and illnesses on the project site. Such documents will be made available to Construction Manager upon request.
41. Each Contractor shall maintain all appropriate documentation under the Hazard Communications standard and the Globally Harmonized System (GHS). The Contractor shall submit all SDS/MSDS's used in the performance of work to Construction Manager. The Contractor shall maintain a copy of a hazardous communications program and a library of SDS/MSDS's for materials provided/used in the performance of its scope of work. Contractor shall submit its written Hazard Communication program to Construction Manager upon request. Contractor will ensure that all employees are trained to address any potential chemical exposures/interfaces.
42. Contractor shall conduct daily inspections of all work areas. Contractor shall conduct a formal and documented weekly safety inspection and take corrective actions for recognized hazards. A copy of all completed inspections performed by the Contractor shall be provided to Construction Manager within 24 hours.
43. Contractor shall have a qualified safety professional perform one documented safety assessment of the project monthly. The documented assessment will be submitted to the Construction Manager Project Superintendent. Deficiencies shall be immediately addressed by the Contractor.
44. Contractor shall conduct periodic safety meetings with employees, foremen, and subcontractors, at all tiers, to address safety instructions with work assignments including hazard recognition training, lessons learned and high-hazard activities.
45. When working with mobile cranes or tower cranes, Contractor shall appoint a certified signal person and qualified rigger prior to the lift. Documentation on qualifications/certifications will be provided to Construction Manager. All current and subsequent Construction Manager crane and rigging policies and practices will be adhered to.

46. Contractors that fail to meet safety performance standards as determined by Construction Manager may be required to designate a full-time, on site, dedicated safety professional. Such determination may be based upon: on site injury/illness rates, safety violations/concerns issued by Construction Manager or a regulatory authority, or lack of participation in required safety forums, activities and meetings. Any designated safety professional shall meet the following minimum requirements:
 - a. Successfully completed an OSHA 30-hour construction safety course within the last five years.
 - b. Qualify as a competent person in accordance with OSHA definitions.
 - c. Have the ability to recognize hazards associated with the scope of work.
 - d. Have "Stop work" authority.
47. If Construction Manager determines a Contractor's work to be "high hazard" (e.g., critical lifts, extensive scaffolding, demolition, excavations, fire- or smoke-generating activities, pre-cast decking, steel erection, confined spaces, work at heights, work at depths, etc.) the Contractor may be required to provide a written High Hazard Assessment (HHA) prior to the commencement of work. This HHA will address known and potential hazards and all controls or mitigation plans and actions.
48. Contractor shall develop and submit a Pressure Testing Safety Plan to the Construction Manager Superintendent prior to performing any pneumatic, hydrostatic or other pressure testing of pipes or vessels. Contractor shall not use pneumatic testing as a testing medium unless required by the design and approved well in advance by the Construction Manager.
49. Contractor will provide competent flaggers at project entrances for the safe access and egress of all heavy loads, trucks and equipment. Flaggers shall be trained in accordance with OSHA, DOT or other state or federal standards.
50. Construction Manager encourages all Contractor foreman, supervisors and superintendents to pursue OSHA 30-hour certification.
51. Subcontractor shall ensure that all scaffolds are built and tagged in accordance with the Contractor scaffolding procedure and OSHA guidelines.
52. Contractor shall ensure that all Baker scaffolds are equipped with complete handrails while in use.
53. Hot Work Permits are issued by the Construction Manager a minimum of 24 hours prior to any work requiring an open flame; a fire watch is required during all cutting/welding operations and shall continue at least thirty (30) minutes after the completion of cutting/welding operations.
54. Contractor shall provide Construction Manager with a copy of their documented respiratory protection program where applicable. This program shall cover the requirements for Appendix D, Voluntary Respirator Use. The Contractor shall retain all signed copies of Appendix D that were performed on the project. The signed Appendix D shall be made available upon request.
55. Contractor shall ensure that any wooden or aluminum ladder use is approved through Construction Manager. These ladders are to be used only if all other approved methods have been deemed infeasible.

56. The following work rules are important to the safety of all personnel on project sites and shall be adhered to at all times;
- a. Possession of or working under the influence of alcohol or drugs is prohibited and subject to immediate dismissal.
 - b. Hazard Communication and Lockout/Tag out Programs shall be observed.
 - c. Report all unsafe conditions or acts, along with all accidents or near misses, to your immediate supervisor and a member of the Construction Manager's management team.
 - d. Appropriate work attire shall be worn at all times. Hard hats, in construction areas, safety glasses, High-Visibility vests/shirts/jackets and durable boots covering the feet and ankle are minimum requirements.
 - e. Appropriate work gloves are required for all employees at all times while onsite.
 - f. Work wear shall not be offensive or inappropriate.
 - g. "Horseplay", harassment, fighting, work place violence, and other inappropriate behaviors are strictly prohibited.
 - h. Maintaining good housekeeping is mandatory at all times. Contractor is responsible for daily clean up.
 - i. Photos, pictures or video is not allowed on site unless approved by Construction Manager.
 - j. Fire protection equipment is not to be tampered with or removed from its assigned location.
 - k. Only authorized, licensed and properly instructed site employees shall operate machinery, equipment, vehicles, and tools. This includes, but is not limited to cranes, forklifts, Lulls, front-end loaders, flatbed trucks, nail guns, drill presses, skid steers, etc.
 - l. Verification of training shall be submitted prior to any work being conducted on site.
 - m. Vehicles are to be operated and driven in a safe manner at all times.
 - n. Firearms are prohibited on projects at all times.
 - o. Do not enter roped off or barricaded areas without proper authorization.
 - p. Modification or alteration of any piece of personal protective equipment is strictly prohibited.
 - q. "No Smoking" rules shall be adhered to. Smoking/tobacco shall be allowed in designated areas only.
 - r. All gasoline engines shall be shut off and allowed to cool before refueling.
 - s. The use of plastic gas cans for storing combustible/flammable liquids on the site is prohibited. Use only approved metal containers.
 - t. Tampering with firefighting or life safety equipment is prohibited and grounds for immediate termination/removal.
 - u. The use of portable FM/AM, iPod, MP3 radios on site is prohibited at all times. Cell phones are strictly prohibited while performing trade/craft work constructing the project. Bluetooth headsets are prohibited unless used in the execution of specific task or job.

END OF SECTION 01 3500

SECTION 01 4000 - QUALITY REQUIREMENTS

PART 1 - GENERAL

1.1 SUMMARY

- A. Section includes administrative and procedural requirements for quality assurance and quality control.
- B. Testing and inspecting services are required to verify compliance with requirements specified or indicated. These services do not relieve Contractor of responsibility for compliance with the Contract Document requirements.
 - 1. Specific quality-assurance and -control requirements for individual construction activities are specified in the Sections that specify those activities. Requirements in those Sections may also cover production of standard products.
 - 2. Specified tests, inspections, and related actions do not limit Contractor's other quality-assurance and -control procedures that facilitate compliance with the Contract Document requirements.
 - 3. Requirements for Contractor to provide quality-assurance and -control services required by Architect, Owner, Construction Manager, or authorities having jurisdiction are not limited by provisions of this Section.
- C. Related Sections:
 - 1. Division 01 Section "Construction Progress Documentation" for developing a schedule of required tests and inspections.
 - 2. Division 01 Section "Special Inspections" for tests and inspections ordered by the Owner.
 - 3. Individual Sections for specific test and inspection requirements.

1.2 DEFINITIONS

- A. Quality-Assurance Services: Activities, actions, and procedures performed before and during execution of the Work to guard against defects and deficiencies and substantiate that proposed construction will comply with requirements.
- B. Quality-Control Services: Tests, inspections, procedures, and related actions during and after execution of the Work to evaluate that actual products incorporated into the Work and completed construction comply with requirements. Services do not include contract enforcement activities performed by Architect or Construction Manager.
- C. Mockups: Full size physical assemblies that are constructed on-site. Mockups are constructed to verify selections made under sample submittals; to demonstrate aesthetic effects and, where indicated, qualities of materials and execution; to review coordination, testing, or operation; to show interface between dissimilar materials; and to demonstrate compliance with specified installation tolerances. Mockups are not Samples. Unless otherwise indicated, approved mockups establish the standard by which the Work will be judged.
 - 1. Integrated Exterior Mockups: Mockups of the Roof Edge, Fascia, Soffit & Overhang.
- D. Preconstruction Testing: Tests and inspections performed specifically for the Project before products and materials are incorporated into the Work to verify performance or compliance with specified criteria.
- E. Product Testing: Tests and inspections that are performed by an NRTL, an NVLAP, or a testing agency qualified to conduct product testing and acceptable to authorities having jurisdiction, to establish product performance and compliance with specified requirements.
- F. Source Quality-Control Testing: Tests and inspections that are performed at the source, i.e., plant, mill, factory, or shop.

- G. Field Quality-Control Testing: Tests and inspections that are performed on-site for installation of the Work and for completed Work.
- H. Testing Agency: An entity engaged to perform specific tests, inspections, or both. Testing laboratory shall mean the same as testing agency.
- I. Installer/Applicator/Erector: Contractor or another entity engaged by Contractor as an employee, Subcontractor, or Sub-subcontractor, to perform a particular construction operation, including installation, erection, application, and similar operations.
 - 1. Use of trade-specific terminology in referring to a trade or entity does not require that certain construction activities be performed by accredited or unionized individuals, or that requirements specified apply exclusively to specific trade or trades.
- J. Experienced: When used with an entity or individual, "experienced" means having successfully completed a minimum of five similar in nature, size, and extent to this Project; being familiar with special requirements indicated; and having complied with requirements of authorities having jurisdiction.

1.3 CONFLICTING REQUIREMENTS

- A. Referenced Standards: If compliance with two or more standards is specified and the standards establish different or conflicting requirements for minimum quantities or quality levels, comply with the most stringent requirement. Refer conflicting requirements that are different, but apparently equal, to Architect for a decision before proceeding.
- B. Minimum Quantity or Quality Levels: The quantity or quality level shown or specified shall be the minimum provided or performed. The actual installation may comply exactly with the minimum quantity or quality specified, or it may exceed the minimum within reasonable limits. To comply with these requirements, indicated numeric values are minimum or maximum, as appropriate, for the context of requirements. Refer uncertainties to Architect for a decision before proceeding.

1.4 ACTION SUBMITTALS

- A. Shop Drawings: For integrated exterior mockups, provide plans, sections, and elevations, indicating materials and size of mockup construction.
 - 1. Indicate manufacturer and model number of individual components.
 - 2. Provide axonometric drawings for conditions difficult to illustrate in two dimensions.

1.5 INFORMATIONAL SUBMITTALS

- A. Contractor's Statement of Responsibility: When required by authorities having jurisdiction, submit copy of written statement of responsibility sent to authorities having jurisdiction before starting work on the following systems.
 - 1. Seismic-force resisting system, designated seismic system, or component listed in the designated seismic system quality assurance plan prepared by the Architect.
 - 2. Main wind-force resisting system or a wind-resisting component listed in the wind-force-resisting system quality assurance plan prepared by the Architect.
- B. Testing Agency Qualifications: For testing agencies specified in "Quality Assurance" Article to demonstrate their capabilities and experience. Include proof of qualifications in the form of a recent report on the inspection of the testing agency by a recognized authority.
- C. Schedule of Tests and Inspections: Prepare in tabular form and include the following:
 - 1. Specification Section number and title.
 - 2. Entity responsible for performing tests and inspections.
 - 3. Description of test and inspection.
 - 4. Identification of applicable standards.

5. Identification of test and inspection methods.
6. Number of tests and inspections required.
7. Time schedule or time span for tests and inspections.
8. Requirements for obtaining samples.
9. Unique characteristics of each quality-control service.

1.6 REPORTS AND DOCUMENTS

- A. Test and Inspection Reports: Prepare and submit certified written reports specified in other Sections. Include the following:
 1. Date of issue.
 2. Project title and number.
 3. Name, address, and telephone number of testing agency.
 4. Dates and locations of samples and tests or inspections.
 5. Names of individuals making tests and inspections.
 6. Description of the Work and test and inspection method.
 7. Identification of product and Specification Section.
 8. Complete test or inspection data.
 9. Test and inspection results and an interpretation of test results.
 10. Record of temperature and weather conditions at time of sample taking and testing and inspecting.
 11. Comments or professional opinion on whether tested or inspected Work complies with the Contract Document requirements.
 12. Name and signature of laboratory inspector.
 13. Recommendations on retesting and reinspecting.
- B. Manufacturer's Technical Representative's Field Reports: Prepare written information documenting manufacturer's technical representative's tests and inspections specified in other Sections. Include the following:
 1. Name, address, and telephone number of technical representative making report.
 2. Statement on condition of substrates and their acceptability for installation of product.
 3. Statement that products at Project site comply with requirements.
 4. Summary of installation procedures being followed, whether they comply with requirements and, if not, what corrective action was taken.
 5. Results of operational and other tests and a statement of whether observed performance complies with requirements.
 6. Statement whether conditions, products, and installation will affect warranty.
 7. Other required items indicated in individual Specification Sections.
- C. Factory-Authorized Service Representative's Reports: Prepare written information documenting manufacturer's factory-authorized service representative's tests and inspections specified in other Sections. Include the following:
 1. Name, address, and telephone number of factory-authorized service representative making report.
 2. Statement that equipment complies with requirements.
 3. Results of operational and other tests and a statement of whether observed performance complies with requirements.
 4. Statement whether conditions, products, and installation will affect warranty.
 5. Other required items indicated in individual Specification Sections.
- D. Permits, Licenses, and Certificates: For Owner's records, submit copies of permits, licenses, certifications, inspection reports, releases, jurisdictional settlements, notices, receipts for fee payments, judgments, correspondence, records, and similar documents, established for compliance with standards and regulations bearing on performance of the Work.

1.7 QUALITY ASSURANCE

- A. General: Qualifications paragraphs in this article establish the minimum qualification levels required; individual Specification Sections specify additional requirements.
- B. Manufacturer Qualifications: A firm experienced in manufacturing products or systems similar to those indicated for this Project and with a record of successful in-service performance, as well as sufficient production capacity to produce required units.
- C. Fabricator Qualifications: A firm experienced in producing products similar to those indicated for this Project and with a record of successful in-service performance, as well as sufficient production capacity to produce required units.
- D. Installer Qualifications: A firm or individual experienced in installing, erecting, or assembling work similar in material, design, and extent to that indicated for this Project, whose work has resulted in construction with a record of successful in-service performance.
- E. Professional Engineer Qualifications: A professional engineer who is legally qualified to practice in jurisdiction where Project is located and who is experienced in providing engineering services of the kind indicated. Engineering services are defined as those performed for installations of the system, assembly, or product that are similar to those indicated for this Project in material, design, and extent.
- F. Specialists: Certain Specification Sections require that specific construction activities shall be performed by entities who are recognized experts in those operations. Specialists shall satisfy qualification requirements indicated and shall be engaged for the activities indicated.
 - 1. Requirements of authorities having jurisdiction shall supersede requirements for specialists.
- G. Testing Agency Qualifications: An NRTL, an NVLAP, or an independent agency with the experience and capability to conduct testing and inspecting indicated, as documented according to ASTM E 329; and with additional qualifications specified in individual Sections; and where required by authorities having jurisdiction, that is acceptable to authorities.
 - 1. NRTL: A nationally recognized testing laboratory according to 29 CFR 1910.7.
 - 2. NVLAP: A testing agency accredited according to NIST's National Voluntary Laboratory Accreditation Program.
- H. Manufacturer's Technical Representative Qualifications: An authorized representative of manufacturer who is trained and approved by manufacturer to observe and inspect installation of manufacturer's products that are similar in material, design, and extent to those indicated for this Project.
- I. Factory-Authorized Service Representative Qualifications: An authorized representative of manufacturer who is trained and approved by manufacturer to inspect installation of manufacturer's products that are similar in material, design, and extent to those indicated for this Project.
- J. Preconstruction Testing: Where testing agency is indicated to perform preconstruction testing for compliance with specified requirements for performance and test methods, comply with the following:
 - 1. Contractor responsibilities include the following:
 - a. Provide test specimens representative of proposed products and construction.
 - b. Submit specimens in a timely manner with sufficient time for testing and analyzing results to prevent delaying the Work.
 - c. Provide sizes and configurations of test assemblies, mockups, and laboratory mockups to adequately demonstrate capability of products to comply with performance requirements.
 - d. Build site-assembled test assemblies and mockups using installers who will perform same tasks for Project.

- e. Build laboratory mockups at testing facility using personnel, products, and methods of construction indicated for the completed Work.
 - f. When testing is complete, remove test specimens, assemblies, mockups; do not reuse products on Project.
- 2. Testing Agency Responsibilities: Submit a certified written report of each test, inspection, and similar quality-assurance service to Architect, through Construction Manager, with copy to Contractor. Interpret tests and inspections and state in each report whether tested and inspected work complies with or deviates from the Contract Documents.
- K. Mockups: Before installing portions of the Work requiring mockups, build mockups for each form of construction and finish required to comply with the following requirements, using materials indicated for the completed Work:
 - 1. Build mockups in location and of size indicated or, if not indicated, as directed by Architect.
 - 2. Demonstrate the proposed range of aesthetic effects and workmanship.
 - 3. Obtain Architect's approval of mockups before starting work, fabrication, or construction.
 - 4. Maintain mockups during construction in an undisturbed condition as a standard for judging the completed Work.
 - 5. Demolish and remove mockups when directed, unless otherwise indicated.

1.8 QUALITY CONTROL

- A. Owner Responsibilities: Where quality-control services are indicated as Owner's responsibility, Owner will engage a qualified testing agency to perform these services.
 - 1. Owner will furnish Contractor with names, addresses, and telephone numbers of testing agencies engaged and a description of types of testing and inspecting they are engaged to perform.
 - 2. Costs for retesting and reinspecting construction that replaces or is necessitated by work that failed to comply with the Contract Documents will be charged to Contractor, and the Contract Sum will be adjusted by Change Order.
- B. Contractor Responsibilities: Tests and inspections not explicitly assigned to Owner are Contractor's responsibility. Perform additional quality-control activities required to verify that the Work complies with requirements, whether specified or not.
 - 1. Unless otherwise indicated, provide quality-control services specified and those required by authorities having jurisdiction. Perform quality-control services required of Contractor by authorities having jurisdiction, whether specified or not.
 - 2. Where services are indicated as Contractor's responsibility, engage a qualified testing agency to perform these quality-control services.
 - 3. Where quality-control services are indicated as Contractor's responsibility, submit a certified written report, in duplicate, of each quality-control service.
 - 4. Testing and inspecting requested by Contractor and not required by the Contract Documents are Contractor's responsibility.
 - 5. Submit additional copies of each written report directly to authorities having jurisdiction, when they so direct.
 - 6. Notify testing agencies at least 24 hours in advance of time when Work that requires testing or inspecting will be performed.
- C. Manufacturer's Field Services: Where indicated, engage a factory-authorized service representative to inspect field-assembled components and equipment installation, including service connections. Report results in writing as specified in Division 01 Section "Submittal Procedures."

- D. Manufacturer's Technical Services: Where indicated, engage a manufacturer's technical representative to observe and inspect the Work. Manufacturer's technical representative's services include participation in preinstallation conferences, examination of substrates and conditions, verification of materials, observation of Installer activities, inspection of completed portions of the Work, and submittal of written reports.
- E. Retesting/Reinspecting: Regardless of whether original tests or inspections were Contractor's responsibility, provide quality-control services, including retesting and reinspecting, for construction that replaced Work that failed to comply with the Contract Documents.
- F. Testing Agency Responsibilities: Cooperate with Architect, Construction Manager, and Contractor in performance of duties. Provide qualified personnel to perform required tests and inspections.
1. Notify Architect, Construction Manager, and Contractor promptly of irregularities or deficiencies observed in the Work during performance of its services.
 2. Determine the location from which test samples will be taken and in which in-situ tests are conducted.
 3. Conduct and interpret tests and inspections and state in each report whether tested and inspected work complies with or deviates from requirements.
 4. Submit a certified written report, in duplicate, of each test, inspection, and similar quality-control service through Contractor.
 5. Do not release, revoke, alter, or increase the Contract Document requirements or approve or accept any portion of the Work.
 6. Do not perform any duties of Contractor.
- G. Associated Services: Cooperate with agencies performing required tests, inspections, and similar quality-control services, and provide reasonable auxiliary services as requested. Notify agency sufficiently in advance of operations to permit assignment of personnel. Provide the following:
1. Access to the Work.
 2. Incidental labor and facilities necessary to facilitate tests and inspections.
 3. Adequate quantities of representative samples of materials that require testing and inspecting. Assist agency in obtaining samples.
 4. Facilities for storage and field curing of test samples.
 5. Preliminary design mix proposed for use for material mixes that require control by testing agency.
 6. Security and protection for samples and for testing and inspecting equipment at Project site.
- H. Coordination: Coordinate sequence of activities to accommodate required quality-assurance and -control services with a minimum of delay and to avoid necessity of removing and replacing construction to accommodate testing and inspecting.
1. Schedule times for tests, inspections, obtaining samples, and similar activities.

1.9 SPECIAL INSPECTIONS AND TESTS

- A. Special Tests and Inspections: Owner will engage a qualified testing agency to conduct special tests and inspections required by authorities having jurisdiction as the responsibility of Owner, as indicated in Statement of Special Inspections, and as follows:
1. Verifying that manufacturer maintains detailed fabrication and quality-control procedures and reviews the completeness and adequacy of those procedures to perform the Work.
 2. Notifying Architect, Construction Manager, and Contractor promptly of irregularities and deficiencies observed in the Work during performance of its services.
 3. Submitting a certified written report of each test, inspection, and similar quality-control service to Architect, through Construction Manager, with copy to Contractor and to authorities having jurisdiction.

4. Submitting a final report of special tests and inspections at Substantial Completion, which includes a list of unresolved deficiencies.
5. Interpreting tests and inspections and stating in each report whether tested and inspected work complies with or deviates from the Contract Documents.
6. Retesting and reinspecting corrected work.

PART 2 - PRODUCTS (Not Applicable)

PART 3 - EXECUTION

3.1 TEST AND INSPECTION LOG

- A. Prepare a record of tests and inspections. Include the following:
 1. Date test or inspection was conducted.
 2. Description of the Work tested or inspected.
 3. Date test or inspection results were transmitted to Architect.
 4. Identification of testing agency or special inspector conducting test or inspection.
- B. Maintain log at Project site. Post changes and modifications as they occur. Provide access to test and inspection log for Architect's and Construction Manager's reference during normal working hours.

3.2 REPAIR AND PROTECTION

- A. General: On completion of testing, inspecting, sample taking, and similar services, repair damaged construction and restore substrates and finishes.
 1. Provide materials and comply with installation requirements specified in other Specification Sections or matching existing substrates and finishes. Restore patched areas and extend restoration into adjoining areas with durable seams that are as invisible as possible. Comply with the Contract Document requirements for cutting and patching in Division 01 Section "Execution."
- B. Protect construction exposed by or for quality-control service activities.
- C. Repair and protection are Contractor's responsibility, regardless of the assignment of responsibility for quality-control services.

END OF SECTION 01 4000

SECTION 01 4119 – REGULATORY REQUIREMENTS (NYS EDUCATION DEPARTMENT)

PART 1 - GENERAL

1.1 SUMMARY

- A. Section includes:
 - 1. “Uniform Safety Standards for School Construction and Maintenance Projects” for maintaining a Certificate of Occupancy during construction.

1.2 REFERENCES

- A. Section 155.5 of the Regulations of the New York State Commissioner of Education “Uniform Safety Standards for School Construction and Maintenance Projects”.

PART 2 - PRODUCTS (Not Applicable)

PART 3 - EXECUTION

3.1 GENERAL REQUIREMENT

- A. The occupied portion of any school building shall always comply with the minimum requirements necessary to maintain a certificate of occupancy.

3.2 HAZARDOUS BUILDING MATERIALS

- A. Surfaces that will be disturbed during renovation or demolition have been tested for lead and asbestos. Results of the testing are available, upon request, from the Owner.

3.3 GENERAL SAFETY AND SECURITY STANDARDS FOR CONSTRUCTION

- A. General safety and security standards for construction projects include the following:
 - 1. All construction materials shall be stored in a safe and secure manner.
 - 2. Fences around construction supplies or debris shall be maintained.
 - 3. Gates shall always be locked unless a worker is in attendance to prevent unauthorized entry.
 - 4. During exterior renovation work, overhead protection shall be provided for any sidewalks or areas immediately beneath the work site or such areas shall be fenced off and provided with warning signs to prevent entry.
 - 5. Workers shall be required to wear photo-identification badges at all times for identification and security purposes while working at occupied sites.

3.4 SEPARATION OF CONSTRUCTION AREAS FROM OCCUPIED AREAS

- A. Construction areas which are under the control of a contractor and therefore not occupied by district staff or students shall be separated from occupied areas. Provisions shall be made to prevent the passage of dust and contaminants into occupied parts of the building. Periodic inspection and repairs of the containment barriers must be made to prevent exposure to dust or contaminants. Gypsum board must be used in exit ways or other areas that require fire rated separation. Heavy duty plastic sheeting may be used only for a vapor, fine dust or air infiltration barrier, and shall not be used to separate occupied spaces from construction areas.
 - 1. A specific stairwell and/or elevator should be assigned for construction worker use during work hours. In general, workers may not use corridors, stairs or elevators designated for students or school staff.

2. Large amounts of debris must be removed by using enclosed chutes or a similar sealed system. There shall be no movement of debris through halls or occupied spaces of the building. No material shall be dropped or thrown outside the walls of the building.
3. All occupied parts of the building affected by renovation activity shall be cleaned at the close of each workday. School buildings occupied during a construction project shall maintain required health, safety and educational capabilities at all times that classes are in session."

3.5 MAINTAINING EXITING DURING CONSTRUCTION

- A. The Contractor will prepare a plan detailing how exiting required by the applicable building code will be maintained during construction. The plan shall indicate temporary construction required to isolate construction equipment, materials, people, dust, fumes, odors, and noise during the construction period. Temporary construction details shall meet code-required fire ratings for separation and corridor enclosure. At a minimum, required exits, temporary stairs, ramps, exit signs, and door hardware shall be provided at all times.

3.6 MAINTAINING VENTILATION DURING CONSTRUCTION

- A. The Contractor will prepare a plan detailing how adequate ventilation will be maintained during construction. The plan shall indicate ductwork that must be rerouted, disconnected, or capped in order to prevent contaminants from the construction area from entering the occupied areas of the building. The plan shall also indicate how required ventilation to occupied spaces affected by the construction will be maintained during the project.

3.7 NOISE ABATEMENT DURING CONSTRUCTION

- A. Construction and maintenance operations shall not produce noise in excess of 60 dba in occupied spaces or shall be scheduled for times when the building or affected building spaces are not occupied or acoustical abatement measures shall be taken
- B. Noise level measurements (dba) shall be taken with a type 2 sound level meter in the occupied space in a location closest to the source of noise.
- C. Each prime contractor shall have a type 2 sound level meter available on the project site at all times for use by the architect/engineer for the entire duration of the construction project.

3.8 CONTROL OF CHEMICAL FUMES, GASES AND OTHER CONTAMINANTS DURING CONSTRUCTION

- A. The contractor shall be responsible for the control of chemical fumes, gases, and other contaminants produced by, including but not limited to, welding, gasoline or diesel engines, roofing, paving, or painting, to ensure they do not enter occupied portions of the building or air intakes.
 1. Contractors shall provide a plan indicating how and where welding, gasoline engine, roofing, paving, painting or other fumes will be exhausted from the work site. Contractors shall provide all temporary means to assure that fresh air intakes do not draw in such fumes.
 2. If any portion of the work will generate toxic gases that cannot be contained in an isolated area, the work shall be done when school classes and programs are not in session. The contractor shall include costs associated with this requirement in his bid. The building shall be properly ventilated and, the material shall be given proper time, as recommended by the manufacturer, to cure "off-gas" before re-occupancy.
 3. The contractor shall maintain all manufacturers' Material Safety Data Sheets (MSDS) at the site for all products used in the project. Copies of the MSDS sheets shall be given to the Architect and to the School District. MSDS sheets shall be provided to anyone who requests them.

3.9 CONTROL OF OFF-GASSING DURING CONSTRUCTION

- A. The contractor shall be responsible to ensure that activities and materials which result in "off-gassing" of volatile organic compounds such as glues, paints, furniture, carpeting, wall covering, drapery, etc. are scheduled, cured or ventilated in accordance with manufacturers recommendations before a space can be occupied.
1. Contractor shall provide, in their schedules for work of the construction, proper time for "off-gassing" or volatile organic compounds introduced during construction before occupancy is allowed. Specific attention is warranted for activities including glues, adhesives, paint, furniture, carpeting, wall coverings, and drapery. Manufacturers shall be contacted to obtain information regarding appropriate temperatures and times needed to cure or ventilate the product during use and before safe occupancy of the space can be assured. The contractor shall include the above-mentioned information and shall clearly highlight the information, as part of the shop drawing submittal.
 2. Building materials or furnishings which "off-gas" chemical fumes, gases, or other contaminants shall be aired out in a well ventilated heated warehouse before it is brought to the project for installation or, the manufacturer's recommended "off-gassing" periods must be scheduled between installation and use of the space.
 3. The contractor shall maintain all manufacturers' Material Safety Data Sheets (MSDS) at the site for all products used in the project. Copies of the MSDS sheets shall be given to the Architect and to the School District. MSDS sheets shall be provided to anyone who requests them.

3.10 ASBESTOS-CONTAINING BUILDING MATERIALS

- A. Large and small asbestos abatement projects as defined by 12NYCRR56 shall not be performed while the building is occupied. The term "building", as referenced in this section, means a wing or major section of a building that can be completely isolated from the rest of the building with sealed non combustible construction. The isolated portion of the building must contain exits that do not pass through the occupied portion and ventilation systems must be physically separated and sealed at the isolation barrier.
- B. Exterior work such as roofing, flashing, siding, or soffit work may be performed on occupied buildings provided proper variances are in place as required, and complete isolation of ventilation systems and at windows is provided. Care must be taken to schedule work so that classes are not disrupted by noise or visual distraction.
- C. For clearance sampling, the air sampling technician shall provide aggressive air sampling per Rule 56 and as follows: First direct the exhaust of a leaf blower, against all walls, ceilings, floors, ledges, and other surfaces in the work area. Continue agitation for at least five minutes per every 1,000 sf of floor space. Following this aggressive agitation, the air-sampling technician shall use at least one 20-inch fan per 10,000 cubic feet of work area space for continuous agitation. The fan shall be operated on low speed and pointed toward the ceiling. Sampling pumps shall be started after the fans are started and stopped before the fans are stopped.
1. Samples shall be logged on a permanently bound logbook at the laboratory. No whiteout will be used to make corrections.
 2. All lab counts, data and analysis shall be recorded on a lab summary sheet for each sample.
 3. Per the requirements of the New York State Education Department all Final Air Clearance Samples shall be (TEM) Transmission Electron Microscopy methodology..

3.11 LEAD-CONTAINING BUILDING MATERIALS

- A. Surfaces that will be disturbed by reconstruction have been tested for the present of lead based paint materials. This information is provided in order that proper measures are taken, to train and protect workers per OSHA regulations. Refer to Division 0 Existing Hazardous Material Information for testing results.

- B. Projects which disturb surfaces that contain lead shall have in the specifications a plan prepared by a certified Lead Risk Assessor or Supervisor which details provisions for occupant protection, worksite preparation, work methods, cleaning and clearance testing which are in general accordance with the HUD Guidelines.

END OF SECTION 01 4119

SECTION 01 4200 - REFERENCES

PART 1 - GENERAL

1.1 KEY DEFINITIONS

- A. General: Basic Contract definitions are included in the Conditions of the Contract.
- B. "Approved": When used to convey Architect's action on Contractor's submittals, applications, and requests, "approved" is limited to Architect's duties and responsibilities as stated in the Conditions of the Contract.
- C. "Directed": A command or instruction by Architect. Other terms including "requested," "authorized," "selected," "required," and "permitted" have the same meaning as "directed."
- D. "Indicated": Requirements expressed by graphic representations or in written form on Drawings, in Specifications, and in other Contract Documents. Other terms including "shown," "noted," "scheduled," and "specified" have the same meaning as "indicated."
- E. "Regulations": Laws, ordinances, statutes, and lawful orders issued by authorities having jurisdiction, and rules, conventions, and agreements within the construction industry that control performance of the Work.
- F. "Furnish": Supply and deliver to Project site, ready for unloading, unpacking, assembly, installation, and similar operations.
- G. "Install": Operations at Project site including unloading, temporarily storing, unpacking, assembling, erecting, placing, anchoring, applying, working to dimension, finishing, curing, protecting, cleaning, and similar operations.
- H. "Provide": Furnish and install, complete and ready for the intended use.
- I. "Project Site": Space available for performing construction activities. The extent of Project site is shown on Drawings and may or may not be identical with the description of the land on which Project is to be built.

1.2 DEFINITIONS

- A. Air Handling Unit: A blower or fan used for the purpose of distributing supply air to a room, space or area.
- B. Approved Agency: An established and recognized agency regularly engaged in conducting tests or furnishing inspection services, when such agency has been approved according to the requirements established in this Section and as required by the Code Official having jurisdiction over this project.
- C. Architect: Other terms including "Architect/Engineer" and "Engineer" have the same meaning as "Architect".
- D. Company Field Adviser: An employee of the Company which lists and markets the primary components of the system under the name who is certified in writing by the Company to be technically qualified in design, installation, and servicing of the required products or an employee of an organization certified by the foregoing Company to be technically qualified in design, installation, and servicing of the required products. Personnel involved solely in sales do not qualify.
- E. Concealed Location: A location that cannot be accessed without damaging permanent parts of the building structure or finish surface. Spaces above, below or behind readily removable panels or doors shall not be considered as concealed.
- F. Concealed Piping: Piping that is located in a concealed location. (See "concealed location".)

- G. Connect: A term contraction and unless otherwise specifically noted is to mean “ The labor and materials necessary to join or attach equipment, materials or systems to perform the functions intended”.
- H. Construction Manager: The Palombo Group
- I. Drain: Any pipe that carries wastewater or water-borne wastes in a building drainage system.
- J. Drainage Fittings: Type of fitting or fittings utilized in the drainage system. Drainage fittings are similar to cast-iron fittings, except that instead of having a bell and spigot, drainage fittings are recessed and tapped to eliminate ridges on the inside of the installed pipe.
- K. Drainage System: Piping within a public or private premise that conveys sewage, rainwater or other liquid wastes to a point of disposal. A drainage system does not include the mains of a public sewer system or a private or public sewage treatment or disposal plant.
 - 1. Building Gravity: A drainage system that drains by gravity into the building sewer.
 - 2. Sanitary: A drainage system that carries sewage and excludes storm, surface and ground water.
 - 3. Storm: A drainage system that carries rainwater, surface water, condensate, cooling water or similar liquid wastes.
- L. Duct: A tube or conduit utilized for conveying air. The air passages of self-contained systems are not to be construed as air ducts.
- M. Duct System: A continuous passageway for the transmission of air that, in addition to ducts, includes duct fittings, dampers, plenums, fans and accessory air-handling equipment and appliances.
- N. Experienced: When used with an entity, "experienced" means having successfully completed a minimum of five previous projects similar in size and scope to this Project; being familiar with special requirements indicated; and having complied with requirements of authorities having jurisdiction.
- O. Headroom: Minimum clearance between the floor and the underside of the point of lowest installed mechanical construction above. In case of stairways and walkways, the minimum clearance between the step or surface of the walkway and the lowest installed mechanical construction above the stairway or the walkway.
- P. Include: When used in any form other than “inclusive”, is non-limiting and is not intended to mean “all-inclusive.”
- Q. Indicated: Requirements expressed by graphic representations or in written form on Drawings, in Specifications, and in other Contract Documents. Other terms including "shown," "noted," "scheduled," and "specified" have the same meaning as "indicated."
- R. Inspection Certificate: Identification applied on a product by an approved agency containing the name of the manufacturer, the function and performance characteristics, and the name and identification of an approved agency that indicates that the product or material has been inspected and evaluated by an approved agency.
- S. Installer: An installer is the Contractor or another entity engaged by the Contractor, either as an employee, subcontractor, or contractor of lower tier, to perform a particular construction activity, including installation, erection, application, or similar operations. Installers are required to be experienced in the operations they are engaged to perform.
 - 1. Trades: Using a term such as "carpentry" does not imply that certain construction activities must be performed by accredited or unionized individuals of a corresponding generic name, such as "carpenter." It also does not imply that requirements specified apply exclusively to tradespersons of the corresponding generic name.
 - 2. Assigning Specialists: Certain Sections of the Specifications require that specific construction activities shall be performed by specialists who are recognized experts in

- those operations. The specialists must be engaged for those activities, and their assignments are requirements over which the Contractor has no option. However, the ultimate responsibility for fulfilling contract requirements remains with the Contractor.
3. This requirement shall not be interpreted to conflict with enforcing building codes and similar regulations governing the Work. It is also not intended to interfere with local trade-union jurisdictional settlements and similar conventions.
- T. Label: An identification applied on a product by the manufacturer that contains the name of the manufacturer, the function and performance characteristics of the product or material, and the name and identification of an approved agency and that indicates that the representative sample of the product or material has been tested and evaluated by an approved agency.
- U. Location:
1. Damp Location: Partially protected locations under canopies, marquees, roofed open porches and like locations, and interior locations subject to moderate degrees of moisture, such as some basements, some barns and some cold-storage warehouses.
 2. Dry Location: A location not normally subject to dampness or wetness. A location classified as dry may be temporarily subject to dampness or wetness, as in the case of a building under construction.
 3. Wet Location: Installations underground or in concrete slabs or masonry in direct contact with the earth and locations subject to saturation with water or other liquids, such as vehicle-washing areas, and locations exposed to weather and unprotected.
- V. Manufacturer's Designation: Identification applied on a product by the manufacturer indicating that a product or material complies with a specified standard or set of rules (see also "Inspection Certificate," "Label" and "Mark").
- W. Mark: An identification applied on a product by the manufacturer indicating the name of the manufacturer and the function of a product or material (see also "Inspection Certificate," "Label" and "Manufacturer's Designation").
- X. Mechanical: Other terms including "HVAC", "Plumbing", "Sprinkler", "Laboratory Equipment", "Food Service Equipment", "Laundry Equipment", and "Refrigeration" have the same meaning as "Mechanical".
- Y. Owner: Pine Bush Central School District
- Z. Piping: This term includes pipe, tube and appurtenant fittings, flanges, valves, traps, hangers and supports.
- AA. Piping, Concealed: Piping built into construction and not accessible without removal of construction Work such as masonry, plaster or other finish material, and piping installed in floors, furred spaces, suspended ceilings, non-walk-in tunnels, conduits, and behind removable panels and cabinet doors.
- BB. Piping, Distribution: Domestic water supply piping, starting with a connection to service piping, and continuing throughout the building to point of connection to equipment and fixture supply piping.
- CC. Piping, Exposed: Piping directly accessible by normal accesses without removal of any construction Work or material.
- DD. Piping, Service: Underground domestic water supply piping with a connection to a water main or supply as noted, and continuing to and into a building and terminating with the exposed fitting inside the building.
- EE. Piping, Tunnel: Piping installed in walk-in or non-walk-in tunnels or conduits up to first shut-off valve inside building.
- FF. Plumbing System: Includes the water supply and distribution pipes; plumbing fixtures and traps; water-treating or water-using equipment; soil, waste and vent pipes; and sanitary and storm

sewers and building drains, in addition to their respective connections, devices and appurtenances within a structure or premises.

- GG. Product: As used includes materials, systems and equipment.
- HH. Registered Design Professional: An individual who is a registered architect (RA) in accordance with Article 147 of the New York State Education Law or a licensed professional engineer (PE) in accordance with Article 145 of the New York State Education Law.
- II. Space, Finished: A space which has a finishing material applied to walls or ceilings, such as paint, plaster, ceramic tile, enamel glazing, face brick, vinyl wall covering, etc. to provide a finished appearance or which will have such finishes applied under a related Contract.
- JJ. Space, Unfinished: A space which does not meet the definition of a finished space.
- KK. Special Inspection: Inspection as herein required of the materials, installation, fabrication, erection, or placement of components and connections requiring special expertise to ensure compliance with approved construction documents and referenced standards.
- LL. Steam-Heating Boiler: A boiler operated at pressures not exceeding 15 psi for steam.
- MM. Supplier: Any person or organization who supplies materials or equipment for the work, including that fabricated to a special design.
- NN. Utility: Any gas, steam, water, sanitary sewer, storm sewer, electrical or other such service.
- OO. Water Supply System: The water service pipe, water distribution pipes, and the necessary connecting pipes, fittings, control valves and all appurtenances in or adjacent to the structure or premises.
1. Chilled: Water-cooled by refrigeration.
 2. Cold: Water with at temperature between 33 degrees F and 80 degrees F and which is neither cooled nor heated mechanically.
 3. Domestic: Water for use in buildings, except water used in connection with space heating and space cooling.
 4. High Temperature: Water with a supply water temperature above 350 degrees.
 5. Hot: Water at a temperature greater than or equal to 110°F.

1.3 INDUSTRY STANDARDS

- A. Applicability of Standards: Unless the Contract Documents include more stringent requirements, applicable construction industry standards have the same force and effect as if bound or copied directly into the Contract Documents to the extent referenced. Such standards are made a part of the Contract Documents by reference.
- B. Publication Dates: Comply with standards in effect as of date of the Contract Documents unless otherwise indicated.
- C. Conflicting Requirements: If compliance with two or more standards is specified and the standards establish different or conflicting requirements for minimum quantities or quality levels, comply with the most stringent requirement. Refer uncertainties and requirements that are different, but apparently equal, to Architect for a decision before proceeding.
1. Minimum Quantity or Quality Levels: The quantity or quality level shown or specified shall be the minimum provided or performed. The actual installation may comply exactly with the minimum quantity or quality specified, or it may exceed the minimum within reasonable limits. To comply with these requirements, indicated numeric values are minimum or maximum, as appropriate, for the context of requirements. Refer uncertainties to Architect for a decision before proceeding.
- D. Copies of Standards: Each entity engaged in construction on Project should be familiar with industry standards applicable to its construction activity. Copies of applicable standards are not bound with the Contract Documents.

1. Where copies of standards are needed to perform a required construction activity, obtain copies directly from publication source.

1.4 ABBREVIATIONS AND ACRONYMS

AA	Aluminum Association, Inc. (The)
AABC	Associated Air Balance Council
AAMA	American Architectural Manufacturers Association
AASHTO	American Association of State Highway and Transportation Officials
ACI	ACI International (American Concrete Institute)
ACPA	American Concrete Pipe Association
AF&PA	American Forest & Paper Association
AGA	American Gas Association
AGC	Associated General Contractors of America (The)
AHA	American Hardboard Association (part of CPA)
AI	Asphalt Institute
AIA	American Institute of Architects (The)
AISC	American Institute of Steel Construction
AISI	American Iron and Steel Institute
ALSC	American Lumber Standard Committee, Incorporated
AMCA	Air Movement and Control Association International, Inc.
ANSI	American National Standards Institute
AOSA	Association of Official Seed Analysts, Inc.
APA	Architectural Precast Association
APA	APA - The Engineered Wood Association
ARI	Air-Conditioning & Refrigeration Institute
ASCE	American Society of Civil Engineers
ASHRAE	American Society of Heating, Refrigerating and Air-Conditioning Engineers

ASME	ASME International
ASSE	American Society of Sanitary Engineering
ASTM	ASTM International
AWCMA	American Window Covering Manufacturers Association (WCSC)
AWI	Architectural Woodwork Institute
AWPA	American Wood-Preservers' Association
AWS	American Welding Society
AWWA	American Water Works Association
BHMA	Builders Hardware Manufacturers Association
BIA	Brick Industry Association (The)
CCC	Carpet Cushion Council
CDA	Copper Development Association
CISCA	Ceilings & Interior Systems Construction Association
CISPI	Cast Iron Soil Pipe Institute
CLFMI	Chain Link Fence Manufacturers Institute
CPA	Composite Panel Association
CRI	Carpet & Rug Institute (The)
CRSI	Concrete Reinforcing Steel Institute
CSI	Cast Stone Institute
CSI	Construction Specifications Institute (The)
CTI	Cooling Technology Institute
DHI	Door and Hardware Institute
EIA	Electronic Industries Alliance
EIMA	EIFS Industry Members Association
EJCDC	Engineers Joint Contract Documents Committee
EJMA	Expansion Joint Manufacturers Association, Inc.
ESD	ESD Association

FM Approvals	Factory Mutual Approvals
FSA	Fluid Sealing Association
GA	Gypsum Association
GANA	Glass Association of North America
GSI	Geosynthetic Institute
HI	Hydraulic Institute
HI	Hydronics Institute
HMMA	Hollow Metal Manufacturers Association
HPVA	Hardwood Plywood & Veneer Association
ICEA	Insulated Cable Engineers Association, Inc
ICRI	International Concrete Repair Institute, Inc.
IEC	International Electrotechnical Commission
IEEE	Institute of Electrical and Electronics Engineers, Inc. (The)
IESNA	Illuminating Engineering Society of North America
IEST	Institute of Environmental Sciences and Technology
IGCC	Insulating Glass Certification Council
IGMA	Insulating Glass Manufacturers Alliance
ILI	Indiana Limestone Institute of America, Inc.
ISO	International Organization for Standardization
ISSFA	International Solid Surface Fabricators Association
ITU	International Telecommunication Union
KCMA	Kitchen Cabinet Manufacturers Association
LEED	Leadership in Energy and Environmental Design
MBMA	Metal Building Manufacturers Association
MFMA	Maple Flooring Manufacturers Association, Inc.
MFMA	Metal Framing Manufacturers Association, Inc.
MIA	Marble Institute of America

MPI	Master Painters Institute
MSS	Manufacturers Standardization Society of The Valve and Fittings Industry Inc.
NAAMM	National Association of Architectural Metal Manufacturers
NACE	NACE International
NADCA	National Air Duct Cleaners Association
NAIMA	North American Insulation Manufacturers Association
NCMA	National Concrete Masonry Association
NCPI	National Clay Pipe Institute
NCTA	National Cable & Telecommunications Association
NEBB	National Environmental Balancing Bureau
NECA	National Electrical Contractors Association
NeLMA	Northeastern Lumber Manufacturers' Association
NEMA	National Electrical Manufacturers Association
NETA	National Electrical Testing Association
NFHS	National Federation of State High School Associations
NFPA	National Fire Protection Association
NFRC	National Fenestration Rating Council
NGA	National Glass Association
NHLA	National Hardwood Lumber Association
NLGA	National Lumber Grades Authority
NOFMA	NOFMA: The Wood Flooring Manufacturers Association
NRCA	National Roofing Contractors Association
NRMCA	National Ready Mixed Concrete Association
NSF	NSF International (National Sanitation Foundation International)
NSSGA	National Stone, Sand & Gravel Association
NTMA	National Terrazzo & Mosaic Association, Inc. (The)
NWWDA	National Wood Window and Door Association (WDMA)

PCI	Precast/Prestressed Concrete Institute
PDCA	Painting & Decorating Contractors of America
PDI	Plumbing & Drainage Institute
PGI	PVC Geomembrane Institute
PTI	Post-Tensioning Institute
RCSC	Research Council on Structural Connections
RFCI	Resilient Floor Covering Institute
SAE	SAE International
SDI	Steel Deck Institute
SDI	Steel Door Institute
SEFA	Scientific Equipment and Furniture Association
SEI/ASCE	Structural Engineering Institute/American Society of Civil Engineers
SGCC	Safety Glazing Certification Council
SIA	Security Industry Association
SIGMA	Sealed Insulating Glass Manufacturers Association
SJI	Steel Joist Institute
SMA	Screen Manufacturers Association
SMACNA	Sheet Metal and Air Conditioning Contractors' National Association
SPIB	Southern Pine Inspection Bureau (The)
SPRI	Single Ply Roofing Industry
SSINA	Specialty Steel Industry of North America
SSPC	SSPC: The Society for Protective Coatings
STI	Steel Tank Institute
SWRI	Sealant, Waterproofing, & Restoration Institute
TCA	Tile Council of America, Inc.
TIA/EIA	Telecommunications Industry Association/Electronic Industries Alliance
TMS	The Masonry Society

TPI	Turfgrass Producers International
UL	Underwriters Laboratories Inc.
UNI	Uni-Bell PVC Pipe Association
USGBC	U.S. Green Building Council
WASTEC	Waste Equipment Technology Association
WCSC	Window Covering Safety Council

1.5 FEDERAL GOVERNMENT AGENCIES:

- A. Where abbreviations and acronyms are used in Specifications or other Contract Documents, they shall mean the recognized name of the entities in the following list. Names, telephone numbers, and Web sites are subject to change and are believed to be accurate and up-to-date as of the date of the Contract Documents.

CE	Army Corps of Engineers
CPSC	Consumer Product Safety Commission
DOC	Department of Commerce
DOD	Department of Defense
DOE	Department of Energy
EPA	Environmental Protection Agency
FAA	Federal Aviation Administration
FCC	Federal Communications Commission
FDA	Food and Drug Administration
GSA	General Services Administration
HUD	Department of Housing and Urban Development
NIST	National Institute of Standards and Technology
OSHA	Occupational Safety & Health Administration
PHS	Office of Public Health and Science
SD	State Department
TRB	Transportation Research Board
USDA	Department of Agriculture
USPS	Postal Service

- B. Codes, Standards and Regulations: Where abbreviations and acronyms are used in Specifications or other Contract Documents, they shall mean the recognized name of the standards and regulations in the following list.

ADAAG	Americans with Disabilities Act (ADA) Accessibility Guidelines
BCNYS	Building Code of New York State
CFR	Code of Federal Regulations
DOD	Department of Defense Military Specifications and Standards
FS	Federal Specification
MILSPEC	Military Specification and Standards

1.6 NEW YORK STATE GOVERNMENT AGENCIES:

- A. Where abbreviations and acronyms are used in Specifications or other Contract Documents, they shall mean the recognized name of the entities in the following list.

DASNY	Dormitory Authority of the State of New York
DEC	Department of Environmental Conservation
DHCR	Division of Housing and Community Renewal
DOH	Department of Health
NYSDOL	New York State Department of Labor
DOS	Department of State
DOT	Department of Transportation
NYSPA	New York State Power Authority
OGS	Office of General Services
OCFS	Office of Children and Family Services
OMRD	Office of Mental Retardation and Developmental Disabilities
OPRHP	Office of Parks, Recreation and Historic Preservation
NYSED	New York State Education Department (Department of Education)
SHPO	State Historic Preservation Office
SUCF	State University Construction Fund
SUNY	State University of New York

1.7 OTHER TERMS OR ACRONYMS:

- A. Where abbreviations and acronyms are used in Specifications or other Contract Documents, they shall mean the recognized name in the following list.

ACM	Asbestos Containing Materials
ACT	Acoustical Tile
ICRA	Infection Control Risk Assessment
RVT	Resilient Vinyl Tile
SAT	Suspended Acoustical Tile
SFRM	Spray on Fire Resistive Materials
TSI	Thermal Systems Insulation
VAT	Vinyl Asbestos Tile
VCT	Vinyl Composition Tile

PART 2 - PRODUCTS (Not Applicable)

PART 3 - EXECUTION (Not Applicable)

END OF SECTION 01 4200

SECTION 014529 – ASBESTOS TESTING LABORATORY SERVICES (NYS)

PART 1 - GENERAL

1.1 SUMMARY

- A. Section Includes:
 - 1. Air monitoring services for asbestos removal provided by the Owner.
 - 2. Security expenses incurred by the District when building is unoccupied.
- B. Related Sections:
 - 1. Division 01 Section "Summary" for use of premises and Owner-occupancy requirements.
 - 2. Division 01 Section "Temporary Facilities and Controls" for general temporary construction and environmental-protection measures for demolition operations.
 - 3. Division 02 Section "Asbestos Abatement" for air monitoring required by OSHA and other monitoring requirements within work areas.

1.2 PERFORMANCE REQUIREMENTS

- A. General: Provide air monitoring for the Owner to verify that the building areas beyond the asbestos abatement work areas and the exterior environment remain uncontaminated.
 - 1. Upon completion of abatement activities, verify that elevated airborne fiber count encountered during abatement operations have been reduced to an acceptable level.
- B. Regulatory Requirements: Comply with the current and applicable portions of the following:
 - 1. New York State Regulations:
 - a. 12NYCRR56, referred to as "Code Rule 56" of the NYS Codes, Rules and Regulations (Statutory Authority: New York State Labor Law Section 906).
 - 1) Exception: Variances obtained in accordance with Article 30 of the Labor Law.
 - b. New York State School Asbestos Safety Act (SASA).
 - 2. Regulations and Requirements of Federal Agencies:
 - a. Occupational Safety and Health Administration (OSHA).
 - b. United States Environmental Protection Agency (EPA).
 - c. 40 CFR Part 763 Subpart E (ASHERA) Appendix A unless permitted otherwise by the N.Y. State Department of Labor, EPA, and the Owner's Representative.

1.3 SUBMITTALS

- A. Proposed Materials and Equipment: List by brand name and model number including, but not necessarily limited to, the following:
 - 1. Sampling pumps.
 - 2. Sampling stands.
 - 3. Flow meters.
 - 4. Sample cassettes.
 - 5. Sample filters.
 - 6. Aggressive sampling equipment.
 - 7. Microscopes.
- B. Qualification Data: For qualified testing laboratory, including the following:
 - 1. Current NYS Asbestos Contractor's License.
 - 2. Certificate of the Environmental Laboratory Approval Program (ELAP).
 - 3. List of the names, addresses and telephone numbers of all laboratory technical personnel employed on the project.
 - 4. Current State and Federal licenses and certifications, analyst qualifications, respirator fit tests and medical screenings for all personnel.
 - 5. Lab CIH and field supervisor CIH's, ABIH and/or PIH's Certificate.

- C. Sampling Plan: Proposed plan for sampling based on the air monitor's understanding of the project. The plan shall include:
 - 1. Number and type of samples to be collected on each date.
 - 2. Proposed methodologies for collection and analyzing samples.
- D. References: Not less than three (3) names and telephone numbers from New York State Public School Districts (K-12) in which asbestos project consultation has been approved.

1.4 QUALITY ASSURANCE

- A. Daily Recordkeeping:
 - 1. For all records, each sheet shall include all necessary "who, what, when, how" data by minimally including project, work area, location, dates, times, type, person doing the work, applicable observations, and sample I.D. instruments used.
 - 2. Field sheets shall be kept for each sample during collection. Field sheets shall additionally include start/stop times of pumps, sample I.D. number, air volumes, machine used, filters, calibration data, Owner's Representative sign-off, etc. For exterior samples, include temperature, wind speed and direction, and precipitation data.
 - 3. A chain of custody form shall be initiated for each sample in the field. The form shall be kept with the sample and updated as the sample changes possession.
 - 4. Samples will be logged in at the laboratory, and a separate lab sheet (or combined with field sheet) shall be kept, for all lab data, for each sample, equipment used, count, methodology, calculations and interpretations.
 - 5. Daily field sheets, lab analysis and chain of custody sheets, for each work area set of samples, shall be kept together with a summary cover sheet indicating general data above, specific fiber counts for each sample, plus applicable calculations, status of blanks, and interpretations of "pass" or "failed". Phone notification data shall also be included. These shall all be stapled together at the upper left-hand corner. This shall comprise a "Daily Progress Report" for that work area.
 - 6. This Recordkeeping format shall also apply to samples taken prior to commencement of work and for final air clearance.
- B. Documentation:
 - 1. Weekly Air Monitoring Results: At the beginning of each week (Monday) written summary results of the prior week's air samples shall be submitted to the School District's Environmental Safety Office. Each work area shall have a summary of daily analysis including a listing of counts for each sample with locations indicated and interpretation results.
 - 2. Close-out Documentation: Within two weeks from the completion of the project, the air monitoring contractor shall submit three (3) bound copies of a final report; one (1) copy to the Project Inspector, two (2) copies to the School District's Environmental Safety Office. The final reports shall be broken down by each work area including:
 - a. Project Executive Summary per work area including an overall project description, a summary "Daily Progress Reports", dates of non-compliance, reasons, actions taken by Asbestos Abatement Contractor to bring into compliance. Final air clearance interpretation.
 - b. "Daily Progress Reports" includes field logs, calculations, lab logs, counts, interpretations, chain of custody documents. All organized consecutively by days.
 - c. Final Clearance PCM Sample Results, counts, calculations, and interpretations.
 - d. Final Clearance TEM Sample Results, counts, calculations, and interpretations.
 - e. Floor plans for each work area identifying exact sample locations including separate drawings for pre-abatement, during abatement, and final clearance sampling.
 - f. Certified Industrial Hygienist Certification (Stamp).

- g. Air sample pump and rotometer calibration records.
 - h. A copy of all start of work submittals required in the SUBMITTALS article of this Section.
- C. Worker Protection:
 - 1. The air-monitoring contractor shall supply all air-sampling technicians with the proper respiratory protection and training.
 - 2. The air-sampling technicians shall enter and exit the work areas using the protocols established for personal decontamination for asbestos projects.
- D. Supervision: Supervise and certify by a CIH or a Professional Industrial Hygienist (PIH) all air monitoring practices and procedures. The PIH's responsibilities shall include:
 - 1. Review and become familiar with the asbestos project specifications.
 - 2. Attend at a minimum the initial pre-abatement meeting.
 - 3. Review and document that preliminary, concurrent, and final air sampling and pump calibration techniques conform to AHERA and New York State asbestos abatement regulations.
 - 4. Visit the project site at a minimum of one time per week, accompanied by School District's Director of Environmental Safety, to document and insure proper sampling techniques, methods and equipment are being utilized and conform to AHERA and New York State requirements.
 - 5. Review and certify (stamp) final reports.

1.5 COORDINATION

- A. General: Coordinate the activities of the air-sampling technicians with the abatement contractor and Owner's Representative.
- B. Collect air samples, 24 hours a day, seven days a week, as instructed by the Owner's Representative.
 - 1. Present the field sheet to the Owner's Representative to be initialed and dated prior to leaving the site.
 - 2. Unless otherwise instructed by the Owner's Representative, air sampling shall be performed during the abatement contractor's shift.

PART 2 - PRODUCTS

2.1 MATERIALS AND EQUIPMENT

- A. General: Provide all necessary and proper materials and equipment, canisters, filters, etc. to obtain and process air samples.

PART 3 - EXECUTION

3.1 SAMPLES

- A. Air sampling shall occur continuously during all shift hours of the contractors per Code Rule 56. Minimally this shall be assumed as 9 hours per day 7 days a week.
- B. The air-sampling technician shall calibrate sampling pumps on site at least once before, once at the midpoint and once after the collection of samples, and record in the field sheets.
- C. Where possible, sample locations shall be at least 3 feet from any wall or column and 2 feet above the floor. Sampler shall be supported by a stand.
- D. For clearance sampling, the air sampling technician shall provide aggressive air sampling per Rule 56 and as follows:

1. First direct the exhaust of a leaf blower against all walls, ceilings, floors, ledges, and other surfaces in the work area.
2. Continue agitation for at least five minutes per every 1,000 sf of floor space. Following this aggressive agitation, the air-sampling technician shall use at least one 20-inch fan per 10,000 cubic feet of work area space for continuous agitation.
3. The fan shall be operated on low speed and pointed toward the ceiling.
4. Sampling pumps shall be started after the fans are started and stopped before the fans are stopped.

3.2 ANALYSIS

- A. Samples shall be logged on a permanently bound logbook at the laboratory. No whiteout will be used to make corrections.
- B. All lab counts, data and analysis shall be recorded on a lab summary sheet for each sample.
- C. When both TEM and PCM Clearance samples are collected, PCM samples shall be analyzed first. TEM samples will be analyzed only if PCM samples pass clearance criteria.
 1. If TEM samples are analyzed, they shall be analyzed one at a time until the number of asbestos structures counted total 350, or one more sample is found to have 140 asbestos structures. If, and only if, neither of these cases is found, then all TEM samples will be analyzed.
- D. Analytical Methods: The following methods shall be used in analyzing filters used to collect air samples:
 1. Cellulose ester filters (PCM) shall be analyzed using NIOSH 7400. This analysis shall be carried out at a laboratory located off the job site.
 2. Polycarbonate filters (TEM) shall be analyzed using AHERA Counting Protocol analysis per EPA.
- E. If blank samples analysis causes that batch of samples to be suspect so as to cause resampling that shall be done at no cost to the Owner.

3.3 INTERPRETATIONS

- A. Daily monitoring sample results shall be daily compared to all requirement levels per Rule 56. If they exceed background or .01 fibers per C.C., Air Monitoring Contractor shall fail the daily sample. If all samples are satisfactory, the summary sheet shall so indicate.
 1. Final Clearance Monitoring: Satisfactory levels.
- B. For Rule 56 PCM Analysis: The clearance air monitoring results shall be considered satisfactory when every sample demonstrates an airborne concentration of asbestos fibers of less than 0.01 fibers per cubic centimeter, or the background level, whichever is greater.
- C. For AHERA TEM Analysis: Clearance shall be satisfactory per AHERA protocols including: If the mean average of all the inside samples have asbestos structure concentrations at or below 70 s/mm' and the average airborne asbestos concentrations inside the area is not higher than the average outside calculated by the "Z" Test. All analysis to be per AHERA requirements.
- D. Passing of PCM/56 criteria shall satisfy that requirement. Further work by the Asbestos Abatement Contractor, daily monitoring, and clearance retesting need only be done to satisfy the failed TEM method. If PCM/56 sampling fails, TEM samples will be discarded unanalyzed and the clearance has failed. Recleaning and resampling is required for both the PCM and TEM.

3.4 NOTIFICATION

- A. Results for pre-abatement and daily abatement sampling shall be reported to the Owner's Representative and the Asbestos Abatement Contractor within 48 hours with the exception that the few final daily sample results must be reported to the Owner's Representative within 24 hours

of the clearance sampling. Results for clearance sampling and roofing work area samples shall be reported to the Owner's Representative and the Asbestos Abatement Contractor within 24 hours.

- B. If any daily monitoring of clearance sampling fails, the Asbestos Abatement Contractor shall immediately notify the Owner's Representative and the applicable Asbestos Abatement Contractor. The Asbestos Abatement Contractor shall make note of possible reasons for failure, and what corrective actions the Asbestos Abatement Contractor undertakes.
- C. All notifications shall occur first by telephone followed by written notices. Telephone notifications shall be recorded indicating who was notified, position, time, date, telephone number, etc. Telephone notification shall only be to acceptable people approved at the beginning of the project.
- D. Final air clearance results shall be sent to the Commissioner of Labor per CR-56, minimally by certified mail with copies and certificate to the Owner's Representative.

3.5 SCHEDULE OF AIR SAMPLES

- A. Before start of work, verify locations and number of samples, as well as methodology for approval. Submittal shall include pre-abatement, post-abatement and during-abatement phases. Comply with Part 56.
 - 1. Per the requirements of the New York State Education Department all Final Air Clearance Samples shall be (TEM) Transmission Electron Microscopy Methodology.

END OF SECTION 014529

SECTION 015001 - TEMPORARY FACILITIES & CONTROLS-MULTIPLE PRIME CONTRACTS

PART 1 - GENERAL

1.1 SUMMARY

- A. This Section includes requirements for temporary facilities and controls, including temporary utilities, support facilities, and security and protection.
- B. Temporary utilities include, but are not limited to, the following:
 - 1. Temporary electric power and light.
 - 2. Ventilation and Humidity Control
 - 3. Sanitary facilities, including drinking water.
 - 4. Storm and sanitary sewer.
- C. Support facilities include, but are not limited to, the following:
 - 1. Field offices and storage containers.
 - 2. Temporary roads and paving.
 - 3. Dewatering facilities and drains.
 - 4. Temporary partitions and enclosures.
 - 5. Hoists and temporary elevator use.
 - 6. Temporary project identification sign and project signage.
 - 7. Waste disposal services and dumpsters.
 - 8. Construction aids and miscellaneous services and facilities.
- D. Security and protection facilities include, but are not limited to, the following:
 - 1. Barricades, warning signs, and lights.
 - 2. Environmental protection.
 - 3. Tree and plant protection.
 - 4. Security enclosure and lockup.
 - 5. Temporary enclosures.
 - 6. Temporary partitions.
 - 7. Sidewalk Bridge for maintaining legal exits.
 - 8. Enclosure fence for the work site.

1.2 INFORMATIONAL SUBMITTALS

- A. Temporary Utilities: Each prime contractor shall submit reports of tests, inspections, meter readings, and similar procedures performed on temporary utilities.
- B. Implementation and Termination Schedule: Within 15 days of the date established for submittal of the Contractor's Construction Schedule, each prime contractor shall submit a schedule indicating implementation and termination of each temporary utility for which the Contractor is responsible.
- C. Site Plan: Show temporary facilities, utility hookups, staging areas, and parking areas for construction personnel.
- D. Erosion- and Sedimentation-Control Plan: Show compliance with requirements of EPA Construction General Permit or authorities having jurisdiction, whichever is more stringent
- E. Moisture-Protection Plan: Describe procedures and controls for protecting materials and construction from water absorption and damage, including delivery, handling, and storage provisions for materials subject to water absorption or water damage, discarding water-damaged materials, protocols for mitigating water intrusion into completed Work, and replacing water damaged Work.

1. Describe delivery, handling, and storage provisions for materials subject to water absorption or water damage.
 2. Indicate procedures for discarding water-damaged materials, protocols for mitigating water intrusion into completed Work, and replacing water-damaged Work.
 3. Indicate sequencing of work that requires water, such as sprayed fire-resistive materials, plastering, and terrazzo grinding, and describe plans for dealing with water from these operations. Show procedures for verifying that wet construction has dried sufficiently to permit installation of finish materials.
- F. Dust-Control and HVAC-Control Plan: Submit coordination drawing and narrative that indicates the dust-control and HVAC-control measures proposed for use, proposed locations, and proposed time frame for their operation. Identify further options if proposed measures are later determined to be inadequate. Include the following:
1. Locations of dust-control partitions at each phase of the work.
 2. HVAC system isolation schematic drawing.
 3. Location of proposed air filtration system discharge.
 4. Other dust-control measures.
 5. Waste management plan.
- G. Accessible Temporary Egress: Comply with applicable provisions in the U.S. Architectural & Transportation Barriers Compliance Board's ADA-ABA Accessibility Guidelines and ICC/ANSI A117.1.

1.3 DEFINITIONS

- A. Temporary Enclosure: As determined by Architect, temporary roofing is complete, insulated, all exterior wall openings are closed with temporary closures.
- B. Permanent Enclosure: As determined by Architect, permanent roofing is complete, insulated, and weather tight; exterior walls are insulated and weather tight; and all openings are closed with permanent construction or substantial temporary closures.
- C. Temporary Facilities: Construction, fixtures, fittings, and other built items required to accomplish the work, but which are not incorporated into the finished work.
- D. Temporary Utilities: A type of temporary facility, primary sources of electric power, water, natural gas supply, etc., obtained from public utilities, other main distribution systems, or temporary sources constructed for the project, but not including the fixtures and equipment served.
- E. Temporary Services: Activities required during construction, which do not directly accomplish the work.

1.4 QUALITY ASSURANCE

- A. Regulations: The contractor shall comply with industry standards and with applicable laws and regulations of authorities having jurisdiction including, but not limited to, the following:
1. Building code requirements.
 2. Health and safety regulations.
 3. Utility company regulations.
 4. Police, fire department and rescue squad rules.
 5. Environmental protection regulations.
- B. Standards: The Contractor shall comply with NFPA 241 "Standard for Safeguarding Construction, Alterations, and Demolition Operations," ANSI-A10 Series standards for "Safety Requirements for Construction and Demolition," and NECA Electrical Design Library "Temporary Electrical Facilities."

- C. Trade Jurisdictions: Assigned responsibilities for installation and operation of temporary utilities are not intended to interfere with the normal application of trade regulations and union jurisdictions.
- D. Tests and Inspections: Arrange for authorities having jurisdiction to test and inspect each temporary utility before use. Obtain required certifications and permits.

1.5 USE CHARGES

- A. General: Installation and removal of and use charges for temporary facilities shall be included in the Contract Sum unless otherwise indicated. Allow other entities to use temporary services and facilities without cost, including, but not limited to, Architect, testing agencies, and authorities having jurisdiction.
 - 1. Water and Sewer Service from Existing System: Water from Owner's existing water system is available for use without metering and without payment of use charges. Provide connections and extensions of services as required for construction operations.
 - 2. Electric Power Service from Existing System: Electric power from Owner's existing system is available for use without metering and without payment of use charges. Provide connections and extensions of services as required for construction operations.
- B. Cost or use charges for temporary facilities are not chargeable to the Owner or the Architect. The Architect will not accept a prime contractor's cost or use charges for temporary services or facilities as a basis of claim for an adjustment in the Contract Sum or the Contract Time.
- C. Other entities using temporary services and facilities include, but are not limited to, the following:
 - 1. Other nonprime contractors.
 - 2. The Owner's work forces.
 - 3. Occupants of the Project.
 - 4. The Architect.
 - 5. Testing agencies.
 - 6. Personnel of government agencies.

1.6 PROJECT CONDITIONS

- A. Temporary Utilities: Each prime contractor shall prepare a schedule indicating dates for implementation and termination of each temporary utility for which the Contractor is responsible. At the earliest feasible time, when acceptable to the Owner, change over from use of temporary service to use of permanent service.
- B. Conditions of Use: Keep temporary services and facilities clean and neat in appearance. Operate in a safe and efficient manner. Relocate temporary services and facilities as the Work progresses. Do not overload facilities or permit them to interfere with progress. Take necessary fire-prevention measures. Do not allow hazardous, dangerous, or unsanitary conditions, or public nuisances to develop or persist on-site.
- C. Temporary Use of Permanent Facilities: If the Owner permits temporary use of the permanent facilities the Installer of each permanent service shall assume responsibility for its operation, maintenance, and protection during use as a construction facility prior to the Owner's acceptance, regardless of previously assigned responsibilities.

1.7 DIVISION OF RESPONSIBILITIES

- A. General: These Specifications assign each prime contractor specific responsibilities for certain temporary facilities used by other prime contractors and other entities at the site. The Contractor for General Construction is responsible for providing temporary facilities and controls that are not normal construction activities of other prime contractors and are not specifically assigned otherwise by the Architect.

B. EACH PRIME CONTRACTOR is responsible for the following:

1. Installation, operation, maintenance, and removal of each temporary facility usually considered as its own normal construction activity.
2. Plug-in electric power cords and extension cords, supplementary plug-in task lighting, and special lighting necessary exclusively for its own activities.
3. Its own field office complete with necessary furniture, utilities, and telephone service.
4. Its own storage containers for tools and storage of materials not yet incorporated into the building construction.
5. Containerized tap dispenser drinking-water with paper cup supply
6. Dewatering for their own construction operations.
7. Temporary heat, ventilation, humidity control, and enclosure of the building prior to “Permanent Enclosure” where these facilities are necessary for its construction activity but have not yet been completed by the responsible prime contractor.
 - a. Temporary ventilation to control temperature and humidity is required by the Contractor responsible for installing the specified finish and equipment as these finishes may be damaged by excessive humidity or promote the growth of mold. The permanent HVAC system shall not be relied upon to provide the necessary ventilation or conditioning of the humidity in the building. Each Contractor is required to protect their work in place and provide the necessary ventilation and or humidity control.
8. Collection and disposal of its own hazardous, dangerous, unsanitary, or other harmful waste material.
9. Collection of its waste material and transporting to a dumpster.
10. Power for welding units is the Responsibility of the contractor requiring such units.
11. Secure lockup of its own tools, materials, and equipment.
12. Construction aids and miscellaneous services and facilities necessary exclusively for its own construction activities.

C. The General Construction Contractor is responsible for the following:

1. General disposal of wastes and spoils from all prime contractors except the site contractor who will be responsible for their own dumpsters for their scope of work.
2. Site Enclosure fence as necessary for safety precautions and or as indicated on the
3. drawings.
4. Barricades and warning signs
5. Temporary fencing (including for building excavation).
6. Temporary safety railings and stairs
7. Temporary toilets, including disposable supplies for all prime contractors use at each project site location. Provide as required per OSHA, at all facilities while work is being performed.
8. Temporary enclosure of the building’s roof windows and doors. Prior to “Permanent Enclosure”
9. General disposal of wastes for all prime contracts from the new and renovated building areas including costs for dumpsters.
10. Building exit bridges and fences.
11. Security enclosure and lockup.
12. Project Identification signage, directional signage and safety signage

D. The Plumbing Contractor is responsible for the following:

1. Temporary piping for roof drains not permanently connected
2. Temporary sewers and drainage from 5” ft. outside the building to a point inside the building.

- E. The Mechanical/ HVAC Contractor is responsible for the following:
 - 1. Temporary heat after temporary or permanent enclosure where the permanent heating system is not ready for use or cannot be used.
- F. The Electrical Contractor is responsible for the following:
 - 1. Temporary electric power service and branch distribution.
 - 2. Temporary generator. To keep portions of the building in service during power shutdowns or replacement of main services
 - 3. Temporary site lighting.
 - 4. Temporary lighting.
 - 5. Power for the Construction Manager's temporary office trailer located on Edmunds Lane is the responsibility of Electrical Construction Contractor. Labor and material to connect power from the existing utility pole / meter box, buried across the gravel lot to trailer location. Consumption to be paid by the General Contractor.
 - 6. Electrical Work Contractor will provide all temporary power and lighting for all interior construction activities. Temporary power and lighting required for hazardous material abatement will be the responsibility of the Contractor performing the work. Tie-in of the temporary power distribution panel for the abatement contractor to the building service will be provided by the Electrical Contractor.
 - 7. Electric Power Service use electric power from the Owner's existing system without metering and without payment of use charges.

PART 2 - PRODUCTS

2.1 MATERIALS

- A. General: Each prime contractor shall provide new materials. If acceptable to the Architect, undamaged, previously used materials in serviceable condition may be used. Provide materials suitable for use intended.
- B. Lumber and Plywood: Comply with requirements in Division 6 Section "Rough Carpentry."
 - 1. For safety barriers, sidewalk bridges, and similar uses, provide minimum 5/8-inch- thick exterior plywood.
- C. Gypsum Wallboard: Provide 5/8 type x gypsum wallboard on interior walls of temporary offices or temporary partitions.
- D. Roofing Materials: Provide UL Class A standard-weight asphalt shingles or UL Class C mineral-surfaced roll roofing on roofs of job-built temporary offices, shops, and sheds.
- E. Tarpaulins: Provide waterproof, fire-resistant, UL-labeled tarpaulins with flame-spread rating of 15 or less. For temporary enclosures, provide translucent, nylon-reinforced, laminated polyethylene or polyvinyl chloride, fire-retardant tarpaulins.
- F. Polyethylene Sheet: Reinforced, fire-resistive sheet, 10-mil minimum thickness, with flame-spread rating of 15 or less per ASTM E 84 and passing NFPA 701 Test Method 2.
- G. Dust-Control Adhesive-Surface Walk-off Mats: Provide mats minimum 24 by 36 inches, maintained and changed daily.
- H. Insulation: Unfaced mineral-fiber blanket, manufactured from glass, slag wool, or rock wool; with maximum flame-spread and smoke-developed indexes of 25 and 50, respectively.
- I. Water: Provide potable water approved by local health authorities.

- J. Portable Chain-Link Fencing: Minimum 2-inch, 0.148-inch- thick, galvanized-steel, chain-link fabric fencing; minimum 6 feet high with galvanized-steel pipe posts; minimum 2-3/8-inch- OD line posts and 2-7/8-inch- OD corner and pull posts, with 1-5/8-inch- OD top and bottom rails. Provide galvanized-steel bases for supporting posts.
- K. Open-Mesh Fencing: Provide 0.12-inch- thick, galvanized 2-inch chain link fabric fencing 6 feet high and galvanized steel pipe posts, 1-1/2 inches I.D. for line posts and 2-1/2 inches I.D. for corner posts.

2.2 EQUIPMENT

- A. General: Each prime contractor shall provide new equipment. If acceptable to the Architect, undamaged, previously used equipment in serviceable condition may be used. Provide equipment suitable for use intended.
- B. Water Hoses: Provide 3/4-inch heavy-duty, abrasion-resistant, flexible rubber hoses 100 feet long, with pressure rating greater than the maximum pressure of the water distribution system. Provide adjustable shutoff nozzles at hose discharge.
- C. Electrical Outlets: Provide properly configured, NEMA-polarized outlets to prevent insertion of 110- to 120-V plugs into higher voltage outlets. Provide receptacle outlets equipped with ground-fault circuit interrupters, reset button, and pilot light for connection of power tools and equipment.
- D. Electrical Power Cords: Provide grounded extension cords. Use hard-service cords where exposed to abrasion and traffic. Provide waterproof connectors to connect separate lengths of electric cords if single lengths will not reach areas where construction activities are in progress. Do not exceed safe length-voltage ratio.
- E. Lamps and Light Fixtures: Provide general service incandescent lamps of wattage required for adequate illumination. Provide guard cages or tempered-glass enclosures, where exposed to breakage. Provide exterior fixtures where exposed to moisture.
- F. Permanent HVAC System: If Owner authorizes use of permanent HVAC system for temporary use during construction, provide filter with MERV of 8 at each return air grille in system and remove at end of construction and clean HVAC system as required in Division 01 Section "Closeout Procedures".
 - 1. Air Filtration Units: HEPA primary and secondary filter-equipped portable units with four-stage filtration. Provide single switch for emergency shutoff. Configure to run continuously.
- G. Temporary Toilet Units: The General Contractor shall provide self-contained, single-occupant toilet units of the chemical, aerated recirculation, or combustion type at each building for app prime contractors use. Provide units properly vented and fully enclosed with a glass-fiber-reinforced polyester shell or similar nonabsorbent material.
- H. Fire Extinguishers: Each prime contractor will provide hand-carried, portable, UL-rated; Class A fire extinguishers for temporary offices and similar spaces. In other locations, provide hand-carried, portable, UL-rated, Class ABC, dry-chemical extinguishers or a combination of extinguishers of NFPA-recommended classes for the exposures.
 - 1. Comply with NFPA 10 and NFPA 241 for classification, extinguishing agent, and size required by location and class of fire exposure.

PART 3 - EXECUTION

3.1 INSTALLATION

- A. Use qualified personnel for installation of temporary facilities. Locate facilities where they will serve the Project adequately and result in minimum interference with performance of the Work. Relocate and modify facilities as required.
- B. Each prime contractor shall provide each facility ready for use when needed to avoid delay. Maintain and modify as required. Do not remove until facilities are no longer needed or are replaced by authorized use of completed permanent facilities.
- C. The contractor shall provide each facility ready for use when needed to avoid delay. Maintain and modify as required. Do not remove until facilities are no longer needed or are replaced by authorized use of completed permanent facilities.
- D. Sanitary Facilities: The General Construction Contractor will provide temporary toilets for use of construction personnel. Comply with requirements of authorities having jurisdiction for type, number, location, operation, and maintenance of fixtures and facilities.
 - 1. Toilets: Install self-contained toilet units. Shield toilets to ensure privacy. Use of pit-type privies will not be permitted.
 - 2. Provide toilet tissue, paper towels, paper cups, and similar disposable materials for each facility. Provide covered waste containers for used material.
- E. Water Service: Connect to Owner's existing water service facilities. Clean and maintain water service facilities in a condition acceptable to Owner. At Substantial Completion, restore these facilities to condition existing before initial use.
- F. Drinking-Water Facilities: Each Contractor shall provide containerized, tap-dispenser, drinking-water units, including paper cup supply.
- G. Temporary Electric Power Service: Connect to Owner's existing electric power service. Maintain equipment in a condition acceptable to Owner.
 - 1. Connect temporary service to Owner's existing power source, as directed by Owner.
- H. Temporary Electric Power Service: The Electrical Contractor will provide weatherproof, grounded electric power service and distribution system of sufficient size, capacity, and power characteristics at each building addition and maintain them during construction period. Include overload-protected disconnects, automatic ground-fault interrupters.
 - 1. Provide electric power service and distribution system of sufficient size, capacity, and power characteristics required for construction operations.
 - 2. Install electric power service underground, except where overhead service must be used.
 - 3. Power Distribution System: Install wiring overhead and rise vertically where least exposed to damage. Where permitted, wiring circuits not exceeding 125 V, ac 20 ampere rating, and lighting circuits may be nonmetallic-sheathed cable where overhead and exposed for surveillance.
 - 4. The Electrical Contractor will provide temporary power in the areas of renovation where the existing receptacles have been removed and the proximity to power source exceeds 50'.
- I. Temporary Lighting: When an overhead floor or roof deck has been installed, The Electrical Contractor will provide temporary lighting with local switching.
 - 1. For Demolition and New Work.
 - 2. The Electrical Contractor will install and operate temporary lighting that will fulfill security and protection requirements without operating the entire system. Provide temporary lighting that will provide adequate illumination for construction operations and traffic conditions.

- a. Security lighting for building exteriors shall be continuously operational and maintained.
 3. Temporary lighting shall be maintained in accordance with OSHA standards for power and foot candle levels in all areas while workers occupy the space
 4. The Electrical Contractor will provide temporary lighting in the areas of renovation where the existing fixtures have been removed and the new lighting has not been installed
- J. Temporary Heat: Each prime contractor will provide temporary heat required by construction activities for curing or drying of completed installations or for protecting installed construction from adverse effects of low temperatures or high humidity. Select safe equipment that will not have a harmful effect on completed installations or elements being installed. Coordinate ventilation requirements to produce the ambient condition required and minimize energy consumption. Direct fired propane or Kerosene salamanders will not be permitted.
- K. Heating Facilities: Where the Owner authorizes use of the permanent system, the HVAC Contractor will protect all permanent equipment put into services from dust, dust infiltration and soiling by installing filtering media at each supply and return outlet. Filters shall be changed in all air handling equipment including unit vents prior to owner occupancy. Failure to provide the necessary protection to the equipment may result in the contractor to be charged to clean the equipment and associated ductwork.
- L. Isolation of Work Areas in Occupied Facilities: Prevent dust, fumes, and odors from entering occupied areas.
1. Prior to commencing work, The Mechanical/ HVAC Contractor will isolate the HVAC system in area where work is to be performed in accordance with approved coordination drawings.
 - a. Disconnect supply and return ductwork in work area from HVAC systems servicing occupied areas.
 - b. The General Construction Contractor will maintain negative air pressure within work area using HEPA-equipped air filtration units, starting with commencement of temporary partition construction, and continuing until removal of temporary partitions is complete.
 2. The General Construction Contractor will maintain dust partitions during the Work. Use vacuum collection attachments on dust-producing equipment. Isolate limited work within occupied areas using portable dust containment devices.
 3. Each Contractor will perform daily construction cleanup and final cleanup using approved, HEPA-filter-equipped vacuum equipment.

3.2 SUPPORT FACILITIES INSTALLATION

- A. Each prime contractor will locate field offices, storage trailers, sanitary facilities, and other temporary construction and support facilities as directed by the Construction Manager.
1. Maintain support facilities until near Substantial Completion. Remove prior to Substantial Completion. Personnel remaining after Substantial Completion will be permitted to use permanent facilities, under conditions acceptable to the Owner.
- B. Construction Manager Field Office: Prefabricated or mobile units with serviceable finishes, temperature controls, and foundations adequate for normal loading.
1. The General Construction Contractor shall provide: Construction Manager Field Office. Furnish the office and equip offices as follows:
 - a. CM office trailer delivery and ready for occupancy May 1, 2021.

- b. CM Office trailer removal will be performed under another contract. Include rental of the field office and utilities, phone, internet, copier, toilets, water service, etc. through site August 31, 2022.
- C. One (1) rented office trailer (12'x 64') for the exclusive use of the Construction Manager. The trailer shall consist of two offices, one fully operational bathroom, one large center room. The trailer bathroom shall be functional and have potable water and sanitary storage tanks maintained weekly or as needed. The office trailer will remain on site for the schedule noted above. Rental, service costs, and removal shall be included. Provide all related rental and maintenance.
- D. Field trailer consists of the following existing items:
 - 1. Air conditioning and heating.
 - 2. All windows with security wire mesh.
 - 3. Exterior trailer insulated skirting.
 - 4. All exterior doors provided through wall bolted brackets and security bar with two (2) shrouded padlocks at both ends.
 - 5. Two (2) sets of metal stairs for trailer and 36" x 60" walk-off mats inside each door.
 - 6. Internet – Maintain Spectrum Business Class High Speed Internet with wireless service and with minimum (2) data connections per room.
 - 7. Telephones – Maintain telephone services with two (2) main lines.
 - 8. Temporary electrical service to the Construction Manager's trailer shall be installed by the Electrical Prime Contractor. Electrical service consumption to be paid by the Owner.
 - 9. Maintain one (1) large color photo copier that will copy, staple, scan, email, fax, and wireless network capabilities. Copier model Ricoh Aficio MP C3504ex or equal. Services and supplies (paper, toner, staples, etc.) shall be maintained. Provide copy paper 8.5" x 11", 8.5"x14" and 11"x17" as required.
 - 10. Provide two (2) office sit/stand desks with returns and premium office chairs for each desk.
 - 11. Provide one (1) four drawer legal lateral (30" wide) metal file cabinets for trailer.
 - 12. Provide four (4) tables (2-6"x8') and twenty (20) padded folding chairs for trailer.
 - 13. Provide one (1) 12' plan table with lower shelf.
 - 14. Provide twelve (12) 24" Safco hanging plan clamps and two (2) sets of the Safco 5030 Wall Rack.
 - 15. First aid cabinet serving 40-50 employees. Seton Model 84472 or equivalent.
 - 16. One commercial (1) water cooler with hot and cold faucets 5-gallon capacity and water service.
 - 17. Provide one temporary toilet (handicap) for the entire duration of the project. Temporary toilets, including disposable supplies for use at the project field office location on Edmunds Lane.
 - 18. Restore all areas at trailers and storage conex units at the completion of the project.
- E. Temporary electrical service to the Construction Managers temporary field office trailer shall be installed by the Electrical Prime Contractor. Electrical service consumption to be paid by the Owner. Storage trailers / containers: Each prime contractor will install storage containers equipped to accommodate materials and equipment involved, if needed. Storage trailers are to be located at each site in the designated staging areas determined by the Construction Manager.
- F. Traffic Controls: Comply with requirements of authorities having jurisdiction.
 - 1. Protect existing site improvements to remain including curbs, pavement, and utilities.
 - 2. Maintain access for fire-fighting equipment and access to fire hydrants.
 - a. Temporary parking by construction personnel shall be allowed only in areas so designated.

- G. Collection and Disposal of Waste: Each prime contractor will collect waste from their construction areas and elsewhere daily. Comply with requirements of NFPA 241 for removal of combustible waste material and debris. The Construction Manager will enforce requirements strictly. Do not hold materials more than 7 days during normal weather or 3 days when the temperature is expected to rise above 80 deg F. Handle hazardous, dangerous, or unsanitary waste materials separately from other waste by containerizing properly.
- H. The General Construction Contractor will provide waste-collection containers in sizes adequate to handle waste from construction operations. The General Construction Contractor will provide dumpsters at each site for use by all other prime and sub contracts.
 - 1. Comply with requirements of authorities having jurisdiction. Comply with Division 01 Section "Execution" for progress cleaning requirements.
- I. Existing Stair Usage: Use of Owner's existing stairs will be permitted, as long as stairs are cleaned and maintained in a condition acceptable to Owner. At Substantial Completion, restore stairs to condition existing before initial use.
 - 1. Provide protective coverings, barriers, devices, signs, or other procedures to protect stairs and to maintain means of egress. If, despite such protection, stairs become damaged, restore damaged areas so no evidence remains of correction work.
- J. Temporary Lifts and Hoists: Each prime contractor will provide facilities for hoisting materials and employees.
- K. Temporary Elevator Use: Use of the Owner's existing elevators will not be permitted.
- L. Existing Elevator Use: Use of Owner's existing elevators will not be permitted.

3.3 SECURITY AND PROTECTION FACILITIES INSTALLATION

- A. Protection of Existing Facilities: Each contractor will protect existing vegetation, equipment, structures, utilities, and other improvements at Project site and on adjacent properties, except those indicated to be removed or altered. Repair damage to existing facilities.
- B. Environmental Protection: Each contractor will provide protection, operate temporary facilities, and conduct construction as required to comply with environmental regulations and that minimize possible air, waterway, and subsoil contamination or pollution or other undesirable effects. Avoid using tools and equipment that produce harmful noise. Restrict use of noise-making tools and equipment to hours that will minimize complaints from persons or firms near the site.
 - 1. Comply with work restrictions specified in Division 01 Section "Summary."
- C. Temporary Erosion and Sedimentation Control: Each Contractor will provide measures to prevent soil erosion and discharge of soil-bearing water runoff and airborne dust to undisturbed areas and to adjacent properties and walkways, according to erosion- and sedimentation-control Drawings and requirements of 2003 EPA Construction General Permit or authorities having jurisdiction, whichever is more stringent.
 - 1. Verify that flows of water redirected from construction areas or generated by construction activity do not enter or cross tree- or plant- protection zones.
 - 2. Inspect, repair, and maintain erosion- and sedimentation-control measures during construction until permanent vegetation has been established.
 - 3. Clean, repair, and restore adjoining properties and roads affected by erosion and sedimentation from the project site during the course of the project.
 - 4. Remove erosion and sedimentation controls and restore and stabilize areas disturbed during removal.

- D. Stormwater Control: Each Contractor will comply with requirements of authorities having jurisdiction. Provide barriers in and around excavations and subgrade construction to prevent flooding by runoff of stormwater from heavy rains.
- E. Tree and Plant Protection: Each Contractor will install temporary fencing located as indicated or outside the drip line of trees to protect vegetation from damage from construction operations. Protect tree root systems from damage, flooding, and erosion.
- F. Enclosure Fence: Each Contractor will install an enclosure fence with lockable entrance gates in areas of exterior work, storage of materials, and as directed by the Construction Manager. Install in a manner that will prevent the public and animals from easily entering the site, except by the entrance gates.
1. Provide open-mesh, 6' high chain link fence with posts, see fencing plan within construction documents.
 2. Extent of Fence: As required to enclose entire Project site or portion determined sufficient to accommodate construction operations.
 3. Extent of Fence: As indicated on Drawings.
 4. Movable fence held down at all times with sand bags.
 5. Provide double swing access gates and man gates. Each gate is to have a chain and padlock.
 6. Provide a combination type lock for each gate to the Construction Manager.
 7. Remove fence upon completion of all exterior activities or sooner if directed by Construction Manager.
- G. Barricades, Warning Signs, and Lights: Each Contractor will comply with standards and code requirements for erecting structurally adequate barricades. Paint with appropriate colors, graphics, and warning signs to inform personnel and the public of the hazard being protected against. Where appropriate and needed, provide lighting, including flashing red or amber lights.
- H. Project Identification and Temporary Signs: Each Contractor will prepare Project identification and other signs in sizes indicated. Install signs to inform public and persons seeking entrance to Project. Do not permit installation of unauthorized signs.
1. Provide legible active construction area signs as necessary to adequately define construction areas.
- I. Temporary Signs: The General Construction Contractor and Site Contractor will prepare signs to provide directional information to construction personnel and visitors for each site. Unauthorized signs are not permitted.
1. For construction traffic control/flow at entrances/exits, as designated by the Owner.
 2. For warning signs as required
 3. Per OSHA standards as necessary
 4. For trailer identification
 5. For "No Smoking" safe work site at multiple locations.
- J. Temporary Egress: The General Construction Contractor will maintain temporary egress from existing occupied facilities as indicated and as required by authorities having jurisdiction.
- K. Temporary Enclosures: Each prime contractor will provide temporary enclosure for protection of construction, in progress and completed, from exposure, foul weather, other construction operations, and similar activities.
1. Where heat is needed and the permanent building enclosure is not complete, the contractor responsible for the work will provide temporary enclosures where there is no other provision for containment of heat. Coordinate enclosure with ventilating and material drying or curing requirements to avoid dangerous conditions and effects.

2. Install tarpaulins securely, with incombustible wood framing and other materials. Close openings of 25 sq. ft. or less with plywood or similar materials.
 3. Close openings through floor or roof decks and horizontal surfaces with load-bearing, wood-framed construction.
 4. Where temporary wood or plywood enclosure exceeds 100 sq. ft. in area, use UL labeled, fire-retardant-treated material for framing and main sheathing.
- L. Temporary Partitions: General Construction Contractor will provide floor-to-ceiling dustproof partitions to limit dust, dirt migration, fumes and noise to separate areas occupied by the Owner.
1. The General Contractor will provide two-hundred (200') linear feet of temporary partition to the underside of the floor above, and to be used at the direction of the Construction Manager.
 - a. The General Contractor will provide three (3) 3070 HM doors and frames and three (3) 6070 HM doors and frames for use in the temporary partitions, at the direction of the Construction Manager. Include lockable hardware compatible with the district standard lockset and keying and closures.
 2. The General Contractor will provide fifty (50) construction cores and one-hundred (100) keys compatible with the District BEST lock system. To be turned over to the Construction Manager.
 3. Construct dustproof partitions and hard ceilings with gypsum wallboard with joints taped and painted on occupied side, and fire-retardant plywood on construction operations side.
 4. Construct dustproof partitions that sealed at all perimeter edges.
 5. Insulate partitions to provide noise protection to occupied areas.
 6. Seal joints and perimeter. Equip partitions with dustproof doors and security locks.
 7. Protect air-handling equipment.
 8. Weather strip openings.
 9. Provide walk-off mats at each entrance through temporary partition.
- M. Temporary Fire Protection: Each prime contractor until fire-protection needs are supplied by permanent facilities, install and maintain temporary fire-protection facilities of the types needed to protect against reasonably predictable and controllable fire losses. Comply with NFPA 10, "Standard for Portable Fire Extinguishers," and NFPA 241, "Standard for Safeguarding Construction, Alterations, and Demolition Operations."
1. Locate fire extinguishers where convenient and effective for their intended purpose, but not less than one extinguisher on each floor at or near each usable stairwell.
 2. Store combustible materials in containers in fire-safe locations.
 3. Maintain unobstructed access to fire extinguishers, fire hydrants, temporary fire-protection facilities, stairways, and other access routes for fighting fires. Prohibit smoking in hazardous fire-exposure areas.
 4. Provide supervision of welding operations, combustion-type temporary heating units, and similar sources of fire ignition.
- N. Permanent Fire Protection: At the earliest feasible date in each area of the Project, complete installation of the permanent fire-protection facility, including connected services, and place into operation and use. Instruct key personnel on use of facilities.
- O. Security Enclosure and Lockup: Each Prime Contractor will install substantial temporary enclosure in areas opened during construction and of partially completed areas of construction. Provide temporary doors and locking entrances to prevent unauthorized entrance, vandalism, theft and similar violations of security.

1. Storage: Each prime contractor is responsible at for their materials and equipment to be stored, and are of value or attractive for theft, provide a secure lockup. Enforce discipline in connection with the installation and release of material to minimize the opportunity for theft and vandalism.

3.4 MOISTURE AND MOLD CONTROL

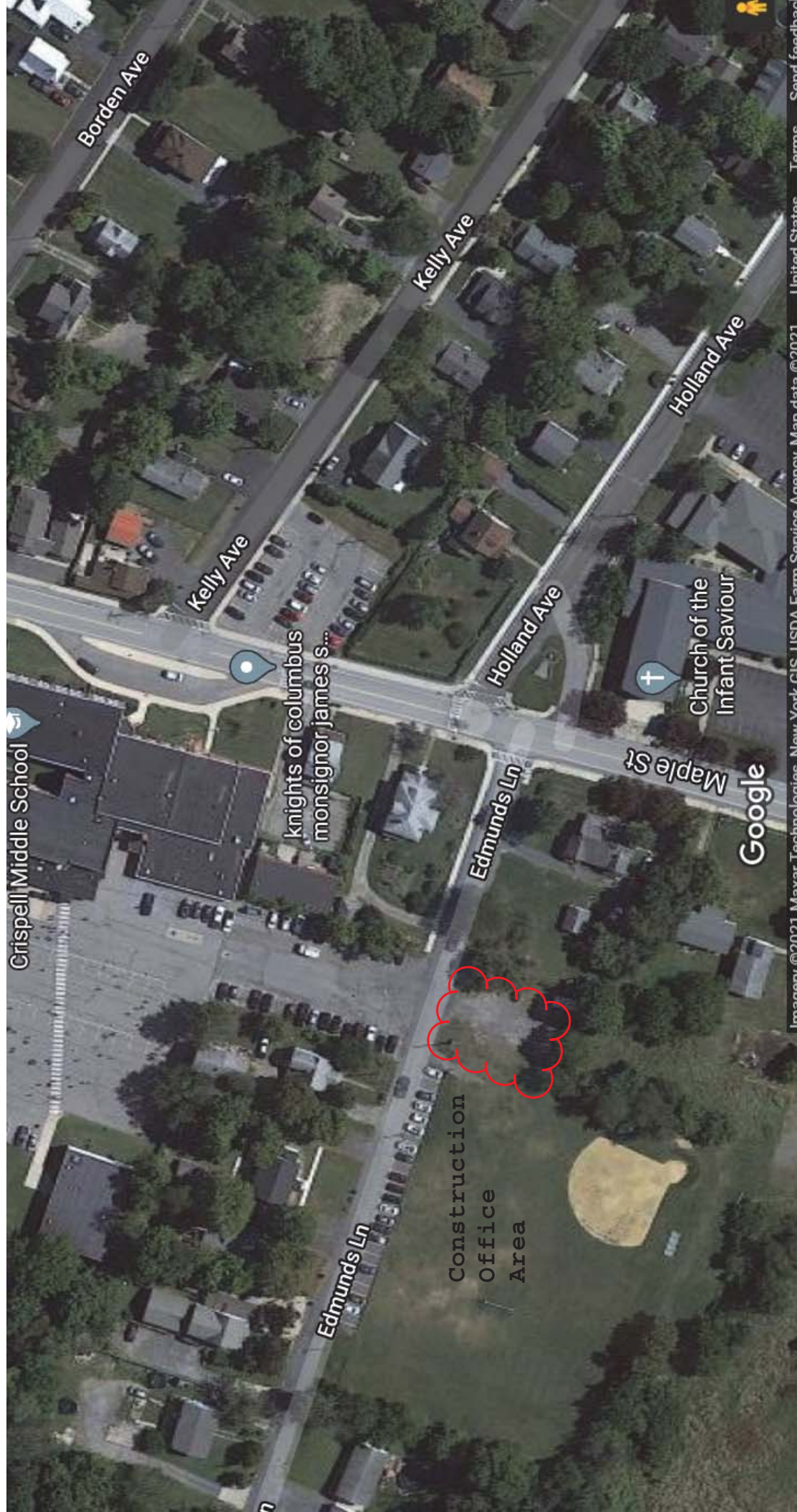
- A. Contractor's Moisture-Protection Plan: Each Prime Contractor is to avoid trapping water in finished work. Document visible signs of mold that may appear during construction.
- B. Exposed Construction Phase: Before installation of weather barriers, when materials are subject to wetting and exposure and to airborne mold spores, protect as follows:
 1. Protect porous materials from water damage.
 2. Protect stored and installed material from flowing or standing water.
 3. Keep porous and organic materials from coming into prolonged contact with concrete.
 4. Remove standing water from decks.
 5. Keep deck openings covered or dammed.
- C. Partially Enclosed Construction Phase: After installation of weather barriers but before Permanent Enclosure and conditioning of building, when installed materials are still subject to infiltration of moisture and ambient mold spores, protect as follows:
 1. Do not load or install drywall or other porous materials or components, or items with high organic content, into partially enclosed building.
 2. Keep interior spaces reasonably clean and protected from water damage.
 3. Periodically collect and remove waste containing cellulose or other organic matter.
 4. Discard or replace water-damaged material.
 5. Do not install material that is wet.
 6. Discard, replace or clean stored or installed material that begins to grow mold.
 7. Perform work in a sequence that allows any wet materials adequate time to dry before enclosing the material in drywall or other interior finishes.
- D. Controlled Construction Phase of Construction: After completing and sealing of the permanent building enclosure but prior to the full operation of permanent HVAC systems, maintain as follows:
 1. Control moisture and humidity inside building by maintaining effective dry-in conditions.
 2. Use permanent HVAC system to control humidity.
 3. HVAC/Mechanical Contractor is to provide temporary dehumidification and ventilation until the building systems are operational and the spaces are substantially completed.
 4. Comply with manufacturer's written instructions for temperature, relative humidity, and exposure to water limits.
 - a. Hygroscopic materials that may support mold growth, including wood and gypsum-based products, that become wet during the course of construction and remain wet for 48 hours are considered defective.
 - b. Measure moisture content of materials that have been exposed to moisture during construction operations or after installation. Record daily readings over a forty-eight-hour period. Identify materials containing moisture levels higher than allowed. Report findings in writing to Architect.
 - c. Remove materials that cannot be completely restored to their manufactured moisture level in 48 hours.

3.5 OPERATION, TERMINATION, AND REMOVAL

- A. Supervision: Enforce strict discipline in use of temporary facilities. Limit availability of temporary facilities to essential and intended uses to minimize waste and abuse.

- B. Maintenance: Maintain facilities and good operating condition until removal. Protect from damage by freezing temperatures and similar elements.
 - 1. Maintain operation of temporary enclosures, heating, cooling, humidity control, ventilation, and similar facilities on a 24-hour basis where required to achieve indicated results and to avoid possibility of damage.
 - 2. Protection: Prevent water-filled piping from freezing. Maintain markers for underground lines. Protect from damage during excavation operations.
- C. Temporary Facility Changeover: Do not change over from using temporary security and protection facilities to permanent facilities until Substantial Completion.
- D. Termination and Removal: Unless the Architect requests that it be maintained longer each prime contractor will remove each temporary facility when the need has ended, when replaced by authorized use of a permanent facility, or no later than Substantial Completion. Complete or, if necessary, restore permanent construction that may have been delayed because of interference with the temporary facility. Repair damaged Work, clean exposed surfaces, and replace construction that cannot be satisfactorily repaired.
 - 1. Materials and facilities that constitute temporary facilities are the property of each prime contractor.
 - 2. At Substantial Completion, Each prime contractor will be responsible to clean and renovate permanent facilities related to the work of their contract and used during the construction period including, but not limited to, the following:
 - a. Replace air filters and clean inside of ductwork and housings.
 - b. Replace significantly worn parts and parts subject to unusual operating conditions.
 - c. Replace lamps burned out or noticeably dimmed by hours of use.

END OF SECTION 015001



SECTION 01 6000 - PRODUCT REQUIREMENTS

PART 1 - GENERAL

1.1 SUMMARY

- A. Section includes administrative and procedural requirements for selection of products for use in Project; product delivery, storage, and handling; manufacturers' standard warranties on products; special warranties; and comparable products.
- B. Related Requirements:
 - 1. Section 01 2100 "Allowances" for products selected under an allowance.
 - 2. Section 01 2300 "Alternates" for products selected under an alternate.
 - 3. Section 01 4200 "References" for applicable industry standards for products specified.

1.2 DEFINITIONS

- A. Products: Items obtained for incorporating into the Work, whether purchased for Project or taken from previously purchased stock. The term "product" includes the terms "material," "equipment," "system," and terms of similar intent.
 - 1. Named Products: Items identified by manufacturer's product name, including make or model number or other designation shown or listed in manufacturer's published product literature that is current as of date of the Contract Documents.
 - 2. New Products: Items that have not previously been incorporated into another project or facility. Products salvaged or recycled from other projects are not considered new products.
 - 3. Comparable Product: Product that is demonstrated and approved through submittal process to have the indicated qualities related to type, function, dimension, in-service performance, physical properties, appearance, and other characteristics that equal or exceed those of specified product.
- B. Basis-of-Design Product Specification: A specification in which a specific manufacturer's product is named and accompanied by the words "basis-of-design product," including make or model number or other designation, to establish the significant qualities related to type, function, dimension, in-service performance, physical properties, appearance, and other characteristics for purposes of evaluating comparable products of additional manufacturers named in the specification.

1.3 ACTION SUBMITTALS

- A. Comparable Product Requests: Submit request for consideration of each comparable product. Identify product or fabrication or installation method to be replaced. Include Specification Section number and title and Drawing numbers and titles.
 - 1. Include data to indicate compliance with the requirements specified in "Comparable Products" Article.
 - 2. Architect's Action: If necessary, Architect will request additional information or documentation for evaluation within one week of receipt of a comparable product request. Architect will notify Contractor through Construction Manager of approval or rejection of proposed comparable product request within 10 days of receipt of request, or seven days of receipt of additional information or documentation, whichever is later.

- a. Form of Approval: As specified in Section 013300 "Submittal Procedures."
 - b. Use product specified if Architect does not issue a decision on use of a comparable product request within time allocated.
- B. Basis-of-Design Product Specification Submittal: Comply with requirements in Section 013300 "Submittal Procedures." Show compliance with requirements.

1.4 QUALITY ASSURANCE

- A. Compatibility of Options: If Contractor is given option of selecting between two or more products for use on Project, select product compatible with products previously selected, even if previously selected products were also options.
 - 1. Each contractor is responsible for providing products and construction methods compatible with products and construction methods of other contractors.
 - 2. If a dispute arises between contractors over concurrently selectable but incompatible products, Architect will determine which products shall be used.

1.5 PRODUCT DELIVERY, STORAGE, AND HANDLING

- A. Deliver, store, and handle products using means and methods that will prevent damage, deterioration, and loss, including theft and vandalism. Comply with manufacturer's written instructions.
- B. Delivery and Handling:
 - 1. Schedule delivery to minimize long-term storage at Project site and to prevent overcrowding of construction spaces.
 - 2. Coordinate delivery with installation time to ensure minimum holding time for items that are flammable, hazardous, easily damaged, or sensitive to deterioration, theft, and other losses.
 - 3. Deliver products to Project site in an undamaged condition in manufacturer's original sealed container or other packaging system, complete with labels and instructions for handling, storing, unpacking, protecting, and installing.
 - 4. Inspect products on delivery to determine compliance with the Contract Documents and to determine that products are undamaged and properly protected.
- C. Storage:
 - 1. Store products to allow for inspection and measurement of quantity or counting of units.
 - 2. Store materials in a manner that will not endanger Project structure.
 - 3. Store products that are subject to damage by the elements, under cover in a weathertight enclosure above ground, with ventilation adequate to prevent condensation.
 - 4. Protect foam plastic from exposure to sunlight, except to extent necessary for period of installation and concealment.
 - 5. Comply with product manufacturer's written instructions for temperature, humidity, ventilation, and weather-protection requirements for storage.
 - 6. Protect stored products from damage and liquids from freezing.
 - 7. Provide a secure location and enclosure at Project site for storage of materials and equipment by Owner's construction forces. Coordinate location with Owner.

1.6 PRODUCT WARRANTIES

- A. Warranties specified in other Sections shall be in addition to, and run concurrent with, other warranties required by the Contract Documents. Manufacturer's disclaimers and limitations on product warranties do not relieve Contractor of obligations under requirements of the Contract Documents.
 - 1. Manufacturer's Warranty: Written warranty furnished by individual manufacturer for a particular product and specifically endorsed by manufacturer to Owner.
 - 2. Special Warranty: Written warranty required by the Contract Documents to provide specific rights for Owner.
- B. Special Warranties: Prepare a written document that contains appropriate terms and identification, ready for execution.
 - 1. Manufacturer's Standard Form: Modified to include Project-specific information and properly executed.
 - 2. Specified Form: When specified forms are included with the Specifications, prepare a written document using indicated form properly executed.
 - 3. See other Sections for specific content requirements and particular requirements for submitting special warranties.
- C. Submittal Time: Comply with requirements in Section 017700 "Closeout Procedures."

PART 2 - PRODUCTS

2.1 PRODUCT SELECTION PROCEDURES

- A. General Product Requirements: Provide products that comply with the Contract Documents, are undamaged and, unless otherwise indicated, are new at time of installation.
 - 1. Provide products complete with accessories, trim, finish, fasteners, and other items needed for a complete installation and indicated use and effect.
 - 2. Standard Products: If available, and unless custom products or nonstandard options are specified, provide standard products of types that have been produced and used successfully in similar situations on other projects.
 - 3. Owner reserves the right to limit selection to products with warranties not in conflict with requirements of the Contract Documents.
 - 4. Where products are accompanied by the term "as selected," Architect will make selection.
 - 5. Descriptive, performance, and reference standard requirements in the Specifications establish salient characteristics of products.
 - 6. Or Equal: For products specified by name and accompanied by the term "or equal," or "or approved equal," or "or approved," comply with requirements in "Comparable Products" Article to obtain approval for use of an unnamed product.
- B. Product Selection Procedures:
 - 1. Products:
 - a. Restricted List: Where Specifications include a list of names of both manufacturers and products, provide one of the products listed that complies with requirements. Substitutions for Contractor's convenience will not be considered.

- b. Nonrestricted List: Where Specifications include a list of names of both available manufacturers and products, provide one of the products listed, or an unnamed product, that complies with requirements. Comply with requirements in "Comparable Products" Article for consideration of an unnamed product.
 - 2. Manufacturers:
 - a. Restricted List: Where Specifications include a list of manufacturers' names, provide a product by one of the manufacturers listed that complies with requirements. Substitutions for Contractor's convenience will not be considered.
 - b. Nonrestricted List: Where Specifications include a list of available manufacturers, provide a product by one of the manufacturers listed, or a product by an unnamed manufacturer, that complies with requirements. Comply with requirements in "Comparable Products" Article for consideration of an unnamed manufacturer's product.
 - 3. Basis-of-Design Product: Where Specifications name a product, or refer to a product indicated on Drawings, and include a list of manufacturers, provide the specified or indicated product or a comparable product by one of the other named manufacturers. Drawings and Specifications indicate sizes, profiles, dimensions, and other characteristics that are based on the product named. Comply with requirements in "Comparable Products" Article for consideration of an unnamed product by one of the other named manufacturers.
- C. Visual Matching Specification: Where Specifications require "match Architect's sample", provide a product that complies with requirements and matches Architect's sample. Architect's decision will be final on whether a proposed product matches.
- D. Visual Selection Specification: Where Specifications include the phrase "as selected by Architect from manufacturer's full range" or similar phrase, select a product that complies with requirements. Architect will select color, gloss, pattern, density, or texture from manufacturer's product line that includes both standard and premium items.

2.2 COMPARABLE PRODUCTS

- A. Conditions for Consideration: Architect will consider Contractor's request for comparable product when the following conditions are satisfied. If the following conditions are not satisfied, Architect may return requests without action, except to record noncompliance with these requirements:
 - 1. Evidence that the proposed product does not require revisions to the Contract Documents, that it is consistent with the Contract Documents and will produce the indicated results, and that it is compatible with other portions of the Work.
 - 2. Detailed comparison of significant qualities of proposed product with those named in the Specifications. Significant qualities include attributes such as performance, weight, size, durability, visual effect, and specific features and requirements indicated.
 - 3. Evidence that proposed product provides specified warranty.
 - 4. List of similar installations for completed projects with project names and addresses and names and addresses of architects and owners, if requested.
 - 5. Samples, if requested.

PART 3 - EXECUTION (Not Used)

END OF SECTION 01 6000

SECTION 01 7300 - EXECUTION

PART 1 - GENERAL

1.1 SUMMARY

- A. Section includes general administrative and procedural requirements governing execution of the Work including, but not limited to, the following:
1. Construction layout.
 2. Field engineering and surveying.
 3. Installation of the Work.
 4. Cutting and patching.
 5. Coordination of Owner-installed products.
 6. Progress cleaning.
 7. Starting and adjusting.
 8. Protection of installed construction.

1.2 DEFINITIONS

- A. Cutting: Removal of in-place construction necessary to permit installation or performance of other work.
- B. Patching: Fitting and repair work required to restore construction to original conditions after installation of other work.

1.3 INFORMATIONAL SUBMITTALS

- A. Qualification Data: For land surveyor.
- B. Certificates: Submit certificate signed by land surveyor certifying that location and elevation of improvements comply with requirements.
- C. Cutting and Patching Plan: Submit plan describing procedures at least 10 days prior to the time cutting and patching will be performed. Include the following information:
1. Extent: Describe reason for and extent of each occurrence of cutting and patching.
 2. Changes to In-Place Construction: Describe anticipated results. Include changes to structural elements and operating components as well as changes in building appearance and other significant visual elements.
 3. Products: List products to be used for patching and firms or entities that will perform patching work.
 4. Dates: Indicate when cutting and patching will be performed.
 5. Utilities and Mechanical and Electrical Systems: List services and systems that cutting and patching procedures will disturb or affect. List services and systems that will be relocated and those that will be temporarily out of service. Indicate length of time permanent services and systems will be disrupted.
 - a. Include description of provisions for temporary services and systems during interruption of permanent services and systems.
- D. Landfill Receipts: Submit copy of receipts issued by a landfill facility, licensed to accept hazardous materials, for hazardous waste disposal.

1.4 QUALITY ASSURANCE

- A. Land Surveyor Qualifications: A professional land surveyor who is legally qualified to practice in jurisdiction where Project is located and who is experienced in providing land-surveying services of the kind indicated.
- B. Cutting and Patching: Comply with requirements for and limitations on cutting and patching of construction elements.
 - 1. Structural Elements: When cutting and patching structural elements, notify Architect of locations and details of cutting and await directions from Architect before proceeding. Shore, brace, and support structural elements during cutting and patching. Do not cut and patch structural elements in a manner that could change their load-carrying capacity or increase deflection
 - 2. Operational Elements: Do not cut and patch operating elements and related components in a manner that results in reducing their capacity to perform as intended or that results in increased maintenance or decreased operational life or safety. Operational elements include the following:
 - a. Primary operational systems and equipment.
 - b. Fire separation assemblies.
 - c. Air or smoke barriers.
 - d. Fire-suppression systems.
 - e. Mechanical systems piping and ducts.
 - f. Control systems.
 - g. Communication systems.
 - h. Fire-detection and -alarm systems.
 - i. Electrical wiring systems.
 - 3. Other Construction Elements: Do not cut and patch other construction elements or components in a manner that could change their load-carrying capacity, that results in reducing their capacity to perform as intended, or that results in increased maintenance or decreased operational life or safety. Other construction elements include but are not limited to the following:
 - a. Water, moisture, or vapor barriers.
 - b. Membranes and flashings.
 - c. Exterior curtain-wall construction.
 - d. Equipment supports.
 - e. Piping, ductwork, vessels, and equipment.
 - f. Noise- and vibration-control elements and systems.
 - 4. Visual Elements: Do not cut and patch construction in a manner that results in visual evidence of cutting and patching. Do not cut and patch exposed construction in a manner that would, in Architect's opinion, reduce the building's aesthetic qualities. Remove and replace construction that has been cut and patched in a visually unsatisfactory manner.
- C. Manufacturer's Installation Instructions: Obtain and maintain on-site manufacturer's written recommendations and instructions for installation of products and equipment.

PART 2 - PRODUCTS

2.1 MATERIALS

- A. General: Comply with requirements specified in other Sections.
- B. In-Place Materials: Use materials for patching identical to in-place materials. For exposed surfaces, use materials that visually match in-place adjacent surfaces to the fullest extent possible.
 - 1. If identical materials are unavailable or cannot be used, use materials that, when installed, will provide a match acceptable to Architect for the visual and functional performance of in-place materials.

PART 3 - EXECUTION

3.1 EXAMINATION

- A. Existing Conditions: The existence and location of underground and other utilities and construction indicated as existing are not guaranteed. Before beginning sitework, investigate and verify the existence and location of underground utilities, mechanical and electrical systems, and other construction affecting the Work.
 - 1. Before construction, verify the location and invert elevation at points of connection of sanitary sewer, storm sewer, and water-service piping; underground electrical services, and other utilities.
 - 2. Furnish location data for work related to Project that must be performed by public utilities serving Project site.
- B. Examination and Acceptance of Conditions: Before proceeding with each component of the Work, examine substrates, areas, and conditions, with Installer or Applicator present where indicated, for compliance with requirements for installation tolerances and other conditions affecting performance. Record observations.
 - 1. Examine roughing-in for mechanical and electrical systems to verify actual locations of connections before equipment and fixture installation.
 - 2. Examine walls, floors, and roofs for suitable conditions where products and systems are to be installed.
 - 3. Verify compatibility with and suitability of substrates, including compatibility with existing finishes or primers.
- C. Written Report: Where a written report listing conditions detrimental to performance of the Work is required by other Sections, include the following:
 - 1. Description of the Work.
 - 2. List of detrimental conditions, including substrates.
 - 3. List of unacceptable installation tolerances.
 - 4. Recommended corrections.
- D. Proceed with installation only after unsatisfactory conditions have been corrected. Proceeding with the Work indicates acceptance of surfaces and conditions.

3.2 PREPARATION

- A. Existing Utility Information: Furnish information to local utility that is necessary to adjust, move, or relocate existing utility structures, utility poles, lines, services, or other utility appurtenances located in or affected by construction. Coordinate with authorities having jurisdiction.
- B. Field Measurements: Take field measurements as required to fit the Work properly. Recheck measurements before installing each product. Where portions of the Work are indicated to fit to other construction, verify dimensions of other construction by field measurements before fabrication. Coordinate fabrication schedule with construction progress to avoid delaying the Work.
- C. Space Requirements: Verify space requirements and dimensions of items shown diagrammatically on Drawings.
- D. Review of Contract Documents and Field Conditions: Immediately on discovery of the need for clarification of the Contract Documents caused by differing field conditions outside the control of Contractor, submit a request for information to Architect according to requirements in Section 013100 "Project Management and Coordination."

3.3 CONSTRUCTION LAYOUT

- A. Verification: Before proceeding to lay out the Work, verify layout information shown on Drawings, in relation to the property survey and existing benchmarks. If discrepancies are discovered, notify Architect and Construction Manager promptly.
- B. General: Engage a land surveyor to lay out the Work using accepted surveying practices.
 - 1. Establish benchmarks and control points to set lines and levels at each story of construction and elsewhere as needed to locate each element of Project.
 - 2. Establish limits on use of Project site.
 - 3. Establish dimensions within tolerances indicated. Do not scale Drawings to obtain required dimensions.
 - 4. Inform installers of lines and levels to which they must comply.
 - 5. Check the location, level and plumb, of every major element as the Work progresses.
 - 6. Notify Architect and Construction Manager when deviations from required lines and levels exceed allowable tolerances.
 - 7. Close site surveys with an error of closure equal to or less than the standard established by authorities having jurisdiction.
- C. Site Improvements: Locate and lay out site improvements, including pavements, grading, fill and topsoil placement, utility slopes, and rim and invert elevations.
- D. Building Lines and Levels: Locate and lay out control lines and levels for structures, building foundations, column grids, and floor levels, including those required for mechanical and electrical work. Transfer survey markings and elevations for use with control lines and levels. Level foundations and piers from two or more locations.
- E. Record Log: Maintain a log of layout control work. Record deviations from required lines and levels. Include beginning and ending dates and times of surveys, weather conditions, name and duty of each survey party member, and types of instruments and tapes used. Make the log available for reference by Architect and Construction Manager.

3.4 FIELD ENGINEERING

- A. Reference Points: Locate existing permanent benchmarks, control points, and similar reference points before beginning the Work. Preserve and protect permanent benchmarks and control points during construction operations.
 - 1. Do not change or relocate existing benchmarks or control points without prior written approval of Architect. Report lost or destroyed permanent benchmarks or control points promptly. Report the need to relocate permanent benchmarks or control points to Architect and Construction Manager before proceeding.
 - 2. Replace lost or destroyed permanent benchmarks and control points promptly. Base replacements on the original survey control points.
- B. Benchmarks: Establish and maintain a minimum of two permanent benchmarks on Project site, referenced to data established by survey control points. Comply with authorities having jurisdiction for type and size of benchmark.
 - 1. Record benchmark locations, with horizontal and vertical data, on Project Record Documents.
 - 2. Where the actual location or elevation of layout points cannot be marked, provide temporary reference points sufficient to locate the Work.
 - 3. Remove temporary reference points when no longer needed. Restore marked construction to its original condition.

3.5 INSTALLATION

- A. General: Locate the Work and components of the Work accurately, in correct alignment and elevation, as indicated.
 - 1. Make vertical work plumb and make horizontal work level.
 - 2. Where space is limited, install components to maximize space available for maintenance and ease of removal for replacement.
 - 3. Conceal pipes, ducts, and wiring in finished areas unless otherwise indicated.
 - 4. Maintain minimum headroom clearance of 114 inches in occupied spaces and 90 inches in unoccupied spaces.
- B. Comply with manufacturer's written instructions and recommendations for installing products in applications indicated.
- C. Install products at the time and under conditions that will ensure the best possible results. Maintain conditions required for product performance until Substantial Completion.
- D. Conduct construction operations so no part of the Work is subjected to damaging operations or loading in excess of that expected during normal conditions of occupancy.
- E. Sequence the Work and allow adequate clearances to accommodate movement of construction items on site and placement in permanent locations.
- F. Tools and Equipment: Do not use tools or equipment that produce harmful noise levels.
- G. Templates: Obtain and distribute to the parties involved templates for work specified to be factory prepared and field installed. Check Shop Drawings of other work to confirm that adequate provisions are made for locating and installing products to comply with indicated requirements.

- H. Attachment: Provide blocking and attachment plates and anchors and fasteners of adequate size and number to securely anchor each component in place, accurately located and aligned with other portions of the Work. Where size and type of attachments are not indicated, verify size and type required for load conditions.
1. Mounting Heights: Where mounting heights are not indicated, mount components at heights directed by Architect.
 2. Allow for building movement, including thermal expansion and contraction.
 3. Coordinate installation of anchorages. Furnish setting drawings, templates, and directions for installing anchorages, including sleeves, concrete inserts, anchor bolts, and items with integral anchors, that are to be embedded in concrete or masonry. Deliver such items to Project site in time for installation.
- I. Joints: Make joints of uniform width. Where joint locations in exposed work are not indicated, arrange joints for the best visual effect. Fit exposed connections together to form hairline joints.
- J. Hazardous Materials: Use products, cleaners, and installation materials that are not considered hazardous.

3.6 CUTTING AND PATCHING

- A. Cutting and Patching, General: Employ skilled workers to perform cutting and patching. Proceed with cutting and patching at the earliest feasible time, and complete without delay.
1. Cut in-place construction to provide for salvage of components for reuse. Subsequently patch as required to restore surfaces to their original condition.
- B. Existing Warranties: Remove, replace, patch, and repair materials and surfaces cut or damaged during installation or cutting and patching operations, by methods and with materials so as not to void existing warranties.
- C. Temporary Support: Provide temporary support of work to be cut.
- D. Protection: Protect in-place construction during cutting and patching to prevent damage. Provide protection from adverse weather conditions for portions of Project that might be exposed during cutting and patching operations.
- E. Adjacent Occupied Areas: Where interference with use of adjoining areas or interruption of free passage to adjoining areas is unavoidable, coordinate cutting and patching according to requirements in Section 011000 "Summary."
- F. Existing Utility Services and Mechanical/Electrical Systems: Where existing services/systems are required to be removed, relocated, or abandoned, bypass such services/systems before cutting to prevent interruption to occupied areas.
- G. Cutting: Cut in-place construction by sawing, drilling, grinding, and similar operations, using methods least likely to damage elements retained or salvaged for reuse in adjoining construction.
- H. In general, use hand or small power tools designed for sawing and grinding, not hammering and chopping. Cut holes and slots neatly to minimum size required, and with minimum disturbance of adjacent surfaces. Temporarily cover openings when not in use.
1. Finished Surfaces: Cut or drill from the exposed or finished side into concealed surfaces.
 2. Concrete and Masonry: Cut using a cutting machine, such as an abrasive saw or a diamond-core drill.

3. Excavating and Backfilling: Comply with requirements in applicable Sections where required by cutting and patching operations.
 4. Mechanical and Electrical Services: Cut off pipe or conduit in walls or partitions to be removed. Cap, valve, or plug and seal remaining portion of pipe or conduit to prevent entrance of moisture or other foreign matter after cutting.
 5. Proceed with patching after construction operations requiring cutting are complete.
- I. Patching: Patch construction by filling, repairing, refinishing, closing up, and similar operations following performance of other work. Patch with durable seams that are as invisible as practicable. Provide materials and comply with installation requirements specified in other Sections, where applicable.
1. Inspection: Where feasible, test and inspect patched areas after completion to demonstrate physical integrity of installation.
 2. Exposed Finishes: Restore exposed finishes of patched areas and extend finish restoration into retained adjoining construction in a manner that will minimize evidence of patching and refinishing.
 - a. Clean piping, conduit, and similar features before applying paint or other finishing materials.
 - b. Restore damaged pipe covering to its original condition.
 3. Floors and Walls: Where walls or partitions that are removed extend one finished area into another, patch and repair floor and wall surfaces in the new space. Provide an even surface of uniform finish, color, texture, and appearance. Remove in-place floor and wall coverings and replace with new materials, if necessary, to achieve uniform color and appearance.
 - a. Where patching occurs in a painted surface, prepare substrate and apply primer and intermediate paint coats appropriate for substrate over the patch, and apply final paint coat over entire unbroken surface containing the patch extending to an inside or outside corner of a wall. Provide additional coats until patch blends with adjacent surfaces.
 4. Ceilings: Patch, repair, or rehang in-place ceilings as necessary to provide an even-plane surface of uniform appearance.
 5. Exterior Building Enclosure: Patch components in a manner that restores enclosure to a weathertight condition and ensures thermal and moisture integrity of building enclosure.
- J. Cleaning: Clean areas and spaces where cutting and patching are performed. Remove paint, mortar, oils, putty, and similar materials from adjacent finished surfaces.

3.7 OWNER-INSTALLED PRODUCTS

- A. Site Access: Provide access to Project site for Owner's construction personnel.
- B. Coordination: Coordinate construction and operations of the Work with work performed by Owner's construction personnel.
1. Construction Schedule: Inform Owner of Contractor's preferred construction schedule for Owner's portion of the Work. Adjust construction schedule based on a mutually agreeable timetable. Notify Owner if changes to schedule are required due to differences in actual construction progress.

2. Preinstallation Conferences: Include Owner's construction personnel at preinstallation conferences covering portions of the Work that are to receive Owner's work. Attend preinstallation conferences conducted by Owner's construction personnel if portions of the Work depend on Owner's construction.

3.8 PROGRESS CLEANING

- A. General: Clean Project site and work areas daily, including common areas. Enforce requirements strictly. Dispose of materials lawfully.
 1. Comply with requirements in NFPA 241 for removal of combustible waste materials and debris.
 2. Do not hold waste materials more than seven days during normal weather or three days if the temperature is expected to rise above 80 deg F.
 3. Containerize hazardous and unsanitary waste materials separately from other waste. Mark containers appropriately and dispose of legally, according to regulations.
 - a. Use containers intended for holding waste materials of type to be stored.
 4. Coordinate progress cleaning for joint-use areas where Contractor and other contractors are working concurrently.
- B. Site: Maintain Project site free of waste materials and debris.
- C. Work Areas: Clean areas where work is in progress to the level of cleanliness necessary for proper execution of the Work.
 1. Remove liquid spills promptly.
 2. Where dust would impair proper execution of the Work, broom-clean or vacuum the entire work area, as appropriate.
- D. Installed Work: Keep installed work clean. Clean installed surfaces according to written instructions of manufacturer or fabricator of product installed, using only cleaning materials specifically recommended. If specific cleaning materials are not recommended, use cleaning materials that are not hazardous to health or property and that will not damage exposed surfaces.
- E. Concealed Spaces: Remove debris from concealed spaces before enclosing the space.
- F. Exposed Surfaces in Finished Areas: Clean exposed surfaces and protect as necessary to ensure freedom from damage and deterioration at time of Substantial Completion.
- G. Waste Disposal: Do not bury or burn waste materials on-site. Do not wash waste materials down sewers or into waterways. Comply with waste disposal requirements in Section 015000 "Temporary Facilities and Controls."
- H. During handling and installation, clean and protect construction in progress and adjoining materials already in place. Apply protective covering where required to ensure protection from damage or deterioration at Substantial Completion.
- I. Clean and provide maintenance on completed construction as frequently as necessary through the remainder of the construction period. Adjust and lubricate operable components to ensure operability without damaging effects.
- J. Limiting Exposures: Supervise construction operations to assure that no part of the construction, completed or in progress, is subject to harmful, dangerous, damaging, or otherwise deleterious exposure during the construction period.

3.9 STARTING AND ADJUSTING

- A. Coordinate startup and adjusting of equipment and operating components with requirements in Section 019113 "General Commissioning Requirements."
- B. Start equipment and operating components to confirm proper operation. Remove malfunctioning units, replace with new units, and retest.
- C. Adjust equipment for proper operation. Adjust operating components for proper operation without binding.
- D. Test each piece of equipment to verify proper operation. Test and adjust controls and safeties. Replace damaged and malfunctioning controls and equipment.
- E. Manufacturer's Field Service: Comply with qualification requirements in Section 014000 "Quality Requirements."

3.10 PROTECTION OF INSTALLED CONSTRUCTION

- A. Provide final protection and maintain conditions that ensure installed Work is without damage or deterioration at time of Substantial Completion.
- B. Comply with manufacturer's written instructions for temperature and relative humidity.

END OF SECTION 01 7300

SECTION 01 7310 - CUTTING AND PATCHING

PART 1 - GENERAL

1.1 SUMMARY

- A. This Section includes procedural requirements for cutting and patching.

1.2 DEFINITIONS

- A. Cutting: Removal of existing construction necessary to permit installation or performance of other Work, including, but not limited to; cutting, drilling, chopping, and other similar operations.
- B. Patching: Fitting and repair work required to restore surfaces to original conditions after installation or removal of other Work, including, but not limited to; patching, rebuilding, reinforcing, repairing, refurbishing, restoring, replacing, and other similar operations to match adjoining surfaces.

1.3 SUBMITTALS

- A. Cutting and Patching Proposal: Submit a proposal describing procedures at least 10 days before the time cutting and patching will be performed, requesting approval to proceed. Include the following information:
1. Extent: Describe cutting and patching, show how they will be performed, and indicate why they cannot be avoided.
 2. Changes to Existing Construction: Describe anticipated results. Include changes to structural elements and operating components as well as changes in building's appearance and other significant visual elements.
 3. Products: List products to be used and firms or entities that will perform the Work.
 4. Dates: Indicate when cutting and patching will be performed.
 5. Utilities: List utilities that cutting and patching procedures will disturb or affect. List utilities that will be relocated and those that will be temporarily out of service. Indicate how long service will be disrupted.
 6. Structural Elements: Where cutting and patching involve adding reinforcement to structural elements, submit details and engineering calculations showing integration of reinforcement with original structure.
 7. Construction Manager's Approval: Obtain approval of cutting and patching proposal before cutting and patching. Approval does not waive right to later require removal and replacement of unsatisfactory work.

1.4 QUALITY ASSURANCE

- A. Structural Elements: Do not cut and patch structural elements in a manner that could change their load-carrying capacity or load-deflection ratio.
1. Obtain approval of the cutting and patching proposal before cutting and patching the following structural elements:
 - a. Foundation construction
 - b. Bearing and retaining walls
 - c. Structural concrete
 - d. Structural steel
 - e. Lintels
 - f. Timber and primary wood framing
 - g. Structural decking
 - h. Stair systems
 - i. Miscellaneous structural metals
 - j. Exterior curtain-wall construction
 - k. Equipment supports

- l. Piping, ductwork, vessels, and equipment
 - m. Structural systems of special construction in Division 13 Sections.
- B. Operational Elements: Do not cut and patch operating elements and related components in a manner that results in reducing their capacity to perform as intended or that results in increased maintenance or decreased operational life or safety.
 - 1. Obtain approval of the cutting and patching proposal before cutting and patching the following operating elements or safety related systems:
 - a. Primary operational systems and equipment
 - b. Air or smoke barriers
 - c. Water, moisture, or vapor barriers
 - d. Membranes and flashings
 - e. Fire protection systems
 - f. Noise and vibration control elements and systems
 - g. Control systems
 - h. Communication systems
 - i. Conveying systems
 - j. Electrical wiring systems
 - k. Operating systems of special construction in Division 13 Sections
- C. Visual Requirements: Do not cut and patch construction in a manner that results in visual evidence of cutting and patching. Do not cut and patch construction exposed on the exterior or in occupied spaces in a manner that would, in Architect's opinion, reduce the building's aesthetic qualities. Remove and replace construction that has been cut and patched in a visually unsatisfactory manner.
 - 1. If possible, retain the original install or fabricator to cut and patch the exposed Work listed below. If it is impossible to engage the original installer or fabricator, engage another recognized experienced and specialized firm.
 - a. Firestopping
 - b. Acoustical ceilings
 - c. Acoustical panels
 - d. Finished wood flooring
 - e. Synthetic sports flooring
 - f. Carpeting
 - g. HVAC enclosures, cabinets, or covers
 - h. Ceramic and quarry tile
 - i. Gypsum board
 - j. Masonry (exterior and interior where exposed)
 - k. Tack boards
 - l. Casework
 - m. Finish carpentry
- D. Miscellaneous Elements: Do not cut and patch the following elements or related components in a manner that could change their load-carrying capacity, that results in reducing their capacity to perform as intended, or that results in increased maintenance or decreased operational life or safety.
 - 1. Water, moisture, or vapor barriers.
 - 2. Membranes and flashings.
 - 3. Exterior curtain-wall construction.
 - 4. Equipment supports.
 - 5. Piping, ductwork, vessels, and equipment.
 - 6. Noise- and vibration-control elements and systems.

1.5 WARRANTY

- A. Existing Warranties: Remove, replace, patch, and repair materials and surfaces cut or damaged during cutting and patching operations, by methods and with materials so as not to void existing warranties.

PART 2 - PRODUCTS

2.1 MATERIALS

- A. General: Comply with requirements specified in other Sections of these Specifications.
- B. Existing Materials: Use materials identical to existing materials. For exposed surfaces, use materials that visually match existing adjacent surfaces to the fullest extent possible.
 - 1. If identical materials are unavailable or cannot be used, use materials that, when installed, will match the visual and functional performance of existing materials.

PART 3 - EXECUTION

3.1 EXAMINATION

- A. Examine surfaces to be cut and patched and conditions under which cutting and patching are to be performed.
 - 1. Compatibility: Before patching, verify compatibility with and suitability of substrates, including compatibility with existing finishes or primers.
 - 2. Proceed with installation only after unsafe or unsatisfactory conditions have been corrected.

3.2 PREPARATION

- A. Temporary Support: Provide temporary support of Work to be cut.
- B. Protection: Protect existing construction during cutting and patching to prevent damage. Provide protection from adverse weather conditions for portions of Project that might be exposed during cutting and patching operations.
- C. Adjoining Areas: Avoid interference with use of adjoining areas or interruption of free passage to adjoining areas.
- D. Existing Services: Where existing services are required to be removed, relocated, or abandoned, bypass such services before cutting to minimize interruption of services to occupied areas.

3.3 PERFORMANCE

- A. General: Employ skilled workers to perform cutting and patching. Proceed with cutting and patching at the earliest feasible time, and complete without delay.
 - 1. Cut existing construction to provide for installation of other components or performance of other construction, and subsequently patch as required to restore surfaces to their original condition.
- B. Cutting: Cut existing construction by sawing, drilling, breaking, chipping, grinding, and similar operations, including excavation, using methods least likely to damage elements retained or adjoining construction. If possible, review proposed procedures with original Installer; comply with original Installer's written recommendations.
 - 1. In general, use hand or small power tools designed for sawing and grinding, not hammering and chopping. Cut holes and slots as small as possible, neatly to size required, and with minimum disturbance of adjacent surfaces. Temporarily cover openings when not in use.

2. Existing Finished Surfaces: Cut or drill from the exposed or finished side into concealed surfaces.
 3. Concrete and Masonry: Cut using a cutting machine, such as an abrasive saw or a diamond-core drill.
 4. Excavating and Backfilling: Comply with requirements in applicable Division 2 Sections where required by cutting and patching operations.
 5. Mechanical and Electrical Services: Cut off pipe or conduit in walls or partitions to be removed. Cap, valve, or plug and seal remaining portion of pipe or conduit to prevent entrance of moisture or other foreign matter after cutting.
 6. Proceed with patching after construction operations requiring cutting are complete.
- C. Patching: Patch construction by filling, repairing, refinishing, closing up, and similar operations following performance of other Work. Patch with durable seams that are as invisible as possible. Provide materials and comply with installation requirements specified in other Sections of these Specifications.
1. Inspection: Where feasible, test and inspect patched areas after completion to demonstrate integrity of installation.
 2. Exposed Finishes: Restore exposed finishes of patched areas and extend finish restoration into retained adjoining construction in a manner that will eliminate evidence of patching and refinishing.
 3. Floors and Walls: Where walls or partitions that are removed extend one finished area into another, patch and repair floor and wall surfaces in the new space. Provide an even surface of uniform finish, color, texture, and appearance. Remove existing floor and wall coverings and replace with new materials, if necessary, to achieve uniform color and appearance.
 - a. Where patching occurs in a painted surface, apply primer and intermediate paint coats over the patch and apply final paint coat over entire unbroken surface containing the patch. Provide additional coats until patch blends with adjacent surfaces.
 4. Ceilings: Patch, repair, or rehang existing ceilings as necessary to provide an even-plane surface of uniform appearance.
 5. Exterior Building Enclosure: Patch components in a manner that restores enclosure to a weathertight condition.

END OF SECTION 01 7310

SECTION 01 7700 - CLOSEOUT PROCEDURES

PART 1 - GENERAL

1.1 SUMMARY

- A. Section includes administrative and procedural requirements for contract closeout, including, but not limited to, the following:
 - 1. Substantial Completion procedures.
 - 2. Final completion procedures.
 - 3. Warranties.
 - 4. Final cleaning.
 - 5. Repair of the Work.

1.2 ACTION SUBMITTALS

- A. Product Data: For cleaning agents.
- B. Contractor's List of Incomplete Items: Initial submittal at Substantial Completion.
- C. Certified List of Incomplete Items: Final submittal at Final Completion.

1.3 CLOSEOUT SUBMITTALS

- A. Certificates of Release: From authorities having jurisdiction.
- B. Certificate of Insurance: For continuing coverage.

1.4 MAINTENANCE MATERIAL SUBMITTALS

- A. Schedule of Maintenance Material Items: For maintenance material submittal items specified in other Sections.

1.5 SUBSTANTIAL COMPLETION PROCEDURES

- A. Contractor's List of Incomplete Items: Prepare and submit a list of items to be completed and corrected (Contractor's punch list), indicating the value of each item on the list and reasons why the Work is incomplete. **The Architect will not perform a punch list inspection until the contractors punch list is received and reviewed.**
- B. Submittals Prior to Substantial Completion: Complete the following a minimum of 10 days prior to requesting inspection for determining date of Substantial Completion. List items below that are incomplete at time of request.
 - 1. Certificates of Release: Obtain and submit releases from authorities having jurisdiction permitting Owner unrestricted use of the Work and access to services and utilities. Include occupancy permits, operating certificates, and similar releases.
 - 2. Submit closeout submittals specified in other Division 01 Sections, including project record documents, operation and maintenance manuals, final completion construction photographic documentation, damage or settlement surveys, property surveys, and similar final record information.

3. Submit closeout submittals specified in individual Sections, including specific warranties, workmanship bonds, maintenance service agreements, final certifications, and similar documents.
 4. Submit maintenance material submittals specified in individual Sections, including tools, spare parts, extra materials, and similar items, and deliver to location designated by Construction Manager. Label with manufacturer's name and model number where applicable.
 - a. Schedule of Maintenance Material Items: Prepare and submit schedule of maintenance material submittal items, including name and quantity of each item and name and number of related Specification Section. Obtain Construction Manager's signature for receipt of submittals.
 5. Submit test/adjust/balance records.
 6. Submit changeover information related to Owner's occupancy, use, operation, and maintenance.
- C. Procedures Prior to Substantial Completion: Complete the following a minimum of 10 days prior to requesting inspection for determining date of Substantial Completion. List items below that are incomplete at time of request.
1. Prepare a list of items to be completed and corrected (punch list), the value of items on the list, and reasons why the Work is not complete.
 2. Complete startup and testing of systems and equipment
 3. Submit test/adjust/balance records.
 4. Terminate and remove temporary facilities from Project site, along with mockups, construction tools, and similar elements.
 5. Perform preventive maintenance on equipment used prior to Substantial Completion.
 6. Complete startup testing of systems.
 7. Instruct Owner's personnel in operation, adjustment, and maintenance of products, equipment, and systems. Submit demonstration and training video recordings specified in Section 017900 "Demonstration and Training."
 8. Complete final cleaning requirements, including touchup painting
- D. Inspection: Submit a written request for inspection to determine Substantial Completion a minimum of 10 days prior to date the work will be completed and ready for final inspection and tests. On receipt of request, Architect and Construction Manager will either proceed with inspection or notify Contractor of unfulfilled requirements. Architect will prepare the Certificate of Substantial Completion after inspection or will notify Contractor of items, either on Contractor's list or additional items identified by Architect, that must be completed or corrected before certificate will be issued.
1. Reinspection: Request reinspection when the Work identified in previous inspections as incomplete is completed or corrected.
 - a. **The Architects basics services include one initial punch list and one follow up punch list inspection to insure all corrective action and or incomplete work has been finished. The Contractor is responsible to the Owner for all costs incurred by the Architect for additional services to provide multiple punch lists for the same work area. This cost may be deducted for the Contractors Contract by Change Order.**

2. Results of completed inspection will form the basis of requirements for final completion.

1.6 FINAL COMPLETION PROCEDURES

- A. Submittals Prior to Final Completion: Before requesting final inspection for determining final completion, complete the following:
 1. Submit a final Application for Payment according to Section 012900 "Payment Procedures."
 2. Certified List of Incomplete Items: Submit certified copy of Architect's Substantial Completion inspection list of items to be completed or corrected (punch list), endorsed and dated by Architect. Certified copy of the list shall state that each item has been completed or otherwise resolved for acceptance.
 3. Certificate of Insurance: Submit evidence of final, continuing insurance coverage complying with insurance requirements.
 4. Obtain and submit releases permitting Owner unrestricted use of the Work and access to services and utilities. Include occupancy permits, operating certificates, and similar releases.
 5. Advise Owner of pending insurance changeover requirements.
 6. Make final changeover of permanent locks and deliver keys to Owner. Advise Owner's personnel of changeover in security provisions.
 7. Participate with Owner in conducting inspection and walkthrough with local emergency responders.
 8. Touch up and otherwise repair and restore marred exposed finishes to eliminate visual defects.
 9. Deliver tools, spare parts, extra materials, and similar items to location designated by Owner. Label with manufacturer's name and model number where applicable.
 10. Submit specific warranties, workmanship bonds, maintenance service agreements, final certifications, and similar documents.
 11. Prepare and submit Project Record Documents, operation and maintenance manuals, final completion construction photographic documentation, damage or settlement surveys, property surveys, and similar final record information.
- B. Inspection: Submit a written request for final inspection to determine acceptance, a minimum of 10 days prior to date the work will be completed and ready for final inspection and tests. On receipt of request, Architect and Construction Manager will either proceed with inspection or notify Contractor of unfulfilled requirements. Architect will prepare a final Certificate for Payment after inspection or will notify Contractor of construction that must be completed or corrected before certificate will be issued.
 1. Reinspection: Request reinspection when the Work identified in previous inspections as incomplete is completed or corrected.

1.7 LIST OF INCOMPLETE ITEMS (PUNCH LIST)

- A. Organization of List: Include name and identification of each space and area affected by construction operations for incomplete items and items needing correction including, if necessary, areas disturbed by Contractor that are outside the limits of construction. Use CSI Form 14.1A.
 1. Organize items applying to each space by major element, including categories for ceiling, individual walls, floors, equipment, and building systems.
 2. Include the following information at the top of each page:

- a. Project name.
 - b. Date.
 - c. Name of Architect and Construction Manager.
 - d. Name of Contractor.
 - e. Page number.
3. Submit list of incomplete items in the following format:
 - a. MS Excel electronic file. Architect, through Construction Manager, will return annotated file.

1.8 SUBMITTAL OF PROJECT WARRANTIES

- A. Time of Submittal: Submit written warranties on request of Architect for designated portions of the Work where commencement of warranties other than date of Substantial Completion is indicated, or when delay in submittal of warranties might limit Owner's rights under warranty.
- B. Partial Occupancy: Submit properly executed warranties within 15 days of completion of designated portions of the Work that are completed and occupied or used by Owner during construction period by separate agreement with Contractor.
- C. Organize warranty documents into an orderly sequence based on the table of contents of Project Manual.
 1. Bind warranties and bonds in heavy-duty, three-ring, vinyl-covered, loose-leaf binders, thickness as necessary to accommodate contents, and sized to receive 8-1/2-by-11-inch paper.
 2. Provide heavy paper dividers with plastic-covered tabs for each separate warranty. Mark tab to identify the product or installation. Provide a typed description of the product or installation, including the name of the product and the name, address, and telephone number of Installer.
 3. Identify each binder on the front and spine with the typed or printed title "WARRANTIES," Project name, and name of Contractor.
 4. Warranty Electronic File: Scan warranties and bonds and assemble complete warranty and bond submittal package into a single indexed electronic PDF file with links enabling navigation to each item. Provide bookmarked table of contents at beginning of document.
- D. Provide additional copies of each warranty to include in operation and maintenance manuals.

PART 2 - PRODUCTS

2.1 MATERIALS

- A. Cleaning Agents: Use cleaning materials and agents recommended by manufacturer or fabricator of the surface to be cleaned. Do not use cleaning agents that are potentially hazardous to health or property or that might damage finished surfaces.

PART 3 - EXECUTION

3.1 FINAL CLEANING

- A. General: Perform final cleaning. Conduct cleaning and waste-removal operations to comply with local laws and ordinances and Federal and local environmental and antipollution regulations.
- B. Cleaning: Employ experienced workers or professional cleaners for final cleaning. Clean each surface or unit to condition expected in an average commercial building cleaning and maintenance program. Comply with manufacturer's written instructions.
 - 1. Complete the following cleaning operations before requesting inspection for certification of Substantial Completion for entire Project or for a designated portion of Project:
 - a. Clean Project site, yard, and grounds, in areas disturbed by construction activities, including landscape development areas, of rubbish, waste material, litter, and other foreign substances.
 - b. Sweep paved areas broom clean. Remove petrochemical spills, stains, and other foreign deposits.
 - c. Rake grounds that are neither planted nor paved to a smooth, even-textured surface.
 - d. Remove tools, construction equipment, machinery, and surplus material from Project site.
 - e. Remove snow and ice to provide safe access to building.
 - f. Clean exposed exterior and interior hard-surfaced finishes to a dirt-free condition, free of stains, films, and similar foreign substances. Avoid disturbing natural weathering of exterior surfaces. Restore reflective surfaces to their original condition.
 - g. Remove debris and surface dust from limited access spaces, including roofs, plenums, shafts, trenches, equipment vaults, manholes, attics, and similar spaces.
 - h. Sweep concrete floors broom clean in unoccupied spaces.
 - i. Vacuum carpet and similar soft surfaces, removing debris and excess nap; clean according to manufacturer's recommendations if visible soil or stains remain.
 - j. Clean transparent materials, including mirrors and glass in doors and windows. Remove glazing compounds and other noticeable, vision-obscuring materials. Polish mirrors and glass, taking care not to scratch surfaces.
 - k. Remove labels that are not permanent.
 - l. Wipe surfaces of mechanical and electrical equipment and similar equipment. Remove excess lubrication, paint and mortar droppings, and other foreign substances.
 - m. Clean plumbing fixtures to a sanitary condition, free of stains, including stains resulting from water exposure.
 - n. Replace disposable air filters and clean permanent air filters. Clean exposed surfaces of diffusers, registers, and grills.
 - o. Clean ducts, blowers, and coils if units were operated without filters during construction or that display contamination with particulate matter on inspection.
 - 1) Clean HVAC system in compliance with NADCA Standard 1992-01. Provide written report on completion of cleaning.
 - p. Clean light fixtures, lamps, globes, and reflectors to function with full efficiency.

- C. Construction Waste Disposal: Comply with waste disposal requirements in Section 015000 "Temporary Facilities and Controls."

3.2 REPAIR OF THE WORK

- A. Complete repair and restoration operations before requesting inspection for determination of Substantial Completion.
- B. Repair or remove and replace defective construction. Repairing includes replacing defective parts, refinishing damaged surfaces, touching up with matching materials, and properly adjusting operating equipment. Where damaged or worn items cannot be repaired or restored, provide replacements. Remove and replace operating components that cannot be repaired. Restore damaged construction and permanent facilities used during construction to specified condition.
 - 1. Remove and replace chipped, scratched, and broken glass, reflective surfaces, and other damaged transparent materials.
 - 2. Touch up and otherwise repair and restore marred or exposed finishes and surfaces. Replace finishes and surfaces that already show evidence of repair or restoration.
 - a. Do not paint over "UL" and other required labels and identification, including mechanical and electrical nameplates. Remove paint applied to required labels and identification.
 - 3. Replace parts subject to operating conditions during construction that may impede operation or reduce longevity.
 - 4. Replace burned-out bulbs

END OF SECTION 01 7700

SECTION 01 7823 - OPERATION AND MAINTENANCE DATA

PART 1 - GENERAL

1.1 SUMMARY

- A. Section includes administrative and procedural requirements for preparing operation and maintenance manuals, including the following:
 - 1. Operation and maintenance documentation directory.
 - 2. Emergency manuals.
 - 3. Operation manuals for systems, subsystems, and equipment.
 - 4. Product maintenance manuals.
 - 5. Systems and equipment maintenance manuals.
- B. Related Requirements:
 - 1. Individual Sections for any specific closeout requirements for the Work in those Sections.

1.2 DEFINITIONS

- A. System: An organized collection of parts, equipment, or subsystems united by regular interaction.
- B. Subsystem: A portion of a system with characteristics similar to a system.

1.3 CLOSEOUT SUBMITTALS

- A. Manual Content: Operations and maintenance manual content is specified in individual Specification Sections to be reviewed at the time of Section submittals. Submit reviewed manual content formatted and organized as required by this Section.
 - 1. Architect will comment on whether content of operations and maintenance submittals are acceptable.
 - 2. Where applicable, clarify and update reviewed manual content to correspond to revisions and field conditions.
- B. Format: Submit operations and maintenance manuals in the following format:
 - 1. Two paper copies. Include a complete operation and maintenance directory. Enclose title pages and directories in clear plastic sleeves.
- C. Initial Manual Submittal: Submit draft copy of each manual at least 20 days to Architect. Architect will comment on whether general scope and content of manual are acceptable
 - 1. Correct or revise each manual to comply with Architect's comments. Submit copies of each corrected manual within 15 days of receipt of Architect's comments and prior to commencing demonstration and training.
- D. Final Manual Submittal: Submit each manual in final form prior to requesting inspection for Substantial Completion and at least 15 days before commencing demonstration and training. Architect will return copy with comments.

PART 2 - PRODUCTS

2.1 OPERATION AND MAINTENANCE DOCUMENTATION DIRECTORY

- A. Directory: Prepare a single, comprehensive directory of emergency, operation, and maintenance data and materials, listing items and their location to facilitate ready access to desired information. Include a section in the directory for each of the following:
 - 1. List of documents.
 - 2. List of systems.
 - 3. List of equipment.
 - 4. Table of contents.
- B. List of Systems and Subsystems: List systems alphabetically. Include references to operation and maintenance manuals that contain information about each system.
- C. List of Equipment: List equipment for each system, organized alphabetically by system. For pieces of equipment not part of system, list alphabetically in separate list.
- D. Tables of Contents: Include a table of contents for each emergency, operation, and maintenance manual.
- E. Identification: In the documentation directory and in each operation and maintenance manual, identify each system, subsystem, and piece of equipment with same designation used in the Contract Documents. If no designation exists, assign a designation according to ASHRAE Guideline 4, "Preparation of Operating and Maintenance Documentation for Building Systems."

2.2 REQUIREMENTS FOR EMERGENCY, OPERATION, AND MAINTENANCE MANUALS

- A. Organization: Unless otherwise indicated, organize each manual into a separate section for each system and subsystem, and a separate section for each piece of equipment not part of a system. Each manual shall contain the following materials, in the order listed:
 - 1. Title page.
 - 2. Table of contents.
 - 3. Manual contents.
- B. Title Page: Include the following information:
 - 1. Subject matter included in manual.
 - 2. Name and address of Project.
 - 3. Name and address of Owner.
 - 4. Date of submittal.
 - 5. Name and contact information for Contractor.
 - 6. Name and contact information for Construction Manager.
 - 7. Name and contact information for Architect.
 - 8. Name and contact information for Commissioning Authority.
 - 9. Names and contact information for major consultants to the Architect that designed the systems contained in the manuals.
 - 10. Cross-reference to related systems in other operation and maintenance manuals.

- C. Table of Contents: List each product included in manual, identified by product name, indexed to the content of the volume, and cross-referenced to Specification Section number in Project Manual.
 - 1. If operation or maintenance documentation requires more than one volume to accommodate data, include comprehensive table of contents for all volumes in each volume of the set.
- D. Manual Contents: Organize into sets of manageable size. Arrange contents alphabetically by system, subsystem, and equipment. If possible, assemble instructions for subsystems, equipment, and components of one system into a single binder.
- E. Manuals, Paper Copy: Submit manuals in the form of hard copy, bound and labeled volumes.
 - 1. Binders: Heavy-duty, three-ring, vinyl-covered, loose-leaf binders, in thickness necessary to accommodate contents, sized to hold 8-1/2-by-11-inch paper; with clear plastic sleeve on spine to hold label describing contents and with pockets inside covers to hold folded oversize sheets.
 - a. If two or more binders are necessary to accommodate data of a system, organize data in each binder into groupings by subsystem and related components. Cross-reference other binders if necessary to provide essential information for proper operation or maintenance of equipment or system.
 - b. Identify each binder on front and spine, with printed title "OPERATION AND MAINTENANCE MANUAL," Project title or name, and subject matter of contents, and indicate Specification Section number on bottom of spine. Indicate volume number for multiple-volume sets.
 - 2. Dividers: Heavy-paper dividers with plastic-covered tabs for each section of the manual. Mark each tab to indicate contents. Include typed list of products and major components of equipment included in the section on each divider, cross-referenced to Specification Section number and title of Project Manual.
 - 3. Protective Plastic Sleeves: Transparent plastic sleeves designed to enclose diagnostic software storage media for computerized electronic equipment.
 - 4. Supplementary Text: Prepared on 8-1/2-by-11-inch white bond paper.
 - 5. Drawings: Attach reinforced, punched binder tabs on drawings and bind with text.
 - a. If oversize drawings are necessary, fold drawings to same size as text pages and use as foldouts.
 - b. If drawings are too large to be used as foldouts, fold and place drawings in labeled envelopes and bind envelopes in rear of manual. At appropriate locations in manual, insert typewritten pages indicating drawing titles, descriptions of contents, and drawing locations.

2.3 EMERGENCY MANUALS

- A. Content: Organize manual into a separate section for each of the following:
 - 1. Type of emergency.
 - 2. Emergency instructions.
 - 3. Emergency procedures.

- B. Type of Emergency: Where applicable for each type of emergency indicated below, include instructions and procedures for each system, subsystem, piece of equipment, and component:
1. Fire.
 2. Flood.
 3. Gas leak.
 4. Water leak.
 5. Power failure.
 6. Water outage.
 7. System, subsystem, or equipment failure.
 8. Chemical release or spill.
- C. Emergency Instructions: Describe and explain warnings, trouble indications, error messages, and similar codes and signals. Include responsibilities of Owner's operating personnel for notification of Installer, supplier, and manufacturer to maintain warranties.
- D. Emergency Procedures: Include the following, as applicable:
1. Instructions on stopping.
 2. Shutdown instructions for each type of emergency.
 3. Operating instructions for conditions outside normal operating limits.
 4. Required sequences for electric or electronic systems.
 5. Special operating instructions and procedures.

2.4 OPERATION MANUALS

- A. Content: In addition to requirements in this Section, include operation data required in individual Specification Sections and the following information:
1. System, subsystem, and equipment descriptions. Use designations for systems and equipment indicated on Contract Documents.
 2. Performance and design criteria if Contractor has delegated design responsibility.
 3. Operating standards.
 4. Operating procedures.
 5. Operating logs.
 6. Wiring diagrams.
 7. Control diagrams.
 8. Piped system diagrams.
 9. Precautions against improper use.
 10. License requirements including inspection and renewal dates.
- B. Descriptions: Include the following:
1. Product name and model number. Use designations for products indicated on Contract Documents.
 2. Manufacturer's name.
 3. Equipment identification with serial number of each component.
 4. Equipment function.
 5. Operating characteristics.
 6. Limiting conditions.
 7. Performance curves.
 8. Engineering data and tests.
 9. Complete nomenclature and number of replacement parts.

- C. Operating Procedures: Include the following, as applicable:
1. Startup procedures.
 2. Equipment or system break-in procedures.
 3. Routine and normal operating instructions.
 4. Regulation and control procedures.
 5. Instructions on stopping.
 6. Normal shutdown instructions.
 7. Seasonal and weekend operating instructions.
 8. Required sequences for electric or electronic systems.
 9. Special operating instructions and procedures.
- D. Systems and Equipment Controls: Describe the sequence of operation, and diagram controls as installed.
- E. Piped Systems: Diagram piping as installed, and identify color-coding where required for identification.

2.5 PRODUCT MAINTENANCE MANUALS

- A. Content: Organize manual into a separate section for each product, material, and finish. Include source information, product information, maintenance procedures, repair materials and sources, and warranties and bonds, as described below.
- B. Source Information: List each product included in manual, identified by product name and arranged to match manual's table of contents. For each product, list name, address, and telephone number of Installer or supplier and maintenance service agent, and cross-reference Specification Section number and title in Project Manual and drawing or schedule designation or identifier where applicable.
- C. Product Information: Include the following, as applicable:
1. Product name and model number.
 2. Manufacturer's name.
 3. Color, pattern, and texture.
 4. Material and chemical composition.
 5. Reordering information for specially manufactured products.
- D. Maintenance Procedures: Include manufacturer's written recommendations and the following:
1. Inspection procedures.
 2. Types of cleaning agents to be used and methods of cleaning.
 3. List of cleaning agents and methods of cleaning detrimental to product.
 4. Schedule for routine cleaning and maintenance.
 5. Repair instructions.
- E. Repair Materials and Sources: Include lists of materials and local sources of materials and related services.
- F. Warranties and Bonds: Include copies of warranties and bonds and lists of circumstances and conditions that would affect validity of warranties or bonds.
1. Include procedures to follow and required notifications for warranty claims.

2.6 SYSTEMS AND EQUIPMENT MAINTENANCE MANUALS

- A. Content: For each system, subsystem, and piece of equipment not part of a system, include source information, manufacturers' maintenance documentation, maintenance procedures, maintenance and service schedules, spare parts list and source information, maintenance service contracts, and warranty and bond information, as described below.
- B. Source Information: List each system, subsystem, and piece of equipment included in manual, identified by product name and arranged to match manual's table of contents. For each product, list name, address, and telephone number of Installer or supplier and maintenance service agent, and cross-reference Specification Section number and title in Project Manual and drawing or schedule designation or identifier where applicable.
- C. Manufacturers' Maintenance Documentation: Manufacturers' maintenance documentation including the following information for each component part or piece of equipment:
 - 1. Standard maintenance instructions and bulletins.
 - 2. Drawings, diagrams, and instructions required for maintenance, including disassembly and component removal, replacement, and assembly.
 - 3. Identification and nomenclature of parts and components.
 - 4. List of items recommended to be stocked as spare parts.
- D. Maintenance Procedures: Include the following information and items that detail essential maintenance procedures:
 - 1. Test and inspection instructions.
 - 2. Troubleshooting guide.
 - 3. Precautions against improper maintenance.
 - 4. Disassembly; component removal, repair, and replacement; and reassembly instructions.
 - 5. Aligning, adjusting, and checking instructions.
 - 6. Demonstration and training video recording, if available.
- E. Maintenance and Service Schedules: Include service and lubrication requirements, list of required lubricants for equipment, and separate schedules for preventive and routine maintenance and service with standard time allotment.
 - 1. Scheduled Maintenance and Service: Tabulate actions for daily, weekly, monthly, quarterly, semiannual, and annual frequencies.
 - 2. Maintenance and Service Record: Include manufacturers' forms for recording maintenance.
- F. Spare Parts List and Source Information: Include lists of replacement and repair parts, with parts identified and cross-referenced to manufacturers' maintenance documentation and local sources of maintenance materials and related services.
- G. Maintenance Service Contracts: Include copies of maintenance agreements with name and telephone number of service agent.
- H. Warranties and Bonds: Include copies of warranties and bonds and lists of circumstances and conditions that would affect validity of warranties or bonds.
 - 1. Include procedures to follow and required notifications for warranty claims.

PART 3 - EXECUTION

3.1 MANUAL PREPARATION

- A. Operation and Maintenance Documentation Directory: Prepare a separate manual that provides an organized reference to emergency, operation, and maintenance manuals.
- B. Emergency Manual: Assemble a complete set of emergency information indicating procedures for use by emergency personnel and by Owner's operating personnel for types of emergencies indicated.
- C. Product Maintenance Manual: Assemble a complete set of maintenance data indicating care and maintenance of each product, material, and finish incorporated into the Work.
- D. Operation and Maintenance Manuals: Assemble a complete set of operation and maintenance data indicating operation and maintenance of each system, subsystem, and piece of equipment not part of a system.
 - 1. Engage a factory-authorized service representative to assemble and prepare information for each system, subsystem, and piece of equipment not part of a system.
 - 2. Prepare a separate manual for each system and subsystem, in the form of an instructional manual for use by Owner's operating personnel.
- E. Manufacturers' Data: Where manuals contain manufacturers' standard printed data, include only sheets pertinent to product or component installed. Mark each sheet to identify each product or component incorporated into the Work. If data include more than one item in a tabular format, identify each item using appropriate references from the Contract Documents. Identify data applicable to the Work and delete references to information not applicable.
 - 1. Prepare supplementary text if manufacturers' standard printed data are not available and where the information is necessary for proper operation and maintenance of equipment or systems.
- F. Drawings: Prepare drawings supplementing manufacturers' printed data to illustrate the relationship of component parts of equipment and systems and to illustrate control sequence and flow diagrams. Coordinate these drawings with information contained in record Drawings to ensure correct illustration of completed installation.
 - 1. Do not use original project record documents as part of operation and maintenance manuals.
 - 2. Comply with requirements of newly prepared record Drawings in Section 017839 "Project Record Documents."
- G. Comply with Section 017700 "Closeout Procedures" for schedule for submitting operation and maintenance documentation.

END OF SECTION 01 7823

SECTION 01 7839 - PROJECT RECORD DOCUMENTS

PART 1 - GENERAL

1.1 SUMMARY

- A. Section includes administrative and procedural requirements for project record documents, including the following:
1. Record Drawings.
 2. Record Specifications.
 3. Record Product Data.
- B. Related Requirements:
1. Section 01 7700 "Closeout Procedures" for general closeout procedures.
 2. Section 01 7823 "Operation and Maintenance Data" for operation and maintenance manual requirements.
 3. Individual Sections for specific requirements for project record documents of the Work in those Sections.

1.2 CLOSEOUT SUBMITTALS

- A. Record Drawings: Comply with the following:
1. Number of Copies: Submit copies of record Drawings as follows:
 - a. Initial Submittal:
 - 1) Submit one paper-copy set(s) of marked-up record prints.
 - 2) Architect will indicate whether general scope of changes, additional information recorded, and quality of drafting are acceptable.
 - b. Final Submittal:
 - 1) Submit PDF electronic files of scanned record prints and two set(s) of prints.
 - 2) Print each drawing, whether or not changes and additional information were recorded.
- B. Record Specifications: Submit one paper copy and a annotated PDF electronic files of Project's Specifications, including addenda and contract modifications.
- C. Record Product Data: Submit one paper copy and annotated PDF electronic files and directories of each submittal.
1. Where record Product Data are required as part of operation and maintenance manuals, submit duplicate marked-up Product Data as a component of manual.
- D. Miscellaneous Record Submittals: See other Specification Sections for miscellaneous record-keeping requirements and submittals in connection with various construction activities. Submit one paper copy and annotated PDF electronic files and directories of each submittal.
- E. Reports: Submit written report weekly indicating items incorporated into project record documents concurrent with progress of the Work, including revisions, concealed conditions, field changes, product selections, and other notations incorporated.

PART 2 - PRODUCTS

2.1 RECORD DRAWINGS

- A. Record Prints: Maintain one set of marked-up paper copies of the Contract Drawings and Shop Drawings, incorporating new and revised drawings as modifications are issued.
1. Preparation: Mark record prints to show the actual installation where installation varies from that shown originally. Require individual or entity who obtained record data, whether individual or entity is Installer, subcontractor, or similar entity, to provide information for preparation of corresponding marked-up record prints.
 - a. Give particular attention to information on concealed elements that would be difficult to identify or measure and record later.
 - b. Accurately record information in an acceptable drawing technique.
 - c. Record data as soon as possible after obtaining it.
 - d. Record and check the markup before enclosing concealed installations.
 - e. Cross-reference record prints to corresponding archive photographic documentation.
 2. Content: Types of items requiring marking include, but are not limited to, the following:
 - a. Dimensional changes to Drawings.
 - b. Revisions to details shown on Drawings.
 - c. Depths of foundations below first floor.
 - d. Locations and depths of underground utilities.
 - e. Revisions to routing of piping and conduits.
 - f. Revisions to electrical circuitry.
 - g. Actual equipment locations.
 - h. Duct size and routing.
 - i. Locations of concealed internal utilities.
 - j. Changes made by Change Order or Construction Change Directive.
 - k. Changes made following Architect's written orders.
 - l. Details not on the original Contract Drawings.
 - m. Field records for variable and concealed conditions.
 - n. Record information on the Work that is shown only schematically.
 3. Mark the Contract Drawings and Shop Drawings completely and accurately. Use personnel proficient at recording graphic information in production of marked-up record prints.
 4. Mark record sets with erasable, red-colored pencil. Use other colors to distinguish between changes for different categories of the Work at same location.
 5. Mark important additional information that was either shown schematically or omitted from original Drawings.
 6. Note Construction Change Directive numbers, alternate numbers, Change Order numbers, and similar identification, where applicable.
- B. Format: Identify and date each record Drawing; include the designation "PROJECT RECORD DRAWING" in a prominent location.

1. Record Prints: Organize record prints and newly prepared record Drawings into manageable sets. Bind each set with durable paper cover sheets. Include identification on cover sheets.
2. Format: Submit record Drawings as paper copy **and** scanned PDF electronic file(s) of marked-up paper copy of Drawing.
3. Identification: As follows:
 - a. Project name.
 - b. Date.
 - c. Designation "PROJECT RECORD DRAWINGS."
 - d. Name of Architect and Construction Manager.
 - e. Name of Contractor.

2.2 RECORD SPECIFICATIONS

- A. Preparation: Mark Specifications to indicate the actual product installation where installation varies from that indicated in Specifications, addenda, and contract modifications.
 1. Give particular attention to information on concealed products and installations that cannot be readily identified and recorded later.
 2. Mark copy with the proprietary name and model number of products, materials, and equipment furnished, including substitutions and product options selected.
 3. Record the name of manufacturer, supplier, Installer, and other information necessary to provide a record of selections made.
 4. For each principal product, indicate whether record Product Data has been submitted in operation and maintenance manuals instead of submitted as record Product Data.
 5. Note related Change Orders, record Product Data, and record Drawings where applicable.
- B. Format: Submit record Specifications as paper copy and scanned PDF electronic file(s) of marked-up paper copy of Specifications.

2.3 RECORD PRODUCT DATA

- A. Preparation: Mark Product Data to indicate the actual product installation where installation varies substantially from that indicated in Product Data submittal.
 1. Give particular attention to information on concealed products and installations that cannot be readily identified and recorded later.
 2. Include significant changes in the product delivered to Project site and changes in manufacturer's written instructions for installation.
 3. Note related Change Orders, record Specifications, and record Drawings where applicable.
- B. Format: Submit record Product Data as paper copy and scanned PDF electronic file(s) of marked-up paper copy of Product Data.
 1. Include record Product Data directory organized by Specification Section number and title, electronically linked to each item of record Product Data.

2.4 MISCELLANEOUS RECORD SUBMITTALS

- A. Assemble miscellaneous records required by other Specification Sections for miscellaneous record keeping and submittal in connection with actual performance of the Work. Bind or file miscellaneous records and identify each, ready for continued use and reference.
- B. Format: Submit miscellaneous record submittals as paper copy and scanned PDF electronic file(s) of marked-up miscellaneous record submittals.
 - 1. Include miscellaneous record submittals directory organized by Specification Section number and title, electronically linked to each item of miscellaneous record submittals.

PART 3 - EXECUTION

3.1 RECORDING AND MAINTENANCE

- A. Recording: Maintain one copy of each submittal during the construction period for project record document purposes. Post changes and revisions to project record documents as they occur; do not wait until end of Project.
- B. Maintenance of Record Documents and Samples: Store record documents and Samples in the field office apart from the Contract Documents used for construction. Do not use project record documents for construction purposes. Maintain record documents in good order and in a clean, dry, legible condition, protected from deterioration and loss. Provide access to project record documents for Architect's and Construction Manager's reference during normal working hours.

END OF SECTION 01 7839

SECTION 01 8200 - DEMONSTRATION AND TRAINING

PART 1 - GENERAL

1.1 SUMMARY

- A. This Section includes administrative and procedural requirements for instructing Owner's personnel, including the following:
 - 1. Demonstration of operation of systems, subsystems, and equipment.
 - 2. Training in operation and maintenance of systems, subsystems, and equipment.

1.2 SUBMITTALS

- A. Instruction Program: Submit two copies of outline of instructional program for demonstration and training, including a schedule of proposed dates, times, length of instruction time, and instructors' names for each training module. Include learning objective and outline for each training module.
 - 1. At completion of training, submit one complete training manual for Owner's use.
- B. Qualification Data: For firms and persons specified in "Quality Assurance" Article to demonstrate their capabilities and experience. Include lists of completed projects with project names and addresses, names and addresses of architects and owners, and other information specified.
- C. Attendance Record: For each training module, submit list of participants and length of instruction time.
- D. Evaluations: For each participant and for each training module, submit results and documentation of performance-based test.
- E. Demonstration and Training Videotape: Submit two copies at end of each training module.

1.3 QUALITY ASSURANCE

- A. Facilitator Qualifications: A firm or individual experienced in training or educating maintenance personnel in a training program similar in content and extent to that indicated for this Project, and whose work has resulted in training or education with a record of successful learning performance.
- B. Instructor Qualifications: A factory-authorized service representative, complying with requirements in Division 1 Section "Quality Requirements," experienced in operation and maintenance procedures and training.
- C. Pre-instruction Conference: Conduct conference at Project site to comply with requirements in Division 1 Section "Project Management and Coordination." Review methods and procedures related to demonstration and training including, but not limited to, the following:
 - 1. Inspect and discuss locations and other facilities required for instruction.
 - 2. Review and finalize instruction schedule and verify availability of educational materials, instructors' personnel, audiovisual equipment, and facilities needed to avoid delays.
 - 3. Review required content of instruction.
 - 4. For instruction that must occur outside, review weather and forecasted weather conditions and procedures to follow if conditions are unfavorable.

1.4 COORDINATION

- A. Coordinate instruction schedule with Owner's operations. Adjust schedule as required to minimize disrupting Owner's operations.

- B. Coordinate instructors, including providing notification of dates, times, length of instruction time, and course content.
- C. Coordinate content of training modules with content of approved emergency, operation, and maintenance manuals. Do not submit instruction program until operation and maintenance data has been reviewed and approved by Architect.

PART 2 - PRODUCTS

2.1 INSTRUCTION PROGRAM

- A. Program Structure: Develop an instruction program that includes individual training modules for each system and equipment not part of a system, as required by individual Specification Sections, and as follows:
 - 1. Motorized doors, including, overhead coiling doors, overhead coiling grilles and automatic entrance doors.
 - 2. Equipment, including stage equipment, projection screens, loading dock equipment, waste compactors, food-service equipment, residential appliances and laboratory fume hoods.
 - 3. Fire-protection systems, including fire alarm, fire pumps and fire-extinguishing systems.
 - 4. Intrusion detection systems.
 - 5. Conveying systems, including elevators, wheelchair lifts and cranes.
 - 6. Gas equipment, including medical gas equipment and piping.
 - 7. Laboratory equipment, including laboratory air and vacuum equipment and piping.
 - 8. Heat generation, including, boilers, feedwater equipment, pumps, steam distribution piping and water distribution piping.
 - 9. Refrigeration systems, including chillers, cooling towers, condensers, pumps and distribution piping.
 - 10. HVAC systems, including air-handling equipment, air distribution systems and terminal equipment and devices.
 - 11. HVAC instrumentation and controls.
 - 12. Electrical service and distribution, including transformers, switchboards panelboards, uninterruptible power supplies and motor controls.
 - 13. Packaged engine generators, including transfer switches.
 - 14. Lighting equipment and controls.
 - 15. Communication systems, including intercommunication, surveillance, clocks, programming voice and data and television equipment.
 - 16. Any other equipment not specifically listed that is part of these construction documents.
- B. Training Modules: Develop a learning objective and teaching outline for each module. Include a description of specific skills and knowledge that participant is expected to master. For each module, include instruction for the following:
 - 1. Basis of System Design, Operational Requirements, and Criteria: Include the following:
 - a. System, subsystem, and equipment descriptions.
 - b. Performance and design criteria if Contractor is delegated design responsibility.
 - c. Operating standards.
 - d. Regulatory requirements.
 - e. Equipment function.
 - f. Operating characteristics.
 - g. Limiting conditions.
 - h. Performance curves.
 - 2. Documentation: Review the following items in detail:
 - a. Emergency manuals.
 - b. Operations manuals.
 - c. Maintenance manuals.

- d. Project Record Documents.
- e. Identification systems.
- f. Warranties and bonds.
- g. Maintenance service agreements and similar continuing commitments.
- 3. Emergencies: Include the following, as applicable:
 - a. Instructions on meaning of warnings, trouble indications, and error messages.
 - b. Instructions on stopping.
 - c. Shutdown instructions for each type of emergency.
 - d. Operating instructions for conditions outside of normal operating limits.
 - e. Sequences for electric or electronic systems.
 - f. Special operating instructions and procedures.
- 4. Operations: Include the following, as applicable:
 - a. Startup procedures.
 - b. Equipment or system break-in procedures.
 - c. Routine and normal operating instructions.
 - d. Regulation and control procedures.
 - e. Control sequences.
 - f. Safety procedures.
 - g. Instructions on stopping.
 - h. Normal shutdown instructions.
 - i. Operating procedures for emergencies.
 - j. Operating procedures for system, subsystem, or equipment failure.
 - k. Seasonal and weekend operating instructions.
 - l. Required sequences for electric or electronic systems.
 - m. Special operating instructions and procedures.
- 5. Adjustments: Include the following:
 - a. Alignments.
 - b. Checking adjustments.
 - c. Noise and vibration adjustments.
 - d. Economy and efficiency adjustments.
- 6. Troubleshooting: Include the following:
 - a. Diagnostic instructions.
 - b. Test and inspection procedures.
- 7. Maintenance: Include the following:
 - a. Inspection procedures.
 - b. Types of cleaning agents to be used and methods of cleaning.
 - c. List of cleaning agents and methods of cleaning detrimental to product.
 - d. Procedures for routine cleaning
 - e. Procedures for preventive maintenance.
 - f. Procedures for routine maintenance.
 - g. Instruction on use of special tools.
- 8. Repairs: Include the following:
 - a. Diagnosis instructions.
 - b. Repair instructions.
 - c. Disassembly; component removal, repair, and replacement; and reassembly instructions.
 - d. Instructions for identifying parts and components.
 - e. Review of spare parts needed for operation and maintenance.

PART 3 - EXECUTION

3.1 PREPARATION

- A. Assemble educational materials necessary for instruction, including documentation and training module. Assemble training modules into a combined training manual.
- B. Set up instructional equipment at instruction location.

3.2 INSTRUCTION

- A. Facilitator: Engage a qualified facilitator to prepare instruction program and training modules, to coordinate instructors, and to coordinate between Contractor and Owner for number of participants, instruction times, and location.
- B. Engage qualified instructors to instruct Owner's personnel to adjust, operate, and maintain systems, subsystems, and equipment not part of a system.
 - 1. Architect will furnish an instructor to describe basis of system design, operational requirements, criteria, and regulatory requirements.
 - 2. Owner will furnish an instructor to describe Owner's operational philosophy.
 - 3. Owner will furnish Contractor with names and positions of participants.
- C. Scheduling: Provide instruction at mutually agreed on times. For equipment that requires seasonal operation, provide similar instruction at start of each season.
 - 1. Schedule training with Owner, through Architect, with at least seven days' advance notice.
- D. Evaluation: At conclusion of each training module, assess and document each participant's mastery of module by use of a demonstration performance-based test.
- E. Demonstration and Training Videotape: Record each training module separately. Include classroom instructions and demonstrations, board diagrams, and other visual aids, but not student practice.
 - 1. At beginning of each training module, record each chart containing learning objective and lesson outline.
- F. Cleanup: Collect used and leftover educational materials and remove from Project site. Remove instructional equipment. Restore systems and equipment to condition existing before initial training use.

END OF SECTION 01 8200

SECTION 019113 - GENERAL COMMISSIONING REQUIREMENTS

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

- A. OPR and BoD documentation are included by reference for information only.

1.2 SUMMARY

- A. Section includes general requirements that apply to implementation of commissioning without regard to specific systems, assemblies, or components.
- B. Related Sections:
 - 1. Section 230800 "Commissioning of HVAC" for commissioning process activities for HVAC&R systems, assemblies, equipment, and components.

1.3 DEFINITIONS

- A. BoD: Basis of Design. A document that records concepts, calculations, decisions, and product selections used to meet the OPR and to satisfy applicable regulatory requirements, standards, and guidelines. The document includes both narrative descriptions and lists of individual items that support the design process.
- B. Commissioning Plan: A document that outlines the organization, schedule, allocation of resources, and documentation requirements of the commissioning process.
- C. CxA: Commissioning Authority.
- D. OPR: Owner's Project Requirements. A document that details the functional requirements of a project and the expectations of how it will be used and operated. These include Project goals, measurable performance criteria, cost considerations, benchmarks, success criteria, and supporting information.
- E. Systems, Subsystems, Equipment, and Components: Where these terms are used together or separately, they shall mean "as-built" systems, subsystems, equipment, and components.

1.4 COMMISSIONING TEAM

- A. Members Appointed by Contractor(s): Individuals, each having the authority to act on behalf of the entity he or she represents, explicitly organized to implement the commissioning process through coordinated action. The commissioning team shall consist of, but not be limited to, representatives of each Contractor, including Project superintendent and subcontractors, installers, suppliers, and specialists deemed appropriate by the CxA.
- B. Members Appointed by Owner:
 - 1. CxA: The designated person, company, or entity that plans, schedules, and coordinates the commissioning team to implement the commissioning process. Owner will engage the CxA under a separate contract.
 - 2. Representatives of the facility user and operation and maintenance personnel.
 - 3. Architect and engineering design professionals.

1.5 OWNER'S RESPONSIBILITIES

- A. Provide the OPR documentation to the CxA and each Contractor for information and use.
- B. Assign operation and maintenance personnel and schedule them to participate in commissioning team activities.
- C. Provide the BoD documentation, prepared by Architect and approved by Owner, to the CxA and each Contractor for use in developing the commissioning plan, systems manual, and operation and maintenance training plan.

1.6 EACH CONTRACTOR'S RESPONSIBILITIES

- A. Each Contractor shall assign representatives with expertise and authority to act on its behalf and shall schedule them to participate in and perform commissioning process activities including, but not limited to, the following:
 - 1. Evaluate performance deficiencies identified in test reports and, in collaboration with entity responsible for system and equipment installation, recommend corrective action.
 - 2. Cooperate with the CxA for resolution of issues recorded in the Issues Log.
 - 3. Attend commissioning team meetings held on a variable basis.
 - 4. Integrate and coordinate commissioning process activities with construction schedule.
 - 5. Review and accept construction checklists provided by the CxA.
 - 6. Complete electronic construction checklists as Work is completed and provide to the Commissioning Authority on a weekly basis.
 - 7. Review and accept commissioning process test procedures provided by the Commissioning Authority.
 - 8. Complete commissioning process test procedures.

1.7 CxA'S RESPONSIBILITIES

- A. Organize and lead the commissioning team.
- B. Provide commissioning plan.
- C. Convene commissioning team meetings.
- D. Provide Project-specific construction checklists and commissioning process test procedures.
- E. Verify the execution of commissioning process activities using random sampling. The sampling rate may vary from 1 to 100 percent. Verification will include, but is not limited to, equipment submittals, construction checklists, training, operating and maintenance data, tests, and test reports to verify compliance with the OPR. When a random sample does not meet the requirement, the CxA will report the failure in the Issues Log.
- F. Prepare and maintain the Issues Log.
- G. Prepare and maintain completed construction checklist log.
- H. Witness systems, assemblies, equipment, and component startup.
- I. Compile test data, inspection reports, and certificates; include them in the systems manual and commissioning process report.

PART 2 - PRODUCTS (Not Used)

PART 3 - EXECUTION (Not Used)

END OF SECTION 019113

SECTION 024119 - SELECTIVE STRUCTURE DEMOLITION

PART 1 - GENERAL

1.1 SUMMARY

- A. This Section includes the following:
 - 1. Demolition and removal of selected portions of building or structure.
 - 2. Salvage of existing items to be reused or recycled.

1.2 DEFINITIONS

- A. Remove: Detach items from existing construction and legally dispose of them off-site, unless indicated to be removed and salvaged or removed and reinstalled.
- B. Remove and Salvage: Detach items from existing construction and deliver them to Owner.
- C. Remove and Reinstall: Detach items from existing construction, prepare them for reuse, and reinstall them where indicated.
- D. Existing to Remain: Existing items of construction that are not to be removed and that are not otherwise indicated to be removed, removed and salvaged, or removed and reinstalled.

1.3 MATERIALS OWNERSHIP

- A. Historic items, relics, and similar objects including, but not limited to, cornerstones and their contents, commemorative plaques and tablets, antiques, and other items of interest or value to Owner that may be encountered during selective demolition remain Owner's property. Carefully remove and salvage each item or object in a manner to prevent damage and deliver promptly to Owner.

1.4 INFORMATIONAL SUBMITTALS

- A. Qualification Data: For refrigerant recovery technician.
- B. Proposed Protection Measures: Submit report, including drawings, that indicates the measures proposed for protecting individuals and property, for environmental protection, for dust control and, for noise control. Indicate proposed locations and construction of barriers.
- C. "Schedule of Selective Demolition Activities" Paragraph below may be used to track Contractor's progress; it may also be used to determine that selective demolition will not interfere with Owner's operations.
- D. Schedule of Selective Demolition Activities: Indicate the following:
 - 1. Detailed sequence of selective demolition and removal work, with starting and ending dates for each activity. Ensure Owner's on-site operations are uninterrupted.
 - 2. Interruption of utility services. Indicate how long utility services will be interrupted.
 - 3. Coordination for shutoff, capping, and continuation of utility services.
 - 4. Use of elevator and stairs.
 - 5. Coordination of Owner's continuing occupancy of portions of existing building and of Owner's partial occupancy of completed Work.
- E. Inventory: Submit a list of items to be removed and salvaged. Verify quantities of salvaged materials that will be incorporated in the cutting and patching work prior to start of demolition.
- F. Pre demolition Photographs or Video: Submit before Work begins.

- G. Statement of Refrigerant Recovery: Signed by refrigerant recovery technician responsible for recovering refrigerant, stating that all refrigerant that was present was recovered and that recovery was performed according to EPA regulations. Include name and address of technician and date refrigerant was recovered.
- H. Warranties: Documentation indicated that existing warranties are still in effect after completion of selective demolition.

1.5 CLOSEOUT SUBMITTALS

- A. Landfill Records: Indicate receipt and acceptance of hazardous wastes by a landfill facility licensed to accept hazardous wastes.

1.6 QUALITY ASSURANCE

- A. Regulatory Requirements: Comply with governing EPA notification regulations before beginning selective demolition. Comply with hauling and disposal regulations of authorities having jurisdiction.
- B. Standards: Comply with ANSI A10.6 and NFPA 241.

1.7 PROJECT CONDITIONS

- A. Owner will occupy portions of building immediately adjacent to selective demolition area. Conduct selective demolition so Owner's operations will not be disrupted.
- B. Conditions existing at time of inspection for bidding purpose will be maintained by Owner as far as practical.
- C. Notify Architect of discrepancies between existing conditions and Drawings before proceeding with selective demolition.
- D. Hazardous Materials: Hazardous materials are present in buildings and structures to be selectively demolished. A report on the presence of hazardous materials is included in the Project Manual. Examine report to become aware of locations where hazardous materials are present.
 - 1. Hazardous material remediation is specified elsewhere in the Contract Documents.
 - 2. Do not disturb hazardous materials or items suspected of containing hazardous materials except under procedures specified elsewhere in the Contract Documents.
 - 3. Owner will provide material safety data sheets for suspected hazardous materials that are known to be present in buildings and structures to be selectively demolished because of building operations or processes performed there.
- E. Storage or sale of removed items or materials on-site is not permitted.
- F. Utility Service: Maintain existing utilities indicated to remain in service and protect them against damage during selective demolition operations.
 - 1. Maintain fire-protection facilities in service during selective demolition operations.

1.8 WARRANTY

- A. Existing Warranties: Remove, replace, patch, and repair materials and surfaces cut or damaged during selective demolition, by methods and with materials so as not to void existing warranties. Notify warrantor before proceeding.

- B. Notify warrantor on completion of selective demolition, and obtain documentation verifying that existing system has been inspected and warranty remains in effect. Submit documentation at Project closeout.

PART 2 - PRODUCTS (Not Used)

PART 3 - EXECUTION

3.1 EXAMINATION

- A. Verify that utilities have been disconnected and capped before starting selective demolition operations.
- B. Review record documents of existing construction provided by Owner. Owner does not guarantee that existing conditions are same as those indicated in record documents.
- C. Survey existing conditions and correlate with requirements indicated to determine extent of selective demolition required.
- D. When unanticipated mechanical, electrical, or structural elements that conflict with intended function or design are encountered, investigate and measure the nature and extent of conflict. Promptly submit a written report to Architect.
- E. Survey of Existing Conditions: Record existing conditions by use of preconstruction photographs.
 - 1. Inventory and record the condition of items to be removed and salvaged. Provide photographs of conditions that might be misconstrued as damage caused by salvage or demolition operations.

3.2 UTILITY SERVICES AND MECHANICAL/ELECTRICAL SYSTEMS

- A. Existing Services/Systems to Remain: Maintain services/systems indicated to remain and protect them against damage.
 - 1. Comply with requirements for existing services/systems interruptions specified in Division 1 "Summary."
- B. Existing Services/Systems to Be Removed, Relocated, or Abandoned: Locate, identify, disconnect, and seal or cap off indicated utility services and mechanical/electrical systems serving areas to be selectively demolished.
 - 1. Arrange to shut off indicated utilities with utility companies.
 - 2. If services/systems are required to be removed, relocated, or abandoned, provide temporary services/systems that bypass area of selective demolition and that maintain continuity of services/systems to other parts of building.
 - 3. Disconnect, demolish, and remove fire-suppression systems, plumbing, and HVAC systems, equipment, and components indicated to be removed.
 - a. Piping to Be Removed: Remove portion of piping indicated to be removed and cap or plug remaining piping with same or compatible piping material.
 - b. Piping to Be Abandoned in Place: Drain piping and cap or plug piping with same or compatible piping material.
 - c. Equipment to Be Removed: Disconnect and cap services and remove equipment.

- d. Equipment to Be Removed and Reinstalled: Disconnect and cap services and remove, clean, and store equipment; when appropriate, reinstall, reconnect, and make equipment operational.
 - e. Equipment to Be Removed and Salvaged: Disconnect and cap services and remove equipment and deliver to Owner.
 - f. Ducts to Be Removed: Remove portion of ducts indicated to be removed and plug remaining ducts with same or compatible ductwork material.
 - g. Ducts to Be Abandoned in Place: Cap or plug ducts with same or compatible ductwork material.
- C. Refrigerant: Remove refrigerant from mechanical equipment to be selectively demolished according to 40 CFR 82 and regulations of authorities having jurisdiction.

3.3 PREPARATION

- A. Site Access and Temporary Controls: Conduct selective demolition and debris-removal operations to ensure minimum interference with roads, streets, walks, walkways, and other adjacent occupied and used facilities.
 - 1. Comply with requirements for access and protection specified in Division 01 Section "Temporary Facilities and Controls."
- B. Temporary Facilities: Provide temporary barricades and other protection required to prevent injury to people and damage to adjacent buildings and facilities to remain.
 - 1. Provide protection to ensure safe passage of people around selective demolition area and to and from occupied portions of building.
 - 2. Provide temporary weather protection, during interval between selective demolition of existing construction on exterior surfaces and new construction, to prevent water leakage and damage to structure and interior areas.
 - 3. Protect walls, ceilings, floors, and other existing finish work that are to remain or that are exposed during selective demolition operations.
 - 4. Cover and protect furniture, furnishings, and equipment that have not been removed.
 - 5. Comply with requirements for temporary enclosures, dust control, heating, and cooling specified in Division 01 Section "Temporary Facilities and Controls."
- C. Temporary Shoring: Provide and maintain shoring, bracing, and structural supports as required to preserve stability and prevent movement, settlement, or collapse of construction and finishes to remain, and to prevent unexpected or uncontrolled movement or collapse of construction being demolished.
 - 1. Strengthen or add new supports when required during progress of selective demolition.

3.4 SELECTIVE DEMOLITION, GENERAL

- A. General: Demolish and remove existing construction only to the extent required by new construction and as indicated. Use methods required to complete the Work within limitations of governing regulations and as follows:
 - 1. Proceed with selective demolition systematically, from higher to lower level. Complete selective demolition operations above each floor or tier before disturbing supporting members on the next lower level.
 - 2. Neatly cut openings and holes plumb, square, and true to dimensions required. Use cutting methods least likely to damage construction to remain or adjoining construction. Use hand tools or small power tools designed for sawing or grinding, not hammering and chopping, to minimize disturbance of adjacent surfaces. Temporarily cover openings to remain.

3. Cut or drill from the exposed or finished side into concealed surfaces to avoid marring existing finished surfaces.
 4. Do not use cutting torches until work area is cleared of flammable materials. At concealed spaces, such as duct and pipe interiors, verify condition and contents of hidden space before starting flame-cutting operations. Maintain fire watch and portable fire-suppression devices during flame-cutting operations.
 5. Maintain adequate ventilation when using cutting torches.
 6. Remove decayed, vermin-infested, or otherwise dangerous or unsuitable materials and promptly dispose of off-site.
 7. Remove structural framing members and lower to ground by method suitable to avoid free fall and to prevent ground impact or dust generation.
 8. Locate selective demolition equipment and remove debris and materials so as not to impose excessive loads on supporting walls, floors, or framing.
 9. Dispose of demolished items and materials promptly.
- B. Remove, Salvage and Reinstalled Items:
1. Clean items to functional condition adequate for intended reuse.
 2. Protect items from damage during transport and storage.
 3. Reinstall items in locations indicated. Comply with installation requirements for new materials and equipment. Provide connections, supports, and miscellaneous materials necessary to make item functional for use indicated.
 4. Items to be salvaged:
 - a. Face brick removed at Gym Lobby exterior wall.
 - b. Marble partitions in all Locker Rooms and Toilet Rooms being remodeled.
 - c. Marble wall panels in Gym Lobby.
 - d. Limestone panels above the Gym Lobby doors.
- C. Existing Items to Remain: Protect construction indicated to remain against damage and soiling during selective demolition. When permitted by Architect, items may be removed to a suitable, protected storage location during selective demolition and cleaned and reinstalled in their original locations after selective demolition operations are complete.

3.5 SELECTIVE DEMOLITION PROCEDURES FOR SPECIFIC MATERIALS

- A. Concrete: Demolish in small sections. Cut concrete to a depth of at least 3/4 inch at junctures with construction to remain, using power-driven saw. Dislodge concrete from reinforcement at perimeter of areas being demolished, cut reinforcement, and then remove remainder of concrete indicated for selective demolition. Neatly trim openings to dimensions indicated.
- B. Concrete: Demolish in sections. Cut concrete full depth at junctures with construction to remain and at regular intervals using power-driven saw, then remove concrete between saw cuts.
- C. Masonry: Demolish in small sections. Cut masonry at junctures with construction to remain, using power-driven saw, then remove masonry between saw cuts.
- D. Concrete Slabs-on-Grade: Saw-cut perimeter of area to be demolished, then break up and remove.
- E. Resilient Floor Coverings: Remove floor coverings and adhesive according to recommendations in RFCI's "Recommended Work Practices for the Removal of Resilient Floor Coverings." Do not use methods requiring solvent-based adhesive strippers.
- F. Roofing: Remove no more existing roofing than what can be covered in one day by new roofing and so that building interior remains watertight and weather tight. See Division 7 for new roofing requirements.

1. Remove existing roof membrane, flashings, copings, and roof accessories.
2. Remove existing roofing system down to substrate.

G. Air-Conditioning Equipment: Remove equipment without releasing refrigerants.

3.6 DISPOSAL OF DEMOLISHED MATERIALS

- A. General: Except for items or materials indicated to be reused, salvaged, reinstalled, or otherwise indicated to remain Owner's property, remove demolished materials from Project site and legally dispose of them in an EPA-approved landfill.
1. Do not allow demolished materials to accumulate on-site.
 2. Remove and transport debris in a manner that will prevent spillage on adjacent surfaces and areas.
 3. Remove debris from elevated portions of building by chute, hoist, or other device that will convey debris to grade level in a controlled descent.
- B. Burning: Do not burn demolished materials.
- C. Disposal: Transport demolished materials off Owner's property and legally dispose of them.

3.7 CLEANING

- A. Clean adjacent structures and improvements of dust, dirt, and debris caused by selective demolition operations. Return adjacent areas to condition existing before selective demolition operations began.

END OF SECTION 024119

TABLE OF CONTENTS

PART 1 - GENERAL

- 1.1 Related Documents
- 1.2 Definitions
- 1.3 Scope of Work
- 1.4 General Conditions
- 1.5 Owner Responsibilities
- 1.6 Contractor Responsibilities
- 1.7 Personal Protective Equipment
- 1.8 Submittals

PART 2 - PRODUCTS

- 2.1 Materials & Equipment

PART 3 - EXECUTION

- 3.1 Utilities
- 3.2 Decontamination Facilities
- 3.3 Negative Pressure Ventilation
- 3.4 Critical Barriers
- 3.5 Pre-Cleaning Activities
- 3.6 Asbestos Handling & Cleaning Activities
- 3.7 Waste Disposal
- 3.8 Inspections
- 3.9 Asbestos Project Monitoring / Air Sampling

APPENDICES

- A: Definitions

SECTION 028213 – ASBESTOS ABATEMENT

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

- A. Drawings and general provisions of the Contract, including General and Supplementary Conditions and other Division 01 Specification Sections, apply to this Section.

1.2 DEFINITIONS

- A. Many key words appear throughout the design documents and New York State Department of Labor (NYSDOL) Industrial Code Rule 56 (ICR 56). Definitions of these key words have been provided in Appendix A (Source: NYSDOL ICR 56).

1.3 SUMMARY OF WORK

- A. In general, the asbestos abatement scope-of-work has been summarized in the following tables:

Table 1: Circleville Elementary School, Asbestos Abatement Scope-of-Work

DRAWING REFERENCE	ACM / PACM DESCRIPTION	ACM / PACM LOCATION	APPROXIMATE QUANTITY
CES HM101	Brown Ceramic Wall Tile Mastic (ACM)	Walls - First Floor Lobby	430 SF
	12 x 12 Floor Tile and Mastic (ACM)	Stage Stair Landings - First Floor Stage	40 SF

Table 2: Circleville Middle School, Asbestos Abatement Scope-of-Work

DRAWING REFERENCE	ACM / PACM DESCRIPTION	ACM / PACM LOCATION	APPROXIMATE QUANTITY
CVMS HM101	Black Window Glazing Compound (ACM)	Windows – Cafeteria 42, South Link 100, Home Economics 52A, Home Economics 52B, Art 57, Art 58, North Link 155	34 SF

Table 3: Pakanasink Elementary School

DRAWING REFERENCE	ACM / PACM DESCRIPTION	ACM / PACM LOCATION	APPROXIMATE QUANTITY
PAK HM101	Gypsum Wallboard (non-ACM) and Joint Compound (ACM)	Transom Panels Above Doors (including above suspended ceiling) - Locker Rooms 102A (Boy's) and 109A (Girl's), General Office 136A, Corridor 5A	96 SF
	Tan Door Frame Caulk (ACM)	Door Frames - Locker Rooms 102A (Boy's) and 109A (Girl's), General Office 136A, Corridor 5A, Girl's Bathroom 136, Boy's Bathroom 137, Men's Room 141, Women's Room 143	20 SF
	Gypsum Wallboard (non-ACM) and Joint Compound (ACM)	Around Perimeter Of Skylight Wells - Locker Rooms 102A (Boy's) and 109A (Girl's)	192 SF
	Slate Fascia Panels and Associated Mastic and/or Thinset Mortar (Presumed ACM)	On Façade at Main Entry	208 SF

Table 4: Pine Bush High School

DRAWING REFERENCE	ACM / PACM DESCRIPTION	ACM / PACM LOCATION	APPROXIMATE QUANTITY
PBHS HM101 through PBHS HM106	Black Window Sill Caulk (ACM)	Exterior of Windows – On and Beneath Metal Sills	140 SF
	White Residual Caulk (ACM)	Brick Exterior – Adjacent to Windows	50 SF

Table Notes:

SF = Square Feet

LF = Linear Feet

1.4 GENERAL CONDITIONS

- A. The Contractor acknowledges that the quantities of asbestos-containing materials (ACMs) and presumed asbestos-containing materials (PACMs) shall be field-verified, prior to submission of bid. Variations of $\pm 20\%$ in the quantities indicated shall be acknowledged by the Contractor and shall be reflected / included in their base bid price.
- B. The Contractor's pricing shall include costs for all labor, materials, equipment, asbestos project notifications and fees, building permits and fees, insurance, bonding, waste transportation and disposal, overhead and profit, and all other costs necessary to complete the work, as specified.
- C. All work shall be performed in accordance with the project design specifications and all applicable federal, state, and local regulations. When conflicts occur between the project design documents and federal, state, and/or local regulations, the most stringent requirement

shall apply. The Contractor shall comply with the following, except where more stringent requirements are shown or specified:

1. Federal Regulations:

- a. OSHA 29 CFR Part 1910.1001 - Asbestos
- b. OSHA 29 CFR Part 1910.1200 - Hazard Communication
- c. OSHA 29 CFR Part 1910.134 - Respiratory Protection
- d. OSHA 29 CFR Part 1910.145 - Specification for Accident Prevention Signs and Tags
- e. OSHA 29 CFR Part 1926 - Construction Industry
- f. OSHA 29 CFR Part 1926.1101 - Asbestos, Tremolite, Anthophyllite, and Actinolite
- g. OSHA 29 CFR Part 1926.500 - Guardrails, Handrails, and Covers
- h. USEPA 40 CFR Part 61, Subpart A - General Provisions
- i. USEPA 40 CFR Part 61, Subpart M - Asbestos NESHAPs
- j. USEPA 40 CFR Part 763, Subpart E, Asbestos Hazard Emergency Response Act (AHERA)

2. New York State Regulations:

- a. NYSDOL 12 NYCRR Part 56 - "Asbestos," as amended 3/21/2007
- b. NYSDEC 6 NYCRR Parts 360 and 364 - Waste Disposal & Transportation
- c. NYSDOH 10 NYCRR Part 73 - Asbestos Safety Program Requirements

3. Standards and Guidance Documents:

- a. American National Standard Institute (ANSI) Z88.2-80, Practices for Respiratory Protection
- b. ANSI Z9.2-79, Fundamentals Governing the Design and Operation of Local Exhaust Systems
- c. USEPA 560/585-024, Guidance for Controlling Asbestos Containing Materials in Buildings (Purple Book)
- d. USEPA 530-SW-85-007, Asbestos Waste Management Guidance

4. All local codes and regulations.

5. All applicable building and fire codes.

- D. The Contractor accepts that multiple means of clearance criteria will be utilized for final clearance criteria based on the applicable regulatory requirements for the abatement work performed. Final visual inspections and clearance air sampling will be utilized to determine satisfactory completion of the asbestos abatement work of this project. Phase Contrast Microscopy (PCM) or Transmission Electron Microscopy (TEM) analysis of air samples will be utilized to determine satisfactory clearance, based upon the size of the regulated work area.

1.5 OWNER RESPONSIBILITIES

A. The Owner shall be responsible for:

- 1. Moving items out of areas affected by abatement work activities.

2. Providing a source for electricity and water at the project site.
3. Hiring an independent, third-party asbestos project monitoring / air sampling firm.

1.6 CONTRACTOR RESPONSIBILITIES

A. The Contractor shall be responsible for:

1. Performing the asbestos abatement work in accordance with all applicable federal, state, and local regulations. Where conflicts occur between federal, state, and local regulations, the most stringent shall apply. As such, the Contractor shall include all necessary costs in their price to complete the work in a legal and safe manner.
2. Providing supervisors and workers who are competent, trained, and medically fit to conduct the asbestos abatement work as well as all materials and equipment necessary to satisfactorily complete the work.
3. Collection and analysis of personal exposure assessment air samples of his employees as required by applicable OSHA standards. The third-party asbestos project monitoring / air sampling firm shall not be responsible for the collection, shipping / delivery, or analysis of the Contractor's personal exposure assessment air samples on this project.
4. Completing the project as specified in the design documents. The Contractor accepts that the asbestos abatement work is not complete until satisfactory final visual inspections are made and after clearance air testing results are deemed to be acceptable, as applicable.
5. Packaging, transporting, and disposing of all asbestos waste generated by the work in accordance with all applicable federal, state, and local regulations.
6. Ensuring regulated work area security during the course of the project, so that unauthorized personnel do not enter regulated work areas.
7. Providing emergency plans and emergency telephone numbers to on-site abatement personnel. The emergency plans and telephone numbers shall be kept on site at all times during the project.
8. Obeying the Owner's policies and procedures pertaining to work on-site.
9. Ensuring that no employee of his company speaks to the media without written permission from the Owner.
10. Complying with the contractual requirements set forth by the Owner.
11. Posting a notice at all building entrances notifying all persons of the Contractor's intent to conduct asbestos abatement, in accordance with State and Federal requirements.
12. Notifying the NYSDOL and USEPA about the asbestos abatement work and paying the associated fees.
13. Contractor shall follow the direction of the Owner and Owner's Representatives pertaining to schedule, health / safety issues, and other site activities. The Contractor shall be responsible for the legal means and methods of performing the work in accordance with the contract.

1.7 PERSONAL PROTECTIVE EQUIPMENT

- A. The Contractor shall be responsible for providing his personnel with adequate personal protective equipment to perform the work on this project as per the applicable federal and state regulations.

- B. The Contractor will be responsible for collecting OSHA personal asbestos samples for their workers on this project. Representative samples shall be taken daily and sample results shall be posted at the personal decontamination unit within 48-hours of collection. The Contractor is responsible for providing their employees with adequate respiratory protection based upon the sample results received.
- C. Street clothing is not permitted inside regulated work areas during abatement activities.
- D. The Contractor is responsible for providing the Project Designer, the Project Monitor, Owner/Owner's Representative, and state and federal inspectors with personal protective equipment (PPE). This may include some or all of the following: protective clothing, respirators, high efficiency particulate air (HEPA) cartridges, hard hats, gloves, eye protection, and rubber disposable boots.
- E. Protective suits and respiratory protection shall be required (at a bare minimum) during all asbestos removal activities, regardless of any negative exposure assessment data.

1.8 SUBMITTALS

- A. Qualification Submittals. If requested by the Owner / Owner's Representatives, the following information shall be transmitted to the Owner / Owner's Representatives prior to contract award:
 - 1. Contractor's Asbestos Handling License issued by the NYSDOL.
 - 2. A notarized statement, signed by an officer of the company, containing the following information:
 - a. Any federal, state, or local regulatory agency citations, violations, notices, orders to comply, or penalties recorded against the asbestos abatement contractor in the last three (3) years.
 - b. Any claims or legal proceedings in which the Contractor has been involved in the past three (3) years.
 - c. Any Occupational Safety and Health Administration (OSHA) fines and/or citations, and a list of OSHA recordable accidents per year for the last three (3) years.
 - d. Any asbestos related projects where a contract has been terminated, including project name, client, dates, and reasons for termination.
 - 3. A minimum of five (5) project references for projects similar in nature to this project that have been self-performed and completed in the past three (3) years including the project name and location, scope of work, client, and contact person's name, telephone number, and e-mail address.
- B. Pre-Abatement Submittals. The following information shall be transmitted to the Project Designer at least ten (10) days prior to the commencement of work activities:
 - 1. Contractor's Asbestos Handling License issued by the NYSDOL.
 - 2. NYSDOL Asbestos Project Notification.
 - 3. USEPA Notification of Demolition & Renovation.

4. Asbestos Project Notice to be posted at the building prior to the start of the work, as required by ICR 56-3.6.
 5. NYSDEC waste transporter permit.
 6. NYSDEC landfill permit, where asbestos project wastes from the site will be disposed.
 7. Project schedule showing phases of work for each regulated work area including, but not limited to, mobilization, work area preparation, abatement/removal, cleanings, work area dismantlement, and demobilization.
 8. NYSDOL-approved asbestos project variance to be used on the project, if applicable.
 9. Wastewater discharge permit required by state, county, or local municipality. If a permit is not required or will not be obtained, submit a written statement describing how wastewater from this project will be collected and disposed.
 10. Safety Data Sheets (SDS) for all chemicals, solvents, products, and materials utilized on the project.
 11. Manufacturer's specifications/certifications for all materials and equipment utilized on the project.
 12. Written notifications to local fire, rescue, and emergency agencies informing them of the nature and schedule of the work at the site.
 13. List of contact persons and emergency phone numbers for Contractor personnel to be posted at the project site.
 14. Asbestos abatement personnel/worker documentation, including:
 - a. NYSDOL Asbestos Handling Certificates.
 - b. NYSDOH 2832 Asbestos Training Certificates.
 - c. Medical examinations / evaluations.
 - d. Respirator fit test certifications.
 - e. OSHA 10-Hour Construction Safety Training certificates.
 15. The Contractor shall not proceed with any work until the pre-abatement submittals have been approved by the Owner/Owner's Representative.
- C. Abatement Submittals. The following information shall be transmitted during the course of asbestos abatement work activities:
1. OSHA personal exposure assessment air sampling data. The Owner, Owner's Representatives, and Project Designer are not responsible for the interpretation of these results. The intent is only to show that the Contractor is collecting these samples as required by OSHA.
 2. A daily list of the personnel on-site accompanied by their NYSDOL Asbestos Handling Certificate number.
- D. Post-Abatement/Closeout Submittals. The following information shall be transmitted within 30 days after completion of asbestos abatement work activities:
1. Copies of all waste disposal manifests, disposal logs, and weight tickets. All original waste disposal records shall be submitted directly to the Owner/Owner's Representative by the Contractor.

2. Copy of supervisor's daily project log as required by ICR 56-7.3 documenting all pertinent events that occur throughout the project and including the following:
 - a. Elevated air sampling results shall be noted along with the time of the work cessation, results of barrier and negative air system inspection, and a summary of any necessary repairs and the required cleaning(s).
 - b. Manometer readings to be documented twice per work shift, if applicable.
 - c. Daily (including days without work shifts) inspection results of negative-air ventilation system and any necessary repairs, if applicable.
 - d. Daily (including days without work shifts) inspections of HVAC system positive pressurization and any necessary repairs, if applicable.
 - e. Daily (including days without work shifts) inspection results of barriers and any necessary repairs, if applicable. Inspections shall be twice per work shift on days with scheduled work.
 - f. Daily testing of barriers and enclosures as per ICR 56-8.2(f) and any necessary repairs, if applicable.
 - g. Daily cleaning of enclosures to be documented at the end of each work shift, if applicable.
 - h. Results of each visual inspection and time of each intermediate completion, if applicable.
 - i. Results of visual inspection by Supervisor and Project Monitor for each asbestos abatement work area prior to clearance air sampling.
 3. Entry / exit logs for each asbestos abatement work area.
 4. Final NYSDOL and USEPA project notifications, and any asbestos variances, if applicable.
 5. Any other submittal requested by Owner, Owner's Representatives, or Project Designer.
- E. The Owner / Owner's Representative shall ensure that the Contractor has met all the contractual obligations to close out this project. Failure to provide all of the requested project closeout documentation may result in the delay of payment to the Contractor. The Contractor shall not be entitled to any additional compensation caused by their failure to submit the requested closeout information in a timely manner.

PART 2 – PRODUCTS

2.1 MATERIALS & EQUIPMENT

- A. The Contractor shall be responsible for:
1. Providing all materials and equipment necessary to complete the work.
 2. Providing safe and reliable materials and equipment.
 3. Providing personal protective equipment for all abatement personnel.
 4. Providing HEPA-filtered air filtration devices and HEPA vacuums.
 5. Providing continuous negative air pressure within regulated work areas for the duration of the project, as applicable.

6. Utilizing barrier tape and danger signs to keep unauthorized personnel away from the work area. Danger signs shall contain the following language:

DANGER
CONTAINS ASBESTOS FIBERS
AVOID CREATING DUST
CANCER AND LUNG DISEASE HAZARD

7. Utilizing airless sprayers to limit airborne dust in regulated work areas.
 8. Utilizing flame-retardant 6-mil polyethylene sheeting for the construction of abatement work areas, decontamination units, and the lining of waste containers.
 9. Utilizing 6-mil polyethylene bags for the containerization of all asbestos wastes.
 10. Utilizing duct tape or approved equivalent to seal polyethylene sheeting and waste disposal bags.
 11. Utilizing electrical equipment and power cords in compliance with all applicable OSHA standards.
 12. Utilizing Ground Fault Interrupters (GFIs) or Ground Fault Circuit Interrupters (GFCIs) on all power sources.
- B. Any miscellaneous products not covered in this specification must have written approval from the Project Architect and Project Designer prior to use on-site.
- C. Any miscellaneous products used at the site must be accompanied by manufacturer's product information and safety data sheet (SDS). This information must be submitted to the Project Architect and Project Designer prior to the products arriving on site. The Contractor may not proceed until the products have been approved for use in writing by the Project Architect and Project Designer.

PART 3 - EXECUTION

3.1 UTILITIES

- A. All water and electrical service connections shall be installed by the Contractor in accordance with all applicable federal, state, and local codes, rules, and regulations.
- B. The Contractor shall be responsible for the maintenance of all electrical cords and water hoses, and keeping them in a secure location to prevent unnecessary tripping and/or slipping hazards.
- C. The Contractor shall temporarily shut down / de-energize, isolate / seal, modify, and/or alter existing mechanical, HVAC, electrical, plumbing, and any other related systems, services, and utilities at the site, as required by applicable regulations, prior to the start of the asbestos abatement work. All such work shall be carefully coordinated with the Owner and Owner's Representative.
- D. Existing mechanical, HVAC, electrical, plumbing, and all other building systems, services, and utilities within regulated work areas that are to remain in operation shall be adequately protected by the Contractor during all work activities.

3.2 DECONTAMINATION FACILITIES

- A. All personal and waste decontamination facilities shall be constructed, installed, or otherwise provided by the Contractor to meet the requirements of ICR 56 and shall be deemed adequate by the Project Monitor prior to the commencement of any asbestos abatement preparation work.
- B. The personal decontamination unit shall be equipped with one (1) shower per six (6) full-shift abatement workers.
- C. Decontamination units shall be cleaned at the beginning, during, and end of each work shift. Accumulations of dirt / debris in decontamination units shall not be permitted.

3.3 NEGATIVE PRESSURE VENTILATION

- A. Negative air pressure ventilation shall be installed for all OSHA Class I, Class III, and interior Class II regulated asbestos abatement work areas.
- B. The negative air pressure equipment shall operate continuously, 24-hours a day, from startup of negative air pressure ventilation equipment through cleanup operations and clearance air sampling until satisfactory clearance air sampling results are obtained.
- C. If more than one (1) primary HEPA-filtered ventilation unit is installed, the units shall be turned on one at a time and the integrity of temporary hard-wall isolation barriers checked for secure attachment. A minimum of one (1) additional negative air pressure ventilation unit, having a capacity of at least equal to that of the primary unit, shall be installed as a backup unit to be used upon primary unit failure and during primary unit filter changes.
- D. Negative air pressure ventilation equipment shall be installed and operated continuously to provide at least four (4) air changes per hour in the regulated work area including during clearance air sampling.
- E. The exhaust shall be vented to the outside of the building or structure, to a controllable area away from public access. Each negative pressure ventilation unit exhaust duct shall not terminate less than 15 feet from a receptor or adversely affect the air intake of any building or structure. If the exhaust duct termination location cannot be met due to allowable space restrictions or the regulated abatement work area being located above the ground floor, the exhaust shall terminate at the exterior of the building or structure, and all receptors within 15 feet of the exterior exhaust duct termination location shall be plasticized with two (2) layers of 6-mil polyethylene. Exhaust tubes may be grouped together in banks of no more than five (5) tubes, with each tube exhausting separately and the bank of tubes terminating together at the same controlled area.
- F. Construction fence at a height of four (4) feet with appropriate signage shall be installed a minimum of 10 feet from the end of the exhaust duct tube or bank of duct tubes to surround and control the area from public access. For ground level exhaust duct terminations at the immediate exterior of the building/structure, the fence shall be installed at the tube discharge location.
- G. Manometers shall be used to document the pressure differential for all OSHA Class I large and small size regulated asbestos abatement work areas. A minimum of -0.02 column inches of water pressure differential, relative to pressure outside the regulated work area, shall be

maintained within the regulated work area, as evidenced by manometric measurements. Once installed, on a daily basis and at least twice per work shift, the Contractor shall document the manometer readings in the daily project log. The manometer shall be installed and made operational once negative air ventilation has been established in the regulated work area. At a minimum, manometric manometers shall be calibrated semi-annually, and a copy of the current calibration certification shall be posted at the work site, as required by ICR 56.

H. The Contractor shall be responsible for the following:

1. Monitoring of negative air pressure equipment and records of the daily manometer readings in the supervisor's project log.
2. Stoppage of activities when negative air pressure is lost or is less than required. The Contractor shall not resume activities until constant negative air pressure has been reestablished and maintained for at least 30 minutes.

3.4 PRE-CLEANING ACTIVITIES

- A. Pre-cleaning of regulated work areas shall be conducted in accordance with ICR 56.
- B. The Contractor shall request a visual inspection by the Project Monitor to ensure that regulated work areas have been satisfactorily pre-cleaned prior to commencement of work area preparation activities.

3.5 CRITICAL & ISOLATION BARRIERS

- A. After the pre-cleaning activities are completed, the Contractor shall install critical barriers and isolation barriers in accordance with ICR 56.
- B. Critical barriers shall be constructed to seal off all openings and penetrations to regulated work areas including, but not limited to, operable windows and skylights, doorways and corridors that shall not be used for passage, ducts, grilles, diffusers, HVAC system seams, and any other penetrations to surfaces within the regulated work areas. Critical barriers shall be constructed using two (2) independent layers of 6-mil fire-retardant plastic sheeting, with each layer sealed separately with duct tape. Caulk and fire-retardant expandable foam may be used to seal small openings or penetrations. Doorways and corridors, which shall not be used for passage during the asbestos abatement work, shall also be sealed.
- C. Temporary hard-wall barriers to complete containments/enclosures and establish regulated work areas shall be constructed using the following framing, sheathing, sealing, and plasticizing criteria:
 1. Isolation barrier partitions shall be constructed of wood or metal framing in all openings greater than 32 square feet except, where any one dimension is one (1) foot or less, framing is not required. Existing walls or framing may be used to support isolation barrier partition framing and sheathing.
 2. Plywood or oriented strand board (OSB) sheathing of at least 3/8-inch thickness shall be fastened to the regulated work area side of the barrier partition.
 3. Edges of the isolation barrier partition at the floor, ceiling, walls, and fixtures and seams within the partition sheathing shall be sealed using caulk, fire-retardant expandable foam, or tape to form an airtight seal.

4. The regulated work area side of isolation barrier partitions shall be covered with two (2) layers of 6-mil fire-retardant plastic sheeting with staggered joints and sealed airtight.
- D. Smoke testing shall be conducted by the Contractor prior to the start of abatement activities and at least once a day thereafter until satisfactory clearance air sampling results have been obtained to ensure the effectiveness of all critical barriers, isolation barriers, personal and waste decontamination system enclosures, and regulated work area enclosures. Negative air pressure ventilation units shall be in operation during this testing. Testing of barriers and enclosures is not required on days when there are no Phase IIB or cleaning activities scheduled. Test results, observations and any modifications shall be documented in the daily project log by the asbestos abatement supervisor.
- E. The Contractor shall inspect all barriers at least twice daily - before the start of and following the completion of each day's abatement activities. Inspections are also required on days when there is no Phase II work or support activities scheduled. Inspections and observations shall be documented in the daily project log by the asbestos abatement supervisor.

3.6 ASBESTOS HANDLING & CLEANING ACTIVITIES

- A. The Contractor shall conduct all asbestos abatement activities in accordance with ICR 56 or an approved asbestos project variance.
- B. Negative air machines shall be utilized at all regulated work areas, until satisfactory air sample results have been achieved.
- C. All asbestos materials shall be removed using wet methods. Dry removal, sweeping, wire brushing, use of pressurized water/pressurized air, or other inappropriate techniques will not be permitted.
- D. Airless sprayers shall be utilized to control airborne asbestos fiber concentrations.
- E. The Contractor is responsible for taking appropriate measures to reduce nuisance odors and noise from migrating to other areas of the building.
- F. Waste shall be immediately bagged and be transported to the waste decontamination enclosure. Waste bags shall then be cleaned in the waste decontamination enclosure, double-bagged, labeled, and transported to the waste dumpster, trailer, etc.
- G. Waste bag transfer shall take place inside a cart that has been lined with two (2) layers of 6-mil polyethylene. This cart shall be covered by polyethylene during any waste transfer activities and be labeled with appropriate asbestos signage.
- H. Workers shall wear PPE during work area preparation, abatement activities, cleaning, and during any other work area activities until final air clearance criteria has been achieved.
- I. The Contractor shall be responsible for providing the Project Monitor / Air Sampling Technician with sufficient power to conduct air sampling at the project site. The Contractor shall also provide the Project Monitor / Air Sampling Technician with access to the decontamination unit and hot water on days when final/clearance air sampling is required (even when abatement work is not taking place).

3.7 WASTE DISPOSAL

- A. The Contractor shall ensure that all asbestos waste/debris is sufficiently wet prior to being bagged/containerized for disposal.
- B. Bags, drums, or other acceptable packages/containers used for asbestos waste shall be labeled with appropriate asbestos waste generator tags/labels.
- C. Two (2) 6-mil polyethylene bags or two (2) layers of 6-mil plastic sheeting shall be utilized for the disposal of all asbestos waste.
- D. A daily count of asbestos waste bags, drums, containers, etc. shall be recorded by the asbestos abatement supervisor. This count shall be provided to the Project Monitor each day.
- E. All asbestos waste generated by the work shall be sent to a properly permitted landfill or disposal facility. Waste manifests shall accompany all regulated asbestos-containing material (RACM) waste that is removed from the site. Original waste manifests shall be submitted directly to the Owner/Owner's Representative.
- F. Vehicles used for the transport of all asbestos waste shall bear all appropriate permit tags, markings, and placards.

3.8 INSPECTIONS

- A. The Contractor shall not interfere, impede, or delay any inspections by the Owner/Owner's Representative, Project Designer, Project Monitor, or federal, state, or local inspectors.
- B. The Contractor shall request inspections from the Project Monitor at the following intervals, as applicable to the project:
 - 1. Upon completion of the decontamination system enclosure(s).
 - 2. Upon completion of the pre-cleaning effort.
 - 3. Upon completion of the preparation of the work area.
 - 4. Upon completion of the abatement process.
 - 5. Upon completion of teardown/dismantling activities.
- C. The asbestos abatement supervisor shall be responsible for adequately documenting inspections in the daily project log.

3.9 ASBESTOS PROJECT MONITORING/AIR SAMPLING

- A. The Contractor shall not include any costs in their price for project monitoring or air sampling. The Contractor will not be responsible for the selection or payment of the Project Monitoring/Air Sampling firm.
- B. The Project Monitor/Air Sampling Technician will be responsible for the following:
 - 1. Conducting air sampling during the asbestos abatement phase of the project.
 - 2. Conducting a visual inspection for completeness of abatement and completeness of cleanup as per the provisions of the current ASTM Standard E1368 - "Standard Practice

for Visual Inspection of Asbestos Abatement Projects.” An entry shall be made into the daily project log by both the asbestos abatement supervisor and the individual performing the inspection, detailing the findings of the visual inspection. The full name and NYSDOL asbestos handling certificate number of the certified individual performing the inspection shall also be documented in the supervisor’s daily project log.

3. Performing aggressive air sampling techniques for final clearance air sampling.
4. Collecting final clearance air samples.

- C. The Contractor understands that a Project Monitor has been retained by the Owner to oversee the asbestos abatement work and that the Owner/Owner’s Representative has authorized the Project Monitor to stop the Contractor’s work if the Contractor is not following the contract documents or the applicable codes, rules, and regulations. Work shall only be permitted to commence if allowed by the Owner/Owner’s Representative after corrective actions have been made. The Contractor acknowledges that it is their responsibility to follow all applicable rules and regulations and failure to do so may result in lost time and/or dismissal from site at no cost to the Owner, Project Designer, or Project Monitor. The Contractor shall not be compensated for any lost time, labor, materials, etc., due to inappropriate action.

END OF SECTION 028213

TABLE OF CONTENTS

PART 1 - GENERAL

- 1.1 Related Documents
- 1.2 Definitions
- 1.3 Summary of Work
- 1.4 Applicable Regulations
- 1.5 Lead Hazards
- 1.6 General Requirements
- 1.7 Submittals
- 1.8 Personal Air Sampling & Analysis

PART 2 - PRODUCTS

- 2.1 Materials
- 2.2 Equipment

PART 3 - EXECUTION

- 3.1 Lead Compliance Plan
- 3.2 Signage
- 3.3 Work Methods
- 3.4 Cleaning Activities
- 3.5 Waste Disposal
- 3.6 Project Closeout

SECTION 02 83 14 – LEAD SAFE WORK PRACTICES

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

- A. Drawings and general provisions of the Contract, including General and Supplementary Conditions and other Division 01 Specification Sections, apply to this Section.

1.2 DEFINITIONS

- A. Lead-based paint (LBP), as defined by the U.S. Environmental Protection Agency (USEPA) and the U.S. Department of Housing and Urban Development (HUD), means painted or glazed materials (i.e. ceramic tile) containing 0.5% lead or more by weight.
- B. Lead, as defined by OSHA 29 CFR Part 1926.62, means metallic lead, all inorganic lead compounds, and organic lead soaps. All other organic lead compounds are excluded from this definition.
- C. Action Level, as defined by OSHA 29 CFR Part 1926.62, means employee exposure, without regard to the use of respirators, to an airborne concentration of lead of 30 micrograms per cubic meter (30 $\mu\text{g}/\text{m}^3$) of air calculated as an 8-hour time-weighted average (TWA).
- D. Permissible Exposure Limit (PEL), as defined by OSHA 29 CFR Part 1926.62, means employee exposure, without regard to personal protective equipment, to an airborne concentration of lead of 50 $\mu\text{g}/\text{m}^3$ (calculated as a TWA).
- E. Competent person, as defined by OSHA 29 CFR Part 1926.62, means one who is capable of identifying lead hazards and implementing corrective measures to eliminate hazards.
- F. Lead-containing material (LCM) includes LBP, lead-containing components, lead-containing surfaces, and glazed / ceramic tile applications. A building material is defined as an LCM if any detectable amount of lead is present in that building material.

1.3 SUMMARY OF WORK

- A. Unless otherwise indicated, all painted surfaces and building materials are presumed to contain lead and shall be treated as LCM. As such, the Contractor shall perform lead safe work practices during all construction-related work activities.
- B. Upon request, the Contractor may review available inspection / survey reports for additional details pertaining to LCMs identified at the site.
- C. Activities that will disturb LCM shall comply with the conditions specified herein. The Occupational Safety & Health Administration (OSHA) regulates occupational exposure to lead under 29 CFR Part 1926.62, Lead in Construction Standard. Any Contractor disturbing LCM shall comply with all the requirements of 29 CFR Part 1926.62 and this specification. The intent is for the Contractor to protect their workers and other building occupants from unnecessary exposures to lead.

- D. The Contractor shall provide all labor, materials, tools, and equipment necessary to protect both their workers and other building occupants from potential lead exposure.
- E. Any waste products shall be considered industrial or hazardous waste, based on the results of a Toxicity Characteristic Leaching Procedure (TCLP) test. The costs for this testing shall be the responsibility of the Contractor and included in their bid for the project.
- F. Exact quantities and locations of LCMs that will be disturbed shall be determined by the Contractor at the time of bidding. The Contractor must be satisfied as to the quantity of waste requiring disposal and include all such costs in their bid price.
- G. All work shall be performed in accordance with this specification and applicable federal, state, and/or local regulations. Dry sweeping of lead-containing dust is prohibited. Lead-containing debris shall be removed and collected using high efficiency particulate air (HEPA) vacuums designed to collect waste including paint chips, debris, and dust.
- H. It is the Contractor's responsibility to ensure that waste materials are contained, transported, and disposed of in accordance with all applicable federal, state, and local regulations.

1.4 APPLICABLE REGULATIONS

- A. The Contractor shall comply with all federal, state, and local laws, ordinances, rules, and regulations regarding the handling, storage, and disposal of LCM. The Contractor is further responsible to conduct work in compliance with all applicable codes, rules, laws, and regulations including, but not limited to:
 - 1. Worker Protection - Occupational Safety and Health Administration (OSHA)
 - a. 29 CFR Part 1910.134 - Respiratory Protection Standard
 - b. 29 CFR Part 1926.20 - General Safety and Health Provisions
 - c. 29 CFR Part 1926.59 - Hazard Communication
 - d. 29 CFR Part 1926.62 - Lead Exposure in Construction
 - e. 29 CFR Part 1910.94 and Part 1926.57 - Ventilation
 - 2. Ambient Air Quality - Environmental Protection Agency (EPA)
 - a. 40 CFR Part 50.6 - National Primary and Secondary Ambient Air Quality Standards for Particulate Matter
 - 3. Water Quality - Environmental Protection Agency (EPA)
 - a. 40 CFR Part 122 - Administered Permit Programs; The National Pollutant Discharge Elimination System
 - 4. Waste Disposal - Environmental Protection Agency (EPA)
 - a. 40 CFR Part 261 - Identification and Listing of Hazardous Waste
 - b. 40 CFR Part 262 - Standards Applicable to Generators of Hazardous Waste
 - c. 40 CFR Part 263 - Standards Applicable to Transporters of Hazardous Waste

5. New York State Department of Environmental Conservation (NYSDEC)

a. Title 6 Parts 360-7, 364, and 370 through 374

B. The Contractor shall comply with the following regulations and guidance documents:

1. U.S. Department of Labor
2. Occupational Safety and Health Administration Pub. 3126 - Working with Lead in the Construction Industry
3. USEPA Lead Renovation, Repair and Painting (RRP) Program

1.5 LEAD HAZARDS

- A. Work practices / methods that may release lead dust or fumes into the air and onto surrounding surfaces are prohibited. It is the Contractor's responsibility to reduce potential exposure to lead.
- B. Lead is a toxic substance, which travels into the body by inhalation or ingestion due to lead dust and/or fumes that are present. Upon entering the body, lead enters the bloodstream, traveling throughout the body. The body cannot eliminate all of the lead; therefore, it is stored in tissue and organs. Stored quantities of lead may cause irreversible damage to cells, organs, and body systems.
- C. Exposure to lead may affect individuals differently. Exposure may occur without any indication of exposure or symptoms developing. Symptoms of lead poisoning to be aware of include, but are not limited to, loss of appetite, trouble sleeping, irritability, fatigue, headache, joint and muscle ache, metallic taste, decreased sex drive, lack of concentration, and moodiness.
- D. Prolonged exposure may result in damage to the body's systems including nervous, reproductive and circulatory systems. Symptoms of such exposures may include, but are not limited to, stomach pains, high blood pressure, nausea, tremors, seizures, anemia, constipation, and convulsions.
- E. The Contractor's Supervisor is responsible to monitor any workers for such symptoms and is further responsible for ensuring affected workers are removed from the area. Affected workers shall not return until such time that the requirements outlined in the OSHA Lead in Construction Standard (29 CFR Part 1926.62) have been met.

1.6 GENERAL REQUIREMENTS

- A. The Contractor is responsible for complying with the following general requirements applicable to the project (at a minimum):
 1. Respiratory Protection and personal protection
 2. Medical examinations
 3. Utilization of engineering controls, as necessary, to reduce potential exposure
 4. Proper clean up and disposal of all lead-related waste materials, as required.

- B. The Contractor is solely responsible for properly protecting their workers. Additional safety measures beyond OSHA requirements are encouraged, but are at the implementation and discretion of the Contractor.

1.7 SUBMITTALS

- A. The following information shall be transmitted for review and approval, prior to starting the work:
 - 1. Work Plan - The Contractor shall submit a work plan in compliance with the requirements of the OSHA Lead in Construction Standard (29 CFR Part 1926.62). The plan shall include but is not limited to: handling, cleaning, containerizing, transport, and disposal.
 - 2. Equipment - Information for all equipment utilized shall be submitted for review prior to commencement of project activities. This includes, but is not limited to, equipment specifications and safety data sheets (SDS).
 - 3. Training - The Contractor shall provide proof of Lead Awareness training in accordance with OSHA 29 CFR Part 1926.62 for all employees performing renovation/repair activities resulting in disturbance of LCMs.
 - 4. Disposal - The Contractor shall submit documentation including all required permits, anticipated disposal facilities, and anticipated transporter information should construction waste be determined to be hazardous. If applicable, copies of applicable laboratory credentials shall be provided for the laboratory performing TCLP analysis.
- B. Post-Abatement / Closeout Submittals. The following information shall be transmitted for review and approval within 30 days following completion of the work:
 - 1. Copies of all OSHA personal/employee lead exposure assessment air sampling data collected during the project.
 - 2. Original waste manifests/disposal records associated with any LCM waste removed from the site to be provided to the Building Owner.
 - 3. Any other documentation requested by the Building Owner or Environmental Consultant.

1.8 PERSONAL AIR SAMPLING & ANALYSIS

- A. The Contractor is responsible for conducting personal lead exposure assessment air monitoring of their employees, as required by OSHA 29 CFR Part 1926.62. Personal air samples shall be collected which are representative of a full-shift including at least one sample for each job classification in each work area either for each shift or for the shift with the highest exposure level. Full-shift personal samples shall be representative of the monitored employee's regular, daily exposure to lead.
- B. If requested by the Building Owner or Consultant, the Contractor shall provide laboratory analysis reports showing that they are conducting personal lead exposure assessment air monitoring of employees working with lead in accordance with OSHA 29 CFR Part 1926.62.

PART 2 - PRODUCTS

2.1 MATERIALS

- A. Cleaning Solutions - A lead-specific cleaning solution shall be utilized for all cleaning activities. The cleaning solution shall be an approved solution that does not contain tri-sodium phosphate (TSP).
- B. Plastic Sheeting - To prevent dust migration, dust barriers, containments, and/or enclosures shall be constructed utilizing 6-mil fire-retardant plastic sheeting. These barriers shall be constructed to minimize dust migration into adjacent non-work areas.
- C. Framing - If framing is utilized for the construction of dust barriers/containments, all reinforcement framing/sheathing materials must be at least $\frac{3}{8}$ -inch thick. Minimum requirements for framing materials shall be comprised of 2"x4" stud framing in accordance with all applicable building codes.
- D. Adhesives - Commercially available tape and spray adhesives designed for such purposes to maintain the integrity of barriers, containments, and enclosures.

2.2 EQUIPMENT

- A. Protective Clothing - Coveralls, gloves, eye protection, ear protection, safety footwear, hard hats, and fall protection are required as per all applicable OSHA regulations.
- B. Respiratory Protection - The Contractor shall provide workers with adequate respiratory protection based on the lead hazards identified at the site. The level of respiratory protection shall be determined through personal exposure assessment air monitoring.
- C. Respirator Filters - The Contractor shall provide their workers with appropriate respirator filters for the respiratory protection the workers are utilizing as per OSHA 29 CFR Part 1910.134.

PART 3 - EXECUTION

3.1 LEAD COMPLIANCE PLAN

- A. The Contractor is required to establish and follow a lead compliance plan for the project. The requirements, as outlined in OSHA 29 CFR Part 1926.62, include written procedures for construction activities with regard to control methods and engineering controls.
- B. If the Contractor fails to follow their lead compliance plan, the Building Owner may elect to hire a third-party consultant to oversee the Contractor's work. The cost for the third-party consultant shall be borne by the Contractor.

3.2 SIGNAGE

- A. Warning signs shall be posted where the potential for any lead exposure exists.
- B. Signs shall remain in place until renovation/demolition activities have been completed and the area cleaned.

- C. All signage shall comply with OSHA 29 CFR Part 1926.62.

3.3 WORK METHODS

- A. The Contractor shall select work methods in compliance with OSHA 29 CFR Part 1926.62. All work shall be performed utilizing wet methods and other engineering controls, as necessary.
- B. The Contractor is prohibited from dry methods of removal, heat gun applications, mechanical methods (grinding/sanding), and/or torch-cutting during renovation / demolition activities.

3.4 CLEANING & CLEARANCE

- A. Following the completion of all lead-related work activities, all surfaces within and 25 feet beyond the areas impacted by the work shall be cleaned of all visible paint chips, dust, and debris.
- B. Visual examinations/inspections of all areas affected by the lead-related work shall be conducted by the Contractor's competent person to determine satisfactory cleaning of all affected areas; however, the Building Owner may retain a third-party consultant to perform visual clearance examinations/inspections and/or perform lead dust wipe sampling to determine satisfactory cleaning and satisfactory completion of the work.
- C. If the Contractor does not satisfactorily clean an area based on visual examinations, or if lead dust-wipe sampling results are unacceptable, the affected areas shall be re-cleaned by the Contractor at their own expense.
- D. The cost for re-cleaning, third-party consultant oversight, and additional sampling & analysis associated with re-cleaning activities shall be borne by the Contractor.

3.5 WASTE TRANSPORTATION & DISPOSAL

- A. The Contractor is responsible for proper waste characterization sampling and laboratory analysis of LCM prior to disposal / removal from site. Waste materials include, but are not limited to, the following: personal protective equipment, plastic sheeting, signage, barrier tape, LBP components, and associated materials.
- B. The Contractor is responsible to coordinate interim storage of waste containers at the site with the Owner / Owner's Representative while awaiting waste characterization laboratory results.
- C. Loose lead paint chips and lead paint debris shall not be co-mingled with construction and demolition (C+D) debris. Failure to do so may result in the Contractor having to pay the associated fees for co-mingled lead waste disposal.

END OF SECTION 02 83 14

TABLE OF CONTENTS

PART 1 - GENERAL

- 1.1 Related Documents
- 1.2 Summary of Work
- 1.3 Submittals
- 1.4 Environmental Consultant

PART 2 - PRODUCTS

- 2.1 Materials

PART 3 - EXECUTION

- 3.1 General
- 3.2 Close-Out Documentation

SECTION 028416 – MISCELLANEOUS HAZARDOUS & SPECIAL WASTES

PART 1 – GENERAL

1.1 RELATED DOCUMENTS

- A. Drawings and general provisions of the Contract, including General and Supplementary Conditions and other Division 01 Specification Sections, apply to this Section.

1.2 SUMMARY OF WORK

- A. The scope of work includes the handling, packaging, transportation, and disposal of all the miscellaneous hazardous / special wastes from the designated work areas. In general, the miscellaneous hazardous / special wastes to be properly handled and disposed of on this project include, but are not necessarily limited to:

Table 1: Circleville Elementary School

ITEM DESCRIPTION	ITEM LOCATION(S)	ESTIMATED COUNT	PRESUMED HAZARDOUS MATERIAL	ITEM CONDITION
Fluorescent Light Tubes / Bulbs	1 st Floor - Lobby 135 & Stage 169	44	Mercury	Intact
Light Ballasts		22	PCBs	Intact
Exit Signs (Bulbs & Batteries)	1 st Floor - Lobby 135 & Stage 169	3	Mercury, Lead	Intact
Interior Emergency Flood Light Batteries	1 st Floor - Lobby 135 & Stage 169	3	Lead	Intact
Thermostat	Stage 169	1	Mercury	Intact

Table 2: Circleville Middle School

ITEM DESCRIPTION	ITEM LOCATION(S)	ESTIMATED COUNT	PRESUMED HAZARDOUS MATERIAL	ITEM CONDITION
Fluorescent Light Tubes / Bulbs	1 st Floor - South Link 100, Girl's Locker Room Areas, Boy's Locker Room Areas, Boys Bathroom 61, Girls Bathroom 62, Women's Toilet Room & Men's Toilet Room	132	Mercury	Intact
Light Ballasts		66	PCBs	Intact
Exit Signs (Bulbs & Batteries)	1 st Floor - South Link 100	2	Mercury, Lead	Intact

Table 3: Pakanasink Elementary School

ITEM DESCRIPTION	ITEM LOCATION(S)	ESTIMATED COUNT	PRESUMED HAZARDOUS MATERIAL	ITEM CONDITION
Exit Sign (Bulbs & Batteries)	1 st Floor – Lobby 1	1	Mercury, Lead	Intact
Fluorescent Light Tubes / Bulbs	1 st Floor – Boys Locker 102A, Girls Locker 109A, Girls Bathroom 136, Boys Bathroom 137, Men's Room 141 & Women's Room 143	40	Mercury	Intact
Light Ballasts		20	PCBs	Intact

Table 4: Pine Bush High School

ITEM DESCRIPTION	ITEM LOCATION(S)	ESTIMATED COUNT	PRESUMED HAZARDOUS MATERIAL	ITEM CONDITION
Fluorescent Light Tubes / Bulbs	Basement - Boys Locker 001, Girls Locker 002, Boys Locker 004 & Girls Locker 006	390	Mercury	Intact
Light Ballasts	1 st Floor - Boys Locker 110, Girls Locker 111, Corridor C110, Classroom 104, Classroom 105, Classroom 106 & Classroom 107	195	PCBs	Intact
Exit Signs (Bulbs & Batteries)	Basement - Boys Locker 001, Girls Locker 002, Boys Locker 004 & Girls Locker 006 1 st Floor - Boys Locker 110, Girls Locker 111 & Corridor C110	14	Mercury and Lead	Intact
Thermostats	Basement - Boys Locker 001, Girls Locker 002, Boys Locker 004 & Girls Locker 006 1 st Floor - Boys Locker 110 & Girls Locker 111	6	Mercury	Intact

- B. Due to the potential presence of hazardous wastes and/or regulated materials, these items may not be disposed of as construction and demolition (C+D) debris. The Contractor shall comply with all applicable state and federal (i.e., OSHA, NYSDEC, USEPA, etc.) regulations when characterizing, handling, packaging, containerizing, transporting, and disposing of these wastes.

- C. If any spills or releases of mercury, PCBs, petroleum, or any other hazardous or regulated material occurs, the Contractor shall notify the District, Construction Manager, and Project Designer immediately and take all necessary precautions and measures to contain and cleanup such spills or releases in accordance with all applicable regulations.
- D. The Contractor shall ensure that their workers are properly trained and protected during all waste handling operations.
- E. The Contractor is responsible for following all applicable federal, state, and local regulations. Failure to comply with regulations shall result in the Contractor having to pay for any legal fees, fines, cleanup costs, and/or other penalties associated with improper activities. If conflicts occur between any regulations and this project specification, the Contractor shall be ultimately responsible for following the most stringent course of action.

1.3 SUBMITTALS

- A. The Contractor shall provide the following submittals prior to conducting any work activities at the project site:
 - 1. Proof of Training – In accordance with OSHA regulations, training must be provided to inform workers about the potential hazards associated with the hazardous / special wastes at the project site, prior to conducting operations at the project site. HAZMAT or HAZWOPER training certificates are recommended.
 - 2. Waste Container Information – Contractor shall provide documentation detailing the description of the waste containers that shall be utilized for all of the miscellaneous hazardous / special wastes during the course of this project.

1.4 ENVIRONMENTAL CONSULTANT

- A. The District shall retain the services of an Environmental Consultant to oversee the Contractor during the removal and packaging of the miscellaneous hazardous / special wastes from the gymnasium area. The Environmental Consultant shall be responsible for the following tasks:
 - 1. Keeping a daily project log of the Contractor's activities on-site.
 - 2. Providing oversight of the Contractor.
 - 3. Immediately notifying the District, Construction Manager, and Project Designer, if any damaged, leaking, or broken hazardous / special wastes are identified.

PART 2 – PRODUCTS

2.1 MATERIALS

- A. Contractor shall only utilize proper NYSDOT / USDOT shipping containers to package and containerize waste products for disposal purposes.
- B. Raw vermiculite insulation shall not be utilized to package miscellaneous hazardous / special wastes, unless the Contractor has sufficient documentation to verify that the vermiculite insulation is asbestos-free. The documentation must be provided directly from the manufacturer.

PART 3 - EXECUTION

3.1 GENERAL

- A. The Contractor shall be responsible for the removal, packaging, transportation, and disposal of all miscellaneous hazardous / special wastes associated with the gymnasium renovation project.
- B. The Contractor shall provide all labor, materials, tools, equipment, and personal protective equipment (PPE) necessary to complete this work.

3.2 CLOSE-OUT DOCUMENTATION

- A. The Contractor shall provide the Project Designer with exact quantities of all hazardous / special wastes removed during the course of completing this project.
- B. The Contractor shall provide the Project Designer with copies of all pertinent waste documentation and manifests for the hazardous / special wastes removed and disposed of as part of this project. Original waste manifests and/or waste documentation shall be returned to the District directly within ten (10) days of the wastes leaving the project site.

END OF SECTION 02 84 16

SECTION 033000 - CAST-IN-PLACE CONCRETE

PART 1 - GENERAL

1.1 SUMMARY

- A. This Section specifies cast-in place concrete, including formwork, reinforcement, concrete materials, mixture design, placement procedures, and finishes, for the following:
1. Footings.
 2. Foundation walls.
 3. Slabs-on-grade.
 4. Building walls.

1.2 DEFINITIONS

- A. Cementitious Materials: Portland cement alone or in combination with fly ash; subject to compliance with requirements.

1.3 SUBMITTALS

- A. Product Data: For each type of product indicated.
- B. Design Mixtures: For each concrete mixture, indicating quantity of each ingredient and admixtures proposed or required. Submit alternate design mixtures when characteristics of materials, Project conditions, weather, test results, or other circumstances warrant adjustments.
1. For mix designs based on field experience, include individual strength test results, standard deviation, and required average compressive strength calculations.
 2. For mix designs based on trial, include proportions, test results, and graphic analysis indicating average compressive strength.
 3. Indicate amounts of mixing water to be withheld for later addition at Project site.
- C. Steel Reinforcement Shop Drawings: Placing drawings that detail fabrication, bending, and placement. Include bar sizes, lengths, material, grade, bar schedules, stirrup spacing, bent bar diagrams, bar arrangement, splices and laps, mechanical connections, tie spacing, hoop spacing, and supports for concrete reinforcement.
- D. Formwork Shop Drawings: Prepared by or under the supervision of a qualified professional engineer detailing fabrication, assembly, and support of formwork.
1. Shoring and Reshoring: Indicate proposed schedule and sequence of stripping formwork, shoring removal, and installing and removing reshoring.
- E. Schedule for Concrete Placement: Order-of-construction schedule by location in structure.
1. Include shop drawings indicating all construction joints required, including any anticipated joints due to placement schedule.
- F. Submit description of planned procedures and protective measures for cold weather or hot weather concreting.
- G. Qualification Data: For Installer.
- H. Material Test Reports: For the following, from a qualified testing agency, indicating compliance with requirements:
1. Aggregates. Include service record data indicating absence of deleterious expansion of concrete due to alkali aggregate reactivity.
- I. Material Certificates: For each of the following, signed by manufacturers; indicate compatibility with application of surface applied flooring products where applicable:
1. Cementitious materials.
 2. Admixtures.
 3. Form materials and form-release agents.

4. Steel reinforcement and accessories.
 5. Curing compounds.
 6. Bonding agents.
 7. Adhesives.
 8. Vapor retarders.
 9. Joint-filler strips.
 10. Repair materials.
- J. Floor surface flatness and levelness measurements to determine compliance with specified tolerances.
- K. Field quality-control test and inspection reports.
1. Include copies of delivery tickets complying with ASTM C 94 for each load of concrete delivered to the site.
- L. Minutes of preinstallation conference.

1.4 QUALITY ASSURANCE

- A. Installer Qualifications: A qualified installer who employs on Project personnel qualified as ACI-certified Flatwork Technician and Finisher and a supervisor who is an ACI-certified Concrete Flatwork Technician.
- B. Manufacturer Qualifications: A firm experienced in manufacturing ready-mixed concrete products and that complies with ASTM C 94 requirements for production facilities and equipment.
1. Comply with requirements of the Concrete Manufacturers Association "Concrete Plant Standards."
- C. Source Limitations: Obtain each type or class of cementitious material of the same brand from the same manufacturer's plant, obtain aggregate from one source, and obtain admixtures through one source from a single manufacturer.
- D. Welding: Qualify procedures and personnel according to AWS D1.4, "Structural Welding Code--Reinforcing Steel."
- E. ACI Publications: Comply with the following unless modified by requirements in the Contract Documents:
1. ACI 301, "Specification for Structural Concrete," Sections 1 through 5 and Section 7, "Lightweight Concrete."
 2. ACI 117, "Specifications for Tolerances for Concrete Construction and Materials."
 3. ACI 305, "Hot Weather Concreting".
 4. ACI 306, "Cold Weather Concreting".
 5. ACI 308, "Guide to Curing Concrete".
 6. ACI 302, "Guide for Concrete Floor and Slab Construction".
 7. Concrete Repair Manual, by ACI and ICRI.
- F. Concrete Testing Service: Engage a qualified independent testing agency to perform material evaluation tests and to design concrete mixtures.
- G. Preinstallation Conference: Conduct conference at Project site to comply with requirements in Division 01 Section "Project Management and Coordination."
1. Before submitting design mixtures, review concrete design mixture and examine procedures for ensuring quality of concrete materials. Require representatives of each entity directly concerned with cast-in-place concrete to attend, including the following:
 - a. Contractor's superintendent.
 - b. Independent testing agency responsible for concrete design mixtures.
 - c. Ready-mix concrete manufacturer.
 - d. Concrete subcontractor.

2. Review the following:
 - a. Coordination with special inspection and testing and inspecting agency procedures for field quality control.
 - b. Concrete finishes and finishing.
 - c. Cold- and hot-weather concreting procedures.
 - d. Curing procedures.
 - e. Construction contraction and isolation joints and joint-filler strips.
 - f. Forms and form removal limitations.
 - g. Vapor-retarder installation.
 - h. Anchor rod and anchorage device installation tolerances.
 - i. Steel reinforcement installation.
 - j. Floor and slab flatness and levelness measurement.
 - k. Concrete repair procedures.
 - l. Concrete protection.

I. The Contractor is responsible for correction of concrete work which does not conform to the specified requirements, including strength, tolerances, and finishes. The Contractor shall correct deficient concrete as directed by the Architect.

1.5 DELIVERY, STORAGE, AND HANDLING

- A. Steel Reinforcement: Deliver, store, and handle steel reinforcement to prevent bending and damage.
 1. Store steel reinforcement off ground, under suitable cover or enclosed.
 2. Maintain ease of access for inspection and identification of materials.

PART 2 - PRODUCTS

2.1 FORM-FACING MATERIALS

- A. Smooth-Formed Finished Concrete: Form-facing panels that will provide continuous, true, and smooth concrete surfaces. Furnish in largest practicable sizes to minimize number of joints.
 1. Metal or other approved panel materials.
 2. Exterior-grade plywood panels, suitable for concrete forms, complying with DOC PS 1, and as follows:
 - a. High-density overlay, Class 1 or better.
 - b. Medium-density overlay, Class 1 or better; mill-release agent treated and edge sealed.
 - c. B-B (Concrete Form), Class 1 or better; mill oiled and edge sealed.
- B. Rough-Formed Finished Concrete: Plywood, lumber, metal, or another approved material. Provide lumber dressed on at least two edges and one side for tight fit.
- C. Forms for Cylindrical Columns, Pedestals, and Supports: Metal, glass-fiber-reinforced plastic, paper, or fiber tubes that will produce surfaces with gradual or abrupt irregularities not exceeding specified formwork surface class. Provide units with sufficient wall thickness to resist plastic concrete loads without detrimental deformation.
- D. Chamfer Strips: Wood, metal, PVC, or rubber strips, 3/4 by 3/4 inch, minimum.
- E. Form-Release Agent: Commercially formulated form-release agent that will not bond with, stain, or adversely affect concrete surfaces and will not impair subsequent treatments of concrete surfaces.
 1. Formulate form-release agent with rust inhibitor for steel form-facing materials.

- F. Form Ties: Factory-fabricated, removable or snap-off metal or glass-fiber-reinforced plastic form ties designed to resist lateral pressure of fresh concrete on forms and to prevent spalling of concrete on removal.
1. Furnish units that will leave no corrodible metal closer than 1 inch to the plane of exposed concrete surface.
 2. Furnish ties that, when removed, will leave holes no larger than 1 inch in diameter in concrete surface.

2.2 STEEL REINFORCEMENT

- A. Recycled Content of Steel Products: Provide products with an average recycled content of steel products so postconsumer recycled content plus one-half of preconsumer recycled content is not less than 60 percent.
- B. Reinforcing Bars: ASTM A 615, Grade 60, deformed.
1. Include supplementary requirement S1.
- C. Plain-Steel Wire: ASTM A 82, as drawn.
- D. Plain-Steel Welded Wire Reinforcement: ASTM A 185, plain, fabricated from as-drawn steel wire into flat sheets.

2.3 REINFORCEMENT ACCESSORIES

- A. Joint Dowel Bars: ASTM A 615, Grade 60, plain-steel bars, cut bars true to length with ends square and free of burrs.
- B. Bar Supports: Bolsters, chairs, spacers, and other devices for spacing, supporting, and fastening reinforcing bars and welded wire reinforcement in place. Manufacture bar supports from steel wire, plastic, or precast concrete according to CRSI's "Manual of Standard Practice," of greater compressive strength than concrete and as follows:
1. For concrete surfaces exposed to view where legs of wire bar supports contact forms, use CRSI Class 1 plastic-protected steel wire or CRSI Class 2 stainless-steel bar supports.
 2. Supporting devices for slabs-on-grade shall have sand plates.
- C. Tie Wire: 16 gauge annealed type.

2.4 CONCRETE MATERIALS

- A. Cementitious Material: Use the following cementitious materials, of the same type, brand, and source, throughout Project:
1. Portland Cement: ASTM C 150, Type I or II. Supplement with the following:
 - a. Fly Ash: ASTM C 618, Class F.
- B. Aggregates, General: Tested and passed within 6 months of use for the following:
1. Gradation: ASTM C 136.
 2. Material Passing No. 200 Sieve: ASTM C 117.
 3. Organic Impurities: ASTM C 40.
 4. Soundness: ASTM C 88.
 5. Clay Lumps: ASTM C 142.
 6. Lightweight Constituents: ASTM C 123.
 7. Abrasiveness of Coarse Materials: ASTM C 131.
 8. Soft Particles: ASTM C 235.
 9. Freeze/Thaw Resistance: ASTM C 66, ASTM C 682.
- C. Normal-Weight Aggregates: ASTM C 33, Class 3S coarse aggregate or better, graded. Provide aggregates from a single source with documented service record data of at least 10 years' satisfactory service in similar applications and service conditions using similar aggregates and cementitious materials.

1. Maximum Coarse-Aggregate Size:
 - a. Percentage passing No. 200 sieve shall be less than 0.7%.
 - b. Nominal size 1 1/2": ASTM Size No. 467.
 - c. Nominal size 1": ASTM Size No. 57.
 - d. Nominal size 1/2": ASTM Size No. 7.
 2. Fine Aggregate: Free of materials with deleterious reactivity to alkali in cement.
 - a. Percentage passing No. 200 sieve shall be less than 3%.
- D. Water: ASTM C 94 and potable.

2.5 ADMIXTURES

- A. Air-Entraining Admixture: ASTM C 260.
- B. Chemical Admixtures: Provide admixtures certified by manufacturer to be compatible with other admixtures and that will not contribute water-soluble chloride ions exceeding those permitted in hardened concrete. Do not use calcium chloride or admixtures containing calcium chloride. Admixtures which result in more than 0.1% of soluble chloride ions by weight of cement are prohibited.
1. Water-Reducing Admixture: ASTM C 494, Type A.
 2. Retarding Admixture: ASTM C 494, Type B.
 3. Water-Reducing and Retarding Admixture: ASTM C 494, Type D.
 4. High-Range, Water-Reducing Admixture: ASTM C 494, Type F.
 5. High-Range, Water-Reducing and Retarding Admixture: ASTM C 494, Type G.
 6. Plasticizing and Retarding Admixture: ASTM C 1017, Type II.
- C. Set-Accelerating Corrosion-Inhibiting Admixture: Commercially formulated, anodic inhibitor or mixed cathodic and anodic inhibitor; capable of forming a protective barrier and minimizing chloride reactions with steel reinforcement in concrete and complying with ASTM C 494, Type C.
1. Products:
 - a. Euclid Chemical Company (The); Eucon CIA.
 - b. Grace Construction Products, W. R. Grace & Co.; DCI.
 - c. Master Builders, Inc.; Rheocrete CNI.
 - d. Sika Corporation; Sika CNI.

2.6 VAPOR RETARDERS

- A. Plastic Vapor Retarder: ASTM E 1745, Class B. Include manufacturer's recommended adhesive or pressure-sensitive tape.
1. Products:
 - a. Stego Industries, LLC; Stego Wrap, 15 mils.
- B. Granular Fill: Clean mixture of crushed stone or crushed or uncrushed gravel; ASTM D 448, Size 57, with 100 percent passing a 1-1/2-inch sieve and 0 to 5 percent passing a No. 8 sieve.
- C. Fine-Graded Granular Material: Clean mixture of crushed stone, crushed gravel, and manufactured or natural sand; ASTM D 448, Size 10, with 100 percent passing a 3/8-inch sieve, 10 to 30 percent passing a No. 100 sieve, and at least 5 percent passing No. 200 sieve; complying with deleterious substance limits of ASTM C 33 for fine aggregates.

2.7 FLOOR AND SLAB TREATMENTS

- A. Penetrating Liquid Floor Treatment: ASTM C309 and C1315.
1. Clear, chemically reactive, waterborne solution of inorganic silicate or silicate materials and proprietary components.
 2. Odorless; colorless.
 3. Formulated to penetrate, harden, and densify concrete surfaces.

4. Formulated to reduce water vapor and alkali migration detrimental to adhesion of applied sheet or tile floor finishes.
5. Products:
 - a. Burke by Edoco; Titan Hard.
 - b. ChemMasters; Chemisil Plus.
 - c. ChemTec International; ChemTec One.
 - d. Concrete Waterproofing Products, Inc.; Creteseal CS2000.
 - e. Euclid Chemical Company (The); Euco Diamond Hard.
 - f. Meadows, W. R., Inc.; Liqui-Hard.
 - g. Symons Corporation, a Dayton Superior Company; Buff Hard.

2.8 CURING MATERIALS

- A. Absorptive Cover: AASHTO M 182, Class 2, burlap cloth made from jute or kenaf, weighing approximately 9 oz./sq. yd. when dry.
- B. Water: Potable.
- C. Clear, Waterborne, Membrane-Forming Curing Compound: ASTM C 309, Type 1, Class B, 18 to 25 percent solids, nondissipating, certified by curing compound manufacturer to not interfere with bonding of floor covering.
 1. Characteristics: Acrylic polymer blend; non-yellowing from ultraviolet exposure; dustproofs concrete.
 2. Products:
 - a. ChemMasters; Safe-Cure Clear.
 - b. Euclid Chemical Company (The); Diamond Clear VOX.
 - c. L&M Construction Chemicals, Inc.; Dress & Seal WB.
 - d. MBT Protection and Repair, Div. of ChemRex; MasterKure-N-Seal VOC.
 - e. Meadows, W. R., Inc.; Vocomp-20.
 - f. Sonneborn, Div. of ChemRex; Kure-N-Seal.
 - g. Symons Corporation, a Dayton Superior Company; Cure & Seal 18 Percent E.
 - h. Tamms Industries, Inc.; Clearseal WB STD.

2.9 RELATED MATERIALS

- A. Expansion-Joint-Filler and Isolation-Joint-Filler Strips: ASTM D 1751, asphalt-saturated cellulosic fiber for pavements and sidewalks, and ASTM D 1752, cork or self-expanding cork for slabs-on-grade.
- B. Preformed Control Joint Former for joints to receive sealant or for sawcut type joints. To be used only with approval of the Architect.
- C. Bonding Agent: ASTM C 1059, Type II, non-redispersible, acrylic emulsion or styrene butadiene.
- D. Burlap: AASHTO M 182, Class 2 jute or kenaf cloth.

2.10 REPAIR MATERIALS

- A. Repair Underlayment: Cement-based, polymer-modified, self-leveling product that can be applied in thicknesses from 1/8 inch and that can be feathered at edges to match adjacent floor elevations.
 1. Cement Binder: ASTM C 150, portland cement or hydraulic or blended hydraulic cement as defined in ASTM C 219.
 2. Primer: Product of underlayment manufacturer recommended for substrate, conditions, and application.
 3. Aggregate: Well-graded, washed gravel, 1/8 to 1/4 inch or coarse sand as recommended by underlayment manufacturer.

4. Compressive Strength: Not less than 4100 psi at 28 days when tested according to ASTM C 109.
- B. Repair Overlayment: Cement-based, polymer-modified, self-leveling product that can be applied in thicknesses from 1/8 inch and that can be feathered at edges to match adjacent floor elevations.
 1. Cement Binder: ASTM C 150, portland cement or hydraulic or blended hydraulic cement as defined in ASTM C 219.
 2. Primer: Product of topping manufacturer recommended for substrate, conditions, and application.
 3. Aggregate: Well-graded, washed gravel, 1/8 to 1/4 inch or coarse sand as recommended by topping manufacturer.
 4. Compressive Strength: Not less than 5000 psi at 28 days when tested according to ASTM C 109.

2.11 CONCRETE MIXTURES, GENERAL

- A. Prepare design mixtures for each type and strength of concrete, on the basis of laboratory trial mixture or field test data, or both, according to ACI 301. Proportion design mixes per the recommendations of ACI 211.1 for normal weight concrete and ACI 211.2 for structural lightweight concrete.
 1. Use a qualified independent testing agency for preparing and reporting proposed mixture designs based on laboratory trial mixtures.
 2. Design mixes to meet or exceed each requirement specified. Adjust mix design to meet the most stringent requirement.
- B. Cementitious Materials: Limit percentage, by weight, of cementitious materials other than portland cement in concrete as follows:
 1. Fly Ash: 25 percent.
- C. Limit water-soluble, chloride-ion content in hardened concrete to 0.06 percent by weight of cement.
- D. Admixtures: Use admixtures according to manufacturer's written instructions.
 1. Use water-reducing, high-range water-reducing or plasticizing admixture in concrete, as required, for placement and workability.
 2. Use water-reducing and retarding admixture when required by high temperatures, low humidity, or other adverse placement conditions.
 3. Use water-reducing admixture in pumped concrete, concrete for heavy-use industrial slabs and parking structure slabs, concrete required to be watertight, and concrete with a water-cementitious materials ratio below 0.50.
 4. Use set-accelerating corrosion-inhibiting admixture in concrete mixtures where indicated.

2.12 CONCRETE MIXTURES FOR BUILDING ELEMENTS

- A. Footings and Non-Retaining Walls: Proportion normal-weight concrete mixture as follows:
 1. Minimum Compressive Strength: 3000 psi at 28 days.
 2. Maximum Water-Cementitious Materials Ratio by Weight: 0.50.
 3. Minimum Cementitious Materials Content: 475 lb/cu. yd.
 4. Maximum Nominal Aggregate Size: 1 inch.
 5. Maximum Slump Limit: 3-1/2 inches, plus or minus 1 inch.
 6. Air Content: 4 to 6 percent.
- B. Slabs-on-Grade (Interior): Proportion normal-weight concrete mixture as follows:
 1. Minimum Compressive Strength: 3000 psi at 28 days.
 2. Maximum Water-Cementitious Materials Ratio by Weight: 0.45.
 3. Minimum Cementitious Materials Content: 540 lb/cu. yd.
 4. Maximum Nominal Aggregate Size: 1 inch.
 5. Maximum Slump Limit: 3-1/2 inches, plus or minus 1 inch.

- C. Foundation, Exterior Slabs and Retaining Walls: Proportion normal-weight concrete mixture as follows:
1. Minimum Compressive Strength: 4000 psi at 28 days.
 2. Maximum Water-Cementitious Materials Ratio by Weight: 0.45.
 3. Minimum Cementitious Materials Content: 590 lb./cu.yd.
 4. Minimum Nominal Aggregate Size: 1/2 inch.
 5. Maximum Nominal Aggregate Size: 1-1/2 inches.
 6. Maximum Slump Limit: 3-1/2 inches, plus or minus 1 inch.
 7. Air Content: 4 to 6 percent.
- F. Controlled Low Strength Material (CLSM)
1. Permanent Material
 - a. Material shall meet the requirements of ACI 229R with a minimum compressive strength of 400 lb./sq. in.
 2. Removable Material
 - a. Material shall meet the requirements of ACI 229R with a minimum compressive strength of 50 to 100 lb./sq. in.

2.13 FABRICATING REINFORCEMENT

- A. Fabricate steel reinforcement according to CRSI's "Manual of Standard Practice."
- B. Bend steel reinforcement in accordance with ACI 318.
1. Do not heat steel reinforcement for bending. Bend or straighten bars cold.
 2. Do not bend partially embedded steel reinforcement, except as approved.

2.14 CONCRETE MIXING

- A. Ready-Mixed Concrete: Measure, batch, mix, and deliver concrete according to ASTM C 94, paragraphs 1 to 15 and 18 only, and furnish batch ticket information.
1. When air temperature is between 85 and 90 deg F, reduce mixing and delivery time from 1-1/2 hours to 75 minutes; when air temperature is above 90 deg F, reduce mixing and delivery time to 60 minutes.
- B. Project-Site Mixing: Measure, batch, and mix concrete materials and concrete according to ASTM C 94. Mix concrete materials in appropriate drum-type batch machine mixer.
1. For mixer capacity of 1 cu. yd. or smaller, continue mixing at least 1-1/2 minutes, but not more than 5 minutes after ingredients are in mixer, before any part of batch is released.
 2. For mixer capacity larger than 1 cu. yd., increase mixing time by 15 seconds for each additional 1 cu. yd.
 3. Provide batch ticket for each batch discharged and used in the Work, indicating Project identification name and number, date, mixture type, mixture time, quantity, and amount of water added. Record approximate location of final deposit in structure.

PART 3 - EXECUTION

3.1 FORMWORK

- A. Design, erect, shore, brace, and maintain formwork, according to ACI 301, to support vertical, lateral, static, and dynamic loads, and construction loads that might be applied, until structure can support such loads.
- B.
1. Where elevated concrete thickness exceeds 8 inches, contractor to provide Design Plans and Calculations of formwork shoring and bracing for review.
 2. Earth forms are not permitted.

- C. Construct formwork so concrete members and structures are of size, shape, alignment, elevation, and position indicated, within tolerance limits of ACI 117.
- D. Limit concrete surface irregularities, designated by ACI 347R as abrupt or gradual, as follows:
 - 1. Class A, 1/8 inch for smooth-formed finished surfaces.
 - 2. Class C, 1/2 inch for rough-formed finished surfaces.
- E. Construct forms tight enough to prevent loss of concrete mortar.
- F. Fabricate forms for easy removal without hammering or prying against concrete surfaces. Provide crush or wrecking plates where stripping may damage cast concrete surfaces. Provide top forms for inclined surfaces steeper than 1.5 horizontal to 1 vertical.
 - 1. Do not use rust-stained steel form-facing material.
- G. Set edge forms, bulkheads, and intermediate screed strips for slabs to achieve required elevations and slopes in finished concrete surfaces. Provide and secure units to support screed strips; use strike-off templates or compacting-type screeds.
- H. Provide temporary openings for cleanouts and inspection ports where interior area of formwork is inaccessible. Close openings with panels tightly fitted to forms and securely braced to prevent loss of concrete mortar. Locate temporary openings in forms at inconspicuous locations.
- I. Chamfer exterior corners and edges of permanently exposed concrete, unless specifically indicated otherwise on the drawings.
- J. Form openings, chases, offsets, sinkages, keyways, reglets, blocking, screeds, and bulkheads required in the Work. Determine sizes and locations from trades providing such items.
- K. Clean forms and adjacent surfaces to receive concrete. Remove chips, wood, sawdust, dirt, and other debris just before placing concrete.
- L. Retighten forms and bracing before placing concrete, as required, to prevent mortar leaks and maintain proper alignment.
- M. Coat contact surfaces of forms with form-release agent, according to manufacturer's written instructions, before placing reinforcement.

3.2 EMBEDDED ITEMS

- A. Place and secure anchorage devices and other embedded items required for adjoining work that is attached to or supported by cast-in-place concrete. Use setting drawings, templates, diagrams, instructions, and directions furnished with items to be embedded.
 - 1. Install anchor rods, accurately located, to elevations required and complying with tolerances in Section 7.5 of AISC's "Code of Standard Practice for Steel Buildings and Bridges."
 - 2. Installed penetrating conduits and embedded pipes in concrete shall comply with Section 6.3 of ACI 318.
 - a. No conduits or embedded pipes shall be located within supported slabs or slab-on-grade.

3.3 REMOVING AND REUSING FORMS

- A. General: Formwork for sides of beams, walls, columns, and similar parts of the Work that does not support weight of concrete may be removed after cumulatively curing at not less than 50 deg F for 24 hours after placing concrete, if concrete is hard enough to not be damaged by form-removal operations and curing and protection operations are maintained.
 - 1. Leave formwork for beam soffits, joists, slabs, and other structural elements that supports weight of concrete in place until concrete has achieved at least 70 percent of its 28-day design compressive strength.

2. Remove forms only if shores have been arranged to permit removal of forms without loosening or disturbing shores.
- B. Clean and repair surfaces of forms to be reused in the Work. Split, frayed, delaminated, or otherwise damaged form-facing material will not be acceptable for exposed surfaces. Apply new form-release agent.
- C. When forms are reused, clean surfaces, remove fins and laitance, and tighten to close joints. Align and secure joints to avoid offsets. Do not use patched forms for exposed concrete surfaces unless approved by Architect.

3.4 SHORES AND RESHORES

- A. Comply with ACI 318 and ACI 301 for design, installation, and removal of shoring and reshoring.
 1. Do not remove shoring or reshoring until measurement of slab tolerances is complete.
- B. In multistory construction, extend shoring or reshoring over a sufficient number of stories to distribute loads in such a manner that no floor or member will be excessively loaded or will induce tensile stress in concrete members without sufficient steel reinforcement.
- C. Plan sequence of removal of shores and reshore to avoid damage to concrete. Locate and provide adequate reshoring to support construction without excessive stress or deflection.

3.5 VAPOR RETARDERS

- A. Plastic Vapor Retarders: Place, protect, and repair vapor retarders according to ASTM E 1643 and manufacturer's written instructions.
 1. Lap joints 6 inches and seal with manufacturer's recommended tape.

3.6 STEEL REINFORCEMENT

- A. General: Comply with CRSI's "Manual of Standard Practice" for placing reinforcement.
 1. Do not cut or puncture vapor retarder. Repair damage and reseal vapor retarder before placing concrete.
 2. Allow six hours between completion of reinforcement installation and placement of concrete for special inspection.
- B. Clean reinforcement of dirt, grease, scale, loose rust, oil, paint and other foreign matter prior to installation.
- C. Accurately position, support, and secure reinforcement against displacement. Locate and support reinforcement with bar supports to maintain minimum concrete cover.
- D. Splicing and Embedment of Reinforcement: Conform to ACI 318 Chapter 12 for wired lap splices and embedment lengths.
- E. Set wire ties with ends directed into concrete, not toward exposed concrete surfaces.
- F. Install welded wire reinforcement in longest practicable lengths on bar supports spaced to minimize sagging. Lap edges and ends of adjoining sheets at least one mesh spacing. Offset laps of adjoining sheet widths to prevent continuous laps in either direction. Lace overlaps with wire.
- G.
 1. "Hooking-up" or "Walking-in" of any reinforcement will not be permitted.
- H. Maintain required concrete cover dimensions indicated. Coordinate placement of conduit and inserts with reinforcement. Protect installed reinforcement from damage or displacement prior to and during concrete placement.
 1. The Contractor shall repair or replace damaged, distorted, or displaced reinforcement.

3.7 JOINTS

- A. General: Construct joints true to line with faces perpendicular to surface plane of concrete.
- B. Construction Joints: Install so strength and appearance of concrete are not impaired, at locations indicated or as approved by Architect.
 - 1. Place joints perpendicular to main reinforcement. Continue reinforcement across construction joints, unless otherwise indicated. Do not continue reinforcement through sides of strip placements of floors and slabs.
 - 2. Form keyed joints as indicated. Embed keys at least 1-1/2 inches into concrete.
 - 3. Locate joints for beams, slabs, joists, and girders in the middle third of spans. Offset joints in girders a minimum distance of twice the beam width from a beam-girder intersection.
 - 4. Locate horizontal joints in walls and columns at underside of floors, slabs, beams, and girders and at the top of footings or floor slabs.
 - 5. Space vertical joints in walls as indicated. Locate joints beside piers integral with walls, near corners, and in concealed locations where possible.
 - 6. Use a bonding agent at locations where fresh concrete is placed against hardened or partially hardened concrete surfaces.
- C. Contraction Joints in Slabs-on-Grade: Form weakened-plane contraction joints, sectioning concrete into areas as indicated. Construct contraction joints for a depth equal to at least one-fourth of concrete thickness as follows:
 - 1. Grooved Joints: Form contraction joints after initial floating by grooving and finishing each edge of joint to a radius of 1/8 inch. Repeat grooving of contraction joints after applying surface finishes. Eliminate groover tool marks on concrete surfaces.
 - 2. Sawed Joints: Form contraction joints with power saws equipped with shatterproof abrasive or diamond-rimmed blades. Cut 1/8-inch-wide joints into concrete when cutting action will not tear, abrade, or otherwise damage surface and before concrete develops random contraction cracks.
 - 3. Spacing of joints shall not exceed 2.5 times the thickness of the slab nor 15 feet on center. All panels should be square or nearly so. Joints shall typically isolate columns and run between columns.
- D. Contraction Joints in Walls: Form weakened-plane contraction joints, sectioning concrete into areas as indicated. Provide adequate shear reinforcement as indicated or directed. Construct contraction joints as follows:
 - 1. Joints shall be constructed to provide for the installation of watertight joint and sealant, and filled with sealant.
 - 2.. Spacing of joints shall be located about 4 feet from corners and intersections, and then at 25 feet on center thereafter.
- E. Isolation Joints in Slabs-on-Grade: After removing formwork, install joint-filler strips at slab junctions with vertical surfaces, such as column pedestals, foundation walls, grade beams, and other locations, as indicated.
 - 1. Extend joint-filler strips full width and depth of joint, terminating flush with finished concrete surface, unless otherwise indicated.
 - 2. Terminate full-width joint-filler strips not less than 1/2 inch or more than 1 inch below finished concrete surface where joint sealants, specified in Division 07 Section "Joint Sealants," are indicated.
 - 3. Install joint-filler strips in lengths as long as practicable. Where more than one length is required, lace or clip sections together.
- F. Doweled Joints: Install dowel bars and support assemblies at joints where indicated. Lubricate or asphalt coat one-half of dowel length to prevent concrete bonding to one side of joint.

3.8 CONCRETE PLACEMENT

- A. Before placing concrete, verify that installation of formwork, reinforcement, and embedded items is complete and that required inspections have been performed and corrections made.
- B. Do not add water to concrete during delivery, at Project site, or during placement unless approved by Architect.
- C. Before test sampling and placing concrete, water may be added at Project site, subject to limitations of ACI 301.
 - 1. Do not add water to concrete after adding high-range water-reducing admixtures to mixture.
- D. Deposit concrete continuously in one layer or in horizontal layers of such thickness that no new concrete will be placed on concrete that has hardened enough to cause seams or planes of weakness. If a section cannot be placed continuously, provide construction joints as indicated. Deposit concrete to avoid segregation.
 - 1. Deposit concrete in horizontal layers of depth to not exceed formwork design pressures and in a manner to avoid inclined construction joints.
 - 2. Consolidate placed concrete with mechanical vibrating equipment according to ACI 301.
 - a. Do not supplement mechanical consolidation by hand, spading, rodding, or tamping unless approved by Architect.
 - 3. Do not use vibrators to transport concrete inside forms. Insert and withdraw vibrators vertically at uniformly spaced locations to rapidly penetrate placed layer and at least 6 inches into preceding layer. Do not insert vibrators into lower layers of concrete that have begun to lose plasticity. At each insertion, limit duration of vibration to time necessary to consolidate concrete and complete embedment of reinforcement and other embedded items without causing mixture constituents to segregate.
- E. Deposit and consolidate concrete for floors and slabs in a continuous operation, within limits of construction joints, until placement of a panel or section is complete.
 - 1. Consolidate concrete during placement operations so concrete is thoroughly worked around reinforcement and other embedded items and into corners.
 - 2. Maintain reinforcement in position on chairs during concrete placement.
 - 3. Screed slab surfaces with a straightedge and strike off to correct elevations.
 - 4. Slope surfaces uniformly to drains where required.
 - 5. Begin initial floating using bull floats or darbies to form a uniform and open-textured surface plane, before excess bleedwater appears on the surface. Do not further disturb slab surfaces before starting finishing operations.
- F. Provide sufficient time for excess water to evaporate prior to placement of floor coverings.
 - 1. Refer to floor covering product manufacturer submittals for requirements.
- G. Cold-Weather Placement: Comply with ACI 306 and as follows. Protect concrete work from physical damage or reduced strength that could be caused by frost, freezing actions, or low temperatures.
 - 1. When average high and low temperature is expected to fall below 40 deg F for three successive days, maintain delivered concrete mixture temperature within the temperature range required by ACI 301.
 - 2. Do not use frozen materials or materials containing ice or snow. Do not place concrete on frozen subgrade or on subgrade containing frozen materials.
 - 3. Do not use calcium chloride, salt, or other materials containing antifreeze agents or chemical accelerators unless otherwise specified and approved in mixture designs.
- H. Hot-Weather Placement: Comply with ACI 305 and as follows:
 - 1. Maintain concrete temperature below 90 deg F at time of placement. Chilled mixing water or chopped ice may be used to control temperature, provided water equivalent of

ice is calculated to total amount of mixing water. Using liquid nitrogen to cool concrete is Contractor's option.

2. Fog-spray forms, steel reinforcement, and subgrade just before placing concrete. Keep subgrade uniformly moist without standing water, soft spots, or dry areas.

3.9 FINISHING FORMED SURFACES

- A. Rough-Formed Finish: As-cast concrete texture imparted by form-facing material with tie holes and defects repaired and patched. Remove fins and other projections that exceed specified limits on formed-surface irregularities.
 1. Apply to concrete surfaces not exposed to public view.
- B. Smooth-Formed Finish: As-cast concrete texture imparted by form-facing material, arranged in an orderly and symmetrical manner with a minimum of seams. Repair and patch tie holes and defects. Remove fins and other projections that exceed specified limits on formed-surface irregularities.
 1. Apply to concrete surfaces exposed to public view, to receive a rubbed finish, or to be covered with a coating or covering material applied directly to concrete.
- C. Rubbed Finish: Apply the following to smooth-formed finished as-cast concrete at concrete walls that will be exposed to view.
 1. Grout-Cleaned Finish: Wet concrete surfaces and apply grout of a consistency of thick paint to coat surfaces and fill small holes. Mix one part portland cement to one and one-half parts fine sand with a 1:1 mixture of bonding admixture and water. Add white portland cement in amounts determined by trial patches so color of dry grout will match adjacent surfaces. Scrub grout into voids and remove excess grout. When grout whitens, rub surface with clean burlap and keep surface damp by fog spray for at least 36 hours.
- D. Related Unformed Surfaces: At tops of walls, horizontal offsets, and similar unformed surfaces adjacent to formed surfaces, strike off smooth and finish with a texture matching adjacent formed surfaces. Continue final surface treatment of formed surfaces uniformly across adjacent unformed surfaces, unless otherwise indicated.

3.10 FINISHING FLOORS AND SLABS

- A. General: Comply with ACI 302.1R recommendations for screeding, restraighening, and finishing operations for concrete surfaces. Do not wet concrete surfaces.
- B. Float Finish: Consolidate surface with power-driven floats or by hand floating if area is small or inaccessible to power driven floats. Restraighten, cut down high spots, and fill low spots. Repeat float passes and restraighening until surface is left with a uniform, smooth, granular texture.
 1. Apply float finish to surfaces to receive trowel finish, or to be covered with fluid-applied or sheet waterproofing, built-up or membrane roofing, or sand-bed terrazzo.
- C. Trowel Finish: After applying float finish, apply first troweling and consolidate concrete by hand or power-driven trowel. Continue troweling passes and restraighten until surface is free of trowel marks and uniform in texture and appearance. Grind smooth any surface defects that would telegraph through applied coatings or floor coverings.
 1. Apply a trowel finish to surfaces exposed to view or to be covered with resilient flooring, carpet, ceramic or quarry tile set over a cleavage membrane, paint, or another thin-film-finish coating system.
 2. Finish surfaces to the following tolerances, according to ASTM E 1155, for a randomly trafficked floor surface:
 3. Finish and measure surface so gap at any point between concrete surface and an unlevelled, freestanding, 10-foot-long straightedge resting on 2 high spots and placed anywhere on the surface does not exceed 1/8 inch-

- D. Broom Finish: Apply a broom finish to exposed concrete platforms, steps, and ramps, and elsewhere as indicated.
1. Immediately after float finishing, slightly roughen trafficked surface by brooming with fiber-bristle broom perpendicular to main traffic route. Coordinate required final finish with Architect before application.

3.11 MISCELLANEOUS CONCRETE ITEMS

- A. Filling In: Fill in holes and openings left in concrete structures, unless otherwise indicated, after work of other trades is in place. Mix, place, and cure concrete, as specified, to blend with in-place construction. Provide other miscellaneous concrete filling indicated or required to complete the Work.
- B. Equipment Bases and Foundations: Provide machine and equipment bases and foundations as shown on Drawings. Set anchor bolts for machines and equipment at correct elevations, complying with diagrams or templates from manufacturer furnishing machines and equipment.

3.12 CONCRETE PROTECTING AND CURING

- A. General: Protect freshly placed concrete from premature drying and excessive cold or hot temperatures. Comply with ACI 306 for cold-weather protection and ACI 305 for hot-weather protection during curing.
- B. Evaporation Retarder: Apply evaporation retarder to unformed concrete surfaces if hot, dry, or windy conditions cause moisture loss approaching 0.2 lb/sq. ft. x h before and during finishing operations. Apply according to manufacturer's written instructions after placing, screeding, and bull floating or darbying concrete, but before float finishing.
- C. Formed Surfaces: Cure formed concrete surfaces, including underside of beams, supported slabs, and other similar surfaces. If forms remain during curing period, moist cure after loosening forms. If removing forms before end of curing period, continue curing for the remainder of the curing period.
- D. Unformed Surfaces: Begin curing immediately after finishing concrete. Cure unformed surfaces, including floors and slabs, concrete floor toppings, and other surfaces.
- E. Cure concrete according to ACI 308.1, by one or a combination of the following methods:
1. Moisture Curing: Keep surfaces continuously moist for not less than seven days with the following materials:
 - a. Water.
 - b. Continuous water-fog spray.
 - c. Absorptive cover, water saturated, and kept continuously wet. Cover concrete surfaces and edges with 12-inch lap over adjacent absorptive covers.
 2. Moisture-Retaining-Cover Curing: Cover concrete surfaces with moisture-retaining cover for curing concrete, placed in widest practicable width, with sides and ends lapped at least 12 inches, and sealed by waterproof tape or adhesive. Cure for not less than seven days. Immediately repair any holes or tears during curing period using cover material and waterproof tape.
 - a. Moisture cure or use moisture-retaining covers to cure concrete surfaces to receive penetrating liquid floor treatments as recommended by manufacturer.
 - b. Cure concrete surfaces to receive floor coverings with either a moisture-retaining cover or a curing compound that the manufacturer certifies will not interfere with bonding of floor coverings used on Project.
 3. Curing Compound: Apply uniformly in continuous operation by power spray or roller according to manufacturer's written instructions. Recoat areas subjected to heavy rainfall within three hours after initial application. Maintain continuity of coating and repair damage during curing period.

- a. After curing period has elapsed, remove curing compound without damaging concrete surfaces by method recommended by curing compound manufacturer unless manufacturer certifies curing compound will not interfere with bonding of floor covering used on Project.
- b. Curing compound to be applied only in locations permitted or required.
4. Curing and Sealing Compound: Apply uniformly to floors and slabs indicated in a continuous operation by power spray or roller according to manufacturer's written instructions. Recoat areas subjected to heavy rainfall within three hours after initial application. Repeat process 24 hours later and apply a second coat. Maintain continuity of coating and repair damage during curing period.
 - a. Curing and sealing compound to be applied only in locations permitted or required.

3.13 JOINT FILLING

- A. Prepare, clean, and install joint filler according to manufacturer's written instructions.
 1. Defer joint filling until concrete has aged at least one month(s). Do not fill joints until construction traffic has permanently ceased.
- B. Remove dirt, debris, saw cuttings, curing compounds, and sealers from joints; leave contact faces of joint clean and dry.
- C. Install semirigid joint filler full depth in saw-cut joints and at least 2 inches deep in formed joints. Overfill joint and trim joint filler flush with top of joint after hardening.

3.14 CONCRETE SURFACE REPAIRS

- A. Defective Concrete: Repair and patch defective areas when approved by Architect. Remove and replace concrete that cannot be repaired and patched to Architect's approval.
- B. Patching Mortar: Mix dry-pack patching mortar, consisting of one part portland cement to two and one-half parts fine aggregate passing a No. 16 sieve, using only enough water for handling and placing.
- C. Repairing Formed Surfaces: Surface defects include color and texture irregularities, cracks, spalls, air bubbles, honeycombs, rock pockets, fins and other projections on the surface, and stains and other discolorations that cannot be removed by cleaning.
 1. Immediately after form removal, cut out honeycombs, rock pockets, and voids more than 1/2 inch in any dimension in solid concrete, but not less than 1 inch in depth. Make edges of cuts perpendicular to concrete surface. Clean, dampen with water, and brush-coat holes and voids with bonding agent. Fill and compact with patching mortar before bonding agent has dried. Fill form-tie voids with patching mortar or cone plugs secured in place with bonding agent.
 2. Repair defects on surfaces exposed to view by blending white portland cement and standard portland cement so that, when dry, patching mortar will match surrounding color. Patch a test area at inconspicuous locations to verify mixture and color match before proceeding with patching. Compact mortar in place and strike off slightly higher than surrounding surface.
 3. Repair defects on concealed formed surfaces that affect concrete's durability and structural performance as determined by Architect.
- D. Repairing Unformed Surfaces: Test unformed surfaces, such as floors and slabs, for finish and verify surface tolerances specified for each surface. Correct low and high areas. Test surfaces sloped to drain for trueness of slope and smoothness; use a sloped template.
 1. Repair finished surfaces containing defects. Surface defects include spalls, popouts, honeycombs, rock pockets, crazing and cracks in excess of 0.01 inch wide or that penetrate to reinforcement or completely through unreinforced sections regardless of width, and other objectionable conditions.

2. After concrete has cured at least 14 days, correct high areas by grinding.
 3. Correct localized low areas during or immediately after completing surface finishing operations by cutting out low areas and replacing with patching mortar. Finish repaired areas to blend into adjacent concrete.
 4. Correct other low areas scheduled to receive floor coverings with a repair underlayment. Prepare, mix, and apply repair underlayment and primer according to manufacturer's written instructions to produce a smooth, uniform, plane, and level surface. Feather edges to match adjacent floor elevations.
 5. Correct other low areas scheduled to remain exposed with a repair topping. Cut out low areas to ensure a minimum repair topping depth of 1/4 inch to match adjacent floor elevations. Prepare, mix, and apply repair topping and primer according to manufacturer's written instructions to produce a smooth, uniform, plane, and level surface.
 6. Repair defective areas, except random cracks and single holes 1 inch or less in diameter, by cutting out and replacing with fresh concrete. Remove defective areas with clean, square cuts and expose steel reinforcement with at least a 3/4-inch clearance all around. Dampen concrete surfaces in contact with patching concrete and apply bonding agent. Mix patching concrete of same materials and mixture as original concrete except without coarse aggregate. Place, compact, and finish to blend with adjacent finished concrete. Cure in same manner as adjacent concrete.
 7. Repair random cracks and single holes 1 inch or less in diameter with patching mortar. Groove top of cracks and cut out holes to sound concrete and clean off dust, dirt, and loose particles. Dampen cleaned concrete surfaces and apply bonding agent. Place patching mortar before bonding agent has dried. Compact patching mortar and finish to match adjacent concrete. Keep patched area continuously moist for at least 72 hours.
- E. Exposed reinforcing steel shall be mechanically cleaned using sandblasting or waterblasting methods. Reinforcing steel shall be free from rust, grease, or other bond-inhibiting coating.
- F. Repairs of depths greater than 3 inches are not covered by this specification. Notify Architect if such conditions are discovered for further direction of repair methods and products.
- G. Perform structural repairs of concrete, subject to Architect's approval, using epoxy adhesive and patching mortar.
- H. Repair materials and installation not specified above may be used, subject to Architect's approval.

3.15 FIELD QUALITY CONTROL

- A. Testing and Inspecting: Owner will engage a special inspector and qualified testing and inspecting agency to perform field tests and inspections and prepare test reports.
- B. Inspections:
1. Steel reinforcement placement.
 2. Steel reinforcement welding.
 3. Verification of use of required design mixture.
 4. Concrete placement, including conveying and depositing.
 5. Curing procedures and maintenance of curing temperature.
 6. Verification of concrete strength before removal of shores and forms from beams and slabs.
- C. Concrete Tests: Testing of composite samples of fresh concrete obtained according to ASTM C 172 shall be performed according to the following requirements:
1. Testing Frequency: Obtain one composite sample for each day's pour of each concrete mixture exceeding 5 cu. yd., but less than 25 cu. yd., plus one set for each additional 50 cu. yd. or fraction thereof.

2. Slump: ASTM C 143; one test at point of placement for each composite sample, but not less than one test for each day's pour of each concrete mixture. Perform additional tests when concrete consistency appears to change.
 3. Air Content: ASTM C 231, pressure method, for normal-weight concrete; ASTM C 173, volumetric method, for structural lightweight concrete; one test for each composite sample, but not less than one test for each day's pour of each concrete mixture.
 4. Concrete Temperature: ASTM C 1064; one test hourly when air temperature is 40 deg F and below and when 80 deg F and above, and one test for each composite sample.
 5. Unit Weight: ASTM C 567, equilibrium unit weight of structural lightweight concrete; one test for each composite sample, but not less than one test for each day's pour of each concrete mixture.
 6. Compression Test Specimens: ASTM C 31.
 - a. Cast and laboratory cure two sets of two standard cylinder specimens for each composite sample.
 - b. Cast and field cure two sets of two standard cylinder specimens for each composite sample.
 7. Compressive-Strength Tests: ASTM C 39; test one set of two laboratory-cured specimens at 7 days and one set of two specimens at 28 days.
 - a. Test one set of two field-cured specimens at 7 days and one set of two specimens at 28 days.
 - b. A compressive-strength test shall be the average compressive strength from a set of two specimens obtained from same composite sample and tested at age indicated.
 8. When strength of field-cured cylinders is less than 85 percent of companion laboratory-cured cylinders, Contractor shall evaluate operations and provide corrective procedures for protecting and curing in-place concrete.
 9. Strength of each concrete mixture will be satisfactory if every average of any three consecutive compressive-strength tests equals or exceeds specified compressive strength and no compressive-strength test value falls below specified compressive strength by more than 500 psi.
 10. Test results shall be reported in writing to Architect, concrete manufacturer, and Contractor within 48 hours of testing. Reports of compressive-strength tests shall contain Project identification name and number, date of concrete placement, name of concrete testing and inspecting agency, location of concrete batch in Work, design compressive strength at 28 days, concrete mixture proportions and materials, compressive breaking strength, and type of break for both 7- and 28-day tests.
 11. Nondestructive Testing: Impact hammer, sonoscope, or other nondestructive device may be permitted by Architect but will not be used as sole basis for approval or rejection of concrete.
 12. Additional Tests: Testing and inspecting agency shall make additional tests of concrete when test results indicate that slump, air entrainment, compressive strengths, or other requirements have not been met, as directed by Architect. Testing and inspecting agency may conduct tests to determine adequacy of concrete by cored cylinders complying with ASTM C 42 or by other methods as directed by Architect.
 13. Additional testing and inspecting, at Contractor's expense, will be performed to determine compliance of replaced or additional work with specified requirements.
 14. Correct deficiencies in the Work that test reports and inspections indicate does not comply with the Contract Documents.
- D. Measure floor and slab flatness and levelness according to ASTM E 1155 within 72 hours of finishing.

END OF SECTION 033000

SECTION 03 5400 - HYDRAULIC CEMENT UNDERLAYMENT

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

- A. Drawings and general provisions of the Contract, including General and Supplementary Conditions and Division 01 Specification Sections, apply to this Section.

1.2 SUMMARY

- A. This Section includes hydraulic-cement-based underlayment for use below interior floor coverings.

1.3 SUBMITTALS

- A. Product Data: For each type of product indicated.
- B. Manufacturer Certificates: Signed by manufacturers of both underlayment and floor covering system certifying that products are compatible.
- C. Qualification Data: For Installer.

1.4 QUALITY ASSURANCE

- A. Installer Qualifications: Installer who is approved by manufacturer for application of underlayment products required for this Project.
- B. Product Compatibility: Manufacturers of both underlayment and floor covering system certify in writing that products are compatible.

1.5 DELIVERY, STORAGE, AND HANDLING

- A. Store materials to comply with manufacturer's written instructions to prevent deterioration from moisture or other detrimental effects.

1.6 PROJECT CONDITIONS

- A. Environmental Limitations: Comply with manufacturer's written instructions for substrate temperature, ambient temperature and humidity, ventilation, and other conditions affecting underlayment performance.
 - 1. Place hydraulic-cement-based underlayments only when ambient temperature and temperature of substrates are between 50 and 80 deg F (10 and 27 deg C).

1.7 COORDINATION

- A. Coordinate application of underlayment with requirements of floor covering products, including adhesives, specified in Division 09 Sections, to ensure compatibility of products.

PART 2 - PRODUCTS

2.1 HYDRAULIC-CEMENT-BASED UNDERLAYMENTS

- A. Underlayment: Hydraulic-cement-based, polymer-modified, self-leveling product that can be applied in minimum uniform thicknesses of 1/8 inch (3 mm) and that can be feathered at edges to match adjacent floor elevations.
 - 1. Available Products: Subject to compliance with requirements, products that may be incorporated into the Work include, but are not limited to, the following:
 - 2. Products: Subject to compliance with requirements, provide one of the following:
 - a. Ardex; **K-15 Self-Leveling Underlayment Concrete**.
 - 3. Cement Binder: ASTM C 150, portland cement, or hydraulic or blended hydraulic cement as defined by ASTM C 219.
 - 4. Compressive Strength: Not less than **4100 psi (28 MPa)** at 28 days when tested according to ASTM C 109/C 109M.
 - 5. Underlayment Additive: Resilient-emulsion product of underlayment manufacturer formulated for use with underlayment when required by underlayment manufacturer for substrate and/or conditions encountered.
- B. Aggregate: Well-graded, washed gravel, 1/8 to 1/4 inch (3 to 6 mm); or coarse sand as recommended by underlayment manufacturer.
 - 1. Provide aggregate when recommended in writing by underlayment manufacturer for underlayment thickness required.
- C. Water: Potable and at a temperature of not more than 70 deg F (21 deg C).
- D. Primer: Product of underlayment manufacturer recommended in writing for substrate, conditions, and application indicated.

PART 3 - EXECUTION

3.1 EXAMINATION

- A. Examine substrates, with Installer present, for conditions affecting performance.
 - 1. Proceed with application only after unsatisfactory conditions have been corrected.

3.2 PREPARATION

- A. General: Prepare and clean substrate according to manufacturer's written instructions.
 - 1. Treat nonmoving substrate cracks according to manufacturer's written instructions to prevent cracks from telegraphing (reflecting) through underlayment.
 - 2. Fill substrate voids to prevent underlayment from leaking.
- B. Concrete Substrates: Mechanically remove, according to manufacturer's written instructions, laitance, glaze, efflorescence, curing compounds, form-release agents, dust, dirt, grease, oil, and other contaminants that might impair underlayment bond.
 - 1. Moisture Testing: Perform anhydrous calcium chloride test, ASTM F 1869. Proceed with installation only after substrates do not exceed a maximum moisture-vapor-emission rate of **3 lb of water/1000 sq. ft. (1.36 kg of water/100 sq. m)** in 24 hours.
- C. Nonporous Substrates: For ceramic tile, quarry tile, and terrazzo substrates, remove waxes, sealants, and other contaminants that might impair underlayment bond, and prepare surfaces according to manufacturer's written instructions.
- D. Adhesion Tests: After substrate preparation, test substrate for adhesion with underlayment according to manufacturer's written instructions.

3.3 APPLICATION

- A. General: Mix and apply underlayment components according to manufacturer's written instructions.
 - 1. Close areas to traffic during underlayment application and for time period after application recommended in writing by manufacturer.
 - 2. Coordinate application of components to provide optimum underlayment-to-substrate and intercoat adhesion.
 - 3. At substrate expansion, isolation, and other moving joints, allow joint of same width to continue through underlayment.
- B. Apply primer over prepared substrate at manufacturer's recommended spreading rate.
- C. Apply underlayment to produce uniform, level surface.
 - 1. Apply a final layer without aggregate to produce surface.
 - 2. Feather edges to match adjacent floor elevations.
- D. Cure underlayment according to manufacturer's written instructions. Prevent contamination during application and curing processes.
- E. Do not install floor coverings over underlayment until after time period recommended in writing by underlayment manufacturer.
- F. Remove and replace underlayment areas that evidence lack of bond with substrate, including areas that emit a "hollow" sound when tapped.

3.4 PROTECTION

- A. Protect underlayment from concentrated and rolling loads for remainder of construction period.

END OF SECTION 03 5400

SECTION 04 0100
MAINTENANCE OF MASONRY

PART 1 GENERAL

1.01 SECTION INCLUDES

- A. Water cleaning of brick masonry surfaces.
- B. Replacement of brick and cast stone units.
- C. Repointing mortar joints.
- D. Repair of damaged masonry.
- E. Application of sealants to close and waterproof joints.

1.02 RELATED REQUIREMENTS

- A. Section 04 0511 - Mortar and Masonry Grout.
- B. Section 04 2000 - Unit Masonry: Brick masonry units.

1.03 REFERENCE STANDARDS

- A. TMS 402/602 - Building Code Requirements and Specification for Masonry Structures 2016.

1.04 ADMINISTRATIVE REQUIREMENTS

- A. Preinstallation Meeting: Convene one week prior to commencing work of this section.
 - 1. Require attendance of parties directly affecting work of this section.
 - 2. No work shall proceed until mock up has been approved by the Architect.

1.05 SUBMITTALS

- A. See Section 01 3000 - Administrative Requirements, for submittal procedures.
- B. Shop Drawings: Indicate setting details of stone. Detail shoring.
- C. Product Data: Provide data on cleaning compounds, sealants and mortars, and sealants and mortars.
- D. Provide Manufacturers Safety Data Sheets (MSDS) for all products submitted.
- E. Samples: Submit four samples of face brick, cast stone, and cast stone units to illustrate matching color, texture and extremes of color range.
- F. Mock Up - Provide 8'x 8' area to demonstrate results of cleaning, repointing, mortar match, cast stone color match, brick match, and sealant match. Approved mock up will demonstrate approved level and quality of work required for entire project.
- G. Manufacturer's Instructions: For cleaning materials, indicate special procedures, conditions requiring special attention.
- H. Certification of Specification Compliance.

1.06 QUALITY ASSURANCE

- A. Comply with provisions of TMS 402/602, except where exceeded by requirements of the contract documents.
 - 1. Maintain one copy of each document on project site.
- B. Restorer: Company specializing in masonry restoration with minimum five years of documented experience.

1. The contractor shall submit a list of completed projects comparable to the project being bid for, along with the names and addresses of the specific buildings and the Owners, Managers or Architects involved in those projects.

1.07 WARRANTY

- A. This Contractor shall, and hereby does warrant; and the General Contractor shall, and hereby does guarantee, that caulking and sealing work will be free from defects of materials and workmanship for two (2) years from the date of final acceptance of this work. The following types of failure will be adjudged defective work; leakage, hardening, chalking, crumbling, melting, chinking, or running of caulking, or staining of adjacent work by caulking.
- B. Waterproofing execution shall be done under the supervised control of the manufacturer or his authorized representative so as to permit the issuance of a ten (10) year written warranty covering labor and material.
- C. Repair and replace work which becomes defective during the guarantee term, without cost to the owner.

1.08 MOCK-UP

- A. Restore and repoint an existing masonry wall area sized 8 feet long by 8 feet high; include in mock-up area instances of mortar.
- B. Clean a 10 ft by 10 ft panel of wall to determine extent of cleaning.
- C. Locate where directed.
- D. Acceptable panel and procedures employed will become the standard for work of this section.
- E. Mock-up may remain as part of the Work.
- F. Work can not proceed, and no materials ordered, until the mock up has been approved by the architect.

1.09 DELIVERY, STORAGE, AND HANDLING

- A. Deliver masonry neatly stacked and tied on pallets. Store clear of ground with adequate waterproof covering.

1.10 FIELD CONDITIONS

- A. No work shall be done if the air temperature is below 40 degrees F.
- B. Maintain materials and surrounding air temperature to minimum 40 degrees F prior to, during, and 48 hours after completion of masonry work.
- C. Maintain materials and surrounding air temperature to maximum 90 degrees F prior to, during, and 48 hours after completion of masonry work.
- D. All surfaces to receive new jointing operations shall be dry and clean of all foreign matter. Sealant applicator tool shall have nozzle of proper size and shall provide sufficient pressure to completely fill joints as detailed, specified or arise in the actual field conditions.

PART 2 PRODUCTS

2.01 MANUFACTURERS

- A. Restoration and Cleaning Chemicals:
 1. Diedrich Technologies, Inc; Product 101 Masonry Restorer: www.diedrichtechnologies.com.
 2. PROSOCO; Product Sure-Klean: www.prosoco.com.

3. Substitutions: See Section 01 6000 - Product Requirements.

2.02 CLEANING MATERIALS

- A. Cleaning Agent: Detergent type.
- B. Cleaning Agent: 0.5 lb of sodium hydrosulphite mixture to one gallon of water.

2.03 MORTAR MATERIALS

- A. Conform to requirements of Section 04 0511.

2.04 MASONRY MATERIALS

- A. Brick: Section 04 2000.
 - 1. New brick shall match, as closely as possible, to the satisfaction of the Architect, the existing in color, texture and size for the intended usage and shall meet the requirements of ASTM 216, Grade SW FBS for exterior use.

2.05 2.05 ACCESSORIES

- A. Drilled in anchor devices - "Pos-i-Tie" with "Tapcon" screws and loop ties as manufactured by National Wire.
- B. Brick/brick ties shall be similat and equal to Hilti "HIT" renovation ties modified to receive a stainless steel wire "wye" shaped brick tie.
- C. Brick-backup masonry ties shall be similar and equal to Hilti "HIT-C20" renovation ties with stainless steel loop wire tie for brick anchorage.
- D. Weeps - Preformed PVC tubing, rectangular in design.
- E. Bonding Agents - Material to be used in building our of spalled and deteriorated masonry shall be similar and equal to "Thorobond" by Standard Drywall Products.
- F. Sealants
 - 1. Sealants shall be Type III as specified in 07 9005 including all primers, backers and other material requirements set forth therein.
 - 2. Type III backer is required at wide joints as specified in section 04 0511.

PART 3 EXECUTION

3.01 EXAMINATION

- A. Verify that surfaces to be cleaned, restored and repointed are ready for work of this section.

3.02 SCAFFOLDING

- A. Scaffold work required to accomplish restoration work will be the responsibilty of this Specialty Contractor and will be made available to all required trades without charge and will be adequately and safely maintained. All scaffolding, staging and appurtanences thereto shall comply, in total, to the requirements of the Safety and Health Regualtions for Construction, Chapter XVII of OSHA, 29 CFR Part 1926 and all related ammdments and all other government agencies having jurisdiction. The most stringent requirements shall govern.

3.03 PREPARATION

- A. Protect surrounding elements from damage due to restoration procedures.
- B. Carefully remove and store removable items located in areas to be restored, including fixtures, fittings, finish hardware, and accessories; reinstall upon completion.
- C. Separate areas to be protected from restoration areas using means adequate to prevent damage.
- D. Cover existing landscaping with tarpaulins or similar covers.

- E. Mask immediately adjacent surfaces with material that will withstand cleaning and restoration procedures.
- F. Close off adjacent occupied areas with dust proof and weatherproof partitions.
- G. Protect roof membrane and flashings from damage with 1/2 inch plywood laid on roof surfaces over full extent of work area and traffic route.
- H. When using cleaning methods that involve water or other liquids, install drainage devices to prevent runoff over adjacent surfaces unless those surfaces are impervious to damage from runoff.

3.04 REBUILDING

- A. Cut out damaged and deteriorated masonry with care in a manner to prevent damage to any adjacent remaining materials.
- B. Support structure as necessary in advance of cutting out units.
- C. Cut away loose or unsound adjoining masonry and mortar to provide firm and solid bearing for new work.
- D. Build in new units following procedures for new work specified in other section(s).
- E. Mortar Mix: Colored and proportioned to match existing work.
- F. Ensure that anchors are correctly located and built in.
- G. Install built in masonry work to match and align with existing, with joints and coursing true and level, faces plumb and in line. Build in all openings, accessories and fittings.

3.05 REPOINTING

- A. Perform repointing prior to cleaning masonry surfaces.
- B. Cut out loose or disintegrated mortar in joints to minimum 3/4 inch depth or until sound mortar is reached.
- C. Joints eroded to a depth greater than 1" shall be backpointed prior to cleaning.
- D. Joints worn to greater than 1/4" from surface shall be cut to a minimum 1 inch depth and back pointed to within 3/4 inch from surface.
- E. Use power tools only after test cuts determine no damage to masonry units will result. Architect must give approval for use of power tools.
- F. Hand strip all existing sealants from sealed a/ caulked joints. Work shall be done in cool weather and demonstrate means and methods. Dry ice and hard blades may be used as necessary to facilitate removal.
- G. Do not damage masonry units. Extreme care shall be exercised in cutting of all joints.
- H. When cutting is complete, remove dust and loose material by brushing.
- I. Premoisten joint and apply mortar. Pack tightly in maximum 1/4 inch layers. Form a smooth, compact concave joint to match existing.
- J. Moist cure for 72 hours.
- K. Repair minor structural cracks by saw-cutting and injection of clear Type II sealant.
- L. Remove, reflash and reset existing brick sills where indicated on drawings. Scrape, clean and prime all lintels to be reflashed.
- M. After pointing, all areas shall be cleaned as required.

3.06 SEALANT APPLICATION

- A. Caulking of all joints of sash and other dissimilar surround joints on all faces from grade to top of existing parapet shall be totally cut out, including all backing material and shall be re-caulked and packed.
- B. No caulking or sealant work shall be performed until all necessary repairs have been made to all masonry, stone and brick.
- C. Install back-up material at proper depth in joint to provide sealant dimensions as specified above. Back-up material shall be suitable size and shape so that that when compressed 20 to 50% of it will fit in all joints as required.
- D. Apply masking tape where required in continuous strips in alignment with joint edge. Remove tape immediately after joints have been sealed and tooled.
- E. Prime surfaces where required with primer recommended by sealant manufacturer.
- F. Apply, tool and finish sealant in accordance with manufacturer's recommendations.
- G. Clean adjacent surfaces free of sealant or soiling resulting from this work as work progresses using solvent or cleaning agent recommended by sealant manufacturer. All finished work shall be left in neat clean condition.

3.07 CLEANING EXISTING MASONRY

- A. Cleaning Detergent: Brush clean masonry surfaces at all locations with cleaning agent in accordance with the manufacturer's instructions. Saturate masonry with clean water and flush loose mortar and dirt.
 - 1. Remove all organic and inorganic contaminants from the surface and pores of the substrate, returning the masonry systems to their natural color. The surfaces shall be evenly cleaned with no evidence of streaking or bleaching.
 - 2. The cleaning process shall not affect the density, porosity, or color or the masonry or any other component thereof. The rinsing cycle shall flush deep into the pores of the substrate, removing all traces of acidity or alkalinity.
 - 3. Cleaning shall be done employing solvent and /or detergent, scrubbing and flushing with water. Repeated scrubbing and flushings shall be done until all residue, dirt and cleaning agents have been removed.

3.08 CLEANING NEW MASONRY

- A. Verify mortar is fully set and cured.
- B. Clean surfaces and remove large particles with wood scrapers, brass or nylon wire brushes.
- C. Scrub walls with cleaning agent solution using stiff brush. Thoroughly rinse and wash off cleaning solution, dirt and mortar crumbs using clean, pressurized water.

3.09 RESTORATION CLEANING

- A. Clean surfaces and remove large particles with wood scrapers or non-ferrous wire brush.
- B. Spray coat masonry with above specified restoration cleaner, mixed into solution in accordance with manufacturer's instructions.
- C. Provide a second application if required to match mock-up area.
- D. Allow sufficient time for solution to remain on masonry and agitate with soft fiber brush or sponge.
- E. Rinse from the bottom up with potable water applied at 400 psi and at a rate of 4 gal/min.

3.10 CLEANING

- A. Immediately remove stains, efflorescence, or other excess resulting from the work of this section.
- B. Remove excess mortar, smears, and droppings as work proceeds and upon completion.
- C. Clean surrounding surfaces.

END OF SECTION

SECTION 042000 - UNIT MASONRY

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

- A. Drawings and general provisions of the Contract, including General and Supplementary Conditions and Division 01 Specification Sections, apply to this Section.

1.2 SUMMARY

- A. Section Includes:
1. Concrete masonry units.
 2. Concrete building brick.
 3. Face brick.
 4. Mortar and grout.
 5. Steel reinforcing bars.
 6. Masonry joint reinforcement.
 7. Ties and anchors.
 8. Embedded flashing.
 9. Miscellaneous masonry accessories.
 10. Cavity-wall insulation.

1.3 DEFINITIONS

- A. CMU(s): Concrete masonry unit(s).
- B. Reinforced Masonry: Masonry containing reinforcing steel in grouted cells.

1.4 PERFORMANCE REQUIREMENTS

- A. Provide structural unit masonry that develops indicated net-area compressive strengths at 28 days.
1. Determine net-area compressive strength of masonry from average net-area compressive strengths of masonry units and mortar types (unit-strength method) according to Tables 1 and 2 in ACI 530.1/ASCE 6/TMS 602.

1.5 SUBMITTALS

- A. Product Data: For each type of product indicated.
- B. Shop Drawings: For the following:
1. Masonry Units: Show sizes, profiles, coursing, and locations of special shapes.
 2. Reinforcing Steel: Detail bending and placement of unit masonry reinforcing bars. Comply with ACI 315, "Details and Detailing of Concrete Reinforcement." Show elevations of reinforced walls.
 3. Fabricated Flashing: Detail corner units, end-dam units, and other special applications.
- C. Samples for Initial Selection:
1. Face brick, in the form of straps of five or more bricks.
 2. Colored mortar.
 3. Weep holes/vents.
- D. Samples for Verification: For each type and color of the following:
1. Face brick, in the form of straps of five or more bricks.
 2. Special brick shapes.

3. Pigmented and colored-aggregate mortar. Make Samples using same sand and mortar ingredients to be used on Project.
 4. Weep holes and vents.
 5. Accessories embedded in masonry.
- E. Material Certificates: For each type and size of the following:
1. Masonry units.
 - a. Include material test reports substantiating compliance with requirements.
 - b. For brick, include size-variation data verifying that actual range of sizes falls within specified tolerances.
 - c. For exposed brick, include test report for efflorescence according to ASTM C 67.
 - d. For masonry units used in structural masonry, include data and calculations establishing average net-area compressive strength of units.
 2. Cementitious materials. Include brand, type, and name of manufacturer.
 3. Preblended, dry mortar mixes. Include description of type and proportions of ingredients.
 4. Grout mixes. Include description of type and proportions of ingredients.
 5. Reinforcing bars.
 6. Joint reinforcement.
 7. Anchors, ties, and metal accessories.
- F. Mix Designs: For each type of mortar and grout. Include description of type and proportions of ingredients.
1. Include test reports for mortar mixes required to comply with property specification. Test according to ASTM C 109/C 109M for compressive strength, ASTM C 1506 for water retention, and ASTM C 91 for air content.
 2. Include test reports, according to ASTM C 1019, for grout mixes required to comply with compressive strength requirement.
- G. Statement of Compressive Strength of Masonry: For each combination of masonry unit type and mortar type, provide statement of average net-area compressive strength of masonry units, mortar type, and resulting net-area compressive strength of masonry determined according to Tables 1 and 2 in ACI 530.1/ASCE 6/TMS 602.
- H. Cold-Weather and Hot-Weather Procedures: Detailed description of methods, materials, and equipment to be used to comply with requirements.

1.6 QUALITY ASSURANCE

- A. Testing Agency Qualifications: Qualified according to ASTM C 1093 for testing indicated.
- B. Source Limitations for Masonry Units: Obtain exposed masonry units of a uniform texture and color, or a uniform blend within the ranges accepted for these characteristics, from single source from single manufacturer for each product required.
- C. Source Limitations for Mortar Materials: Obtain mortar ingredients of a uniform quality, including color for exposed masonry, from single manufacturer for each cementitious component and from single source or producer for each aggregate.
- D. Masonry Standard: Comply with ACI 530.1/ASCE 6/TMS 602 unless modified by requirements in the Contract Documents.
- E. Sample Panels: Build sample panels to verify selections made under sample submittals and to demonstrate aesthetic effects.
1. Build sample panels for each type of exposed unit masonry construction in sizes approximately 48 inches long by 48 inches high by full thickness.

2. Where masonry is to match existing, erect panels adjacent and parallel to existing surface.
3. Clean one-half of exposed faces of panels with masonry cleaner indicated.
4. Protect approved sample panels from the elements with weather-resistant membrane.
5. Approval of sample panels is for color, texture, and blending of masonry units; relationship of mortar and sealant colors to masonry unit colors; tooling of joints; aesthetic qualities of workmanship; and other material and construction qualities specifically approved by Architect in writing.
 - a. Approval of sample panels does not constitute approval of deviations from the Contract Documents contained in sample panels unless such deviations are specifically approved by Architect in writing.

1.7 DELIVERY, STORAGE, AND HANDLING

- A. Store masonry units on elevated platforms in a dry location. If units are not stored in an enclosed location, cover tops and sides of stacks with waterproof sheeting, securely tied. If units become wet, do not install until they are dry.
- B. Deliver preblended, dry mortar mix in moisture-resistant containers designed for use with dispensing silos. Store preblended, dry mortar mix in delivery containers on elevated platforms, under cover, and in a dry location or in covered weatherproof dispensing silos.
- C. Store masonry accessories, including metal items, to prevent corrosion and accumulation of dirt and oil.

1.8 PROJECT CONDITIONS

- A. Protection of Masonry: During construction, cover tops of walls, projections, and sills with waterproof sheeting at end of each day's work. Cover partially completed masonry when construction is not in progress.
 1. Extend cover a minimum of 24 inches down both sides of walls and hold cover securely in place.
 2. Where one wythe of multiwythe masonry walls is completed in advance of other wythes, secure cover a minimum of 24 inches down face next to unconstructed wythe and hold cover in place.
- B. Do not apply uniform floor or roof loads for at least 12 hours and concentrated loads for at least three days after building masonry walls or columns.
- C. Stain Prevention: Prevent grout, mortar, and soil from staining the face of masonry to be left exposed or painted. Immediately remove grout, mortar, and soil that come in contact with such masonry.
 1. Protect base of walls from rain-splashed mud and from mortar splatter by spreading coverings on ground and over wall surface.
 2. Protect sills, ledges, and projections from mortar droppings.
 3. Protect surfaces of window and door frames, as well as similar products with painted and integral finishes, from mortar droppings.
 4. Turn scaffold boards near the wall on edge at the end of each day to prevent rain from splashing mortar and dirt onto completed masonry.
- D. Cold-Weather Requirements: Do not use frozen materials or materials mixed or coated with ice or frost. Do not build on frozen substrates. Remove and replace unit masonry damaged by frost or by freezing conditions. Comply with cold-weather construction requirements contained in ACI 530.1/ASCE 6/TMS 602.

1. Cold-Weather Cleaning: Use liquid cleaning methods only when air temperature is 40 deg F and higher and will remain so until masonry has dried, but not less than seven days after completing cleaning.
- E. Hot-Weather Requirements: Comply with hot-weather construction requirements contained in ACI 530.1/ASCE 6/TMS 602.

PART 2 - PRODUCTS

2.1 MASONRY UNITS, GENERAL

- A. Defective Units: Referenced masonry unit standards may allow a certain percentage of units to contain chips, cracks, or other defects exceeding limits stated in the standard. Do not use units where such defects will be exposed in the completed Work.
- B. Fire-Resistance Ratings: Where indicated, provide units that comply with requirements for fire-resistance ratings indicated as determined by testing according to ASTM E 119, by equivalent masonry thickness, or by other means, as acceptable to authorities having jurisdiction.

2.2 CONCRETE MASONRY UNITS

- A. Shapes: Provide shapes indicated and as follows, with exposed surfaces matching exposed faces of adjacent units unless otherwise indicated.
 1. Provide special shapes for lintels, corners, jambs, sashes, movement joints, headers, bonding, and other special conditions.
 2. Provide bullnose units for outside corners unless otherwise indicated.
- B. Integral Water Repellent: Provide units made with integral water repellent for CMU installed in exterior walls.
 1. Integral Water Repellent: Liquid polymeric, integral water-repellent admixture that does not reduce flexural bond strength. Units made with integral water repellent, when tested according to ASTM E 514 as a wall assembly made with mortar containing integral water-repellent manufacturer's mortar additive, with test period extended to 24 hours, shall show no visible water or leaks on the back of test specimen.
 - a. Products: Subject to compliance with requirements, available products that may be incorporated into the Work include, but are not limited to, the following:
 - 1) ACM Chemistries; RainBloc.
 - 2) BASF Aktiengesellschaft; Rheopel Plus.
 - 3) Grace Construction Products, W. R. Grace & Co. - Conn.; Dry-Block.
- C. CMU: ASTM C 90.
 1. Unit Compressive Strength: Provide units with minimum average net-area compressive strength of 1900 psi.
 2. Density Classification: Normal weight.
 3. Size (Width): Manufactured to dimensions 3/8 inch less than nominal dimensions.
- D. Concrete Building Brick: ASTM C 55.
 1. Unit Compressive Strength: Provide units with minimum average net-area compressive strength of 2500 psi.
 2. Density Classification: Normal weight.

2.3 BRICK

- A. General: Provide shapes indicated and as follows, with exposed surfaces matching finish and color of exposed faces of adjacent units:

1. For ends of sills and caps and for similar applications that would otherwise expose unfinished brick surfaces, provide units without cores or frogs and with exposed surfaces finished.
 2. Provide special shapes for applications where stretcher units cannot accommodate special conditions, including those at corners, movement joints, bond beams, sashes, and lintels.
 3. Provide special shapes for applications requiring brick of size, form, color, and texture on exposed surfaces that cannot be produced by sawing.
 4. Provide special shapes for applications where shapes produced by sawing would result in sawed surfaces being exposed to view.
- B. Face Brick: Facing brick complying with ASTM C 216.
1. Products: Subject to compliance with requirements, available products that may be incorporated into the Work include, but are not limited to, the following:
 - a. Glen-Gery Brick, Tuscan Series, "Cedar Ridge".
 - b. Glen-Gery Brick, Tuscan Series, "Burnt Almond".
 - c. Glen-Gery Brick, Canyon Series, "Canyon Sunset".
 2. Grade: SW.
 3. Type: FBX.
 4. Unit Compressive Strength: Provide units with minimum average net-area compressive strength of 3,000 psi.
 5. Efflorescence: Provide brick that has been tested according to ASTM C 67 and is rated "not effloresced."
 6. Size (Actual Dimensions): Match existing (Norman).
 7. Application: Use where brick is exposed unless otherwise indicated.
 8. Where shown to "match existing," provide face brick matching color range, texture, and size of existing adjacent brickwork.
 9. Color and Texture: Match existing:
- C. Building (Common) Brick: ASTM C 62, Grade SW.
1. Unit Compressive Strength: Provide units with minimum average net-area compressive strength of 3,000 psi.
 2. Size: Match size of face brick.
 3. Application: Use where brick is indicated for concealed locations.

2.4 MORTAR AND GROUT MATERIALS

- A. Portland Cement: ASTM C 150, Type I or II, except Type III may be used for cold-weather construction. Provide natural color or white cement as required to produce mortar color indicated.
- B. Hydrated Lime: ASTM C 207, Type S.
- C. Portland Cement-Lime Mix: Packaged blend of portland cement and hydrated lime containing no other ingredients.
- D. Mortar Pigments: Natural and synthetic iron oxides and chromium oxides, compounded for use in mortar mixes and complying with ASTM C 979. Use only pigments with a record of satisfactory performance in masonry mortar.
1. Products: Subject to compliance with requirements, available products that may be incorporated into the Work include, but are not limited to, the following:
 - a. Davis Colors; True Tone Mortar Colors.
 - b. Lanxess Corporation; Bayferrox Iron Oxide Pigments.
 - c. Solomon Colors, Inc.; SGS Mortar Colors.

- E. Colored Cement Product: Packaged blend made from portland cement and hydrated lime and mortar pigments, all complying with specified requirements, and containing no other ingredients.
 - 1. Products: Subject to compliance with requirements, available products that may be incorporated into the Work include, but are not limited to, the following:
 - a. Colored Portland Cement-Lime Mix:
 - 1) Lafarge North America Inc.; Eaglebond Portland & Lime.
 - 2) Lehigh Cement Company; Lehigh Custom Color Portland/Lime Cement.
 - 2. Formulate blend as required to produce color indicated or, if not indicated, as selected from manufacturer's standard colors.
 - 3. Pigments shall not exceed 10 percent of portland cement by weight.
- F. Aggregate for Mortar: ASTM C 144.
 - 1. For mortar that is exposed to view, use washed aggregate consisting of natural sand or crushed stone.
 - 2. For joints less than 1/4 inch thick, use aggregate graded with 100 percent passing the No. 16 sieve.
 - 3. White-Mortar Aggregates: Natural white sand or crushed white stone.
 - 4. Colored-Mortar Aggregates: Natural sand or crushed stone of color necessary to produce required mortar color.
- G. Aggregate for Grout: ASTM C 404.
- H. Epoxy Pointing Mortar: ASTM C 395, epoxy-resin-based material formulated for use as pointing mortar for structural-clay tile facing units (and approved for such use by manufacturer of units); in color indicated or, if not otherwise indicated, as selected by Architect from manufacturer's colors.
- I. Water-Repellent Admixture: Liquid water-repellent mortar admixture intended for use with CMUs containing integral water repellent by same manufacturer.
 - 1. Products: Subject to compliance with requirements, available products that may be incorporated into the Work include, but are not limited to, the following:
 - a. ACM Chemistries; RainBloc for Mortar.
 - b. BASF Aktiengesellschaft; Rheopel Mortar Admixture.
 - c. Grace Construction Products, W. R. Grace & Co. - Conn.; Dry-Block Mortar Admixture.
- J. Water: Potable.

2.5 REINFORCEMENT

- A. Uncoated Steel Reinforcing Bars: ASTM A 615/A 615M or ASTM A 996/A 996M, Grade 60.
- B. Masonry Joint Reinforcement, General: ASTM A 951/A 951M.
 - 1. Interior Walls: Hot-dip galvanized, carbon steel.
 - 2. Exterior Walls: Hot-dip galvanized, carbon steel.
 - 3. Wire Size for Side Rods:
 - a. Standard size: 0.148-inch diameter.
 - b. For 12-inch CMU: 0.187-inch diameter.
 - 4. Wire Size for Cross Rods:
 - a. Standard size: 0.148-inch diameter diameter.
 - b. For 12-inch CMU: 0.187-inch diameter.
 - 5. Wire Size for Veneer Ties: 0.148-inch diameter.
 - 6. Spacing of Cross Rods, Tabs, and Cross Ties: Not more than 16 inches o.c.
 - 7. Provide in lengths of not less than 10 feet, with prefabricated corner and tee units.

- C. Masonry Joint Reinforcement for Single-Wythe Masonry: Ladder type with single pair of side rods.
- D. Masonry Joint Reinforcement for Multiwythe Masonry:
 - 1. Adjustable (two-piece) type, either ladder or truss design, with one side rod at each face shell of backing wythe and with separate adjustable ties with pintle-and-eye connections having a maximum adjustment of 1-1/4 inches. Size ties to extend at least halfway through facing wythe but with at least 5/8-inch cover on outside face.

2.6 TIES AND ANCHORS

- A. Materials: Provide ties and anchors specified in this article that are made from materials that comply with the following unless otherwise indicated.
 - 1. Hot-Dip Galvanized, Carbon-Steel Wire: ASTM A 82/A 82M; with ASTM A 153/A 153M, Class B-2 coating.
 - 2. Steel Sheet, Galvanized after Fabrication: ASTM A 1008/A 1008M, Commercial Steel, with ASTM A 153/A 153M, Class B coating.
 - 3. Steel Plates, Shapes, and Bars: ASTM A 36/A 36M.
- B. Wire Ties, General: Unless otherwise indicated, size wire ties to extend at least halfway through veneer but with at least 5/8-inch cover on outside face. Outer ends of wires are bent 90 degrees and extend 2 inches parallel to face of veneer.
- C. Individual Wire Ties: Rectangular units with closed ends and not less than 4 inches wide.
 - 1. Z-shaped ties with ends bent 90 degrees to provide hooks not less than 2 inches long may be used for masonry constructed from solid units.
 - 2. Where wythes do not align or are of different materials, use adjustable ties with pintle-and-eye connections having a maximum adjustment of 1-1/4 inches.
 - 3. Wire: Fabricate from 3/16-inch-diameter wire, hot-dip galvanized steel.
- D. Adjustable Anchors for Connecting to Structural Steel Framing: Provide anchors that allow vertical or horizontal adjustment but resist tension and compression forces perpendicular to plane of wall.
 - 1. Anchor Section for Welding to Steel Frame: Crimped 1/4-inch-diameter, hot-dip galvanized steel wire.
 - 2. Tie Section: Triangular-shaped wire tie, sized to extend within 1 inch of masonry face, made from 0.187-inch-diameter, hot-dip galvanized steel wire.
- E. Adjustable Anchors for Connecting to Concrete: Provide anchors that allow vertical or horizontal adjustment but resist tension and compression forces perpendicular to plane of wall.
 - 1. Corrugated Metal Ties: Metal strips not less than 7/8 inch wide with corrugations having a wavelength of 0.3 to 0.5 inch and an amplitude of 0.06 to 0.10 inchade from 12 gage, steel sheet, galvanized after fabrication with dovetail tabs for inserting into dovetail slots in concrete and sized to extend to within 1 inch of masonry face.
- F. Adjustable Masonry-Veneer Anchors:
 - 1. General: Provide anchors that allow vertical adjustment but resist tension and compression forces perpendicular to plane of wall, for attachment over sheathing to wood or metal studs, and as follows:
 - a. Structural Performance Characteristics: Capable of withstanding a 100-lbf load in both tension and compression without deforming or developing play in excess of 0.05 inch.
 - 2. Screw-Attached, Masonry-Veneer Anchors: Units consisting of a wire tie and a metal anchor section.

- a. Products: Subject to compliance with requirements, available products that may be incorporated into the Work include, but are not limited to, the following:
 - 1) Heckmann Building Products Inc.; Pos-I-Tie.
- b. Anchor Section: Corrosion-resistant, self-drilling, eye-screw designed to receive wire tie. Eye-screw has spacer that seats directly against framing and is same thickness as sheathing and has gasketed, washer head that covers hole in sheathing.
- c. Fabricate sheet metal anchor sections and other sheet metal parts from 0.075-inch-thick, steel sheet, galvanized after fabrication.
- d. Wire Ties: Triangular-, rectangular-, or T-shaped wire ties fabricated from 0.187-inch-diameter, hot-dip galvanized steel wire.

2.7 MISCELLANEOUS ANCHORS

- A. Unit Type Inserts in Concrete: Cast-iron or malleable-iron wedge-type inserts.
- B. Anchor Bolts: Headed or L-shaped steel bolts complying with ASTM A 307, Grade A; with ASTM A 563 hex nuts and flat washers; hot-dip galvanized to comply with ASTM A 153/A 153M, Class C; of dimensions indicated.
- C. Postinstalled Anchors: Torque-controlled expansion anchors or chemical anchors.
 - 1. Load Capacity: Capable of sustaining, without failure, a load equal to six times the load imposed when installed in unit masonry and four times the load imposed when installed in concrete, as determined by testing according to ASTM E 488, conducted by a qualified independent testing agency.
 - 2. Material for Interior and Exterior Locations: Alloy Group 1 stainless-steel bolts, ASTM F 593, and nuts, ASTM F 594.

2.8 EMBEDDED FLASHING MATERIALS

- A. A. Metal Flashing: Provide metal flashing complying with SMACNA's "Architectural Sheet Metal Manual", Division 07 Section "Sheet Metal Flashing and Trim", and as follows:
 - 1. Copper: ASTM B 370, Temper H00, cold-rolled copper sheet, 16-oz./sq. ft. weight or 0.0216 inch thick or ASTM B 370, Temper H01, high-yield copper sheet, 12-oz./sq. ft. weight or 0.0162 inch thick.
 - 2. Fabricate continuous flashings in sections 96 inches long minimum, but not exceeding 12 feet. Provide splice plates at joints of formed, smooth metal flashing.
 - 3. Fabricate through-wall flashing with snaplock receiver on exterior face where indicated to receive counterflashing.
 - 4. Fabricate through-wall flashing with drip edge. Fabricate by extending flashing 1/2 inch out from wall, with outer edge bent down 30 degrees and hemmed.
- B. Flexible Flashing: Use the following unless otherwise indicated:
 - 1. Copper-Laminated Flashing: 5-oz./sq. ft. copper sheet bonded between 2 layers of glass-fiber cloth. Use only where flashing is fully concealed in masonry.
 - a. Products: Subject to compliance with requirements, available products that may be incorporated into the Work include, but are not limited to, the following:
 - 1) Dayton Superior Corporation, Dur-O-Wal Division; Copper Fabric Thru-Wall Flashing.
 - 2) Hohmann & Barnard, Inc.; H & B C-Fab Flashing.
 - 3) Sandell Manufacturing Co., Inc.; Copper Fabric Flashing.
 - 4) York Manufacturing, Inc.; Multi-Flash 500.
- C. Application: Unless otherwise indicated, use the following:

1. Where flashing is indicated to receive counterflashing, use metal flashing.
 2. Where flashing is indicated to be turned down at or beyond the wall face, use metal flashing.
 3. Where flashing is partly exposed and is indicated to terminate at the wall face, use metal flashing with a drip edge.
 4. Where flashing is fully concealed, use flexible flashing.
- D. Solder and Sealants for Sheet Metal Flashings:
1. Solder for Copper: ASTM B 32, Grade Sn50, 50 percent tin and 50 percent lead.
 2. Elastomeric Sealant: ASTM C 920, chemically curing urethane sealant; of type, grade, class, and use classifications required to seal joints in sheet metal flashing and trim and remain watertight.
- E. Adhesives, Primers, and Seam Tapes for Flashings: Flashing manufacturer's standard products or products recommended by flashing manufacturer for bonding flashing sheets to each other and to substrates.

2.9 MISCELLANEOUS MASONRY ACCESSORIES

- A. Compressible Filler: Premolded filler strips complying with ASTM D 1056, Grade 2A1; compressible up to 35 percent; of width and thickness indicated; formulated from neoprene.
- B. Preformed Control-Joint Gaskets: Made from styrene-butadiene-rubber compound, complying with ASTM D 2000, Designation M2AA-805 and designed to fit standard sash block and to maintain lateral stability in masonry wall; size and configuration as indicated.
- C. Bond-Breaker Strips: Asphalt-saturated, organic roofing felt complying with ASTM D 226, Type I (No. 15 asphalt felt).
- D. Weep/Vent Products:
1. Rectangular Plastic Weep/Vent Tubing: Clear butyrate, 3/8 by 1-1/2 by 3-1/2 inches long.
- E. Cavity Drainage Material: Free-draining mesh, made from polymer strands that will not degrade within the wall cavity.
1. Products: Subject to compliance with requirements, available products that may be incorporated into the Work include, but are not limited to, the following:
 - a. Mortar Net USA, Ltd.; Mortar Net.
 2. Provide one of the following configurations:
 - a. Strips, full-depth of cavity and 10 inches high, with dovetail shaped notches 7 inches deep that prevent clogging with mortar droppings.
- F. Reinforcing Bar Positioners: Wire units designed to fit into mortar bed joints spanning masonry unit cells and hold reinforcing bars in center of cells. Units are formed from 0.148-inch steel wire, hot-dip galvanized after fabrication. Provide units designed for number of bars indicated.
1. Products: Subject to compliance with requirements, available products that may be incorporated into the Work include, but are not limited to, the following:
 - a. Dayton Superior Corporation, Dur-O-Wal Division; D/A 810, D/A 812 or D/A 817.
 - b. Heckmann Building Products Inc.; No. 376 Rebar Positioner.
 - c. Hohmann & Barnard, Inc.; #RB or #RB-Twin Rebar Positioner.

2.10 CAVITY-WALL INSULATION

- A. Product: FOAMULAR 250 Rigid Foam Insulation as manufactured by Owens Corning, or equivalent.

- B. Adhesive: Air-Bloc 21 Insulation Adhesive manufactured by Henry Company, or equivalent. Verify compatibility of adhesive with insulation board manufacturer for application indicated.

2.11 MASONRY CLEANERS

- A. Proprietary Acidic Cleaner: Manufacturer's standard-strength cleaner designed for removing mortar/grout stains, efflorescence, and other new construction stains from new masonry without discoloring or damaging masonry surfaces. Use product expressly approved for intended use by cleaner manufacturer and manufacturer of masonry units being cleaned.
1. Manufacturers: Subject to compliance with requirements, available manufacturers offering products that may be incorporated into the Work include, but are not limited to, the following:
 - a. ProSoCo, Inc.

2.12 MORTAR AND GROUT MIXES

- A. General: Do not use admixtures, including pigments, air-entraining agents, accelerators, retarders, water-repellent agents, antifreeze compounds, or other admixtures, unless otherwise indicated.
1. Do not use calcium chloride in mortar or grout.
 2. Use portland cement-lime mortar.
 3. Add cold-weather admixture (if used) at same rate for all mortar that will be exposed to view, regardless of weather conditions, to ensure that mortar color is consistent.
- B. Preblended, Dry Mortar Mix: Furnish dry mortar ingredients in form of a preblended mix. Measure quantities by weight to ensure accurate proportions, and thoroughly blend ingredients before delivering to Project site.
- C. Mortar for Unit Masonry: Comply with ASTM C 270, Property Specification. Provide the following types of mortar for applications stated unless another type is indicated or needed to provide required compressive strength of masonry.
1. For masonry below grade or in contact with earth, use Type S.
 2. For reinforced masonry, use Type S.
 3. For exterior, above-grade, load-bearing and non-load-bearing walls and parapet walls; for interior load-bearing walls; for interior non-load-bearing partitions; and for other applications where another type is not indicated, use Type N.
 4. Mortar shall attain a minimum compressive strength of 1800 psi at 28 days.
- D. Pigmented Mortar: Use colored cement product.
1. Application: Use pigmented mortar for exposed mortar joints with the following units:
 - a. Face brick.
- E. Grout for Unit Masonry: Comply with ASTM C 476.
1. Use grout of type indicated or, if not otherwise indicated, of type (fine or coarse) that will comply with Table 1.15.1 in ACI 530.1/ASCE 6/TMS 602 for dimensions of grout spaces and pour height.
 2. Grout shall attain a compressive strength of 3000 psi at 28 days.
 3. Grout shall be placed in lifts not exceeding 5 feet in height.
 4. Provide grout with a slump of 8 to 11 inches as measured according to ASTM C 143/C 143M.

PART 3 - EXECUTION

3.1 EXAMINATION

- A. Examine conditions, with Installer present, for compliance with requirements for installation tolerances and other conditions affecting performance of the Work.
 - 1. For the record, prepare written report, endorsed by Installer, listing conditions detrimental to performance of work.
 - 2. Verify that foundations are within tolerances specified.
 - 3. Verify that reinforcing dowels are properly placed.
- B. Before installation, examine rough-in and built-in construction for piping systems to verify actual locations of piping connections.
- C. Proceed with installation only after unsatisfactory conditions have been corrected.

3.2 INSTALLATION, GENERAL

- A. Thickness: Build cavity and composite walls and other masonry construction to full thickness shown. Build single-wythe walls to actual widths of masonry units, using units of widths indicated.
- B. Build chases and recesses to accommodate items specified in this and other Sections.
- C. Leave openings for equipment to be installed before completing masonry. After installing equipment, complete masonry to match the construction immediately adjacent to opening.
- D. Use full-size units without cutting if possible. If cutting is required to provide a continuous pattern or to fit adjoining construction, cut units with motor-driven saws; provide clean, sharp, unchipped edges. Allow units to dry before laying unless wetting of units is specified. Install cut units with cut surfaces and, where possible, cut edges concealed.
- E. Select and arrange units for exposed unit masonry to produce a uniform blend of colors and textures.
 - 1. Mix units from several pallets or cubes as they are placed.
- F. Matching Existing Masonry: Match coursing, bonding, color, and texture of existing masonry.
- G. Wetting of Brick: Wet brick before laying if initial rate of absorption exceeds 30 g/30 sq. in. per minute when tested per ASTM C 67. Allow units to absorb water so they are damp but not wet at time of laying.

3.3 TOLERANCES

- A. Dimensions and Locations of Elements:
 - 1. For dimensions in cross section or elevation do not vary by more than plus 1/2 inch or minus 1/4 inch.
 - 2. For location of elements in plan do not vary from that indicated by more than plus or minus 1/2 inch.
 - 3. For location of elements in elevation do not vary from that indicated by more than plus or minus 1/4 inch in a story height or 1/2 inch total.
- B. Lines and Levels:
 - 1. For bed joints and top surfaces of bearing walls do not vary from level by more than 1/4 inch in 10 feet, or 1/2 inch maximum.

2. For conspicuous horizontal lines, such as lintels, sills, parapets, and reveals, do not vary from level by more than 1/8 inch in 10 feet, 1/4 inch in 20 feet, or 1/2 inch maximum.
 3. For vertical lines and surfaces do not vary from plumb by more than 1/4 inch in 10 feet, 3/8 inch in 20 feet, or 1/2 inch maximum.
 4. For conspicuous vertical lines, such as external corners, door jambs, reveals, and expansion and control joints, do not vary from plumb by more than 1/8 inch in 10 feet, 1/4 inch in 20 feet, or 1/2 inch maximum.
 5. For lines and surfaces do not vary from straight by more than 1/4 inch in 10 feet, 3/8 inch in 20 feet, or 1/2 inch maximum.
 6. For vertical alignment of exposed head joints, do not vary from plumb by more than 1/4 inch in 10 feet, or 1/2 inch maximum.
 7. For faces of adjacent exposed masonry units, do not vary from flush alignment by more than 1/16 inch except due to warpage of masonry units within tolerances specified for warpage of units.
- C. Joints:
1. For bed joints, do not vary from thickness indicated by more than plus or minus 1/8 inch, with a maximum thickness limited to 1/2 inch.
 2. For exposed bed joints, do not vary from bed-joint thickness of adjacent courses by more than 1/8 inch.
 3. For head and collar joints, do not vary from thickness indicated by more than plus 3/8 inch or minus 1/4 inch.
 4. For exposed head joints, do not vary from thickness indicated by more than plus or minus 1/8 inch.
 5. For exposed bed joints and head joints of stacked bond, do not vary from a straight line by more than 1/16 inch from one masonry unit to the next.

3.4 LAYING MASONRY WALLS

- A. Lay out walls in advance for accurate spacing of surface bond patterns with uniform joint thicknesses and for accurate location of openings, movement-type joints, returns, and offsets. Avoid using less-than-half-size units, particularly at corners, jambs, and, where possible, at other locations.
- B. Bond Pattern for Exposed Masonry: Unless otherwise indicated, lay exposed masonry in running bond; do not use units with less than nominal 4-inch horizontal face dimensions at corners or jambs.
- C. Lay concealed masonry with all units in a wythe in running bond. Bond and interlock each course of each wythe at corners. Do not use units with less than nominal 4-inch horizontal face dimensions at corners or jambs.
- D. Stopping and Resuming Work: Stop work by racking back units in each course from those in course below; do not tooth. When resuming work, clean masonry surfaces that are to receive mortar, remove loose masonry units and mortar, and wet brick if required before laying fresh masonry.
- E. Built-in Work: As construction progresses, build in items specified in this and other Sections. Fill in solidly with masonry around built-in items.
- F. Fill space between steel frames and masonry solidly with mortar unless otherwise indicated.
- G. Where built-in items are to be embedded in cores of hollow masonry units, place a layer of metal lath, wire mesh, or plastic mesh in the joint below and rod mortar or grout into core.

- H. Fill cores in hollow CMUs with grout 24 inches under bearing plates, beams, lintels, posts, and similar items unless otherwise indicated.
- I. Build non-load-bearing interior partitions full height of story to underside of solid floor or roof structure above unless otherwise indicated.
 - 1. Install compressible filler in joint between top of partition and underside of structure above.
 - 2. At fire-rated partitions, treat joint between top of partition and underside of structure above to comply with Division 07 Section "Fire-Resistive Joint Systems."

3.5 MORTAR BEDDING AND JOINTING

- A. Lay hollow masonry as follows:
 - 1. With face shells fully bedded in mortar and with head joints of depth equal to bed joints.
 - 2. With webs fully bedded in mortar in all courses of piers, columns, and pilasters.
 - 3. With webs fully bedded in mortar in grouted masonry, including starting course on footings.
 - 4. With entire units, including areas under cells, fully bedded in mortar at starting course on footings where cells are not grouted.
- B. Lay solid masonry units with completely filled bed and head joints; butter ends with sufficient mortar to fill head joints and shove into place. Do not deeply furrow bed joints or slush head joints.
- C. Set stone trim units in full bed of mortar with full vertical joints. Fill dowel, anchor, and similar holes.
 - 1. Clean soiled surfaces with fiber brush and soap powder and rinse thoroughly with clear water.
 - 2. For relatively impervious stones, allow cleaned surfaces to dry before setting.
 - 3. For absorptive stones, wet joint surfaces thoroughly before applying mortar.
- D. Tool exposed joints slightly concave when thumbprint hard, using a jointer larger than joint thickness unless otherwise indicated.
- E. Cut joints flush for masonry walls to receive plaster or other direct-applied finishes (other than paint) unless otherwise indicated.

3.6 COMPOSITE MASONRY

- A. Bond wythes of composite masonry together using one of the following methods:
 - 1. Individual Metal Ties: Provide ties as shown installed in horizontal joints, but not less than one metal tie for 4.5 sq. ft. of wall area spaced not to exceed 36 inches o.c. horizontally and 16 inches o.c. vertically. Stagger ties in alternate courses. Provide additional ties within 12 inches of openings and space not more than 36 inches apart around perimeter of openings. At intersecting and abutting walls, provide ties at no more than 16 inches o.c. vertically.
 - a. Where bed joints of wythes do not align, use adjustable (two-piece) type ties.
 - 2. Masonry Joint Reinforcement: Installed in horizontal mortar joints.
 - a. Where bed joints of both wythes align, use ladder-type reinforcement extending across both wythes.
 - b. Where bed joints of wythes do not align, use adjustable (two-piece) type reinforcement with continuous horizontal wire in facing wythe attached to ties.
- B. Collar Joints: Solidly fill collar joints by parging face of first wythe that is laid and shoving units of other wythe into place.

- C. Corners: Provide interlocking masonry unit bond in each wythe and course at corners unless otherwise indicated.
 - 1. Provide continuity with masonry joint reinforcement at corners by using prefabricated L-shaped units as well as masonry bonding.
- D. Intersecting and Abutting Walls: Unless vertical expansion or control joints are shown at juncture, bond walls together as follows:
 - 1. Provide individual metal ties not more than 8 inches o.c.
 - 2. Provide continuity with masonry joint reinforcement by using prefabricated T-shaped units.
 - 3. Provide rigid metal anchors not more than 24 inches o.c. If used with hollow masonry units, embed ends in mortar-filled cores.

3.7 CAVITY WALLS

- A. Bond wythes of cavity walls together using one of the following methods:
 - 1. Individual Metal Ties: Provide ties as shown installed in horizontal joints, but not less than one metal tie for 4.5 sq. ft. of wall area spaced not to exceed 16 inches o.c. horizontally and 16 inches o.c. vertically. Stagger ties in alternate courses. Provide additional ties within 12 inches of openings and space not more than 16 inches apart around perimeter of openings. At intersecting and abutting walls, provide ties at no more than 16 inches o.c. vertically.
 - a. Where bed joints of wythes do not align, use adjustable (two-piece) type ties.
 - b. Where one wythe is of clay masonry and the other of concrete masonry, use adjustable (two-piece) type ties to allow for differential movement regardless of whether bed joints align.
 - 2. Masonry Veneer Anchors: Comply with requirements for anchoring masonry veneers.
- B. Keep cavities clean of mortar droppings and other materials during construction.
- C. Apply air barrier to face of backup wythe to comply with Division 07 Section Fluid-Applied Membrane Air Barriers."
- D. Installing Cavity-Wall Insulation: Fit courses of insulation between wall ties and other confining obstructions in cavity, with edges butted tightly both ways. Press units firmly against air barrier/adhesive coating on the inside wythe of masonry or other construction as shown.
 - 1. Fill cracks and open gaps in insulation with crack sealer compatible with insulation and masonry.

3.8 MASONRY-CELL INSULATION

- A. Install molded-polystyrene insulation units into masonry unit cells before laying units.

3.9 MASONRY JOINT REINFORCEMENT

- A. General: Install entire length of longitudinal side rods in mortar with a minimum cover of 5/8 inch on exterior side of walls, 1/2 inch elsewhere. Lap reinforcement a minimum of 6 inches.
 - 1. Space reinforcement not more than 16 inches o.c.
 - 2. Provide reinforcement not more than 8 inches above and below wall openings and extending 12 inches beyond openings.
- B. Interrupt joint reinforcement at control and expansion joints unless otherwise indicated.
- C. Provide continuity at wall intersections by using prefabricated T-shaped units.
- D. Provide continuity at corners by using prefabricated L-shaped units.

- E. Cut and bend reinforcing units as directed by manufacturer for continuity at returns, offsets, column fireproofing, pipe enclosures, and other special conditions.

3.10 CONTROL AND EXPANSION JOINTS

- A. General: Install control and expansion joint materials in unit masonry as masonry progresses. Do not allow materials to span control and expansion joints without provision to allow for in-plane wall or partition movement.
- B. Form control joints in concrete masonry as follows:
 - 1. Install preformed control-joint gaskets designed to fit standard sash block.
- C. Form expansion joints in brick as follows:
 - 1. Build in compressible joint fillers where indicated.
 - 2. Form open joint full depth of brick wythe and not less than 3/8 inch wide for installation of sealant and backer rod specified in Division 07 Section "Joint Sealants."

3.11 LINTELS

- A. Install steel lintels where indicated.
- B. Provide masonry lintels where shown and where openings of more than 12 inches for brick-size units and 24 inches for block-size units are shown without structural steel or other supporting lintels.
- C. Provide minimum bearing of 8 inches at each jamb unless otherwise indicated.

3.12 FLASHING, WEEP HOLES, CAVITY DRAINAGE, AND VENTS

- A. General: Install embedded flashing and weep holes in masonry at shelf angles, lintels, ledges, other obstructions to downward flow of water in wall, and where indicated.
- B. Install flashing as follows unless otherwise indicated:
 - 1. Prepare masonry surfaces so they are smooth and free from projections that could puncture flashing. Where flashing is within mortar joint, place through-wall flashing on sloping bed of mortar and cover with mortar. Before covering with mortar, seal penetrations in flashing with adhesive, sealant, or tape as recommended by flashing manufacturer.
 - 2. At multiwythe masonry walls, including cavity walls, extend flashing through outer wythe, turned up a minimum of 8 inches, and 1-1/2 inches into the inner wythe. Form 1/4-inch hook in edge of flashing embedded in inner wythe.
 - 3. At lintels and shelf angles, extend flashing a minimum of 6 inches into masonry at each end. At heads and sills, extend flashing 6 inches at ends and turn up not less than 2 inches to form end dams.
 - 4. Cut flexible flashing off flush with face of wall after masonry wall construction is completed.
- C. Install single-wythe CMU flashing system in bed joints of CMU walls where indicated to comply with manufacturer's written instructions. Install CMU cell pans with upturned edges located below face shells and webs of CMUs above and with weep spouts aligned with face of wall. Install CMU web covers so that they cover upturned edges of CMU cell pans at CMU webs and extend from face shell to face shell.
- D. Install reglets and nailers for flashing and other related construction where they are shown to be built into masonry.

- E. Install weep holes in head joints in exterior wythes of first course of masonry immediately above embedded flashing and as follows:
 - 1. Use specified weep/vent products to form weep holes.
 - 2. Space weep holes 16 inches o.c. unless otherwise indicated.
- F. Place cavity drainage material in cavities per manufacturer's written instructions.

3.13 REINFORCED UNIT MASONRY INSTALLATION

- A. Placing Reinforcement: Comply with requirements in ACI 530.1/ASCE 6/TMS 602.
- B. Grouting: Do not place grout until entire height of masonry to be grouted has attained enough strength to resist grout pressure.
 - 1. Comply with requirements in ACI 530.1/ASCE 6/TMS 602 for cleanouts and for grout placement, including minimum grout space and maximum pour height.
 - 2. Limit height of vertical grout pours to not more than 60 inches.

3.14 FIELD QUALITY CONTROL

- A. Testing and Inspecting: Owner will engage special inspectors to perform tests and inspections and prepare reports. Allow inspectors access to scaffolding and work areas, as needed to perform tests and inspections. Retesting of materials that fail to comply with specified requirements shall be done at Contractor's expense.

3.15 REPAIRING, POINTING, AND CLEANING

- A. Remove and replace masonry units that are loose, chipped, broken, stained, or otherwise damaged or that do not match adjoining units. Install new units to match adjoining units; install in fresh mortar, pointed to eliminate evidence of replacement.
- B. Pointing: During the tooling of joints, enlarge voids and holes, except weep holes, and completely fill with mortar. Point up joints, including corners, openings, and adjacent construction, to provide a neat, uniform appearance. Prepare joints for sealant application, where indicated.
- C. In-Progress Cleaning: Clean unit masonry as work progresses by dry brushing to remove mortar fins and smears before tooling joints.
- D. Final Cleaning: After mortar is thoroughly set and cured, clean exposed masonry as follows:
 - 1. Remove large mortar particles by hand with wooden paddles and nonmetallic scrape hoes or chisels.
 - 2. Test cleaning methods on sample wall panel; leave one-half of panel uncleaned for comparison purposes. Obtain Architect's approval of sample cleaning before proceeding with cleaning of masonry.
 - 3. Protect adjacent stone and non-masonry surfaces from contact with cleaner by covering them with liquid strippable masking agent or polyethylene film and waterproof masking tape.
 - 4. Wet wall surfaces with water before applying cleaners; remove cleaners promptly by rinsing surfaces thoroughly with clear water.
 - 5. Clean masonry with a proprietary acidic cleaner applied according to manufacturer's written instructions.
 - 6. Clean concrete masonry by cleaning method indicated in NCMA TEK 8-2A applicable to type of stain on exposed surfaces.
 - 7. Clean stone trim to comply with stone supplier's written instructions.

3.16 MASONRY WASTE DISPOSAL

- A. Salvageable Materials: Unless otherwise indicated, excess masonry materials are Contractor's property. At completion of unit masonry work, remove from Project site.
- B. Masonry Waste: Dispose of masonry waste legally off Owner's property.

END OF SECTION 042000

SECTION 047200 - CAST STONE MASONRY

PART 1 - GENERAL

1.1 SUMMARY

A. Section Includes:

1. Cast stone trim.
 - a. Window sills.
 - b. Lintels.
 - c. Surrounds.
 - d. Coping.
 - e. Wall caps.
 - f. Belt courses.
 - g. Water tables.
 - h. Quoins.
 - i. Pilasters.
 - j. Column covers.
 - k. Medallions.
2. Cast stone steps.
3. Cast stone bollards.
4. Cast stone benches.
5. Cast stone curbing.

B. Related Sections:

1. Section 034500 "Precast Architectural Concrete."
2. Section 042000 "Unit Masonry" for installing cast stone units in unit masonry.
3. Section 042113 "Brick Masonry" for installing cast stone units in brick masonry

1.2 ACTION SUBMITTALS

A. Product Data: For each type of product indicated.

1. For cast stone units, include construction details, material descriptions, dimensions of individual components and profiles, and finishes.

B. Shop Drawings: Show fabrication and installation details for cast stone units. Include dimensions, details of reinforcement and anchorages if any, and indication of finished faces.

1. Include building elevations showing layout of units and locations of joints and anchors.

C. Samples for Initial Selection: For colored mortar.

D. Samples for Verification:

1. For each color and texture of cast stone required, 10 inches square in size.
2. For colored mortar. Make Samples using same sand and mortar ingredients to be used on Project. Label Samples to indicated types and amounts of pigments used.

E. Full-Size Samples: For each color, texture and shape of cast stone unit required.

1. Make available for Architect's review at Project site.
2. Make Samples from materials to be used for units used on Project.
3. Approved Samples may be installed in the Work.

1.3 INFORMATIONAL SUBMITTALS

A. Qualification Data: For manufacturer and testing agency.

1. Include copies of material test reports for completed projects, indicating compliance of cast stone with ASTM C 1364 using the wet cast method.

B. Material Test Reports: For each mix required to produce cast stone, based on testing according to ASTM C 1364, including test for resistance to freezing and thawing.

1. Provide test reports based on testing within previous two years.

1.4 QUALITY ASSURANCE

A. Manufacturer Qualifications: A qualified manufacturer of cast stone with a minimum of 5 years experience manufacturing units similar to those indicated for this Project, that has sufficient production capacity to manufacture required units, and is a plant certified by the Architectural Precast Association.

B. Testing Agency Qualifications: Qualified according to ASTM E 329 for testing indicated.

C. Source Limitations for Cast Stone: Obtain cast stone units through single source from single manufacturer.

D. Source Limitations for Mortar Materials: Obtain mortar ingredients of a uniform quality, including color, from one manufacturer for each cementitious component and from one source or producer for each aggregate.

E. Mockups: Furnish cast stone for installation in mockups specified in Section 042000 "Unit Masonry."

F. Mockups: Build mockups to verify selections made under sample submittals and to demonstrate aesthetic effects and set quality standards for materials and execution.

1. Build mockup of typical wall area as shown on Drawings.

1.5 DELIVERY, STORAGE, AND HANDLING

A. Coordinate delivery of cast stone with unit masonry work to avoid delaying the Work and to minimize the need for on-site storage.

B. Pack, handle, and ship cast stone units in suitable packs or pallets.

1. Lift with wide-belt slings; do not use wire rope or ropes that might cause staining. Move cast stone units, if required, using dollies with wood supports.
2. Store cast stone units on wood skids or pallets with nonstaining, waterproof covers, securely tied. Arrange to distribute weight evenly and to prevent damage to units. Ventilate under covers to prevent condensation.

C. Store cementitious materials on elevated platforms, under cover, and in a dry location. Do not use cementitious materials that have become damp.

- D. Store mortar aggregates where grading and other required characteristics can be maintained and contamination can be avoided.

1.6 PROJECT CONDITIONS

- A. Cold-Weather Requirements: Do not use frozen materials or materials mixed or coated with ice or frost. Do not build on frozen substrates. Comply with cold-weather construction requirements in ACI 530.1/ASCE 6/TMS 602.
1. Cold-Weather Cleaning: Use liquid cleaning methods only when air temperature is 40 deg F and above and will remain so until cast stone has dried, but no fewer than seven days after completing cleaning.
- B. Hot-Weather Requirements: Comply with hot-weather construction requirements in ACI 530.1/ASCE 6/TMS 602.

PART 2 - PRODUCTS

2.1 CAST STONE MATERIALS

- A. General: Comply with ASTM C 1364 and the following:
1. Compressive Strength shall be 6,500 psi @28 Days according to ASTM C 1194 or 5,000 psi per ASTM C 39.
1. Water absorption not to exceed 6% by dry weight or 10% by boiling water method per ASTM C 1195.
- B. Portland Cement: ASTM C 150, Type I or Type III, containing not more than 0.60 percent total alkali when tested according to ASTM C 114. Provide natural color or white cement as required to produce cast stone color indicated.
- C. Coarse Aggregates: Granite, quartz, or limestone complying with ASTM C 33; gradation and colors as needed to produce required cast stone textures and colors.
- D. Fine Aggregates: Natural sand or crushed stone complying with ASTM C 33, gradation and colors as needed to produce required cast stone textures and colors.
- E. Color Pigment: ASTM C 979, synthetic mineral-oxide pigments or colored water-reducing admixtures; color stable, free of carbon black, nonfading, and resistant to lime and other alkalis.
- F. Admixtures: Use only admixtures specified or approved in writing by Architect.
1. Do not use admixtures that contain more than 0.1 percent water-soluble chloride ions by mass of cementitious materials. Do not use admixtures containing calcium chloride.
2. Use only admixtures that are certified by manufacturer to be compatible with cement and other admixtures used.
3. Air-Entraining Admixture: ASTM C 260. Add to mixes for units exposed to the exterior at manufacturer's prescribed rate to result in an air content of 4 to 6 percent.
4. Water-Reducing Admixture: ASTM C 494/C 494M, Type A, D, E and F.
5. Water-Reducing, Retarding Admixture: ASTM C 494/C 494M, Type D.
6. Water-Reducing, Accelerating Admixture: ASTM C 494/C 494M, Type C and E.
- G. Reinforcement: Deformed steel bars complying with ASTM A 615/A 615M, Grade 60. Use galvanized or epoxy-coated reinforcement when covered with less than 1-1/2 inches of cast stone material.

1. Epoxy Coating: ASTM A 775/A 775M.
 2. Galvanized Coating: ASTM A 767/A 767M.
- H. Embedded Anchors and Other Inserts: Fabricated from [stainless steel complying with ASTM A 240/A 240M, ASTM A 276, or ASTM A 666, Type 304] [steel complying with ASTM A 36/A 36M, and hot-dip galvanized to comply with ASTM A 123/A 123M].

2.2 CAST STONE UNITS

- A. Manufacturers: Subject to compliance with requirements, provide products by one of the following:
1. Southside Precast
 2. American Masonry Supply, Inc.
 3. Architectural Cast Stone, Inc.
- B. Provide cast stone units complying with ASTM C 1364 using the wet-cast method.
1. Provide units that are resistant to freezing and thawing as determined by laboratory testing according to ASTM C 666/C 666M, Procedure A, as modified by ASTM C 1364.
- C. Fabricate units with sharp arris and accurately reproduced details, with indicated texture on all exposed surfaces unless otherwise indicated.
1. Slope exposed horizontal surfaces 1:12 to drain unless otherwise indicated.
 2. Provide raised fillets at backs of sills and at ends indicated to be built into jambs.
 3. Provide drips on projecting elements unless otherwise indicated.
- D. Fabrication Tolerances:
1. Variation in Cross Section: Do not vary from indicated dimensions by more than 1/8 inch.
 2. Variation in Length: Do not vary from indicated dimensions by more than 1/360 of the length of unit or 1/8 inch, whichever is greater, but in no case by more than 1/4 inch.
 3. Warp, Bow, and Twist: Not to exceed 1/360 of the length of unit or 1/8 inch, whichever is greater.
 4. Location of Grooves, False Joints, Holes, Anchorages, and Similar Features: Do not vary from indicated position by more than 1/8 inch on formed surfaces of units and 3/8 inch on unformed surfaces.
- E. Cure units with sufficient protection from moisture evaporation using curing blankets or other approved method to control moisture evaporation.
- F. Acid etch units after curing to remove cement film from surfaces to be exposed to view.
- G. Colors and Textures: [Match Architect's samples] [Match existing units] [As selected by Architect from manufacturer's full range].
- H. Color and Texture: Provide units with fine-grained texture and buff color resembling Indiana limestone.
- I. Color and Texture: Provide units with fine texture and red-brown color resembling brownstone on adjacent buildings.

2.3 MORTAR MATERIALS

- A. Provide mortar materials that comply with Section 042000 "Unit Masonry."

- B. Regional Materials: Aggregate for mortar, cement, and lime shall be manufactured within 500 miles of Project site from materials that have been extracted, harvested, or recovered, as well as manufactured, within 500 miles of Project site.
- C. Portland Cement: ASTM C 150, Type I or II, except Type III may be used for cold-weather construction. Provide natural color or white cement as required to produce mortar color indicated.
- D. Hydrated Lime: ASTM C 207, Type S.
- E. Portland Cement-Lime Mix: Packaged blend of portland cement and hydrated lime containing no other ingredients.
- F. Mortar Pigments: Natural and synthetic iron oxides and chromium oxides, compounded for use in mortar mixes and complying with ASTM C 979. Use only pigments with a record of satisfactory performance in masonry mortar.
 - 1. Products: Subject to compliance with requirements, available products that may be incorporated into the Work include, but are not limited to, the following:
 - a. Davis Colors; True Tone Mortar Colors.
 - b. Lanxess Corporation; Bayferrox Iron Oxide Pigments.
 - c. Solomon Colors, Inc.; SGS Mortar Colors.
- G. Colored Cement Product: Packaged blend made from portland cement and hydrated lime and mortar pigments, all complying with specified requirements and containing no other ingredients.
 - 1. Colored Portland Cement-Lime Mix:
 - a. Products: Subject to compliance with requirements, available products that may be incorporated into the Work include, but are not limited to, the following:
 - 1) Capital Materials Corporation; Riverton Portland Cement Lime Custom Color.
 - 2) Holcim (US) Inc.; Rainbow Mortamix Custom Color Cement/Lime.
 - 3) Lafarge North America Inc.; Eaglebond Portland & Lime.
 - 4) Lehigh Cement Company; Lehigh Custom Color Portland/Lime Cement.
 - 2. Formulate blend as required to produce color indicated or, if not indicated, as selected from manufacturer's standard colors.
 - 3. Pigments shall not exceed 10 percent of portland cement by weight.
 - 4. Pigments shall not exceed 5 percent of masonry cement or mortar cement by weight.
- H. Aggregate for Mortar: ASTM C 144.
 - 1. For mortar that is exposed to view, use washed aggregate consisting of natural sand or crushed stone.
 - 2. For joints less than 1/4 inch thick, use aggregate graded with 100 percent passing the No. 16 sieve.
 - 3. White-Mortar Aggregates: Natural white sand or crushed white stone.
 - 4. Colored-Mortar Aggregates: Natural sand or crushed stone of color necessary to produce required mortar color.
- I. Water: Potable.

2.4 ACCESSORIES

- A. Anchors: Type and size indicated, fabricated from [Type 304 stainless steel complying with ASTM A 240/A 240M, ASTM A 276, or ASTM A 666] [steel complying with ASTM A 36/A 36M, and hot-dip galvanized to comply with ASTM A 123/A 123M].
- B. Dowels: 1/2-inch- diameter, round bars, fabricated from [Type 304 stainless steel complying with ASTM A 240/A 240M, ASTM A 276, or ASTM A 666] [steel complying with ASTM A 36/A 36M, and hot-dip galvanized to comply with ASTM A 123/A 123M].
- C. Proprietary Acidic Cleaner: Manufacturer's standard-strength cleaner designed for removing mortar/grout stains, efflorescence, and other new construction stains from new masonry without discoloring or damaging masonry surfaces. Use product expressly approved for intended use by cast stone manufacturer and expressly approved by cleaner manufacturer for use on cast stone and adjacent masonry materials.
 - 1. Manufacturers: Subject to compliance with requirements, manufacturers offering products that may be incorporated into the Work include, but are not limited to, the following]:
 - a. Diedrich Technologies, Inc.
 - b. EaCo Chem, Inc.
 - c. ProSoCo, Inc.

2.5 MORTAR MIXES

- A. Comply with requirements in Section 042000 "Unit Masonry" for mortar mixes.
- B. Do not use admixtures including pigments, air-entraining agents, accelerators, retarders, water-repellent agents, antifreeze compounds, or other admixtures unless otherwise indicated.
 - 1. Do not use calcium chloride in mortar or grout.
 - 2. Use portland cement-lime mortar unless otherwise indicated.
- C. Comply with ASTM C 270, Proportion Specification.
 - 1. For setting mortar, use Type S and/or Type N based on project specifics.
 - 2. For pointing mortar, use Type N and/or Type O based on project specifics.
- D. Pigmented Mortar: Use colored cement product[or select and proportion pigments with other ingredients to produce color required. Do not add pigments to colored cement products].
 - 1. Pigments shall not exceed 10 percent of portland cement by weight.
 - 2. Mix to match Architect's sample.
 - 3. Application: Use pigmented mortar for exposed mortar joints.
- E. Colored-Aggregate Mortar: Produce required mortar color by using colored aggregates and natural color or white cement as necessary to produce required mortar color.
 - 1. Mix to match Architect's sample.
 - 2. Application: Use colored aggregate mortar for exposed mortar joints.

2.6 SOURCE QUALITY CONTROL

- A. Engage a qualified independent testing agency to sample and test cast stone units according to ASTM C 1364.

1. Include one test for resistance to freezing and thawing from cast stone manufactures previous production within two years of submittal date

PART 3 - EXECUTION

3.1 EXAMINATION

- A. Examine substrates and conditions, with Installer present, for compliance with requirements for installation tolerances and other conditions affecting performance of work.
- B. Proceed with installation only after unsatisfactory conditions have been corrected.

3.2 SETTING CAST STONE IN MORTAR

- A. Install cast stone units to comply with requirements in Section 042000 "Unit Masonry."
- B. Set cast stone as indicated on Drawings. Set units accurately in locations indicated with edges and faces aligned according to established relationships and indicated tolerances.
 1. Install anchors, supports, fasteners, and other attachments indicated or necessary to secure units in place.
 2. Coordinate installation of cast stone with installation of flashing specified in other Sections.
- C. Wet joint surfaces thoroughly before applying mortar or setting in mortar.
- D. Set units in full bed of mortar with full head joints unless otherwise indicated.
 1. Set units with joints 3/8 to 1/2 inch wide unless otherwise indicated.
 2. Build anchors and ties into mortar joints as units are set.
 3. Fill dowel holes and anchor slots with mortar.
 4. Fill collar joints solid as units are set.
 5. Build concealed flashing into mortar joints as units are set.
 6. Keep head joints in coping and other units with exposed horizontal surfaces open to receive sealant.
 7. Keep joints at shelf angles open to receive sealant.
- E. Rake out joints for pointing with mortar to depths of not less than 3/4 inch. Rake joints to uniform depths with square bottoms and clean sides. Scrub faces of units to remove excess mortar as joints are raked.
- F. Point mortar joints by placing and compacting mortar in layers not greater than 3/8 inch. Compact each layer thoroughly and allow it to become thumbprint hard before applying next layer.
- G. Tool exposed joints slightly concave when thumbprint hard, using a jointer larger than joint thickness unless otherwise indicated.
- H. Provide sealant joints at copings and other horizontal surfaces, at expansion, control, and pressure-relieving joints, and at locations indicated.
 1. Keep joints free of mortar and other rigid materials.
 2. Build in compressible foam-plastic joint fillers where indicated.
 3. Form joint of width indicated, but not less than 3/8 inch.
 4. Prime cast stone surfaces to receive sealant and install compressible backer rod in joints before applying sealant unless otherwise indicated.

5. Prepare and apply sealant of type and at locations indicated to comply with applicable requirements in Section 079200 "Joint Sealants."

3.3 SETTING ANCHORED CAST STONE WITH SEALANT-FILLED JOINTS

- A. Set cast stone as indicated on Drawings. Set units accurately in locations indicated with edges and faces aligned according to established relationships and indicated tolerances.
 1. Install anchors, supports, fasteners, and other attachments indicated or necessary to secure units in place.
 2. Shim and adjust anchors, supports, and accessories to set cast stone in locations indicated with uniform joints.
- B. Keep cavities open where unfilled space is indicated between back of cast stone units and backup wall; do not fill cavities with mortar or grout.
- C. Fill anchor holes with sealant.
 1. Where dowel holes occur at pressure-relieving joints, provide compressible material at ends of dowels.
- D. Set cast stone supported on clip or continuous angles on resilient setting shims. Use material of thickness required to maintain uniform joint widths. Hold shims back from face of cast stone a distance at least equal to width of joint.
- E. Keep joints free of mortar and other rigid materials. Remove temporary shims and spacers from joints after anchors and supports are secured in place and cast stone units are anchored. Do not begin sealant installation until temporary shims and spacers are removed.
 1. Form open joint of width indicated, but not less than 3/8 inch.
- F. Prime cast stone surfaces to receive sealant and install compressible backer rod in joints before applying sealant unless otherwise indicated.
- G. Prepare and apply sealant of type and at locations indicated to comply with applicable requirements in Section 079200 "Joint Sealants."

3.4 INSTALLATION TOLERANCES

- A. Variation from Plumb: Do not exceed 1/8 inch in 10 feet, 1/4 inch in 20 feet, or 1/2 inch maximum.
- B. Variation from Level: Do not exceed 1/8 inch in 10 feet, 1/4 inch in 20 feet, or 1/2 inch maximum.
- C. Variation in Joint Width: Do not vary joint thickness more than 1/8 inch in 36 inches or one-fourth of nominal joint width, whichever is less.
- D. Variation in Plane between Adjacent Surfaces (Lipping): Do not vary from flush alignment with adjacent units or adjacent surfaces indicated to be flush with units by more than 1/16 inch, except where variation is due to warpage of units within tolerances specified.

3.5 ADJUSTING AND CLEANING

- A. Remove and replace stained and otherwise damaged units and units not matching approved Samples. Cast stone may be repaired if methods and results are approved by Architect.

- B. Replace units in a manner that results in cast stone matching approved Samples, complying with other requirements, and showing no evidence of replacement.
- C. In-Progress Cleaning: Clean cast stone as work progresses.
 - 1. Remove mortar fins and smears before tooling joints.
 - 2. Remove excess sealant immediately, including spills, smears, and spatter.
- D. Final Cleaning: After mortar is thoroughly set and cured, clean exposed cast stone as follows:
 - 1. Remove large mortar particles by hand with wooden paddles and nonmetallic scrape hoes or chisels.
 - 2. Test cleaning methods on sample; leave one sample uncleaned for comparison purposes. Obtain Architect's approval of sample cleaning before proceeding with cleaning of cast stone.
 - 3. Protect adjacent surfaces from contact with cleaner by covering them with liquid strippable masking agent or polyethylene film and waterproof masking tape.
 - 4. Wet surfaces with water before applying cleaners; remove cleaners promptly by rinsing thoroughly with clear water.
 - 5. Clean cast stone by bucket-and-brush hand-cleaning method described in BIA Technical Notes 20.
 - 6. Clean cast stone with proprietary acidic cleaner applied according to manufacturer's written instructions.

END OF SECTION 047200

SECTION 051200 - STRUCTURAL STEEL FRAMING

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

- A. Drawings and general provisions of the Contract, including General and Supplementary Conditions and Division 01 Specification Sections, apply to this Section.

1.2 SUMMARY

- A. This Section includes the following:
 - 1. Structural steel.
 - 2. Grout.

1.3 DEFINITIONS

- A. Structural Steel: Elements of structural-steel frame, as classified by AISC's "Code of Standard Practice for Steel Buildings and Bridges," that support design loads.

1.4 PERFORMANCE REQUIREMENTS

- A. Connections: Provide details of connections required by the Contract Documents to be selected or completed by structural-steel fabricator to withstand ASD-service loads indicated and comply with other information and restrictions indicated.
 - 1. Select and complete connections using schematic details indicated and AISC's "Manual of Steel Construction – 13th Edition, Allowable Stress Design," Part 9.
 - 2. Engineering Responsibility: Fabricator's responsibilities include using a qualified professional engineer to prepare structural analysis data for structural-steel connections.

1.5 SUBMITTALS

- A. Product Data: For each type of product indicated.
- B. Shop Drawings: Show fabrication of structural-steel components.
 - 1. Include details of cuts, connections, splices, camber, holes, and other pertinent data.
 - 2. Include embedment drawings.
 - 3. Indicate welds by standard AWS symbols, distinguishing between shop and field welds, and show size, length, and type of each weld.
 - 4. Indicate type, size, and length of bolts, distinguishing between shop and field bolts. Identify pretensioned and slip-critical high-strength bolted connections.
 - 5. For structural-steel connections indicated to comply with design loads, include structural analysis data signed and sealed by the qualified professional engineer responsible for their preparation.
- C. Welding certificates.
- D. Qualification Data: For Installer, fabricator, professional engineer and testing agency.
- E. Mill Test Reports: Signed by manufacturers certifying that the following products comply with requirements:
 - 1. Structural steel including chemical and physical properties.
 - 2. Bolts, nuts, and washers including mechanical properties and chemical analysis.
 - 3. Direct-tension indicators.
 - 4. Shop primers.
 - 5. Nonshrink grout.
- F. Source quality-control test reports.

1.6 QUALITY ASSURANCE

- A. Installer Qualifications: A qualified installer who participates in the AISC Quality Certification Program and is designated an AISC-Certified Erector, Category ACSE.
- B. Fabricator Qualifications: A qualified fabricator who participates in the AISC Quality Certification Program and is designated an AISC-Certified Plant, Category STD.
- C. Welding: Qualify procedures and personnel according to AWS D1.1, "Structural Welding Code--Steel."
- D. Comply with applicable provisions of the following specifications and documents:
 - 1. AISC's "Code of Standard Practice for Steel Buildings and Bridges."
 - 2. AISC's "Seismic Provisions for Structural Steel Buildings" and "Supplement No. 2."
 - 3. AISC's "Specification for Structural Steel Buildings--Allowable Stress Design and Plastic Design."
 - 4. AISC's "Specification for the Design of Steel Hollow Structural Sections."
 - 5. AISC's "Specification for Allowable Stress Design of Single-Angle Members."
 - 6. RCSC's "Specification for Structural Joints Using ASTM A 325 or A 490 Bolts."
- E. Preinstallation Conference: Conduct conference at Project site to comply with requirements in Division 01 Section "Project Management and Coordination."

1.7 DELIVERY, STORAGE, AND HANDLING

- A. Store materials to permit easy access for inspection and identification. Keep steel members off ground and spaced by using pallets, dunnage, or other supports and spacers. Protect steel members and packaged materials from erosion and deterioration.
 - 1. Store fasteners in a protected place. Clean and re-lubricate bolts and nuts that become dry or rusty before use.
 - 2. Do not store materials on structure in a manner that might cause distortion, damage, or overload to members or supporting structures. Repair or replace damaged materials or structures as directed.

1.8 COORDINATION

- A. Furnish anchorage items to be embedded in or attached to other construction without delaying the Work. Provide setting diagrams, sheet metal templates, instructions, and directions for installation.

PART 2 - PRODUCTS

2.1 STRUCTURAL-STEEL MATERIALS

- A. W-Shapes: ASTM A 992 and ASTM A 572, Grade 50.
- B. Channels, Angles-Shapes: ASTM A 36.
- C. Plate and Bar: ASTM A 36.
- D. Cold-Formed Hollow Structural Sections: ASTM A 500, Grade B, structural tubing.
- E. Steel Pipe: ASTM A 53, Type E or S, Grade B.
 - 1. Weight Class: Standard.
 - 2. Finish: Black, except where indicated to be galvanized.
- F. Welding Electrodes: Comply with AWS requirements.

2.2 BOLTS, CONNECTORS, AND ANCHORS

- A. High-Strength Bolts, Nuts, and Washers: ASTM A 325, Type 1, heavy hex steel structural bolts; ASTM A 563 heavy hex carbon-steel nuts; and ASTM F 436 hardened carbon-steel washers.
 - 1. Finish: Plain.
 - 2. Direct-Tension Indicators: ASTM F 959, Type 325 compressible-washer type.
 - a. Finish: Plain.
- B. Unheaded Anchor Rods: ASTM A 36.
 - 1. Configuration: Straight.
 - 2. Nuts: ASTM A 563 heavy hex carbon steel.
 - 3. Plate Washers: ASTM A 36 carbon steel.
 - 4. Washers: ASTM F 436 hardened carbon steel.
 - 5. Finish: Plain.
- C. Threaded Rods: ASTM A 36.
 - 1. Nuts: ASTM A 563 heavy hex carbon steel.
 - 2. Washers: ASTM F 436 hardened carbon steel.
 - 3. Finish: Plain.
- D. Clevises and Turnbuckles: ASTM A 108, Grade 1035, cold-finished carbon steel.
- E. Eye Bolts and Nuts: ASTM A 108, Grade 1030, cold-finished carbon steel.
- F. Sleeve Nuts: ASTM A 108, Grade 1018, cold-finished carbon steel.

2.3 PRIMER

- A. Primer: Fabricator's standard lead- and chromate-free, nonasphaltic, rust-inhibiting primer.
- B. Galvanizing Repair Paint: MPI#18, MPI#19, or SSPC-Paint 20.

2.4 GROUT

- A. Nonmetallic, Shrinkage-Resistant Grout: ASTM C 1107, factory-packaged, nonmetallic aggregate grout, noncorrosive, nonstaining, mixed with water to consistency suitable for application and a 30-minute working time.

2.5 FABRICATION

- A. Structural Steel: Fabricate and assemble in shop to greatest extent possible. Fabricate according to AISC's "Code of Standard Practice for Steel Buildings and Bridges" and AISC's "Specification for Structural Steel Buildings--Allowable Stress Design and Plastic Design."
 - 1. Camber structural-steel members where indicated.
 - 2. Identify high-strength structural steel according to ASTM A 6 and maintain markings until structural steel has been erected.
 - 3. Mark and match-mark materials for field assembly.
 - 4. Complete structural-steel assemblies, including welding of units, before starting shop-priming operations.
- B. Thermal Cutting: Perform thermal cutting by machine to greatest extent possible.
 - 1. Plane thermally cut edges to be welded to comply with requirements in AWS D1.1.Bolt Holes: Cut, drill, or punch standard bolt holes perpendicular to metal surfaces.
 - 1. Do not thermally cut bolt holes or enlarge holes by burning.
- D. Finishing: Accurately finish ends of columns and other members transmitting bearing loads.
- E. Cleaning: Clean and prepare steel surfaces that are to remain unpainted according to SSPC-SP 2, "Hand Tool Cleaning."

- F. Holes: Provide holes required for securing other work to structural steel and for passage of other work through steel framing members.
1. Cut, drill, or punch holes perpendicular to steel surfaces.
 2. Base-Plate Holes: Cut, drill, mechanically thermal cut, or punch holes perpendicular to steel surfaces.
 3. Weld threaded nuts to framing and other specialty items indicated to receive other work.

2.6 SHOP CONNECTIONS

- A. High-Strength Bolts: Shop install high-strength bolts according to RCSC's "Specification for Structural Joints Using ASTM A 325 or A 490 Bolts" for type of bolt and type of joint specified.
1. Joint Type: Snug tightened, except slip critical at wind frames and moment connections.
- B. Weld Connections: Comply with AWS D1.1 for welding procedure specifications, tolerances, appearance, and quality of welds and for methods used in correcting welding work.
1. Remove backing bars or runoff tabs, back gouge, and grind steel smooth.
 2. Assemble and weld built-up sections by methods that will maintain true alignment of axes without exceeding tolerances of AISC's "Code of Standard Practice for Steel Buildings and Bridges" for mill material.
 3. Verify that weld sizes, fabrication sequence, and equipment used for architecturally exposed structural steel will limit distortions to allowable tolerances. Prevent weld show-through on exposed steel surfaces.
 - a. Grind butt welds flush.
 - b. Grind or fill exposed fillet welds to smooth profile. Dress exposed welds.

2.7 SHOP PRIMING

- A. Shop prime steel surfaces except the following:
1. Surfaces embedded in concrete or mortar. Extend priming of partially embedded members to a depth of 2 inches.
 2. Surfaces to be field welded.
 3. Surfaces to receive sprayed fire-resistive materials.
 4. Machined or milled surfaces.
- B. Surface Preparation: Clean surfaces to be painted. Remove loose rust and mill scale and spatter, slag, or flux deposits. Prepare surfaces according to the following specifications and standards:
1. SSPC-SP 3, "Power Tool Cleaning."
- C. Priming: Immediately after surface preparation, apply primer according to manufacturer's written instructions and at rate recommended by SSPC to provide a dry film thickness of not less than 1.5 mils and an average thickness of 2.0 mils. Use priming methods that result in full coverage of joints, corners, edges, and exposed surfaces.
1. Stripe paint corners, crevices, bolts, welds, and sharp edges.
 2. Apply two coats of shop paint to inaccessible surfaces after assembly or erection. Change color of second coat to distinguish it from first.

2.8 GALVANIZING

- A. Hot-Dip Galvanized Finish: Apply zinc coating by the hot-dip process to structural steel according to ASTM A 123.
1. Fill vent holes and grind smooth after galvanizing.
 2. Galvanize lintels and shelf angles attached to structural-steel frame and located in exterior walls.

2.9 SOURCE QUALITY CONTROL

- A. Owner will engage an independent testing and inspecting agency to perform shop tests and inspections and prepare test reports.

1. Provide testing agency with access to places where structural-steel work is being fabricated or produced to perform tests and inspections.
2. AISC Quality-Certified Fabricator: Owner will waive testing and inspection.
- B. Correct deficiencies in Work that test reports and inspections indicate does not comply with the Contract Documents.
- C. Bolted Connections: Shop-bolted connections will be tested and inspected according to RCSC's "Specification for Structural Joints Using ASTM A 325 or A 490 Bolts."
- D. Welded Connections: In addition to visual inspection, shop-welded connections will be tested and inspected according to AWS D1.1 and the following inspection procedures, at testing agency's option:
 1. Ultrasonic Inspection: ASTM E 164.
- E. In addition to visual inspection, shop-welded shear connectors will be tested and inspected according to requirements in AWS D1.1 for stud welding and as follows:
 1. Bend tests will be performed if visual inspections reveal either a less-than- continuous 360-degree flash or welding repairs to any shear connector.
 2. Tests will be conducted on additional shear connectors if weld fracture occurs on shear connectors already tested, according to requirements in AWS D1.1.

PART 3 - EXECUTION

3.1 EXAMINATION

- A. Verify elevations of concrete- and masonry-bearing surfaces and locations of anchor rods, bearing plates, and other embedments, with steel erector present, for compliance with requirements.
- B. Proceed with installation only after unsatisfactory conditions have been corrected.

3.2 PREPARATION

- A. Provide temporary shores, guys, braces, and other supports during erection to keep structural steel secure, plumb, and in alignment against temporary construction loads and loads equal in intensity to design loads. Remove temporary supports when permanent structural steel, connections, and bracing are in place, unless otherwise indicated.
 1. Do not remove temporary shoring supporting composite deck construction until cast-in-place concrete has attained its design compressive strength.

3.3 ERECTION

- A. Set structural steel accurately in locations and to elevations indicated and according to AISC's "Code of Standard Practice for Steel Buildings and Bridges" and "Specification for Structural Steel Buildings--Allowable Stress Design and Plastic Design."
- B. Base and Bearing Plates: Clean concrete- and masonry-bearing surfaces of bond-reducing materials and roughen surfaces prior to setting base and bearing plates. Clean bottom surface of base and bearing plates.
 1. Set base and bearing plates for structural members on wedges, shims, or setting nuts as required.
 2. Weld plate washers to top of base plate.
 3. Snug-tighten anchor rods after supported members have been positioned and plumbed. Do not remove wedges or shims but, if protruding, cut off flush with edge of base or bearing plate before packing with grout.

4. Promptly pack grout solidly between bearing surfaces and base or bearing plates so no voids remain. Neatly finish exposed surfaces; protect grout and allow to cure. Comply with manufacturer's written installation instructions for shrinkage-resistant grouts.
- C. Maintain erection tolerances of structural steel within AISC's "Code of Standard Practice for Steel Buildings and Bridges."
- D. Align and adjust various members forming part of complete frame or structure before permanently fastening. Before assembly, clean bearing surfaces and other surfaces that will be in permanent contact with members. Perform necessary adjustments to compensate for discrepancies in elevations and alignment.
 1. Level and plumb individual members of structure.
 2. Make allowances for difference between temperature at time of erection and mean temperature when structure is completed and in service.
- E. Splice members only where indicated.
- F. Do not use thermal cutting during erection unless approved by Architect. Finish thermally cut sections within smoothness limits in AWS D1.1.
- G. Do not enlarge unfair holes in members by burning or using drift pins. Ream holes that must be enlarged to admit bolts.

3.4 FIELD CONNECTIONS

- A. High-Strength Bolts: Install high-strength bolts according to RCSC's "Specification for Structural Joints Using ASTM A 325 or A 490 Bolts" for type of bolt and type of joint specified.
 1. Joint Type: Snug tightened, except slip critical for wind frames and moment connections.
- B. Weld Connections: Comply with AWS D1.1 for welding procedure specifications, tolerances, appearance, and quality of welds and for methods used in correcting welding work.
 1. Comply with AISC's "Code of Standard Practice for Steel Buildings and Bridges" and "Specification for Structural Steel Buildings--Allowable Stress Design and Plastic Design" for bearing, adequacy of temporary connections, alignment, and removal of paint on surfaces adjacent to field welds.
 2. Remove backing bars or runoff tabs, back gouge, and grind steel smooth.
 3. Assemble and weld built-up sections by methods that will maintain true alignment of axes without exceeding tolerances of AISC's "Code of Standard Practice for Steel Buildings and Bridges" for mill material.
 4. Verify that weld sizes, fabrication sequence, and equipment used for architecturally exposed structural steel will limit distortions to allowable tolerances. Prevent weld show-through on exposed steel surfaces.
 - a. Grind butt welds flush.
 - b. Grind or fill exposed fillet welds to smooth profile. Dress exposed welds.

3.5 FIELD QUALITY CONTROL

- A. Testing Agency: Owner will engage a qualified independent testing and inspecting agency to inspect field welds and high-strength bolted connections.
- B. Bolted Connections: Shop-bolted connections will be tested and inspected according to RCSC's "Specification for Structural Joints Using ASTM A 325 or A 490 Bolts."
- C. Welded Connections: Field welds will be visually inspected according to AWS D1.1.
 1. In addition to visual inspection, field welds will be tested according to AWS D1.1 and the following inspection procedures, at testing agency's option:
 - a. Ultrasonic Inspection: ASTM E 164.

- D. In addition to visual inspection, test and inspect field-welded shear connectors according to requirements in AWS D1.1 for stud welding and as follows:
 - 1. Perform bend tests if visual inspections reveal either a less-than- continuous 360-degree flash or welding repairs to any shear connector.
 - 2. Conduct tests on additional shear connectors if weld fracture occurs on shear connectors already tested, according to requirements in AWS D1.1.
- E. Correct deficiencies in Work that test reports and inspections indicate does not comply with the Contract Documents.

3.6 REPAIRS AND PROTECTION

- A. Repair damaged galvanized coatings on galvanized items with galvanized repair paint according to ASTM A 780 and manufacturer's written instructions.
- B. Touchup Painting: After installation, promptly clean, prepare, and prime or reprime field connections, rust spots, and abraded surfaces of prime-painted joists and accessories, bearing plates, and abutting structural steel.
 - 1. Clean and prepare surfaces by SSPC-SP 2 hand-tool cleaning or SSPC-SP 3 power-tool cleaning.
 - 2. Apply a compatible primer of same type as shop primer used on adjacent surfaces.

END OF SECTION 051200

THIS PAGE INTENTIONALLY LEFT BLANK

SECTION 05 3100 - STEEL DECKING

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

- A. Drawings and general provisions of the Contract, including General and Supplementary Conditions and Division 01 Specification Sections, apply to this Section.

1.2 SUMMARY

- A. This Section includes the following:
 - 1. Roof deck.

1.3 SUBMITTALS

- A. Product Data: For each type of deck, accessory, and product indicated.
- B. Shop Drawings: Show layout and types of deck panels, anchorage details, reinforcing channels, pans, cut deck openings, special jointing, accessories, and attachments to other construction.
- C. Product Certificates: For each type of steel deck, signed by product manufacturer.
- D. Welding certificates.
- E. Field quality-control test and inspection reports.
- F. Product Test Reports: Based on evaluation of comprehensive tests performed by a qualified testing agency, indicating that each of the following complies with requirements:
 - 1. Power-actuated mechanical fasteners.
- G. Evaluation Reports: For steel deck, from ICC-ES.

1.4 QUALITY ASSURANCE

- A. Testing Agency Qualifications: An independent agency qualified according to ASTM E 329 for testing indicated.
- B. Welding: Qualify procedures and personnel according to AWS D1.3, "Structural Welding Code - Sheet Steel."
- C. FMG Listing: Provide steel roof deck evaluated by FMG and listed in its "Approval Guide, Building Materials" for Class 1 fire rating and Class 1-90 windstorm ratings.

1.5 DELIVERY, STORAGE, AND HANDLING

- A. Protect steel deck from corrosion, deformation, and other damage during delivery, storage, and handling.
- B. Stack steel deck on platforms or pallets and slope to provide drainage. Protect with a waterproof covering and ventilate to avoid condensation.
 - 1. Protect and ventilate acoustical cellular roof deck with factory-installed insulation to maintain insulation free of moisture.

PART 2 - PRODUCTS

2.1 PERFORMANCE REQUIREMENTS

- A. AISI Specifications: Comply with calculated structural characteristics of steel deck according to AISI's "North American Specification for the Design of Cold-Formed Steel Structural Members."

- B. Fire-Resistance Ratings: Where indicated, provide steel deck units identical to those tested for fire resistance per ASTM E 119 by a testing and inspecting agency acceptable to authorities having jurisdiction.
1. Indicate by design designations of applicable testing and inspecting agency.
 2. Indicate design designations from UL's "fire Resistance Directory" or from the listings of another qualified testing agency

2.2 MANUFACTURERS

- A. Fire-Test-Response Characteristics: Where indicated, provide steel deck units identical to those tested for fire resistance per ASTM E 119 by a testing and inspecting agency acceptable to authorities having jurisdiction.
1. Fire-Resistance Ratings: Indicated by design designations of applicable testing and inspecting agency.
 2. Steel deck units shall be identified with appropriate markings of applicable testing and inspecting agency.
- B. Manufacturers: Subject to compliance with requirements, provide products by one of the following:
1. Steel Deck:
 - a. Consolidated Systems, Inc.
 - b. Nucor Corp.; Vulcraft Division.
 - c. Roof Deck, Inc.
 - d. United Steel Deck, Inc.
 - e. Verco Manufacturing Co.
 - f. Wheeling Corrugating Company; Div. of Wheeling-Pittsburgh Steel Corporation.

2.3 ROOF DECK

- A. Steel Roof Deck: Fabricate panels, without top-flange stiffening grooves, to comply with "SDI Specifications and Commentary for Steel Roof Deck," in SDI Publication No. 31, and with the following:
1. Galvanized Steel Sheet: ASTM A 653, Structural Steel, Grade 33, G60 zinc coating.
 2. Galvanized and Shop-Primed Steel Sheet: ASTM A 653, Structural Steel, Grade 33, G60 zinc coating; cleaned, pretreated, and primed with manufacturer's standard baked-on, rust-inhibitive primer.
 - a. Color: White.
 3. Deck Profile: Type WR, wide rib.
 4. Profile Depth: 1-1/2 inches, unless otherwise indicated.
 5. Design Uncoated-Steel Thickness: 0.0358 inch.
 6. Span Condition: As indicated.
 7. Side Laps: Overlapped.

2.4 ACCESSORIES

- A. General: Provide manufacturer's standard accessory materials for deck that comply with requirements indicated.
- B. Mechanical Fasteners: Corrosion-resistant, low-velocity, power-actuated or pneumatically driven carbon-steel fasteners; or self-drilling, self-threading screws.
- C. Side-Lap Fasteners: Corrosion-resistant, hexagonal washer head; self-drilling, carbon-steel screws, No. 10 minimum diameter.
- D. Flexible Closure Strips: Vulcanized, closed-cell, synthetic rubber.

- E. Miscellaneous Sheet Metal Deck Accessories: Steel sheet, minimum yield strength of 33,000 psi, not less than 0.0359-inch design uncoated thickness, of same material and finish as deck; of profile indicated or required for application.
- F. Piercing Hanger Tabs: Piercing steel sheet hanger attachment devices for use with floor deck.
- G. Weld Washers: Uncoated steel sheet, shaped to fit deck rib, 0.0598 inch thick, with factory-punched hole of 3/8-inch minimum diameter.
- H. Recessed Sump Pans: Single-piece steel sheet, 0.0747 inch thick, of same material and finish as deck, with 3-inch- wide flanges and level recessed pans of 1-1/2-inch minimum depth. For drains, cut holes in the field.
- I. Flat Sump Plate: Single-piece steel sheet, 0.0747 inch thick, of same material and finish as deck. For drains, cut holes in the field.
- J. Galvanizing Repair Paint: SSPC-Paint 20 or MIL-P-21035B, with dry film containing a minimum of 94 percent zinc dust by weight.
- K. Repair Paint: Manufacturer's standard rust-inhibitive primer of same color as primer.

PART 3 - EXECUTION

3.1 EXAMINATION

- A. Examine supporting frame and field conditions for compliance with requirements for installation tolerances and other conditions affecting performance.
- B. Proceed with installation only after unsatisfactory conditions have been corrected.

3.2 INSTALLATION, GENERAL

- A. Install deck panels and accessories according to applicable specifications and commentary in SDI Publication No. 31, manufacturer's written instructions, and requirements in this Section.
- B. Install temporary shoring before placing deck panels, if required to meet deflection limitations.
- C. Locate deck bundles to prevent overloading of supporting members.
- D. Place deck panels on supporting frame and adjust to final position with ends accurately aligned and bearing on supporting frame before being permanently fastened. Do not stretch or contract side-lap interlocks.
 - 1. Align cellular deck panels over full length of cell runs and align cells at ends of abutting panels.
- E. Place deck panels flat and square and fasten to supporting frame without warp or deflection.
- F. Cut and neatly fit deck panels and accessories around openings and other work projecting through or adjacent to deck.
- G. Provide additional reinforcement and closure pieces at openings as required for strength, continuity of deck, and support of other work.
- H. Comply with AWS requirements and procedures for manual shielded metal arc welding, appearance and quality of welds, and methods used for correcting welding work.
- I. Mechanical fasteners may be used in lieu of welding to fasten deck. Locate mechanical fasteners and install according to deck manufacturer's written instructions.

3.3 ROOF-DECK INSTALLATION

- A. Fasten roof-deck panels to steel supporting members by arc spot (puddle) welds of the surface diameter indicated or arc seam welds with an equal perimeter that is not less than 1-1/2 inches long, and as follows:
 - 1. Weld Diameter: 5/8 inch, nominal.
 - 2. Weld Spacing: Weld edge and interior ribs of deck units with a minimum of two welds per deck unit at each support. Space welds 12 inches apart in the field of roof and 6 inches apart in roof corners and perimeter, based on roof-area definitions in FMG Loss Prevention Data Sheet 1-28.
 - 3. Weld Washers: Install weld washers at each weld location.
- B. Side-Lap and Perimeter Edge Fastening: Fasten side laps and perimeter edges of panels between supports, at intervals not exceeding the lesser of 1/2 of the span or 36 inches, and as follows:
 - 1. Mechanically fasten with self-drilling, No. 10 diameter or larger, carbon-steel screws.
 - 2. Fasten with a minimum of 1-1/2-inch- long welds.
- C. End Bearing: Install deck ends over supporting frame with a minimum end bearing of 1-1/2 inches, with end joints as follows:
 - 1. End Joints: Lapped 2 inches minimum.
- D. Roof Sump Pans and Sump Plates: Install over openings provided in roof deck and mechanically fasten flanges to top of deck. Space mechanical fasteners not more than 12 inches apart with at least one fastener at each corner.

3.4 FIELD QUALITY CONTROL

- A. Testing Agency: Owner will engage a qualified independent testing and inspecting agency to perform field tests and inspections and prepare test reports.
- B. Field welds will be subject to inspection.
- C. Testing agency will report inspection results promptly and in writing to Contractor and Architect.
- D. Remove and replace work that does not comply with specified requirements.
- E. Additional inspecting, at Contractor's expense, will be performed to determine compliance of corrected work with specified requirements.

3.5 REPAIRS AND PROTECTION

- A. Galvanizing Repairs: Prepare and repair damaged galvanized coatings on both surfaces of deck with galvanized repair paint according to ASTM A 780 and manufacturer's written instructions.
- B. Repair Painting: Wire brush and clean rust spots, welds, and abraded areas on both surfaces of prime-painted deck immediately after installation, and apply repair paint.
 - 1. Apply repair paint, of same color as adjacent shop-primed deck, to bottom surfaces of deck exposed to view.
 - 2. Wire brushing, cleaning, and repair painting of bottom deck surfaces are included in Division 09 Sections "Exterior Painting" and "Interior Painting."
- C. Provide final protection and maintain conditions to ensure that steel deck is without damage or deterioration at time of Substantial Completion.

END OF SECTION 053100

SECTION 05 5000 - METAL FABRICATIONS

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

- A. Drawings and general provisions of the Contract, including General and Supplementary Conditions and Division 01 Specification Sections, apply to this Section.

1.2 SUMMARY

- A. Section Includes:
1. Steel framing and supports for mechanical and electrical equipment.
 2. Steel framing and supports for applications where framing and supports are not specified in other Sections.
 3. Steel sleeves and base plates.
 4. Miscellaneous steel fabrications not specified in other Sections.
 5. Base plates for spring isolators.
 6. Anchor bolts indicated to be cast into concrete or built into unit masonry, not specified elsewhere.

1.3 PERFORMANCE REQUIREMENTS

- A. Thermal Movements: Allow for thermal movements from ambient and surface temperature changes acting on exterior metal fabrications by preventing buckling, opening of joints, overstressing of components, failure of connections, and other detrimental effects.
1. Temperature Change: 120 deg F (67 deg C), ambient; 180 deg F (100 deg C), material surfaces.

1.4 SUBMITTALS

- A. Product Data: For the following:
1. Paint products.
 2. Grout.
- B. Shop Drawings: Show fabrication and installation details for metal fabrications.
1. Include plans, elevations, sections, and details of metal fabrications and their connections. Show anchorage and accessory items.
- C. Samples for Verification: For each type and finish of extruded nosing.
- D. Welding certificates.

1.5 QUALITY ASSURANCE

- A. Welding Qualifications: Qualify procedures and personnel according to AWS D1.1 "Structural Welding Code - Steel."

1.6 PROJECT CONDITIONS

- A. Field Measurements: Verify actual locations of walls and other construction contiguous with metal fabrications by field measurements before fabrication.

1.7 COORDINATION

- A. Coordinate selection of shop primers with topcoats to be applied over them. Comply with paint and coating manufacturers' written recommendations to ensure that shop primers and topcoats are compatible with one another.

- B. Coordinate installation of anchorages and steel weld plates and angles for casting into concrete. Furnish setting drawings, templates, and directions for installing anchorages, including sleeves, concrete inserts, anchor bolts, and items with integral anchors, that are to be embedded in concrete or masonry. Deliver such items to Project site in time for installation.

PART 2 - PRODUCTS

2.1 METALS, GENERAL

- A. Metal Surfaces, General: Provide materials with smooth, flat surfaces unless otherwise indicated. For metal fabrications exposed to view in the completed Work, provide materials without seam marks, roller marks, rolled trade names, or blemishes.
- B. Steel Plates, Shapes, and Bars: ASTM A 36.
- C. Steel Tubing: ASTM A 500, cold-formed steel tubing.
- D. Steel Pipe: ASTM A 53, standard weight (Schedule 40) unless otherwise indicated.
- E. Slotted Channel Framing: Cold-formed metal box channels (struts) complying with MFMA-4.
1. Size of Channels: 1-5/8 by 1-5/8 inches unless otherwise indicated.
 2. Material: Cold-rolled steel, ASTM A 1008, structural steel, Grade 33; 0.0528-inch minimum thickness; unfinished.
- F. Cast Iron: Either gray iron, ASTM A 48, or malleable iron, ASTM A 47, unless otherwise indicated.

2.2 BOLTS, CONNECTORS, AND ANCHORS

- A. High-Strength Bolts, Nuts, and Washers: ASTM A 325, Type 1, heavy hex steel structural bolts; ASTM A 563 heavy hex carbon-steel nuts; and ASTM F 436 hardened carbon-steel washers.
1. Finish: Plain.
 2. Direct-Tension Indicators: ASTM F 959, Type 325 compressible-washer type.
 - a. Finish: Plain.
- B. High-Strength Bolts, Nuts, and Washers: ASTM A 490, Type 1, heavy hex steel structural bolts; ASTM A 563 heavy hex carbon-steel nuts; and ASTM F 436 hardened carbon-steel washers, plain.
- C. Unheaded Anchor Rods: ASTM A 36.
1. Configuration: Straight.
 2. Nuts: ASTM A 563 heavy hex carbon steel.
 3. Plate Washers: ASTM A 36 carbon steel.
 4. Washers: ASTM F 436 hardened carbon steel.
 5. Finish: Plain.
- D. Threaded Rods: ASTM A 36.
1. Nuts: ASTM A 563 heavy hex carbon steel.
 2. Washers: ASTM F 436 hardened carbon steel.
 3. Finish: Plain.
- E. Clevises and Turnbuckles: ASTM A 108, Grade 1035, cold-finished carbon steel.
- F. Eye Bolts and Nuts: ASTM A 108, Grade 1030, cold-finished carbon steel.
- G. Sleeve Nuts: ASTM A 108, Grade 1018, cold-finished carbon steel.

2.3 GROUT

- A. Nonmetallic, Shrinkage-Resistant Grout: ASTM C 1107, factory-packaged, nonmetallic aggregate grout, noncorrosive, nonstaining, mixed with water to consistency suitable for application and a 30-minute working time.

2.4 NONFERROUS METALS

- A. Aluminum Plate and Sheet: ASTM B 209, Alloy 6061-T6.

2.5 FASTENERS

- A. General: Unless otherwise indicated, provide Type 316 stainless-steel fasteners for exterior use and zinc-plated fasteners with coating complying with ASTM B 633 or ASTM F 1941, Class Fe/Zn 5, at exterior walls. Select fasteners for type, grade, and class required.
 - 1. Provide stainless-steel fasteners for fastening aluminum.
- B. Steel Bolts and Nuts: Regular hexagon-head bolts, ASTM A 307, Grade A; with hex nuts, ASTM A 563; and, where indicated, flat washers.
- C. Stainless-Steel Bolts and Nuts: Regular hexagon-head annealed stainless-steel bolts, ASTM F 593; with hex nuts, ASTM F 594; and, where indicated, flat washers; Alloy Group 2.
- D. Anchor Bolts: ASTM F 1554, Grade 36, of dimensions indicated; with nuts, ASTM A 563; and, where indicated, flat washers.
 - 1. Hot-dip galvanize or provide mechanically deposited, zinc coating where item being fastened is indicated to be galvanized.
- E. Machine Screws: ASME B18.6.3.
- F. Plain Washers: Round, ASME B18.22.1.
- G. Lock Washers: Helical, spring type, ASME B18.21.1.
- H. Anchors, General: Anchors capable of sustaining, without failure, a load equal to six times the load imposed when installed in unit masonry and four times the load imposed when installed in concrete, as determined by testing according to ASTM E 488, conducted by a qualified independent testing agency.
- I. Cast-in-Place Anchors in Concrete: Either threaded type or wedge type unless otherwise indicated; galvanized ferrous castings, either ASTM A 47 malleable iron or ASTM A 27 cast steel. Provide bolts, washers, and shims as needed, all hot-dip galvanized per ASTM F 2329.
- J. Post-Installed Anchors: Chemical anchors.
 - 1. Material for Interior Locations: Carbon-steel components zinc plated to comply with ASTM B 633 or ASTM F 1941, Class Fe/Zn 5, unless otherwise indicated.
 - 2. Material for Exterior Locations and Where Stainless Steel is Indicated: Alloy Group 2 stainless-steel bolts, ASTM F 593, and nuts, ASTM F 594.

2.6 MISCELLANEOUS MATERIALS

- A. Welding Rods and Bare Electrodes: Select according to AWS specifications for metal alloy welded.
- B. Universal Shop Primer: Fast-curing, lead- and chromate-free, universal modified-alkyd primer complying with MPI#79 and compatible with topcoat.
- C. Galvanizing Repair Paint: High-zinc-dust-content paint complying with SSPC-Paint 20 and compatible with paints specified to be used over it.
- D. Bituminous Paint: Cold-applied asphalt emulsion complying with ASTM D 1187.

- E. Nonshrink, Nonmetallic Grout: Factory-packaged, nonstaining, noncorrosive, nongaseous grout complying with ASTM C 1107. Provide grout specifically recommended by manufacturer for interior and exterior applications.
- F. Concrete: Comply with requirements in Division 03 Section "Cast-in-Place Concrete" for normal-weight, air-entrained, concrete with a minimum 28-day compressive strength of 3000 psi.

2.7 FABRICATION, GENERAL

- A. Shop Assembly: Preassemble items in the shop to greatest extent possible. Disassemble units only as necessary for shipping and handling limitations. Use connections that maintain structural value of joined pieces. Clearly mark units for reassembly and coordinated installation.
- B. Cut, drill, and punch metals cleanly and accurately. Remove burrs and ease edges to a radius of approximately 1/32 inch unless otherwise indicated. Remove sharp or rough areas on exposed surfaces.
- C. Form bent-metal corners to smallest radius possible without causing grain separation or otherwise impairing work.
- D. Form exposed work with accurate angles and surfaces and straight edges.
- E. Weld corners and seams continuously to comply with the following:
 - 1. Use materials and methods that minimize distortion and develop strength and corrosion resistance of base metals.
 - 2. Obtain fusion without undercut or overlap.
 - 3. Remove welding flux immediately.
 - 4. At exposed connections, finish exposed welds and surfaces smooth and blended so no roughness shows after finishing and contour of welded surface matches that of adjacent surface.
- F. Form exposed connections with hairline joints, flush and smooth, using concealed fasteners or welds where possible. Where exposed fasteners are required, use Phillips flat-head (countersunk) fasteners unless otherwise indicated. Locate joints where least conspicuous.
- G. Fabricate seams and other connections that will be exposed to weather in a manner to exclude water. Provide weep holes where water may accumulate.
- H. Cut, reinforce, drill, and tap metal fabrications as indicated to receive finish hardware, screws, and similar items.
- I. Provide for anchorage of type indicated; coordinate with supporting structure. Space anchoring devices to secure metal fabrications rigidly in place and to support indicated loads.
 - 1. Where units are indicated to be cast into concrete or built into masonry, equip with integrally welded steel strap anchors, 1/8 by 1-1/2 inches, with a minimum 6-inch embedment and 2-inch hook, not less than 8 inches from ends and corners of units and 24 inches o.c., unless otherwise indicated.

2.8 MISCELLANEOUS FRAMING AND SUPPORTS

- A. General: Provide steel framing and supports not specified in other Sections as needed to complete the Work.
- B. Fabricate units from steel shapes, plates, and bars of welded construction unless otherwise indicated. Fabricate to sizes, shapes, and profiles indicated and as necessary to receive adjacent construction.
 - 1. Fabricate units from slotted channel framing where indicated.
 - 2. Furnish inserts for units installed after concrete is placed.
- C. Galvanize miscellaneous framing and supports where indicated.

2.9 MISCELLANEOUS STEEL TRIM

- A. Unless otherwise indicated, fabricate units from steel shapes, plates, and bars of profiles shown with continuously welded joints and smooth exposed edges. Miter corners and use concealed field splices where possible.
- B. Provide cutouts, fittings, and anchorages as needed to coordinate assembly and installation with other work.
 - 1. Provide with integrally welded steel strap anchors for embedding in concrete or masonry construction.
- C. Galvanize exterior miscellaneous steel trim.

2.10 FINISHES, GENERAL

- A. Comply with NAAMM's "Metal Finishes Manual for Architectural and Metal Products" for recommendations for applying and designating finishes.
- B. Finish metal fabrications after assembly.
- C. Finish exposed surfaces to remove tool and die marks and stretch lines, and to blend into surrounding surface.

2.11 STEEL AND IRON FINISHES

- A. Galvanizing: Hot-dip galvanize items as indicated to comply with ASTM A 153/A 153M for steel and iron hardware and with ASTM A 123/A 123M for other steel and iron products.
 - 1. Do not quench or apply post galvanizing treatments that might interfere with paint adhesion.
- B. Shop prime iron and steel items not indicated to be galvanized unless they are to be embedded in concrete, sprayed-on fireproofing, or masonry, or unless otherwise indicated.
 - 1. Shop prime with universal shop primer unless indicated.
- C. Preparation for Shop Priming: Prepare surfaces to comply with requirements indicated below:
 - 1. Exterior Items: SSPC-SP 6/NACE No. 3, "Commercial Blast Cleaning."
 - 2. Other Items: SSPC-SP 3, "Power Tool Cleaning."
- D. Shop Priming: Apply shop primer to comply with SSPC-PA 1, "Paint Application Specification No. 1: Shop, Field, and Maintenance Painting of Steel," for shop painting.
 - 1. Stripe paint corners, crevices, bolts, welds, and sharp edges.

2.12 ALUMINUM FINISHES

- A. Finish designations prefixed by AA comply with the system established by the Aluminum Association for designating aluminum finishes.
- B. As-Fabricated Finish: AA-M10 (Mechanical Finish: as fabricated, unspecified).

PART 3 - EXECUTION

3.1 INSTALLATION, GENERAL

- A. Cutting, Fitting, and Placement: Perform cutting, drilling, and fitting required for installing metal fabrications. Set metal fabrications accurately in location, alignment, and elevation; with edges and surfaces level, plumb, true, and free of rack; and measured from established lines and levels.
- B. Fit exposed connections accurately together to form hairline joints. Weld connections that are not to be left as exposed joints but cannot be shop welded because of shipping size limitations. Do not weld, cut, or abrade surfaces of exterior units that have been hot-dip galvanized after fabrication and are for bolted or screwed field connections.

- C. Verify elevations of concrete- and masonry-bearing surfaces and locations of anchor rods, bearing plates, and other embedments, with steel erector present, for compliance with requirements.
- D. Base and Bearing Plates: Clean concrete- and masonry-bearing surfaces of bond-reducing materials and roughen surfaces prior to setting base and bearing plates. Clean bottom surface of base and bearing plates.
 - 1. Set base and bearing plates for structural members on wedges, shims, or setting nuts as required.
 - 2. Weld plate washers to top of base plate.
 - 3. Snug-tighten anchor rods after supported members have been positioned and plumbed. Do not remove wedges or shims but, if protruding, cut off flush with edge of base or bearing plate before packing with grout.
 - 4. Promptly pack grout solidly between bearing surfaces and base or bearing plates so no voids remain. Neatly finish exposed surfaces; protect grout and allow to cure. Comply with manufacturer's written installation instructions for shrinkage-resistant grouts.
- E. Field Welding: Comply with the following requirements:
 - 1. Use materials and methods that minimize distortion and develop strength and corrosion resistance of base metals.
 - 2. Obtain fusion without undercut or overlap.
 - 3. Remove welding flux immediately.
 - 4. At exposed connections, finish exposed welds and surfaces smooth and blended so no roughness shows after finishing and contour of welded surface matches that of adjacent surface.
- F. Fastening to In-Place Construction: Provide anchorage devices and fasteners where metal fabrications are required to be fastened to in-place construction. Provide threaded fasteners for use with concrete and masonry inserts, toggle bolts, through bolts, lag screws, wood screws, and other connectors.
- G. Provide temporary bracing or anchors in formwork for items that are to be built into concrete, masonry, or similar construction.
- H. Corrosion Protection: Coat concealed surfaces of aluminum that will come into contact with grout, concrete, masonry, wood, or dissimilar metals with the following:
 - 1. Extruded Aluminum: Two coats of clear lacquer.

3.2 INSTALLING MISCELLANEOUS FRAMING AND SUPPORTS

- A. General: Install framing and supports to comply with requirements of items being supported, including manufacturers' written instructions and requirements indicated on Shop Drawings.
- B. Anchor supports for operable partitions securely to and rigidly brace from building structure.

3.3 ADJUSTING AND CLEANING

- A. Touchup Painting: Immediately after erection, clean field welds, bolted connections, and abraded areas. Paint uncoated and abraded areas with the same material as used for shop painting to comply with SSPC-PA 1 for touching up shop-painted surfaces.
 - 1. Apply by brush or spray to provide a minimum 2.0-mil dry film thickness.
- B. Galvanized Surfaces: Clean field welds, bolted connections, and abraded areas and repair galvanizing to comply with ASTM A 780.

END OF SECTION 05 5000

SECTION 057500 - DECORATIVE FORMED METAL

PART 1 - GENERAL

1.1 SUMMARY

- A. This Section includes the following:
 - 1. Closures and trim.
 - 2. Column covers.
 - 3. Heating-cooling unit enclosures.
 - 4. Lighting coves.
 - 5. Mullion cladding.
 - 6. Pipe system covers.
 - 7. Pockets for window treatment.
 - 8. Window stools.
- B. Related Sections include the following:
 - 1. Division 07 Section "Sheet Metal Roofing" for items made of formed metal for roofing.
 - 2. Division 07 Section "Sheet Metal Flashing and Trim" for items made of formed metal for flashings.
 - 3. Division 07 Section "Roof Specialties" for items made of formed metal for parapets and copings.

1.2 SUBMITTALS

- A. Product Data: For each type of product indicated, including finishes.
- B. Shop Drawings: Detail fabrication and installation of ornamental formed metal. Include plans, elevations, sections, and details of components and their connections. Show anchorage and accessory items.
- C. Coordination Drawings: For ornamental formed-metal elements housing items specified in other Sections. Show dimensions of housed items, including locations of housing penetrations and attachments, and necessary clearances.
- D. Samples for Initial Selection: Manufacturer's color charts consisting of units or sections of units showing the full range of colors, textures, including mechanical finishes, and patterns available for each type of ornamental formed-metal product indicated.
- E. Qualification Data: For fabricator.

1.3 QUALITY ASSURANCE

- A. Fabricator Qualifications: A firm experienced in producing ornamental formed metal similar to that indicated for this Project and with a record of successful in-service performance, as well as sufficient production capacity to produce required units.
- B. Source Limitations: Obtain each ornamental formed-metal item through one source from a single manufacturer.
- C. Welding: Qualify procedures and personnel according to the following:
 - 1. AWS D1.1, "Structural Welding Code - Steel."
 - 2. AWS D1.2, "Structural Welding Code - Aluminum."
 - 3. AWS D1.3, "Structural Welding Code - Sheet Steel."
 - 4. AWS D1.6, "Structural Welding Code - Stainless Steel."

- D. Installer Qualifications: Arrange for installation of ornamental formed metal specified in this Section by the same firm that fabricated it.
- E. Preinstallation Conference: Conduct conference at Project site to comply with requirements in Division 01 Section "Project Management and Coordination."

1.4 DELIVERY, STORAGE, AND HANDLING

- A. Deliver ornamental formed-metal products wrapped in protective coverings and strapped together in suitable packs or in heavy-duty cartons. Remove protective coverings before they stain or bond to finished surfaces.
- B. Store products on elevated platforms in a dry location.

1.5 PROJECT CONDITIONS

- A. Field Measurements: Verify actual locations of walls, columns, beams, and other construction contiguous with ornamental formed metal by field measurements before fabrication and indicate measurements on Shop Drawings.

1.6 COORDINATION

- A. Coordinate installation of anchorages for ornamental formed-metal items. Furnish setting drawings, templates, and directions for installing anchorages, including sleeves, concrete inserts, anchor bolts, and items with integral anchors, that are to be embedded in concrete or masonry. Deliver such items to Project site in time for installation.
- B. Coordinate installation of ornamental formed metal with adjacent construction to ensure that wall assemblies, flashings, trim, and joint sealants, are protected against damage from the effects of weather, age, corrosion, and other causes.

PART 2 - PRODUCTS

2.1 SHEET METAL

- A. General: Provide sheet metal without pitting, seam marks, roller marks, stains, discolorations, or other imperfections where exposed to view on finished units.
- B. Aluminum Sheet: Flat sheet complying with ASTM B 209, alloy and temper recommended by aluminum producer and finisher for type of use and finish indicated, and with not less than strength and durability properties of alloy 5005-H32.
- C. Galvanized Steel Sheet: ASTM A 653, G90 coating, either commercial steel or forming steel.
- D. Steel Sheet: Uncoated, cold-rolled, ASTM A 1008, commercial steel, Type B, exposed or electrolytic zinc-coated, ASTM A 591, with steel sheet substrate complying with ASTM A 1008, commercial steel, exposed.
- E. Stainless-Steel Sheet: ASTM A 240/A 240M or ASTM A 666, Type 316, stretcher-leveled standard of flatness.
- F. Bronze Sheet: ASTM B 36, alloy UNS No. C28000 (muntz metal, 60 percent copper) or alloy UNS No. C23000 (red brass, 85 percent copper).

2.2 MISCELLANEOUS MATERIALS

- A. Sealants, Interior: Nonsag, paintable, nonstaining, latex sealant complying with ASTM C 834; of type and grade required to seal joints in ornamental formed metal; and as recommended in writing by ornamental formed-metal manufacturer.
 - 1. Use sealant that has a VOC content of not more than 250 g/L when calculated according to 40 CFR 59, Subpart D (EPA method 24).
- B. Filler Metal and Electrodes: Provide type and alloy of filler metal and electrodes as recommended by producer of metal to be welded or brazed and as necessary for strength, corrosion resistance, and compatibility in fabricated items.
 - 1. Use filler metals that will match the color of metal being joined and will not cause discoloration.
- C. Fasteners: Use fasteners fabricated from same basic metal and alloy as fastened metal, unless otherwise indicated. Do not use metals that are corrosive or incompatible with materials joined.
 - 1. Provide concealed fasteners for interconnecting ornamental formed-metal items and for attaching them to other work.
- D. Sound-Deadening Materials:
 - 1. Insulation: Unfaced, mineral-fiber blanket insulation complying with ASTM C 665, Type I, and passing ASTM E 136 test.
 - 2. Mastic: Cold-applied asphalt emulsion complying with ASTM D 1187.
- E. Backing Materials: Provided or recommended by ornamental formed-metal manufacturer.
- F. Laminating Adhesive: Compatible with substrate; noncombustible after curing.
 - 1. Contact Adhesive: VOC content of not more than 80 g/L when calculated according to 40 CFR 59, Subpart D (EPA method 24).
 - 2. Metal-to-metal Adhesive: VOC content of not more than 30 g/L when calculated according to 40 CFR 59, Subpart D (EPA method 24).
 - 3. Multi-Purpose Construction Adhesive: VOC content of not more than 70 g/L when calculated according to 40 CFR 59, Subpart D (EPA method 24).
 - 4. Special-Purpose Contact Adhesive (contact adhesive used to bond melamine-covered board, metal, unsupported vinyl, Teflon, ultra-high molecular weight polyethylene, and rubber or wood veneer, 1/16 inch or less in thickness, to any surface): 250 g/L.
- G. Isolation Coating: Manufacturer's standard alkali resistant coating.

2.3 PAINTS AND COATINGS

- A. Shop Primer for Ferrous Metal: Fast-curing, lead- and chromate-free, universal modified-alkyd primer complying with MPI # 79.
- B. Shop Primer for Galvanized Steel: Zinc-dust, zinc-oxide primer formulated for priming zinc-coated steel and for compatibility with finish paint systems indicated; complying with SSPC-Paint 5.
- C. Galvanizing Repair Paint: High-zinc-dust-content paint for reglvanizing welds in steel, complying with SSPC-Paint 20.
- D. Lacquer for Copper Alloys: Clear, waterborne acrylic lacquer specially developed for coating copper products.

2.4 FABRICATION, GENERAL

- A. Shop Assembly: Preassemble ornamental formed-metal items in shop to greatest extent possible to minimize field splicing and assembly. Disassemble units only as necessary for shipping and handling limitations. Clearly mark units for reassembly and coordinated installation.
- B. Coordinate dimensions and attachment methods of ornamental formed-metal items with those of adjoining construction to produce integrated assemblies with closely fitting joints and with edges and surfaces aligned, unless otherwise indicated.
- C. Form metal to profiles indicated, in maximum lengths to minimize joints. Produce flat, flush surfaces without cracking or grain separation at bends. Fold back exposed edges of unsupported sheet metal to form a 1/2-inch- wide hem on the concealed side, or ease edges to a radius of approximately 1/32 inch and support with concealed stiffeners.
- D. Increase metal thickness or reinforce with concealed stiffeners, backing materials, or both, as needed to provide surface flatness equivalent to stretcher-leveled standard of flatness and sufficient strength for indicated use.
 - 1. Support joints with concealed stiffeners as needed to hold exposed faces of adjoining sheets in flush alignment.
- E. Build in straps, plates, and brackets as needed to support and anchor fabricated items to adjoining construction. Reinforce ornamental formed-metal items as needed to attach and support other construction.
- F. Provide support framing, mounting and attachment clips, splice sleeves, fasteners, and accessories needed to install ornamental formed-metal items.
- G. Where welding or brazing is indicated, weld or braze joints and seams continuously. Grind, fill, and dress to produce smooth, flush, exposed surfaces in which joints are not visible after finishing is completed.
 - 1. Use welding and brazing procedures that will blend with and not cause discoloration of metal being joined.

2.5 CLOSURES AND TRIM

- A. Available Manufacturers: Subject to compliance with requirements, manufacturers offering products that may be incorporated into the Work include, but are not limited to, the following:
 - 1. Fry Reglet Corporation.
 - 2. Pittcon Industries.
- B. Form closures and trim from metal of type and thickness indicated below. Fabricate to fit tightly to adjoining construction, with weathertight joints at exterior installations.
 - 1. Aluminum Sheet: 0.063 inch.
 - a. Finish: High-performance organic coating.
 - 2. Galvanized Steel Sheet: 0.052 inch.
 - Finish: High-performance organic coating.
 - 3. Steel Sheet: 0.043 inch.
 - a. Finish: Factory primed and powder coat.
 - 4. Closures and trim may be fabricated from prefinished metal sheet in lieu of finishing after fabrication provided unfinished edges are concealed from view and not exposed to weather.
- C. Conceal fasteners where possible; otherwise, locate where they will be as inconspicuous as possible. Size fasteners to support closures and trim, with fasteners spaced to prevent buckling or waviness in finished surfaces.

- D. Drill and tap holes needed for securing closures and trim to other surfaces.
- E. Miter or cope trim members at corners and reinforce with bent metal splice plates to form tight joints.

2.6 COLUMN COVERS

- A. Available Manufacturers: Subject to compliance with requirements, manufacturers offering products that may be incorporated into the Work include, but are not limited to, the following:
 - 1. ATAS International, Inc.
 - 2. Ceilings Plus, Inc.
 - 3. Copper Sales, Inc.
 - 4. Fry Reglet Corporation.
 - 5. Industrial Louvers, Inc.
 - 6. MM Systems Corporation.
 - 7. Pittcon Industries.
- B. Spackled-Seam Type: Form column covers from 0.125-inch aluminum, rolled to radii indicated. Taper edges of adjoining pieces of column covers, for taping and spackling, to 0.094-inch thickness in approximately 1 inch of width. Punch tapered edges for gypsum board screws at 1/2 inch o.c., and mill grooves in tapered edge to improve bond with joint compound.
 - 1. Support Framing: At vertical joints, provide 1-1/2-by-3-5/8-inch steel channel support posts formed from 0.040-inch galvanized steel.
 - 2. Joint Treatment Materials: Provide joint treatment compounds and reinforcing tape complying with the requirements of Division 09 Section "Gypsum Board."
- C. Snap-Together Type: Form column covers to shapes indicated from metal of type and minimum thickness indicated below. Return vertical edges and bend to form hook that will engage continuous mounting clips.
 - 1. Aluminum Sheet: 0.063 inch.
 - a. Finish: High-performance organic coating.
 - 2. Steel Sheet: 0.053 inch.
 - a. Finish: Powder coat.
 - 3. Stainless-Steel Sheet: 0.050 inch.
 - a. Finish: No. 2B
 - 4. Column covers may be fabricated from prefinished metal sheet in lieu of finishing after fabrication provided unfinished edges are concealed from view.
 - 5. Form returns at vertical joints to provide hairline V-joints.
 - 6. Form returns at vertical joints to provide 1/2-inch wide reveal at joints. Provide snap-in metal filler strips at reveals that leave reveals flush.
 - 7. Form returns at vertical joints to accommodate backer rod and sealant.
 - 8. Fabricate column covers with hairline horizontal V-joints produced by forming returns on mating ends of column cover sections. Locate horizontal joints as indicated.
 - 9. Fabricate column covers without horizontal joints.
 - 10. Fabricate column covers with horizontal butt joints, tightly fitted and backed with a sleeve for field splicing with adhesive.
 - 11. Fabricate column covers with 1/2-inch- wide reveals at horizontal joints produced by forming returns on mating ends of column cover sections. Provide snap-in metal filler strips at reveals matching reveals at vertical joints. Locate horizontal joints as indicated.
 - 12. Fabricate base ring and ceiling ring to match column covers.
 - 13. Fabricate with calk stop/stiffener ring.
 - 14. Apply manufacturer's recommended sound-deadening mastic to backs of column covers.

2.7 HEATING-COOLING UNIT ENCLOSURES

- A. Available Manufacturers: Subject to compliance with requirements, manufacturers offering products that may be incorporated into the Work include, but are not limited to, the following:
 - 1. Airflex Industrial Corp.
 - 2. Architectural Grille; a div. of Giumenta Corp.
 - 3. Arsco Manufacturing Company, Inc.
 - 4. Kees, Inc.
 - 5. Precision Metal Fabricators, Inc.
- B. Fabricate enclosures to withstand 100 lbf/sq. ft. or a concentrated load of 300 lbf on an area of 4 sq. in., whichever produces the greater stress, without exceeding the allowable design working stress of materials involved, including anchors and connections, and without exhibiting permanent deformation in any components.
- C. Fabricate heating-cooling unit enclosures from metal of type and thickness indicated below.
 - 1. Steel Sheet:
 - a. Framing: 0.097 inch.
 - b. Sills and Stools: 0.068 inch.
 - c. Front Panels and Bases: 0.053 inch.
 - d. Concealed Panels and Trim: 0.033 inch.
 - e. Finish: Powder coat.
- D. Weld seams and connections unless otherwise indicated or unless other methods are necessary for access to heating and cooling equipment.
- E. Incorporate stiffeners or laminated backing using noncombustible materials as needed for strength and rigidity.
 - 1. Coat concealed faces of metal panels more than 6 inches wide with a heavy coating of sound-deadening mastic applied at the minimum rate of 20 sq. ft./gal.
- F. Provide louvers and grilles of size, type, and materials indicated.
 - 1. For removable grilles, use modular units with recessed openings formed into surfaces of enclosures and without blank filler panels between grilles, so face panels and stools are continuous. Fabricate removable grilles and openings to precise tolerances to produce well-fitted assemblies free of warp or rattle, with grilles supported continuously along parallel edges and with tops flush with top of enclosure.
- G. Incorporate removable tops and fronts where indicated or needed for access to heating-cooling units and to piping, ductwork, controls, and electrical service, with panels and openings as follows:
 - 1. Fabricate with a fitting tolerance of not less than 1/32 inch and not more than 1/16 inch at each edge, with face of panels flush with adjoining fixed surfaces of enclosure.
 - 2. Form panels for easy removal without interfering with adjoining construction or furniture. Hold panels in place with concealed clips and hardware that prevent warp and rattle.
- H. Incorporate hinged access panels in enclosures for access to heating-cooling unit controls, as either separate elements or integrated with grille openings, as indicated or needed.
- I. Coordinate construction, configuration, and dimensions of enclosures with those of heating-cooling units. Provide support for heating-cooling units and controls where indicated. Provide blind knockouts and supports for piping, ductwork, control lines, electrical conduit, and wiring where indicated or needed.

- J. Locate fixed surfaces of enclosure to coincide precisely with window mullions and partition system terminations. Provide closures at ends of units, at recessed openings in base of units, and at other locations where needed to conceal unfinished wall or floor surfaces, piping, conduit, ductwork, or heating-cooling units.
1. Provide built-in partitions (bulkheads) within enclosures between heating-cooling units, located to coincide with mullions and partition system terminations. Seal partitions to faces of enclosures with compressible gaskets or mastic sealing tape, and cover both sides of partitions with sound-deadening insulation attached to partitions with insulation adhesive.

2.8 LIGHTING COVES

- A. Available Manufacturers: Subject to compliance with requirements, manufacturers offering products that may be incorporated into the Work include, but are not limited to, the following:
1. Fry Reglet Corporation.
 2. Gordon Interior Specialties Division.
 3. MM Systems Corporation.
 4. Pittcon Industries.
- B. Form lighting coves from metal of type and thickness indicated below. Coordinate size of coves, location of cutouts for electrical wiring, and method of attachment to adjoining construction.
1. Aluminum Sheet: **0.063 inch.**
 - a. Finish: Powder coat.
 2. Steel Sheet: **0.043 inch.**
 - a. Finish: Powder coat.
 3. Fabricate light coves with tapered edges for taping and spackling.
 4. Provide factory welded with backplates

2.9 MULLION CLADDING

- A. Available Manufacturers: Subject to compliance with requirements, manufacturers offering products that may be incorporated into the Work include, but are not limited to, the following:
1. Hi-Tech Metals, Inc.
 2. International Metal Works.
 3. KPK Stainless.
 4. Metal Sales & Service, Inc.
 5. Southwest Metalsmiths, Inc.
- B. Form mullion cladding from metal of type and thickness indicated below. Fabricate to fit tightly to adjoining construction.
1. Aluminum Sheet: 0.063 inch.
 - a. Finish: High-performance organic coating
 2. Galvanized Steel Sheet: 0.052 inch.
 - a. Finish: Powder coat
 3. Stainless-Steel Sheet: 0.050 inch.
 - a. Finish: No. 2B

2.10 PIPE SYSTEM COVERS

- A. Available Manufacturers: Subject to compliance with requirements, manufacturers offering products that may be incorporated into the Work include, but are not limited to, the following:
1. Arisco Manufacturing Company, Inc.
 2. Grice Engineering, Inc.

- B. Form pipe system covers from metal of type and thickness indicated below. Coordinate size of covers, location of cutouts for piping, and method of attachment to adjoining construction.
 - 1. Galvanized Steel Sheet: 0.052 inch.
 - a. Finish: Factory primed.
 - 2. Steel Sheet: 0.043 inch.
 - a. Finish: Powder coat.

2.11 POCKETS FOR WINDOW TREATMENT

- A. Form pockets from metal of type and thickness indicated below, with end closures. Coordinate dimensions and attachment methods with window treatment equipment, window frames, ceiling suspension system, and other related construction to produce a coordinated, closely fitting assembly.
 - 1. Aluminum Sheet: 0.063 inch.
 - a. Finish: Powder coat
 - 2. Galvanized Steel Sheet: 0.052 inch.
 - a. Finish: Powder coat
 - 3. Steel Sheet: 0.043 inch.
 - a. Finish: Powder coat
 - 4. Pockets for window treatment may be fabricated from prefinished metal sheet in lieu of finishing after fabrication, provided unfinished edges are concealed from view.
- B. Reinforce pockets for attaching window treatment equipment and hardware, or increase metal thickness.
- C. Divide continuous pockets with built-in partitions located to separate adjoining drapery and blind units, to coincide with window mullions, and to receive filler panels at ends of partitions.

2.12 WINDOW STOOLS

- A. Form window stools from metal of type and thickness indicated below, with end closures.
 - 1. Aluminum Sheet: 0.063 inch.
 - a. Finish: Powder coat
 - 2. Galvanized Steel Sheet: 0.052 inch.
 - a. Finish: Powder coat
 - 3. Stainless-Steel Sheet: 0.050 inch.
 - a. Finish: No. 2B
- B. Weld seams at end closures.
- C. Braze seams at end closures.
- D. Apply sound-deadening mastic to underside of window stools.

2.13 FINISHES, GENERAL

- A. Comply with NAAMM's "Metal Finishes Manual for Architectural and Metal Products" for recommendations for applying and designating finishes.
- B. Comply with SSPC-PA 1, "Paint Application Specification No. 1: Shop, Field, and Maintenance Painting of Steel," for steel sheet finishes.
- C. Complete mechanical finishes of flat sheet metal surfaces before fabrication where possible. After fabrication, finish all joints, bends, abrasions, and other surface blemishes to match sheet finish.

- D. Protect mechanical finishes on exposed surfaces from damage by applying a strippable, temporary protective covering before shipping.
- E. Apply organic and anodic finishes to formed metal after fabrication, unless otherwise indicated.
- F. Appearance of Finished Work: Variations in appearance of abutting or adjacent pieces are acceptable if they are within one-half of the range of approved Samples. Noticeable variations in the same piece are not acceptable. Variations in appearance of other components are acceptable if they are within the range of approved Samples and are assembled or installed to minimize contrast.

2.14 ALUMINUM FINISHES

- A. Finish designations prefixed by AA comply with the system established by the Aluminum Association for designating aluminum finishes.
- B. Class I, Clear Anodic Finish: AA-M12C22A41 (Mechanical Finish: nonspecular as fabricated; Chemical Finish: etched, medium matte; Anodic Coating: Architectural Class I, clear coating 0.018 mm or thicker) complying with AAMA 611.
- C. Class I, Color Anodic Finish: AA-M12C22A42/A44 (Mechanical Finish: nonspecular as fabricated; Chemical Finish: etched, medium matte; Anodic Coating: Architectural Class I, integrally colored or electrolytically deposited color coating 0.018 mm or thicker) complying with AAMA 611.
 - 1. Color: as selected by Architect and Owner
- D. Powder-Coat Finish: Immediately after cleaning and pretreating, apply manufacturer's standard thermosetting polyester or acrylic urethane powder coating with cured-film thickness not less than 1.5 mils. Prepare, treat, and coat metal to comply with resin manufacturer's written instructions.
- E. Siliconized-Polyester Coating: Epoxy primer and silicone-modified, polyester-enamel topcoat; with a dry film thickness of not less than 0.2 mil for primer and 0.8 mil for topcoat. Apply siliconized-polyester coating complying with paint manufacturer's written specifications for cleaning, conversion coating, and painting.
- F. High-Performance Organic Finish (3-Coat Fluoropolymer): AA-C12C40R1x (Chemical Finish: cleaned with inhibited chemicals; Chemical Finish: conversion coatings; Organic Coating: manufacturer's standard 3-coat, thermocured system consisting of specially formulated inhibitive primer, fluoropolymer color coat, and clear fluoropolymer topcoat, with both color coat and clear topcoat containing not less than 70 percent polyvinylidene fluoride resin by weight). Prepare, pretreat, and apply coating to exposed metal surfaces to comply with AAMA 2605 and with coating and resin manufacturers' written instructions.
 - 1. Color and Gloss: As selected by Architect from manufacturer's full range

2.15 GALVANIZED STEEL SHEET FINISHES

- A. Surface Preparation: Clean and prepare surfaces to be painted according to manufacturer's written instructions for each particular substrate condition and as specified.
- B. Surface Preparation: Clean surfaces with nonpetroleum solvent so surfaces are free of oil and other contaminants. After cleaning, apply a conversion coating suited to the organic coating to be applied over it. Clean welds, mechanical connections, and abraded areas, and apply galvanizing repair paint specified below to comply with ASTM A 780.
 - 1. Galvanizing Repair Paint: High-zinc-dust-content paint for regalvanizing welds in steel, complying with SSPC-Paint 20.

- C. Factory Priming for Field-Painted Finish: Where field painting after installation is indicated, apply specified shop primer immediately after cleaning and pretreating.
- D. Powder-Coat Finish: Immediately after cleaning and pretreating, apply manufacturer's standard thermosetting polyester or acrylic urethane powder coating with cured-film thickness not less than 1.5 mils. Prepare, treat, and coat metal to comply with resin manufacturer's written instructions.
- E. Siliconized-Polyester Coating: Immediately after cleaning and pretreating, apply manufacturer's standard epoxy primer and silicone-modified, polyester-enamel topcoat; with a dry film thickness of not less than 0.2 mil for primer and 0.8 mil for topcoat.
 - 1. Color and Gloss: As selected by Architect from manufacturer's full range

2.16 STEEL SHEET FINISHES

- A. Surface Preparation: Clean surfaces to comply with SSPC-SP 1, "Solvent Cleaning," to remove dirt, oil, grease, or other contaminants that could impair paint bond. Remove mill scale and rust, if present, from uncoated steel, complying with SSPC-SP 5/NACE No. 1, "White Metal Blast Cleaning," or SSPC-SP 8, "Pickling."
- B. Pretreatment: Immediately after cleaning, apply a conversion coating of type suited to organic coating applied over it.
- C. Factory Priming for Field-Painted Finish: Immediately after cleaning and pretreating, apply shop primer.
- D. Powder-Coat Finish: Immediately after cleaning and pretreating, apply manufacturer's standard thermosetting polyester or acrylic urethane powder coating with cured-film thickness not less than 1.5 mils. Prepare, treat, and coat metal to comply with resin manufacturer's written instructions.
 - 1. Color and Gloss: As selected by Architect from manufacturer's full range.

2.17 STAINLESS-STEEL FINISHES

- A. Remove tool and die marks and stretch lines or blend into finish.
- B. Grind and polish surfaces to produce uniform, polished finish indicated, free of cross scratches.
 - 1. Run grain of directionally textured finishes with long dimension of each piece.
- C. Bright, Cold-Rolled, Unpolished Finish: No. 2B finish.
- D. Directional Satin Finish: No. 4 finish.
- E. Dull Satin Finish: No. 6 finish.
- F. Satin, Reflective, Directional Polish: No. 7 finish.
- G. Mirrorlike Reflective, Nondirectional Polish: No. 8 finish.
- H. When polishing is completed, passivate and rinse surfaces. Remove embedded foreign matter and leave surfaces chemically clean.

2.18 COPPER-ALLOY FINISHES

- A. Finish designations for copper alloys comply with the system established for designating copper-alloy finish systems defined in NAAMM's "Metal Finishes Manual for Architectural and Metal Products."

- B. Hand-Rubbed Finish, Lacquered: M31-M34-O6x (Mechanical Finish: directionally textured, fine satin; Mechanical Finish: directionally textured, hand rubbed; Coating: clear organic, air drying, as specified below).
 - 1. Clear, Organic Coating: Lacquer specified for copper alloys, applied by air spray in 2 coats per manufacturer's written instructions, with interim drying, to a total thickness of 1 mil.
- C. Statuary Conversion Coating over Satin Finish: M31-C55 (Mechanical Finish: directionally textured, fine satin; Chemical Finish: conversion coating, sulfide).
 - 1. Color: Match Architect's sample.

PART 3 - EXECUTION

3.1 EXAMINATION

- A. Examine substrates, areas, and conditions, with Installer present, for compliance with requirements for installation tolerances and other conditions affecting performance of ornamental formed metal.
 - 1. Proceed with installation only after unsatisfactory conditions have been corrected.

3.2 INSTALLATION

- A. Locate and place ornamental formed-metal items level and plumb and in alignment with adjacent construction.
- B. Use concealed anchorages where possible. Provide brass or lead washers fitted to screws where needed to protect metal surfaces and to make a weathertight connection.
- C. Form tight joints with exposed connections accurately fitted together. Provide reveals and openings for sealants and joint fillers as indicated.
- D. Install concealed gaskets, joint fillers, insulation, sealants, and flashings, as the Work progresses, to make exterior ornamental formed-metal items weatherproof.
- E. Install concealed gaskets, joint fillers, sealants, and insulation, as the Work progresses, to make interior ornamental formed-metal items soundproof or lightproof as applicable to the type of fabrication indicated.
- F. Corrosion Protection: Apply nonmelting/nonmigrating-type bituminous coating or other permanent separation materials on concealed surfaces where metals would otherwise be in direct contact with substrate materials that are incompatible or could result in corrosion or deterioration of either material or finish.
- G. Apply joint treatment at joints of spackled-seam-type metal column covers. Comply with requirements in Division 09 Section "Gypsum Board."

3.3 ADJUSTING

- A. Restore finishes damaged during installation and construction period so no evidence remains of correction work. Return items that cannot be refinished in the field to the shop; make required alterations and refinish entire unit or provide new units.

3.4 PROTECTION

- A. Protect finishes of ornamental formed-metal items from damage during construction period. Remove temporary protective coverings at time of Substantial Completion.

END OF SECTION 057500

SECTION 061053 - MISCELLANEOUS ROUGH CARPENTRY

PART 1 - GENERAL

1.1 SUMMARY

- A. Section Includes:
1. Rooftop equipment bases and support curbs.
 2. Wood blocking, cants, and nailers.
 3. Wood furring and grounds.
 4. Wood sleepers.
 5. Shelving and clothes rods.
 6. Plywood backing panels.
- B. Related Requirements:
1. Division 06 Section "Sheathing."
 2. Division 06 Section "Interior Architectural Woodwork" for wood trim.

1.2 DEFINITIONS

- A. Dimension Lumber: Lumber of 2 inches nominal or greater but less than 5 inches nominal in least dimension.

1.3 ACTION SUBMITTALS

- A. Product Data: For each type of process and factory-fabricated product. Indicate component materials and dimensions and include construction and application details.
1. Include data for wood-preservative treatment from chemical treatment manufacturer and certification by treating plant that treated materials comply with requirements. Indicate type of preservative used and net amount of preservative retained.
 2. Include data for fire-retardant treatment from chemical treatment manufacturer and certification by treating plant that treated materials comply with requirements. Include physical properties of treated materials based on testing by a qualified independent testing agency.
 3. For fire-retardant treatments, include physical properties of treated lumber both before and after exposure to elevated temperatures, based on testing by a qualified independent testing agency according to ASTM D 5664.
 4. For products receiving a waterborne treatment, include statement that moisture content of treated materials was reduced to levels specified before shipment to Project site.
 5. Include copies of warranties from chemical treatment manufacturers for each type of treatment.

1.4 INFORMATIONAL SUBMITTALS

- A. Evaluation Reports: For the following, from ICC-ES:
1. Preservative-treated wood.
 2. Fire-retardant-treated wood.
 3. Power-driven fasteners.
 4. Powder-actuated fasteners.
 5. Expansion anchors.

1.5 DELIVERY, STORAGE, AND HANDLING

- A. Stack lumber flat with spacers beneath and between each bundle to provide air circulation. Protect lumber from weather by covering with waterproof sheeting, securely anchored. Provide for air circulation around stacks and under coverings.

PART 2 - PRODUCTS

2.1 WOOD PRODUCTS, GENERAL

- A. Lumber: DOC PS 20 and applicable rules of grading agencies indicated. If no grading agency is indicated, provide lumber that complies with the applicable rules of any rules-writing agency certified by the ALSC Board of Review. Provide lumber graded by an agency certified by the ALSC Board of Review to inspect and grade lumber under the rules indicated.
 - 1. Factory mark each piece of lumber with grade stamp of grading agency.
 - 2. Where nominal sizes are indicated, provide actual sizes required by DOC PS 20 for moisture content specified. Where actual sizes are indicated, they are minimum dressed sizes for dry lumber.
 - 3. Provide dressed lumber, S4S, unless otherwise indicated.
- B. Maximum Moisture Content of Lumber: 19 percent unless otherwise indicated.

2.2 WOOD-PRESERVATIVE-TREATED MATERIALS

- A. Preservative Treatment by Pressure Process: AWP A U1; Use Category UC2 for interior construction not in contact with the ground, Use Category UC3b for exterior construction not in contact with the ground, and Use Category UC4a for items in contact with the ground.
 - 1. Preservative Chemicals: Acceptable to authorities having jurisdiction and containing no arsenic or chromium.
- B. Kiln-dry lumber after treatment to a maximum moisture content of 19 percent. Do not use material that is warped or does not comply with requirements for untreated material.
- C. Mark lumber with treatment quality mark of an inspection agency approved by the ALSC Board of Review.
- D. Application: Treat items indicated on Drawings, and the following:
 - 1. Wood cants, nailers, curbs, equipment support bases, blocking, stripping, and similar members in connection with roofing, flashing, vapor barriers, and waterproofing.
 - 2. Wood sills, sleepers, blocking, furring, and similar concealed members in contact with masonry or concrete.
 - 3. Wood framing and furring attached directly to the interior of below-grade exterior masonry or concrete walls.
 - 4. Wood floor plates that are installed over concrete slabs-on-grade.

2.3 FIRE-RETARDANT-TREATED MATERIALS

- A. General: Where fire-retardant-treated materials are indicated, use materials complying with requirements in this article, that are acceptable to authorities having jurisdiction, and with fire-test-response characteristics specified as determined by testing identical products per test method indicated by a qualified testing agency.
- B. Fire-Retardant-Treated Lumber and Plywood by Pressure Process: Products with a flame spread index of 25 or less when tested according to ASTM E 84, and with no evidence of significant progressive combustion when the test is extended an additional 20 minutes, and with the flame

front not extending more than 10.5 feet beyond the centerline of the burners at any time during the test.

1. Use treatment that does not promote corrosion of metal fasteners.
 2. Use Interior Type A unless otherwise indicated.
- C. Kiln-dry lumber after treatment to a maximum moisture content of 19 percent. Kiln-dry plywood after treatment to a maximum moisture content of 15 percent.
- D. Identify fire-retardant-treated wood with appropriate classification marking of testing and inspecting agency acceptable to authorities having jurisdiction.
- E. Application: Treat items indicated on Drawings, and the following:
1. Framing for raised platforms.
 2. Concealed blocking.
 3. Plywood backing panels.

2.4 MISCELLANEOUS LUMBER

- A. General: Provide miscellaneous lumber indicated and lumber for support or attachment of other construction, including the following:
1. Blocking.
 2. Nailers.
 3. Rooftop equipment bases and support curbs.
 4. Cants.
 5. Furring.
 6. Grounds.
 7. Utility shelving.
- B. For items of dimension lumber size, provide Construction or No. 2 grade lumber and any of the following species:
1. Northern species; NLGA.
 2. Eastern softwoods; NeLMA.
- C. For blocking and nailers used for attachment of other construction, select and cut lumber to eliminate knots and other defects that will interfere with attachment of other work.
- D. For furring strips for installing plywood or hardboard paneling, select boards with no knots capable of producing bent-over nails and damage to paneling.

2.5 SHELVING AND CLOTHES RODS

- A. Shelving: Made from one of the following materials, 3/4-inch thick.
1. Melamine-faced particleboard with radiused and filled front edge.
 2. Wood boards of solid lumber, Finish Grade eastern white pine; NeLMA or NLGA.
- B. Shelf Cleats: 3/4-by-5-1/2-inch boards with hole and notch to receive clothes rods, either finger-jointed or solid lumber, of Finish Grade eastern white pine; NeLMA or NLGA.
- C. Shelf Brackets: Prime-painted formed steel with provision to support clothes rod where rod is indicated.
- D. Clothes Rods: 1-1/2-inch- diameter, clear, kiln-dried hardwood rods.

2.6 PLYWOOD BACKING PANELS

- A. Equipment Backing Panels: DOC PS 1, Exposure 1, C-D Plugged, fire-retardant treated, in thickness indicated or, if not indicated, not less than 3/4-inch nominal thickness.

2.7 FASTENERS

- A. General: Provide fasteners of size and type indicated that comply with requirements specified in this article for material and manufacture.
 - 1. Where carpentry is exposed to weather, in ground contact, pressure-preservative treated, or in area of high relative humidity, provide fasteners of Type 304 stainless steel.
- B. Nails, Brads, and Staples: ASTM F 1667.
- C. Power-Driven Fasteners: NES NER-272.
- D. Wood Screws: ASME B18.6.1.
- E. Screws for Fastening to Metal Framing: ASTM C 1002 for non-load-bearing metal framing, and ASTM C 954 cold-formed metal framing as applicable, in length as recommended by screw manufacturer for material being fastened.
- F. Lag Bolts: ASME B18.2.1.
- G. Bolts: Steel bolts complying with ASTM A 307, Grade A; with ASTM A 563 hex nuts and, where indicated, flat washers.
- H. Expansion Anchors: Anchor bolt and sleeve assembly of material indicated below with capability to sustain, without failure, a load equal to 6 times the load imposed when installed in unit masonry assemblies and equal to 4 times the load imposed when installed in concrete as determined by testing per ASTM E 488 conducted by a qualified independent testing and inspecting agency.
 - 1. Material: Stainless steel with bolts and nuts complying with ASTM F 593 and ASTM F 594, Alloy Group 1 or 2.

2.8 MISCELLANEOUS MATERIALS

- A. Adhesives for Gluing Furring and Sleepers to Concrete or Masonry: Formulation complying with ASTM D 3498 that is approved for use indicated by adhesive manufacturer.
- B. Flexible Flashing: Composite, self-adhesive, flashing product consisting of a pliable, rubberized-asphalt compound, bonded to a high-density polyethylene film, aluminum foil, or spunbonded polyolefin to produce an overall thickness of not less than 0.025 inch.
 - 1. Use as a separator between preservative-treated wood and metal decking.

PART 3 - EXECUTION

3.1 INSTALLATION, GENERAL

- A. Set carpentry to required levels and lines, with members plumb, true to line, cut, and fitted. Fit carpentry to other construction; scribe and cope as needed for accurate fit. Locate furring, nailers, blocking, and similar supports to comply with requirements for attaching other construction.
- B. Where wood-preservative-treated lumber is installed adjacent to metal decking or metal framing, install continuous flexible flashing separator between wood and metal.
- C. Install plywood backing panels by fastening to studs; coordinate locations with utilities requiring backing panels. Install fire-retardant treated plywood backing panels with classification marking of testing agency exposed to view.
- D. Provide blocking and framing as indicated and as required to support facing materials, fixtures, specialty items, and trim.

1. Provide metal clips for fastening gypsum board or lath at corners and intersections where framing or blocking does not provide a surface for fastening edges of panels. Space clips not more than 16 inches o.c.
- E. Sort and select lumber so that natural characteristics will not interfere with installation or with fastening other materials to lumber. Do not use materials with defects that interfere with function of member or pieces that are too small to use with minimum number of joints or optimum joint arrangement.
- F. Comply with AWWA M4 for applying field treatment to cut surfaces of preservative-treated lumber.
 1. Use inorganic boron for items that are continuously protected from liquid water.
 2. Use copper naphthenate for items not continuously protected from liquid water.
- G. Securely attach carpentry work to substrate by anchoring and fastening as indicated, complying with the following:
 1. Table 2304.9.1, "Fastening Schedule," in Building Code of New York State.
 2. NES NER-272 for power-driven fasteners.
- H. Use steel common nails unless otherwise indicated. Select fasteners of size that will not fully penetrate members where opposite side will be exposed to view or will receive finish materials. Make tight connections between members. Install fasteners without splitting wood. Drive nails snug but do not countersink nail heads unless otherwise indicated.

3.2 WOOD BLOCKING AND NAILER INSTALLATION

- A. Install where indicated and where required for attaching other work. Form to shapes indicated and cut as required for true line and level of attached work. Coordinate locations with other work involved.
- B. Attach items to substrates to support applied loading. Recess bolts and nuts flush with surfaces unless otherwise indicated.
- C. Provide permanent grounds of dressed, pressure-preservative-treated, key-beveled lumber not less than 1-1/2 inches wide and of thickness required to bring face of ground to exact thickness of finish material. Remove temporary grounds when no longer required.

3.3 WOOD FURRING INSTALLATION

- A. Install level and plumb with closure strips at edges and openings. Shim with wood as required for tolerance of finish work.
- B. Furring to Receive Plywood or Hardboard Paneling: Install 1-by-3-inch nominal-size furring horizontally and vertically at 24 inches o.c.
- C. Furring to Receive Gypsum Board or Plaster Lath: Install 1-by-2-inch nominal-size furring vertically at 16 inches o.c.

3.4 PROTECTION

- A. Protect wood that has been treated with inorganic boron (SBX) from weather. If, despite protection, inorganic boron-treated wood becomes wet, apply EPA-registered borate treatment. Apply borate solution by spraying to comply with EPA-registered label.

- B. Protect miscellaneous rough carpentry from weather. If, despite protection, miscellaneous rough carpentry becomes wet, apply EPA-registered borate treatment. Apply borate solution by spraying to comply with EPA-registered label.

END OF SECTION 061053

SECTION 061600 - SHEATHING

PART 1 - GENERAL

1.1 SUMMARY

- A. Section Includes:
 - 1. Wall sheathing.
 - 2. Roof sheathing.

1.2 ACTION SUBMITTALS

- A. Product Data: For each type of process and factory-fabricated product. Indicate component materials and dimensions and include construction and application details.

1.3 DELIVERY, STORAGE, AND HANDLING

- A. Stack panels flat with spacers beneath and between each bundle to provide air circulation. Protect sheathing from weather by covering with waterproof sheeting, securely anchored. Provide for air circulation around stacks and under coverings.

PART 2 - PRODUCTS

2.1 PERFORMANCE REQUIREMENTS

- A. Fire-Test-Response Characteristics: For assemblies with fire-resistance ratings, provide materials and construction identical to those of assemblies tested for fire resistance per ASTM E 119 by a testing and inspecting agency acceptable to authorities having jurisdiction.
 - 1. Fire-Resistance Ratings: Indicated by design designations from UL's "Fire Resistance Directory."

2.2 WOOD PANEL PRODUCTS

- A. Plywood: DOC PS 1.
- B. Thickness: As needed to comply with requirements specified, but not less than thickness indicated.

2.3 WALL SHEATHING

- A. Plywood Wall Sheathing: Exterior, Structural I sheathing, fire-retardant.
- B. Span Rating: Not less than 24/0.
- C. Nominal Thickness: 5/8 inch.

2.4 ROOF SHEATHING

- A. Plywood Roof Sheathing: Exterior, Structural I sheathing.
 - 1. Span Rating: Not less than 24/0.
 - 2. Nominal Thickness: 5/8 inch.

2.5 WATER RESISTIVE BARRIER

- A. No. 15 asphalt felt complying with ASTM D226 for Type 1 felt.

2.6 FASTENERS

- A. General: Provide fasteners of size and type indicated that comply with requirements specified in this article for material and manufacture.
- B. Nails, Brads, and Staples: ASTM F 1667.
- C. Power-Driven Fasteners: NES NER-272.
- D. Wood Screws: ASME B18.6.1.

PART 3 - EXECUTION

3.1 INSTALLATION, GENERAL

- A. Do not use materials with defects that impair quality of sheathing or pieces that are too small to use with minimum number of joints or optimum joint arrangement. Arrange joints so that pieces do not span between fewer than three support members.
- B. Cut panels at penetrations, edges, and other obstructions of work; fit tightly against abutting construction unless otherwise indicated.
- C. Securely attach to substrate by fastening as indicated, complying with the following:
 - 1. Table 2304.9.1, "Fastening Schedule," in Building Code of New York State."
 - 2. NES NER-272 for power-driven fasteners.
- D. Use common wire nails unless otherwise indicated. Select fasteners of size that will not fully penetrate members where opposite side will be exposed to view or will receive finish materials. Make tight connections. Install fasteners without splitting wood.
- E. Coordinate wall and roof sheathing installation with flashing and joint-sealant installation so these materials are installed in sequence and manner that prevent exterior moisture from passing through completed assembly.
- F. Do not bridge building expansion joints; cut and space edges of panels to match spacing of structural support elements.
- G. Coordinate sheathing installation with installation of materials installed over sheathing so sheathing is not exposed to precipitation or left exposed at end of the workday when rain is forecast.

3.2 WOOD STRUCTURAL PANEL INSTALLATION

- A. General: Comply with applicable recommendations in APA Form No. E30, "Engineered Wood Construction Guide," for types of structural-use panels and applications indicated.
- B. Fastening Methods: Fasten panels as indicated below:
 - 1. Wall and Roof Sheathing:
 - a. Screw to cold-formed metal framing.
 - b. Space panels 1/8 inch apart at edges and ends.

END OF SECTION 061600

SECTION 062013 - EXTERIOR FINISH CARPENTRY

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

- A. Drawings and general provisions of the Contract, including General and Supplementary Conditions and Division 01 Specification Sections, apply to this Section.

1.2 SUMMARY

- A. Section Includes:
 - 1. Exterior Cellular PVC trim.
- B. Related Requirements:
 - 1. Section 06 1053 "Miscellaneous Rough Carpentry" for furring, blocking, and other carpentry work not exposed to view.

1.3 DEFINITIONS

- A. MDO: Plywood with a medium-density overlay on the face.
- B. PVC: Polyvinyl chloride.

1.4 ACTION SUBMITTALS

- A. Product Data: For each type of process and factory-fabricated product. Indicate component materials, dimensions, profiles, textures, and colors and include construction and application details.
 - 1. Include data for wood-preservative treatment from chemical-treatment manufacturer and certification by treating plant that treated materials comply with requirements. Indicate type of preservative used and net amount of preservative retained. Include chemical-treatment manufacturer's written instructions for finishing treated material.
 - 2. For products receiving a waterborne treatment, include statement that moisture content of treated materials was reduced before shipment to Project site to levels specified.
- B. Samples: For each exposed product and for each color and texture specified.
- C. Samples for Initial Selection: For each type of product involving selection of colors, profiles, or textures.
- D. Samples for Verification:
 - 1. For cellular PVC trim, with half of exposed surface finished; 50 sq. in. (300 sq. cm).

1.5 INFORMATIONAL SUBMITTALS

A. Compliance Certificates:

1. For lumber that is not marked with grade stamp.
2. For preservative-treated wood that is not marked with treatment-quality mark.

B. Evaluation Reports: For the following, from ICC-ES:

1. Wood-preservative-treated wood.
2. Cellular PVC trim.
3. Foam-plastic moldings.

C. Sample Warranties: For manufacturer's warranties.

1.6 DELIVERY, STORAGE, AND HANDLING

A. Stack lumber, plywood, and other panels flat with spacers between each bundle to provide air circulation.

1. Protect materials from weather by covering with waterproof sheeting, securely anchored.
2. Provide for air circulation around stacks and under coverings.

1.7 FIELD CONDITIONS

A. Weather Limitations: Proceed with installation only when existing and forecast weather conditions permit work to be performed and at least one coat of specified finish can be applied without exposure to rain, snow, or dampness.

B. Do not install finish carpentry materials that are wet, moisture damaged, or mold damaged.

1. Indications that materials are wet or moisture damaged include, but are not limited to, discoloration, sagging, or irregular shape.
2. Indications that materials are mold damaged include, but are not limited to, fuzzy or splotchy surface contamination and discoloration.

1.8 WARRANTY

A. Manufacturer's Warranty for Cellular PVC Siding Soffits, Fascia and Trim: Manufacturer agrees to repair or replace components that fail in materials or workmanship within specified warranty period.

1. Failures include, but are not limited to, deformation or deterioration beyond normal weathering.
2. Warranty Period for Cellular PVC Siding Soffits, Fascia and Trim: 25 years from date of Substantial Completion.

PART 2 - PRODUCTS

2.1 EXTERIOR TRIM

- A. Cellular PVC Trim: Extruded, expanded PVC with a small-cell microstructure, recommended by manufacturer for exterior use, made from UV- and heat-stabilized rigid material.
1. Manufacturers: Subject to compliance with requirements, provide products by one of the following:
 - a. CertainTeed Corporation.
 - b. CPG Building Products LLC.
 - c. Gossen Corporation.
 - d. Kleer Lumber, LLC.
 - e. Kommerling USA, Inc.
 - f. Plasticlad, LLC.
 - g. Ply-Trim, Inc.
 - h. Royal Mouldings Limited.
 - i. Versatex Trimboard; a Wolfpac Technologies, Inc. company.
 - j. Vi-Lux Plastics Inc.
 2. Density: Not less than 31 lb/cu. ft. (500 kg/cu. m).
 3. Heat Deflection Temperature: Not less than 130 deg F (54 deg C), according to ASTM D 648.
 4. Coefficient of Thermal Expansion: Not more than 4.5 x 10(-5) inches/inch x deg F (8.1 x 10(-5) mm/mm x deg C).
 5. Water Absorption: Not more than 1 percent, according to ASTM D 570.
 6. Flame-Spread Index: 75 or less, according to ASTM E 84.

2.2 MISCELLANEOUS MATERIALS

- A. Adhesive for Cellular PVC Trim: Product recommended by trim manufacturer.
- B. Flashing: Comply with requirements in Section 07 6200 "Sheet Metal Flashing and Trim" for flashing materials installed in exterior finish carpentry.
1. Horizontal Joint Flashing for Panel Siding: Preformed, aluminum, Z-shaped flashing.
- C. Sealants: Latex, complying with ASTM C 834 Type OP, Grade NF and applicable requirements in Section 07 9200 "Joint Sealants," and recommended by sealant and substrate manufacturers for intended application.

PART 3 - EXECUTION

3.1 EXAMINATION

- A. Examine substrates, with Installer present, for compliance with requirements for installation tolerances and other conditions affecting performance of the Work.

- B. Examine finish carpentry materials before installation. Reject materials that are wet, moisture damaged, and mold damaged.
- C. Proceed with installation only after unsatisfactory conditions have been corrected.

3.2 PREPARATION

- A. Clean substrates of projections and substances detrimental to application.
- B. Prime lumber and moldings to be painted, including both faces and edges, unless factory primed.
 - 1. Cut to required lengths and prime ends.

3.3 INSTALLATION, GENERAL

- A. Do not use materials that are unsound, warped, improperly treated or finished, inadequately seasoned, or too small to fabricate with proper jointing arrangements.
 - 1. Do not use manufactured units with defective surfaces, sizes, or patterns.
- B. Install exterior finish carpentry level, plumb, true, and aligned with adjacent materials.
 - 1. Use concealed shims where necessary for alignment.
 - 2. Scribe and cut exterior finish carpentry to fit adjoining work.
 - 3. Refinish and seal cuts as recommended by manufacturer.
 - 4. Install to tolerance of 1/8 inch in 96 inches (3 mm in 2438 mm) for level and plumb. Install adjoining exterior finish carpentry with 1/32-inch (0.8-mm) maximum offset for flush installation and 1/16-inch (1.5-mm) maximum offset for reveal installation.
 - 5. Coordinate exterior finish carpentry with materials and systems in or adjacent to it.
 - 6. Provide cutouts for mechanical and electrical items that penetrate exterior finish carpentry.

3.4 STANDING AND RUNNING TRIM INSTALLATION

- A. Install cellular PVC trim to comply with manufacturer's written instructions.
- B. Install trim with minimum number of joints as is practical, using full-length pieces from maximum lengths of lumber available. Do not use pieces less than 24 inches (610 mm) long, except where necessary.
 - 1. Use scarf joints for end-to-end joints.
 - 2. Stagger end joints in adjacent and related members.
- C. Fit exterior joints to exclude water.
 - 1. Cope at returns and miter at corners to produce tight-fitting joints, with full-surface contact throughout length of joint.

2. Plane backs of casings to provide uniform thickness across joints, where necessary for alignment.

- D. Where face fastening is unavoidable, countersink fasteners, fill surface flush, and sand unless otherwise indicated.

3.5 SIDING INSTALLATION

- A. Install siding to comply with manufacturer's written instructions and warranty requirements.

- B. PVC Siding:

1. Install hardboard siding to comply with manufacturer's written instructions.
2. Install panels with edges over framing or blocking.
3. Leave 3/16-inch (5-mm) gap at perimeter, openings, and horizontal panel joints unless otherwise recommended by panel manufacturer.
4. Seal butt joints at inside and outside corners and at trim locations.
5. Install continuous metal flashing at horizontal panel joints.
6. Apply battens and corner trim as indicated.
7. Conceal fasteners to greatest practical extent by placing in grooves of siding pattern or by concealing with applied trim or battens as detailed.

- C. Flashing: Install metal flashing as indicated on Drawings and as recommended by siding manufacturer.

- D. Finish: Apply finish within two weeks of installation.

3.6 ADJUSTING

- A. Replace exterior finish carpentry that is damaged or does not comply with requirements.

1. Exterior finish carpentry may be repaired or refinished if work complies with requirements and shows no evidence of repair or refinishing.

- B. Adjust joinery for uniform appearance.

3.7 CLEANING

- A. Clean exterior finish carpentry on exposed and semiexposed surfaces.

- B. Touch up factory-applied finishes to restore damaged or soiled areas.

3.8 PROTECTION

- A. Protect installed products from damage from weather and other causes during construction.

- B. Remove and replace finish carpentry materials that are wet, moisture damaged, and mold damaged.

1. Indications that materials are wet or moisture damaged include, but are not limited to, discoloration, sagging, or irregular shape.
2. Indications that materials are mold damaged include, but are not limited to, fuzzy or splotchy surface contamination and discoloration.

END OF SECTION 062013

SECTION 064116 - PLASTIC-LAMINATE-CLAD ARCHITECTURAL CABINETS

PART 1 - GENERAL

1.1 SUMMARY

A. Section Includes:

1. Plastic-laminate-clad architectural cabinets.

B. Related Requirements:

1. Section 061053 "Miscellaneous Rough Carpentry" for wood furring, blocking, shims, and hanging strips required for installing cabinets that are concealed within other construction before cabinet installation.
2. Section 123623.13 "Plastic-Laminate-Clad Countertops."

1.2 COORDINATION

- A. Coordinate sizes and locations of framing, blocking, furring, reinforcements, and other related units of Work specified in other Sections to support loads imposed by installed and fully loaded cabinets.

1.3 PREINSTALLATION MEETINGS

- A. Pre-installation Conference: Conduct conference at Project site.

1.4 ACTION SUBMITTALS

- A. Product Data: For each type of product.

1. Include data for fire-retardant treatment from chemical-treatment manufacturer and certification by treating plant that treated materials comply with requirements.
- 2.

- B. Shop Drawings:

1. Include plans, elevations, sections, and attachment details.
2. Show locations and sizes of furring, blocking, and hanging strips, including concealed blocking and reinforcement specified in other Sections.
3. Show locations and sizes of cutouts and holes for items installed in plastic-laminate architectural cabinets.

- C. Samples: For each exposed product and for each color and texture specified, in manufacturer's or manufacturer's standard size.

- D. Samples for Initial Selection: For each type of exposed finish.

- E. Samples for Verification: For the following:

1. Corner Pieces:

- a. Cabinet-front frame joints between stiles and rails and at exposed end pieces, 18 inches high by 18 inches wide by 6 inches deep.
- b. Miter joints for standing trim.

1.5 INFORMATIONAL SUBMITTALS

- A. Qualification Data: For manufacturer
- B. Product Certificates: For each type of product.
- C. Evaluation Reports: For fire-retardant-treated materials, from ICC-ES.

1.6 QUALITY ASSURANCE

- A. Mockups: Build mockups to verify selections made under Sample submittals, to demonstrate aesthetic effects, and to set quality standards for materials and execution.
 - 1. Build mockups of typical architectural cabinets as shown on Drawings.
 - 2. Subject to compliance with requirements, approved mockups may become part of the completed Work if undisturbed at time of Substantial Completion.

1.7 DELIVERY, STORAGE, AND HANDLING

- A. Do not deliver cabinets until painting and similar finish operations that might damage architectural cabinets have been completed in installation areas. Store cabinets in installation areas or in areas where environmental conditions comply with requirements specified in "Field Conditions" Article.

1.8 FIELD CONDITIONS

- A. Environmental Limitations: Do not deliver or install cabinets until building is enclosed, wet-work is complete, and HVAC system is operating and maintaining temperature and relative humidity at levels planned for building occupants during the remainder of the construction period.
- B. Field Measurements: Where cabinets are indicated to fit to other construction, verify dimensions of other construction by field measurements before fabrication, and indicate measurements on Shop Drawings. Coordinate fabrication schedule with construction progress to avoid delaying the Work.
 - 1. Locate concealed framing, blocking, and reinforcements that support cabinets by field measurements before being enclosed/concealed by construction, and indicate measurements on Shop Drawings.
- C. Established Dimensions: Where cabinets are indicated to fit to other construction, establish dimensions for areas where cabinets are to fit. Provide allowance for trimming at site, and coordinate construction to ensure that actual dimensions correspond to established dimensions.

PART 2 - PRODUCTS

2.1 PLASTIC-LAMINATE-CLAD ARCHITECTURAL CABINETS

- A. Quality Standard: Unless otherwise indicated, comply with the Architectural Woodwork Standards for grades of cabinets indicated for construction, finishes, installation, and other requirements.
 - 1. The Contract Documents may contain requirements that are more stringent than the referenced quality standard. Comply with requirements of Contract Documents in addition to those of the referenced quality standard.
- B. Architectural Woodwork Standards Grade: Custom

- C. Type of Construction: Frameless.
- D. Door and Drawer-Front Style: Flush overlay.
- E. High-Pressure Decorative Laminate: NEMA LD 3, grades as indicated or if not indicated, as required by quality standard.
 - 1. **Manufacturers:** Subject to compliance with requirements, provide products by one of the following:
 - a. **Wilsonart LLC.**
- F. Colors and Patterns: As selected by Architect.
 - 1. Refer to Finishes List on Drawing I000 for manufacturers and finish selection.
- G. Laminate Cladding for Exposed Surfaces:
 - 1. Horizontal Surfaces: Grade HGS.
 - 2. Vertical Surfaces: Grade HGS.
 - 3. Edges: PVC edge banding, 3mm thick, matching laminate in color, pattern, and finish.
- H. Materials for Semi-exposed Surfaces:
 - 1. Surfaces Other Than Drawer Bodies: Thermoset decorative panels.
 - a. Edges of Plastic-Laminate Shelves: PVC edge banding, 3mm thick, matching laminate in color, pattern, and finish.
 - 2. Drawer Sides and Backs: Thermoset decorative panels with PVC or polyester edge banding.
 - 3. Drawer Bottoms: Hardwood plywood.
- I. Drawer Construction: Fabricate with exposed fronts fastened to sub-front with mounting screws from interior of body.
 - 1. Join sub-fronts, backs, and sides with glued rabbeted joints supplemented by mechanical fasteners or glued and doweled joints
- J. Colors, Patterns, and Finishes: Provide materials and products that result in colors and textures of exposed laminate surfaces as indicated on the schedule of finishes.

2.2 WOOD MATERIALS

- A. Wood Products: Provide materials that comply with requirements of referenced quality standard for each type of woodwork and quality grade specified unless otherwise indicated.
 - 1. Wood Moisture Content: 5 to 10 percent.
- B. Composite Wood and Agrifiber Products: Provide materials that comply with requirements of referenced quality standard for each type of woodwork and quality grade specified unless otherwise indicated.
 - 1. Composite Wood and Agrifiber Products: Products shall comply with the testing and product requirements of the California Department of Health Services' "Standard Practice for the Testing of Volatile Organic Emissions from Various Sources Using Small-Scale Environmental Chambers."
 - 2. Thermoset Decorative Panels: Particleboard or medium-density fiberboard finished with thermally fused, melamine-impregnated decorative paper and complying with requirements of NEMA LD 3, Grade VGL, for test methods 3.3, 3.4, 3.6, 3.8, and 3.10.

2.3 CABINET HARDWARE AND ACCESSORIES

- A. General: Provide cabinet hardware and accessory materials associated with architectural cabinets, except for items specified in Division 08 Section "Door Hardware (Scheduled by Describing Products)."
- B. Butt Hinges: Stainless-steel, semi concealed, five-knuckle hinges complying with BHMA A156.9, Grade 1, with antifriction bearings and rounded tips. Provide two hinges for doors less than 48 inches high and provide three hinges for doors more than 48 inches high.
 - 1. Semi concealed Hinges for Overlay Doors: BHMA A156.9, B01521.
- C. Wire Pulls: Back mounted, solid metal, 4 inches long, 5/16 inch in diameter.
- D. Catches: Magnetic catches, BHMA A156.9, B03141.
- E. Shelf Rests: BHMA A156.9, B04013; metal.
- F. Drawer Slides: BHMA A156.9, B05091.
 - 1. Heavy Duty (Grade 1HD-100 and Grade 1HD-200): Side mounted; full-extension type; zinc-plated steel ball-bearing slides.
 - 2. Box Drawer Slides: Grade 1HD-100; for drawers not more than 6 inches high and 24 inches wide.
 - 3. File Drawer Slides: Grade 1HD-200; for drawers more than 6 inches high or 24 inches wide.
 - 4. Pencil Drawer Slides: Grade 1; for drawers not more than 3 inches high and 24 inches wide.
 - 5. Keyboard Slides: Grade 1HD-100; for computer keyboard shelves.
 - 6. Trash Bin Slides: Grade 1HD-200; for trash bins not more than 20 inches high and 16 inches wide.
- G. Door Locks: BHMA A156.11, E07121.
- H. Drawer Locks: BHMA A156.11, E07041.
- I. Door and Drawer Silencers: BHMA A156.16, L03011.
- J. Grommets for Cable Passage through Countertop
 - 1. Manufacturer: Doug Mockett and Company
 - 2. Model: MM5 with MM5A liner
 - 3. Product: 2-3/4" Grommet Cap and Liner
 - 4. Color: **Satin Chrome (26D)**
- K. Work Surface Supports
 - 1. Manufacturer: Doug Mockett and Company
 - 2. Model: SWS4
 - 3. Product Large Basic Work surface Support
 - 4. Capacity: 400lbs per pair
 - 5. Color: **Stainless Steel (SSS)**
 - 6.
- L. Exposed Hardware Finishes: For exposed hardware, provide finish that complies with BHMA A156.18 for BHMA finish number indicated.
 - 1. Satin Chromium Plated: BHMA 626 for brass or bronze base; BHMA 652 for steel base.
 - 2. Satin Stainless Steel: BHMA 630
- M. For concealed hardware, provide manufacturer's standard finish that complies with product class requirements in BHMA A156.9.

2.4 MISCELLANEOUS MATERIALS

- A. Furring, Blocking, Shims, and Hanging Strips: Fire-retardant-treated softwood lumber, kiln-dried to less than 15 percent moisture content.
- B. Anchors: Select material, type, size, and finish required for each substrate for secure anchorage. Provide metal expansion sleeves or expansion bolts for post-installed anchors. Use nonferrous-metal or hot-dip galvanized anchors and inserts at inside face of exterior walls and at floors.
- C. Adhesives: Do not use adhesives that contain urea formaldehyde.
- D. Adhesive for Bonding Plastic Laminate: PVA.
 - 1. Adhesive for Bonding Edges: Hot-melt adhesive or adhesive specified above for faces.

2.5 FABRICATION

- A. Fabricate architectural cabinets to dimensions, profiles, and details indicated.
- B. Complete fabrication, including assembly and hardware application, to maximum extent possible before shipment to Project site. Disassemble components only as necessary for shipment and installation. Where necessary for fitting at site, provide ample allowance for scribing, trimming, and fitting.
 - 1. Notify Architect seven days in advance of the dates and times woodwork fabrication will be complete.
 - 2. Trial fit assemblies at fabrication shop that cannot be shipped completely assembled. Install dowels, screws, bolted connectors, and other fastening devices that can be removed after trial fitting. Verify that various parts fit as intended and check measurements of assemblies against field measurements before disassembling for shipment.
- C. Shop-cut openings to maximum extent possible to receive hardware, appliances, electrical work, and similar items. Locate openings accurately and use templates or roughing-in diagrams to produce accurately sized and shaped openings. Sand edges of cutouts to remove splinters and burrs.

PART 3 - EXECUTION

3.1 PREPARATION

- A. Before installation, condition cabinets to humidity conditions in installation areas for not less than 72 hours.
- B. Before installing cabinets, examine shop-fabricated work for completion and complete work as required.

3.2 INSTALLATION

- A. Architectural Woodwork Standards Grade: Install cabinets to comply with quality standard grade of item to be installed.
- B. Assemble cabinets and complete fabrication at Project site to the extent that it was not completed in the shop.
- C. Install cabinets level, plumb, true, and straight. Shim as required with concealed shims. Install level and plumb to a tolerance of 1/8 inch in 96 inches.

- D. Scribe and cut cabinets to fit adjoining work, refinish cut surfaces, and repair damaged finish at cuts.
- E. Anchor cabinets to anchors or blocking built in or directly attached to substrates. Secure with countersunk, concealed fasteners and blind nailing. Use fine finishing nails or finishing screws for exposed fastening, countersunk and filled flush with woodwork.
 - 1. Use filler matching finish of items being installed.
- F. Cabinets: Install without distortion so doors and drawers fit openings properly and are accurately aligned. Adjust hardware to center doors and drawers in openings and to provide unencumbered operation. Complete installation of hardware and accessory items as indicated.
 - 1. Install cabinets with no more than 1/8 inch in 96-inch sag, bow, or other variation from a straight line.
 - 2. Fasten wall cabinets through back, near top and bottom, and at ends not more than 16 inches o.c. with No. 10 wafer-head screws sized for not less than 1-1/2-inch penetration into wood framing, blocking, or hanging strips or No. 10 wafer-head sheet metal screws through metal backing or metal framing behind wall finish.

3.3 ADJUSTING AND CLEANING

- A. Repair damaged and defective cabinets, where possible, to eliminate functional and visual defects. Where not possible to repair, replace architectural cabinets. Adjust joinery for uniform appearance.
- B. Clean, lubricate, and adjust hardware.
- C. Clean cabinets on exposed and semi exposed surfaces.

END OF SECTION 064116

SECTION 07 2726
FLUID APPLIED VAPOR PERMEABLE AIR BARRIER MEMBRANE

PART 1 - GENERAL

1.01 DESCRIPTION

- A. Supply labor, materials and equipment to complete the Work as shown on the Drawings and as specified herein to bridge and seal the following air leakage pathways and gaps:
 - 1. Connections of the walls to the roof air barrier.
 - 2. Connections of the walls to the foundations.
 - 3. Seismic and expansion joints.
 - 4. Openings and penetrations of window and door frames, store front, curtain wall.
 - 5. Piping, conduit, duct and similar penetrations.
 - 6. Masonry ties, screws, bolts and similar penetrations.
 - 7. All other air leakage pathways in the building envelope.
- B. Materials and installation methods of the primary vapor permeable air barrier membrane system and accessories.
- C. Materials and installation methods of through-wall flashing membranes.

1.02 RELATED SECTIONS

- A. Section 09 2116 Gypsum Board Assemblies
- B. Section 07 2100 Thermal Insulation:
- C. Section 07 5100 Built Up Bituminous Roofing:
- D. Section 07 4264 Metal Composite Wall Panels
- E. Section 07 6200 Sheet Metal Flashing & Trim
- F. Section 07 9005 Sealants:
- G. Section 08 1113 Hollow Metal Doors & Frames:
- H. Section 08 5113 Aluminum Windows

1.03 REFERENCES

- A. The following standards are applicable to this section:
 - 1. ASTM E2357: Standard Test Method for Determining Air Leakage of Air Barrier Assemblies.
 - 2. ASTM E2178-01: Standard Test Method for Air Permeance of Building Materials.
 - 3. ASTM E283-91: Standard Test Method for Determining the Rate of Air Leakage Through Exterior Windows, Curtain Walls, and Doors Under Specified Pressure Differences Across the Specimen.
 - 4. ASTM E330-90: Standard Test Method for Structural Performance of Exterior Windows, Curtain Walls, and Doors by Uniform Static Air Pressure Difference.
 - 5. ASTM E331: Standard Test Method for Water Penetration of Exterior Windows, Skylights, Doors, and Curtain Walls by Uniform Static Air Pressure Difference.
 - 6. ASTM E96: Water Vapor Transmission of Materials.
 - 7. AMMA 2400: Standard Practice for Installation of Windows with a Mounting Flange in Stud Frame Construction.
 - 8. ASTM E 2112: Standard Practice for Installation of Exterior Windows, Doors and Skylights.

1.04 SUBMITTALS

- A. Submit documentation from an approved independent testing laboratory certifying the air leakage rates of the air barrier membranes assembly, including primary membrane, primer and sealants have been tested to meet ASTM E2357.

- B. Submit documentation from an approved independent testing laboratory certifying the air leakage and vapor permeance rates of the air barrier membranes, including primary membrane and transition sheets, exceed the requirements of the New York State Energy Code and in accordance with ASTM E2178.
 - 1. Test report submittals shall include test results on porous substrate and include sustained wind load and gust load air leakage results.
- C. Submit copies of manufacturers' current ISO certification.
- D. Submit shop drawings showing locations and extent of air/vapor barrier and details of all typical conditions, intersections with other envelope systems and materials, membrane counter-flashings, and details showing how gaps in the construction will be bridged, how inside and outside corners are negotiated and how miscellaneous penetrations such as conduits, pipes electric boxes and the like are sealed.
- E. Submit manufacturer's product data sheets for each type of membrane, including manufacturer's printed instructions for evaluating, preparing, and treating substrate, temperature and other limitations of installation conditions, technical data, and tested physical and performance properties.
- F. Submit manufacturer's installation instructions.
- G. Certification by air barrier manufacturer that products supplied comply with local regulations controlling use of volatile organic compounds (VOCs).
 - 1. Submit MSDS sheets for all products.
- H. Certification of compatibility by air barrier manufacturer, listing all materials on the project that it connects to or that come in contact with it.
- I. Submit samples, 3 by 4 inch (75 by 100 mm) minimum size, of each air material required for Project.

1.05 QUALITY ASSURANCE

- A. Submit document stating the applicator of the primary air barrier membranes specified in this section is qualified by the manufacturer as suitable for the execution of the Work.
- B. The air barrier contractor shall be, during the bidding period as well as for the duration of the installation, officially recognized as a Licensed Contractor by the Air Barrier Association of America (ABAA).
- C. Air barrier installers must be trained and certified by NECA (National Energy Conservation Association) and PSDI (Professional Skills Development Institute for energy conservation)
- D. Perform Work in accordance with manufacturer's written instructions and this specification.
- E. Maintain one copy of manufacturer's written instructions on site.
- F. Allow access to Work site by the air barrier membrane manufacturer's representative.
- G. Components used shall be sourced from one manufacturer, including sheet membrane, air barrier sealants, primers, mastics, and adhesives.
- H. Single-Source Responsibility:
 - 1. Obtain air barrier materials from a single manufacturer regularly engaged in manufacturing the product.
 - 2. Provide products which comply with all federal, state and local regulations controlling use of volatile organic compounds (VOCs).

1.06 MOCK-UP

- A. Provide mock-up of air barrier materials.
- B. Where directed by architect, construct typical exterior wall panel, 8 foot long by 8 foot wide, incorporating substrate, window frame, attachment of insulation and showing air barrier membrane application details.

- C. Test mock-up for air and water infiltration to conform with ASTM E 783 and ASTM E 1105. Cooperate and coordinate with the Owner's inspection and testing agency.
- D. Do not cover any installed air barrier membrane unless it has been inspected, tested and approved. Mock-up may remain as part of the Work.

1.07 PRE-INSTALLATION CONFERENCE

- A. Contractor shall convene [one] week prior to commencing Work of this section.
- B. Ensure all contractors responsible for creating a continuous plane of air tightness are present.

1.08 DELIVERY, STORAGE AND HANDLING

- A. Refer to current Product MSDS for proper storage and handling.
- B. Deliver materials to the job site in undamaged and original packaging indicating the name of the manufacturer and product.
- C. Store roll materials on end in original packaging. Protect rolls from direct sunlight until ready for use.
- D. Store air barrier membranes, adhesives and primers at temperatures of 40 degrees F and rising.
- E. Keep solvent away from open flame or excessive heat.
 - 1. Wasted Management and Disposal
 - 2. Separate and recycle waste materials in accordance with Section [01355 - Waste Management and Disposal], and with the Waste Reduction Work Plan
- F. Contractor to verify compliance for Volatile Organic Compounds (VOC) limitations of products to comply with all federal, state and local regulations controlling use of volatile organic compounds (VOCs).

1.09 CO-ORDINATION

- A. Ensure continuity of the air barrier throughout the scope of this section.

1.10 PROJECT CONDITIONS

- A. Environmental Conditions: Apply air barrier within range of ambient and substrate temperatures recommended by air barrier manufacturer. Do not apply air barrier to a damp or wet substrate, unless the manufacturer specifically permits that for the product.
 - 1. Do not apply air barrier in snow, rain, fog, or mist.
 - 2. Do not apply air barrier when the temperature of substrate surfaces and surrounding air temperatures are below those recommended by the manufacturer.

1.11 WARRANTY

- A. Provide manufacturer's standard 10-year material warranty.
- B. For sealant and membrane materials provide a two year warranty.

PART 2 - PRODUCTS

2.01 MATERIALS

- A. Air barrier membrane components and accessories must be obtained as a single-source from the membrane manufacturer to ensure total system compatibility and integrity.
 - 1. Acceptable Manufacturers:
 - a. Henry Company- Product: Air Bloc 31, 909 N Sepulveda Blvd, Suite 650 El Segundo, CA 90245 (800) 598-7663 www.henry.com
 - b. Grace Construction - Product: Perm-A-Barrier VP,
 - c. W. R. Meadows, Inc.- Product: Air-Shield™ LMP,
 - d. PROSOCO, Inc., - Product: PROSOCO R-GUARD MVP
 - e. Carlisle Coatings and Waterproofings, -Product: Barritech VP

2.02 MEMBRANES

- A. Primary air and rain barrier membrane for temperatures above 40 degrees F and rising shall be a one component water based elastomeric emulsion membrane, trowel or spray applied. Membrane shall have the following physical properties:
1. Air permeability: 0.0002 CFM/ft² @ 1.6 lbs/ft² to ASTM E2178 and ASTM E283 and have no increased air leakage when subjected to a sustained wind load of 10.5 lbs/ft² for 1 hour and gust wind load pressure of 62.8 lbs/ft² for 10 seconds when tested at 1.6 lbs/ft² to ASTM E331
 2. Tested to ASTM E2357 for Air Leakage of Air Barrier Assemblies
 3. Water vapor permeance (43 mil dry thickness): 12 perms to ASTM E96 Method B
 4. Nominal wet film thickness: 40 mils minimum. If manufacturers product can meet performance specifications without required thickness, provide test data. Contractor will be required to maintain consistent minimum approved working thickness of selected product. Inspection and approval by the Architect of product application will be required of all thin build products before cladding installation. All areas below minimum thickness or areas of damaged product will be required to be repaired to meet standards before proceeding.
 5. Elongation (ASTM D412): 1000% (Typical)
 6. Low temperature flexibility and crack bridging: Pass -4 degrees F to ASTM C836
 7. Long term flexibility: Pass to CGSB 71-GP-24M
 8. Watertightness (CGSB 37-GP-56M): Pass
- B. Self-adhering vapor permeable air barrier membrane for transition and joint treatment shall be a self-adhering membrane consisting of a microporous film laminate, backed with a specially applied adhesive, which allows water vapor to permeate through while acting as a barrier to air and rain water. Membrane shall have the following physical properties:
1. Air leakage: <0.002 CFM/ft² @ 1.6 lbs/ft² to ASTM E283-91
 2. Water vapor permeance: 37 perms to ASTM E96
 3. Membrane Thickness: 17 mils
 4. Low temperature flexibility -40 degrees F: Pass to ASTM D3111
 5. Hydrostatic Water Resistance: 18 psi ASTM D751 Procedure A
 6. Product similar or equal to: Blueskin Breather as manufactured by Henry.
- C. Self-adhering membrane for all window and window sill flashings, door openings, inside and outside corners and other transitions shall be ; a UV stable SBS modified bitumen, self-adhering sheet membrane complete with dual layers of high strength polyethylene with surface layer of metallic aluminum film. Membrane shall have the following physical:
1. Peel Adhesion to Primed Steel 15.0 to ASTM D1000
 2. Vapor permeance: 0.014 perms to ASTM E 96
 3. Membrane Thickness: 0.0443 inches (45 mils)
 4. Low temperature flexibility: -15 degrees F to ASTM D146
 5. Elongation: 85% to ASTM D412-modified
 6. Product similar or equal to : HE200 AM Metal Clad Weather Barrier manufactured by Henry. For application temperatures down to 10 degrees F use Blueskin SA LT.
- D. Alternate joint treatment: HE 183 yellow open weave glass fabric or approved equal.
- E. Through-wall flashing membrane (Self-Adhering) shall be an SBS modified bitumen, self-adhering sheet membrane complete with a cross-laminated polyethylene film. Membrane shall have the following physical properties:
1. Membrane Thickness: 0.0394 inches (40 mils)
 2. Film Thickness: 4.0 mils
 3. Flow (ASTM D5147): Pass @ 212 degrees F
 4. Puncture Resistance: 134 lbf to ASTM E 154
 5. Tensile Strength (film): 5723 psi ASTM D882
 6. Tear Resistance: 13lbs. MD to ASTM D1004

7. Low temperature flexibility: -22 degrees F to CGSB 37-GP-56M
8. Product similar or equal to Blueskin TWF manufactured by Henry;

2.03 PRIMERS

- A. Primer for self-adhering membranes at temperatures above 25 degrees F shall be ; a polymer emulsion based adhesive, quick setting. Primer shall have the following physical properties:
 1. Color: Aqua
 2. Weight: 8.7 lbs/gal
 3. Solids by weight: 53%
 4. Water based, no solvent odors, low VOC
 5. Drying time (initial set): 30 minutes at 50% RH and 70 degrees F
 6. Product similar or equal to Aquatac Primer, manufactured by Henry.
- B. Primer for self-adhering membranes at all temperatures shall be , a synthetic rubber based adhesive, quick setting, having the following physical properties:
 1. Color: Blue,
 2. Weight: 6 lbs/gal,
 3. Solids by weight: 35%,
 4. Drying time (initial set): 30 minutes.
 5. Product similar or equal to Blueskin Adhesive manufactured by Henry.

2.04 PENETRATION & TERMINATION SEALANT

- A. Termination Sealant shall be a moisture cure, medium modulus polymer modified sealing compound having the following physical properties:
 1. Compatible with sheet air barrier, roofing and waterproofing membranes and substrate,
 2. Complies with Fed. Spec. TT-S-00230C, Type II, Class A
 3. Complies with ASTM C 920, Type S, Grade NS, Class 25
 4. Elongation: 450 – 550%
 5. Remains flexible with aging
 6. Seals construction joints up to 1 inch wide
 7. Product similar or equal to HE925 BES Sealant manufactured by Henry.

2.05 INSULATION ADHESIVE

- A. Insulation adhesive shall be; a synthetic, trowel applied, rubber based adhesive, having the following physical properties:
 1. Compatibility: With air barrier membrane, substrate and insulation
 2. Air leakage: 0.0026 CFM/ft2 @ 2.1 lbs/ft2 to ASTM E 283
 3. Water vapor permeance: 0.03 perms to ASTM E96
 4. Long term flexibility: CGSB 71-GP-24M,
 5. Product similar or equal to Air-Bloc 21 Insulation Adhesive manufactured by Henry.

PART 3 EXECUTION

3.01 EXAMINATION

- A. Verify that surfaces and conditions are ready to accept the Work of this section. Notify architect in writing of any discrepancies. Commencement of the Work or any parts thereof shall mean acceptance of the prepared substrates.
- B. All surfaces must be sound, dry, clean and free of oil, grease, dirt, excess mortar or other contaminants. Fill voids, gaps and spalled areas in substrate to provide an even plane. Strike masonry joints flush.
- C. Where curing compounds are used they must be clear resin based without oil, wax or pigments.

- D. Do not proceed with application of air barrier membrane when rain is expected within 24 hours.
- E. Verify substrate is visibly dry and free of moisture. Test for capillary moisture by plastic sheet method according to ASTM D4263.
- F. Condition materials to room temperature prior to application to facilitate handling.

3.02 SURFACE PREPARATION

- A. Water Based Elastomeric Emulsion Air Barrier Membrane: liquid applied water based air barrier membrane may be applied to green concrete 16 hours after forms are removed.
- B. Ensure all preparatory Work is complete prior to applying primary air barrier membrane.
- C. Mechanical fasteners used to secure sheathing boards or penetrate sheathing boards shall be set flush with sheathing and fastened into solid backing.

3.03 INSTALLTION OF AIR BARRIER SYSTEM

A. JOINT TREATMENT

- 1. Seal joints ¼ inch and less between panels of exterior grade gypsum, DensGlass Gold, plywood, OSB or cementitious panels with joint treatment sealant.
 - a. Fill joint between sheathing with approved joint treatment sealant ensuring contact with all edges of sheathing board. Strike flush any excess sealant over joint layer to form a continuous layer over the joint.
 - 1) Seal gaps and voids or irregular joints greater than ¼ inch between panels of exterior grade gypsum, DensGlass Gold, plywood, OSB or cementitious panels with a strip of self-adhering air/vapor barrier transition membrane lapped a minimum of 1 1/2 inches on both sides of the joint.
 - (a) Prime surfaces as per manufacturers' instructions and allow to dry.
 - (b) Align and position self-adhering air/vapor barrier transition membrane, remove protective film and press firmly into place. Ensure minimum 2 inches overlap at all end and side laps of membrane.
 - (c) Roll all laps and membrane with a counter top roller to ensure seal.
 - 2) Alternately, joints not exceeding 1/8 inch can be sealed with yellow open weave glass fabric.
 - (a) Apply yellow open weave glass fabric centered over joint followed by a 1/8 inch (120mils) thick trowel application of air/vapor barrier membrane.
 - (b) Allow to dry prior to application of primary vapor permeable air barrier membrane.

B. INSIDE AND OUTSIDE CORNERS

- 1. Seal inside and outside corners of sheathing boards with a strip of self-adhering transition membrane extending a minimum of 3 inches on either side of the corner detail.
 - a. Prime surfaces as per manufacturers' instructions and allow to dry.
 - 1) Align and position self-adhering transition membrane, remove protective film and press firmly into place. Ensure minimum 2 inches overlap at all end and side laps of membrane.
 - (a) Roll all laps and membrane with a counter top roller to ensure seal.

C. CRACK TREATMENT – MASONRY AND CONCRETE

- 1. Seal cracks over 1/16 inches in masonry and concrete with a strip of self-adhering transition membrane lapped a minimum of 1 1/2 inches on both sides of the crack.
 - a. Prime surfaces as per manufacturers' instructions and allow to dry.
 - 1) Align and position self-adhering transition membrane, remove protective film and press firmly into place. Ensure minimum 2 inches overlap at all end and side laps of membrane.

- (a) Roll all laps and membrane with a counter top roller to ensure seal.
- 2) Alternately, static cracks 1/16 inch to 1/8 inch can be sealed with primary air barrier membrane.
 - (a) Fill crack with primary air barrier membrane.
 - (b) Allow to dry prior to application of primary vapor permeable air barrier membrane.

D. TRANSITION AREAS

- 1. Tie-in to structural beams, columns, floor slabs and intermittent floors, parapet curbs, foundation walls, roofing systems and at the interface of dissimilar materials as indicated in drawings with self-adhering air barrier transition membrane.
 - a. Prime surfaces as per manufacturers' instructions and allow to dry.
 - 1) Align and position self-adhering transition membrane, remove protective film and press firmly into place. Provide minimum 3 inch lap to all substrates.
 - (a) Ensure minimum 2 inch overlap at all end and side laps of membrane.
 - (b) Roll all laps and membrane with a counter top roller to ensure seal.

E. WINDOWS AND ROUGH OPENINGS

- 1. Wrap head and jamb of rough openings with specified self-adhering transition membrane as detailed. Place specified sill flashing membrane across sills and end dam terminations.
 - a. Prime surfaces as per manufacturers' instructions and allow to dry.
 - 1) Align and position self-adhering transition membrane, remove protective film and press firmly into place. Ensure minimum 2 inch overlap at all end and side laps of membrane.
 - (a) Roll all laps and membrane with a counter top roller to ensure seal.

F. THROUGH-WALL FLASHING MEMBRANE

- 1. Apply through-wall flashing membrane along the base of masonry veneer walls and over shelf angles as detailed.
 - a. Prime surfaces and allow to dry, press membrane firmly into place, over lap minimum 2 inches at all end and side laps. Promptly roll all laps and membrane to ensure the seal.
 - b. Applications shall form a continuous flashing membrane and shall extend up a minimum of 8 inches up the back-up wall.
 - c. Seal the top edge of the membrane where it meets the substrate using termination sealant. Trowel-apply a feathered edge to seal termination to shed water.
 - d. Install through-wall flashing membrane and extend 1/2 inch from outside edge of veneer. Provide "end dam" flashing as detailed.

G. PRIMARY AIR BARRIER

- 1. Apply by spray or flat trowel a complete and continuous unbroken film of liquid air and rain barrier membrane.
 - a. For temperatures above 40 degrees F and rising, apply one component water based elastomeric emulsion air barrier membrane at a rate of 18.6 sq.ft/gallon to a uniform wet film thickness of 90 mils.
 - b. Spray apply or trowel around all projections and penetrations ensuring a complete and continuous air barrier membrane. Lap liquid applied membrane 1 inch over self-adhering membranes to seal leading edge.
 - c. Allow air barrier membrane to dry as per manufacturers recommendations prior to placement of insulating materials.

3.04 APPLICATION OF TERMINATION SEALANT

- A. Seal membrane terminations, heads of mechanical fasteners, masonry tie fasteners, around penetrations, duct work, electrical and other apparatus extending through the primary water

resistive air barrier membrane and around the perimeter edge of membrane terminations at window and door frames with specified termination sealant.

3.05 FIELD QUALITY CONTROL

- A. Make notification when sections of Work are complete to allow review prior to covering air barrier system.

3.06 INSTALLATION OF INSULATION

- A. Co-ordinate with Cavity Wall Insulation Section [07 2100] for insulating materials.
- B. Apply insulation adhesive in a serpentine pattern over the air barrier membrane.
- C. Immediately embed insulation into the adhesive and press firmly into place to ensure full contact. Apply additional adhesive if allowed to skin over.

3.07 PROTECTION

- A. Damp substrates must not be inhibited from drying out. Do not expose the backside of the substrate to moisture or rain.
- B. Cap and protect exposed back-up walls against wet weather conditions during and after application of membrane. Drying time varies depending on temperature and relative humidity. Protect air barrier Work against wet weather conditions for a minimum of 24 hours.
- C. Air barrier membranes are not designed for permanent exposure. Good practice calls for covering as soon as possible.

END OF SECTION

SECTION 07 4213.23
METAL COMPOSITE MATERIAL WALL PANELS

PART 1 GENERAL

1.01 SECTION INCLUDES

- A. Self-supporting exterior curtain wall system consisting of formed metal composite material (MCM) sheet, framing, secondary supports, and anchors to structure.
- B. Matching flashing and trim.

1.02 RELATED REQUIREMENTS

- A. Section 07 2716 - Fluid Applied Vapor Permeable Air Barriers

1.03 REFERENCE STANDARDS

- A. ASTM A36/A36M - Standard Specification for Carbon Structural Steel 2014.
- B. ASTM A123/A123M - Standard Specification for Zinc (Hot-Dip Galvanized) Coatings on Iron and Steel Products 2015.
- C. ASTM A153/A153M - Standard Specification for Zinc Coating (Hot-Dip) on Iron and Steel Hardware 2009.
- D. ASTM A276/A276M - Standard Specification for Stainless Steel Bars and Shapes 2017.
- E. ASTM A480/A480M - Standard Specification for General Requirements for Flat-Rolled Stainless and Heat-Resisting Steel Plate, Sheet, and Strip 2015.
- F. ASTM A653/A653M - Standard Specification for Steel Sheet, Zinc-Coated (Galvanized) or Zinc-Iron Alloy-Coated (Galvannealed) by the Hot-Dip Process 2015.
- G. ASTM A666 - Standard Specification for Annealed or Cold-Worked Austenitic Stainless Steel Sheet, Strip, Plate, and Flat Bar 2015.
- H. ASTM A792/A792M - Standard Specification for Steel Sheet, 55% Aluminum-Zinc Alloy-Coated by the Hot-Dip Process 2010 (Reapproved 2015).
- I. ASTM D523 - Standard Test Method for Specular Gloss 2014.
- J. ASTM D1781 - Standard Test Method for Climbing Drum Peel for Adhesives 1998 (Reapproved 2012).
- K. ASTM D1929 - Standard Test Method for Determining Ignition Temperature of Plastics 2014.
- L. ASTM D2244 - Standard Practice for Calculation of Color Differences from Instrumentally Measured Color Coordinates 2011.
- M. ASTM D4145 - Standard Test Method for Coating Flexibility of Prepainted Sheet 2010.
- N. ASTM D4214 - Standard Test Methods for Evaluating the Degree of Chalking of Exterior Paint Films 2007.
- O. ASTM E84 - Standard Test Method for Surface Burning Characteristics of Building Materials 2015a.
- P. ASTM E283 - Standard Test Method for Determining the Rate of Air Leakage Through Exterior Windows, Curtain Walls, and Doors Under Specified Pressure Differences Across the Specimen 2004 (Reapproved 2012).
- Q. ASTM E330/E330M - Standard Test Method for Structural Performance of Exterior Windows, Doors, Skylights and Curtain Walls by Uniform Static Air Pressure Difference 2014.

- R. ASTM E331 - Standard Test Method for Water Penetration of Exterior Windows, Skylights, Doors, and Curtain Walls by Uniform Static Air Pressure Difference 2000 (Reapproved 2009).
- S. NFPA 285 - Standard Fire Test Method for Evaluation of Fire Propagation Characteristics of Exterior Non-Load-Bearing Wall Assemblies Containing Combustible Components 2012.
- T. Underwriters Laboratories, Inc. (UL):
 - 1. UL 263 - Fire Resistance Tests of Building Construction and Materials.
 - 2. UL 723 - Test for Surface Burning Characteristics of Building Materials.
 - 3. UL Fire Resistance Directory.
 - 4. UL 1715 Room Corner Test.

1.04 ADMINISTRATIVE REQUIREMENTS

- A. Pre-Installation Meeting: Convene one week before starting work of this section to verify project requirements, co-ordinate with installers of other work, establish condition and completeness of building substrate, and review manufacturers' installation instructions and warranty requirements.
 - 1. Require attendance by the installer and relevant sub-contractors.
 - 2. Include MCM sheet manufacturer's representative and wall system manufacturer's representative to review storage and handling procedures.
 - 3. Review in detail truck transportation, parking, vertical transportation, schedule, personnel, installation of adjacent materials and substrate.
 - 4. Review procedures for protection of work and other construction.

1.05 SUBMITTALS

- A. See Section 01 3000 - Administrative Requirements, for submittal procedures.
- B. Product Data - MCM Sheets: Manufacturer's data sheets on each product to be used, including thickness, physical characteristics, and finish, and:
 - 1. Finish manufacturer's data sheet showing physical and performance characteristics.
 - 2. Storage and handling requirements and recommendations.
 - 3. Fabrication instructions and recommendations.
 - 4. Specimen warranty for finish, as specified herein.
- C. Product Data - Wall System: Manufacturer's data sheets on each product to be used, including:
 - 1. Physical characteristics of components shown on shop drawings.
 - 2. Storage and handling requirements and recommendations.
 - 3. Installation instructions and recommendations.
 - 4. Specimen warranty for wall system, as specified herein.
- D. Shop Drawings: Show layout and elevations, dimensions and thickness of panels, connections, details and location of joints, sealants and gaskets, method of anchorage, number of anchors, supports, reinforcement, trim, flashings, and accessories.
 - 1. Indicate panel numbering system.
 - 2. Differentiate between shop and field fabrication.
 - 3. Indicate substrates and adjacent work with which the wall system must be coordinated.
 - 4. Include large-scale details of anchorages and connecting elements.
 - 5. Include large-scale details or schematic, exploded or isometric diagrams to fully explain flashing at a scale of not less than 1-1/2 inches per 12 inches.
 - 6. Include design engineer's stamp or seal on shop drawings for attachments and anchors.
- E. Design Data: Submit structural calculations stamped by design engineer, for Sammel Architecture's information and project record.
- F. Test Report: Submit report of full-size mock-up tests for air infiltration, water penetration, and wind performance.

- G. Test Report: Submit report of full-size mock-up test for NFPA 285 fire performance.
- H. Manufacturer's Field Reports: Provide within 48 hours of field review. State what was observed and what changes, if any, were requested or required.
- I. Maintenance Data: Care of finishes and warranty requirements.
- J. Executed Warranty: Submit warranty and ensure that forms have been completed in Newburgh Enlarged City School District's name and registered with manufacturer.

1.06 QUALITY ASSURANCE

- A. Field Measurements: Verify actual dimensions by field measurement before fabrication; show recorded measurements on shop drawings.
- B. Design Engineer's Qualifications: Design structural supports and anchorages under direct supervision of a Structural Engineer experienced in design of this type of Work and licensed in Newburgh, NY.
- C. Wall System Manufacturer Qualifications: Company specializing in manufacturing products specified in this section.
 - 1. With not less than three years of documented experience.
 - 2. Approved by MCM sheet manufacturer.
 - 3. Submit contact names and phone numbers for at least three references connected with successful past projects.
- D. Installer Qualifications: Company specializing in performing work of the type specified in this section.
 - 1. With minimum 3 years of documented experience.
 - 2. Has attended a training session provided by the manufacturer and is approved by wall system manufacturer.
 - 3. Submit contact names and phone numbers for at least three references connected with successful past projects.
- E. Testing Agency Qualifications: Independent agency experienced in testing assemblies of the type required for this project and having the necessary facilities for full-size mock-up testing of the type specified.
- F. Mock-Up: Provide a mock-up for evaluation of fabrication workmanship.
 - 1. Locate where directed.
 - 2. Provide panels finished as specified.
 - 3. Mock-up may remain as part of the Work.
- G. Attic Stock: Provide five (5) 48" x 96" sheets of Metal Composite Panels for each finish type and/or color to be delivered to the Owner at the conclusion of the project. Panels shall have factory protective film in-tact and packaged for handling and storage.

1.07 DELIVERY, STORAGE, AND HANDLING

- A. Deliver products in manufacturer's original, unopened, undamaged containers with identification labels intact.
 - 1. Protect finishes by applying heavy duty removable plastic film during production.
 - 2. Package for protection against transportation damage.
 - 3. Provide markings to identify components consistently with drawings.
 - 4. Exercise care in unloading, storing and installing panels to prevent bending, warping, twisting and surface damage.
- B. Store products protected from exposure to harmful weather conditions and at temperature conditions recommended by manufacturer.
 - 1. Store in well ventilated space out of direct sunlight.
 - 2. Protect from moisture and condensation with tarpaulins or other suitable weather tight covering installed to provide ventilation.
 - 3. Store at a slope to ensure positive drainage of any accumulated water.

4. Do not store in any enclosed space where ambient temperature can exceed 120 degrees F.
5. Avoid contact with any other materials that might cause staining, denting, or other surface damage.

1.08 WARRANTY

- A. Wall System Warranty: Provide joint written warranty by manufacturer and installer, agreeing to correct defects in manufacturing or installation within a Five (5) year period after Date of Substantial Completion.
- B. MCM Sheet Manufacturer's Finish Warranty: Provide manufacturer's written warranty stating that the finish will perform as follows for minimum of 20 years:
 1. Chalking: No more than that represented by a No.8 rating based on ASTM D4214.
 2. Color Retention: No fading or color change in excess of 5 Hunter color difference units, calculated in accordance with ASTM D2244.
 3. Gloss Retention: Minimum of 30 percent gloss retention, when tested in accordance with ASTM D523.
- C. MCM Sheet Manufacturers Material and Installation Warranty: Panels covered by this warranty are warranted not to delaminate at any manufacturers glue line of a period of five (5) years.

PART 2 PRODUCTS

2.01 MANUFACTURERS

- A. Metal Composite Material Sheet Manufacturers:
 1. Laminators Inc., Omega-lite Composite Panel, www.laminatorsinc.com
 2. Alcoa, Inc; Reynobond PE: www.alcoa.com/#sle.
 3. Substitutions: See Section 01 6000 - Product Requirements.
- B. Wall Panel System Manufacturers:
 1. Laminators Inc., Clip and Caulk, tel. 877-OMEGA77, www.laminatorsinc.com
 2. BAMCO, C-500 Composite Metal Wall System: www.bamcoinc.org
 3. C. R. Laurence Co., Inc; CRL Standard Wet Seal Wall Panel System: www.crlaurence.com/#sle.
 4. Firestone Metal Products, LLC; Series 1000: www.unaclad.com/#sle.
 5. Kanalco Ltd; RB240PE: www.kanalco.com/#sle.
 6. Substitutions: See Section 01 6000 - Product Requirements.

2.02 WALL PANEL SYSTEM

- A. Wall Panel System: Metal panels, fasteners, and anchors designed to be supported by framing or other substrate provided by others; provide installed panel system capable of maintaining specified performance without defects, damage or failure.
 1. Provide structural design by or under direct supervision of a Structural Engineer licensed in Newburgh, NY.
 2. Provide panel jointing and weatherseal using a "wet," sealant sealed system.
 3. Anchor panels to supporting framing without exposed fasteners.
- B. Performance Requirements:
 1. All tests are to be on full-size mock-ups ; tests performed previously for other projects are acceptable provided tested assemblies are truly equivalent to those to be used on this project, unless otherwise indicated.
 2. Thermal Movement: Provide for free and noiseless vertical and horizontal thermal movement due to expansion and contraction under material temperature range of minus 20 degrees F to 180 degrees F without buckling, opening of joints, undue stress on fasteners, or other detrimental effects; allow for ambient temperature at time of fabrication, assembly, and erection procedures.

3. Wind Performance: Provide system tested in accordance with ASTM E330 without permanent deformation or failures of structural members under the following conditions:
 - a. Inward Design Wind Pressure: 30 psf.
 - b. Outward Design Wind Pressure: 30 psf.
 - c. Maximum deflection of perimeter framing member of L/175 normal to plane of the wall; maximum deflection of individual panels of L/60.
 - d. Maximum anchor deflection in any direction of 1/16 inch at connection points of framing members to anchors.
 - e. At 1 1/2 times design pressure, permanent deflections of framing members shall not exceed L/100 of span length and components shall not experience failure or gross permanent distortion. At connection points of framing members to anchors, permanent set shall not exceed 1/16 (1.5mm).
 4. Water Penetration: No water penetration under static pressure when tested in accordance with ASTM E331 at a differential of 10 percent of inward acting design load, 6.24 psf minimum, after 15 minutes.
 - a. Water penetration is defined as the appearance of uncontrolled water on the interior face of the wall.
 - b. Design to drain leakage and condensation to the exterior face of the wall.
 5. Water Penetration: Dynamic Testing: No uncontrolled water penetration per AAMA 501.1 at a minimum pressure differential of 25 lb/sf (1.20 kPa) using a minimum 73 1/8 inch by 49 1/4 inches (1857 mm by 1251mm) test panel that includes horizontal and vertical joints.
 6. Horizontal Panel Joint Performance: Static test per ASTM E 331 with horizontal seals removed - 1 inch (25 mm) in 10 feet (3050 mm) lengths to simulate seal defects. No uncontrolled water penetration permitted at a pressure of 25 lb/sf (.90 kPa).
 7. Pressure Equalization of Horizontal Joinery: Passes the Criteria for a Pressure Equalized Horizontal Joint in accordance with AAMA 508-05, a test method for Pressure Equalized Rain Screen Wall Systems.
 8. Seismic Performance: Comply with ASCE 7, "Minimum Design Loads for Buildings and Other Structures": Section 9, "Earthquake Loads."
 9. Fire Performance: Tested in accordance with, and complying with the acceptance criteria of, NFPA 285; testing performed for previous project is acceptable provided tested system was truly equivalent.
 - a. Fire-Test-Response Characteristics per ASTM E 84 or UL Standard 723: "CLASS A"
 - 1) Flame spread index: 25 or less.
 - 2) Smoke developed index: 450 or less.
 10. FM Global Listing: Class 1 Insulating Wall or Ceiling Panel per FMG 4880.
 11. UL Listing for UL 1715 room corner test.
 12. NFPA 286 room corner test.
 13. NFPA 285 ISMA test.
- C. Panels: 1/4" inch deep pans formed of metal composite material sheet by routing back edges of sheet, removing corners, and folding edges.
1. Reinforce corners with riveted aluminum angles.
 2. Provide concealed attachment to supporting structure by adhering attachment members to back of panel; attachment members may also function as stiffeners.
 3. Maintain maximum panel bow of 0.8 percent of panel dimension in width and length; provide stiffeners of sufficient size and strength to maintain panel flatness without showing local stresses or read-through on panel face.
 4. Secure members to back face of panels using structural silicone sealant approved by MCM sheet manufacturer.
 5. Fabricate panels under controlled shop conditions.

6. Where final dimensions cannot be established by field measurement before commencement of manufacturing, make allowance for field adjustments without requiring field fabrication of panels.
7. Fabricate as indicated on drawings and as recommended by MCM sheet manufacturer.
 - a. Make panel lines, breaks, curves and angles sharp and true.
 - b. Keep plane surfaces free from warp or buckle.
 - c. Keep panel surfaces free of scratches or marks caused during fabrication.
8. Provide joint details providing a watertight and structurally sound wall panel system that allows no uncontrolled water penetration on inside face of panel system.

2.03 MATERIALS

- A. Air / Moisture Barriers
 1. Fluid Applied Vapor Permeable Air Barrier Membrane - See Section 07 2726
- B. Metal Composite Material (MCM) Sheet: Two sheets of aluminum sandwiching a solid core of corrugated polyallomer (CPA) core with backer sheet, formed in a continuous process with no glues or adhesives between dissimilar materials; no foamed insulation material content.
 1. Overall Sheet Thickness: 5 mm.
 2. Face Sheet Thickness: 0.032 inches, minimum. Smooth, ASTM B209 aluminum sheet.
 3. Backer Sheet: Same as face sheet.
 4. Alloy: Manufacturer's standard, selected for best appearance and finish durability.
 5. Bond and Peel Strength: No adhesive failure of the bond between the core and the skin nor cohesive failure of the core itself below 40 inch-pound/inch with no degradation in bond performance, when tested in accordance with ASTM D1781, simulating resistance to panel delamination, after 8 hours of submersion in boiling water and after 21 days of immersion in water at 70 degrees F.
 6. Surface Burning Characteristics: Class A, Flame spread index of 25, maximum; smoke developed index of 450, maximum; when tested in accordance with ASTM E 84.
 7. Flammability: Self-ignition temperature of 650 degrees F or greater, when tested in accordance with ASTM D1929.
 8. Factory Finish: One coat fluoropolymer resin coating, approved by the coating manufacturer for the length of warranty specified for the project, and applied by coil manufacturing facility that specializes in coil applied finishes.
 - a. Basis of Design: Kynar 500 fluoropolymer resin coating as manufactured by xxx.
 - b. Coating Flexibility: Pass ASTM D4145 minimum 1T-bend, at time of manufacturing.
 - c. Long-Term Performance: Not less than that specified under WARRANTY in PART 1.
 9. Color/Texture: As selected from manufacturer's standard selection.
 10. Tolerances:
 - a. Panel Bow: Maximum 0.8 percent of any 1828mm (72 inch) panel dimension.
 - b. Panel Flatness: Maximum deviation less than 1/8 inch (3mm) in 5 feet (1524mm) on panel in any direction for assembled units.
- C. Metal Framing Members: Include all sub-girts, zee-clips, base and sill angles and channels, hat-shaped and rigid channels, and furring channels required for complete installation.
 1. Provide material strength, dimensions, configuration as required to meet the applied loads applied and in compliance with applicable building code.
 2. Sheet Steel Components: ASTM A653/A653M galvanized to G90/Z275 or zinc-iron alloy-coated to A60/ZF180; or ASTM A792/A792M aluminum-zinc coated to AZ60/AZM180.
 3. Stainless Steel Sheet Components: ASTM A480/A480M.

- D. Flashing: Sheet aluminum; 0.032 inch thick, minimum; finish and color to match MCM sheet.
- E. Anchors, Clips and Accessories: Use one of the following:
 - 1. Stainless steel complying with ASTM A480/A480M, ASTM A276 or ASTM A666.
 - 2. Steel complying with ASTM A36/A36M and hot-dipped galvanized to ASTM A153/A153M.
 - 3. Steel complying with ASTM A36/A36M and hot-dipped galvanized to ASTM A123/A123M Coating Grade 10.
- F. Fasteners:
 - 1. Exposed fasteners: Stainless steel; permitted only where absolutely unavoidable and subject to prior approval of the Sammel Architecture.
 - 2. Screws: Galvanized
 - a. #6 x 1-1/4" bugle head drywall or phillips head pan-head screws for securing clips into sheathing.
 - b. #8 or #10 x 3/4" or longer, TEK/3 screws to secure clips into steel studs.
 - 3. Bolts: Stainless steel.
 - 4. Fasteners for Flashing and Trim: Blind fasteners of high-strength aluminum or stainless steel.
- G. Panel Adhesives
 - 1. Surebond, Product: SB-400, tel 1-847-843-1818
 - 2. Macco Adhesives, Product: LN-901 Liquid Nails Heavy Duty for Construction
 - 3. Franklin International, Product: Titebond, tel (1-800-877-4583)
 - 4. Substitutions: See Section 01 6000 (01600) - Product Requirements.
- H. Joint Sealer: Subject to MCM sheet manufacturer's approval.
 - 1. GE Silicone, Product: Silpruf, Silglaze II, tel. 1-800-332-3390
 - 2. Dow Corning, Product: Silicone 791, 795, 995, tel. 1-800-248-2481
 - 3. Tremco, Product: Spectrum 1, tel. 1-800-321-7906
- I. Provide panel system manufacturer's and installer's standard corrosion resistant accessories, including fasteners, clips, anchorage devices and attachments.

2.04 WALL SYSTEM FABRICATION

- A. System Type: Clip and Caulk VI.
 - 1. System utilizes flat panels with folded edges with clips and a 12 inch (305 mm) wide lap strap under the flashing at abutted conditions and seal lapped surfaces with a full bed of non-hardening sealant.
 - 2. Reveal joint is a wet seal silicone type.
 - 3. Liquid Applied Vapor Permeable Air Barrier specified in Section 07 2726 encapsulates building envelope prior to installation of wall panels.

2.05 FINISHES

- A. Finish Performance:
 - 1. Coating Thickness: 1.0 mil (+/- 0.2 mil).
 - 2. Hardness: ASTM D 3363; HB minimum using Eagle Turquoise Pencil.
 - 3. Impact:
 - a. Test method: ASTM D 2794; Gardner Variable Impact Tester with 5/8 inch (15mm) mandrel.
 - b. Coating shall withstand reverse impact of 1.5 inch pounds per mil substrate thickness.
 - c. Coating shall adhere tightly to metal when subjected to #600 Scotch Tape pick-off test. Slight minute cracking permissible. No removal of film to substrate.

4. Adhesion: Coating will not pick off when subjected to an 11 inch by 11 inch by 1/16 inch (28mm x 28mm x 1.5mm) grid and taped with #600 Scotch Tape in accordance with ASTM D 3359.
5. Humidity Resistance: No formation of blisters when subject to condensing water fog at 100 percent relative humidity and 100 F (37.8 C) for 4000 hours in accordance with ASTM D 2247.
6. Salt Spray Resistance: Expose coating system to 4000 hours, using 5 percent NaCl solution in accordance with ASTM B 117.
 - a. Corrosion creepage from scribe line: 1/16 inch (1.5mm) max.
 - b. Blister Rating: Minimum of 8 within the test specimen field.
7. Weather Exposure (Exterior): Ten-year exposure at 45 degree angle facing south Florida exposure.
 - a. Color Change: Maximum of 5 Delta E units as calculated in accordance with ASTM D 2244.
 - b. Chalk Rating: 8, in accordance with ASTM D 4214.
 - c. Checking, Crazing, Adhesion loss: None.
8. Chemical Resistance:
 - a. Muriatic Acid: 10 percent solution for an exposure time of 15 minutes in accordance with ASTM D 1308 No loss of film adhesion or visual change when viewed by the unaided eye.
 - b. Sulfuric Acid: 20 percent solution for an exposure time of 18 hours in accordance with ASTM D 1308. No loss of film adhesion or visual change when viewed by the unaided eye.
 - c. Nitric Acid: 70 solution of reagent grade vapor for an exposure time of 30 minutes. Maximum color change of 5 Delta E units as calculated in accordance with ASTM D 2244.

PART 3 EXECUTION

3.01 EXAMINATION

- A. Verify dimensions, tolerances, and interfaces with other work.
- B. Verify substrate on-site to determine that conditions are acceptable for product installation in accordance with manufacturers written instructions.
- C. If substrate preparation is the responsibility of another installer, notify Sammel Architecture of unsatisfactory preparation before proceeding.
- D. Notify Sammel Architecture in writing of conditions detrimental to proper and timely completion of work. Do not proceed with erection until unsatisfactory conditions have been corrected.

3.02 PREPARATION

- A. Protect adjacent work areas and finish surfaces from damage during installation.

3.03 INSTALLATION

- A. Do not install products that are defective, including warped, bowed, dented, and broken members, and members with damaged finishes.
- B. Comply with instructions and recommendations of MCM sheet manufacturer and wall system manufacturer, as well as with approved shop drawings.
- C. Install wall system securely allowing for necessary thermal and structural movement; comply with wall system manufacturer's instructions for installation of concealed fasteners.
- D. Do not handle or tool products during erection in manner that damages finish, decreases strength, or results in visual imperfection or failure in performance. Return component

parts that require alteration to shop for refabrication, if possible, or for replacement with new parts.

- E. Do not form panels in field unless required by wall system manufacturer and approved by the Sammel Architecture; comply with MCM sheet manufacturer's instructions and recommendations for field forming.
- F. Separate dissimilar metals; use gasket fasteners, isolation shims, or isolation tape where needed to eliminate possibility of electrolytic action between metals.
- G. Where joints are designed for field applied sealant, seal joints completely with specified sealant.
- H. Install flashings as indicated on shop drawings At flashing butt joints, provide a lap strap under flashing and seal lapped surfaces with a full bed of non-hardening sealant.
- I. Install square, plumb, straight, and true, accurately fitted, with tight joints and intersections maintaining the following installation tolerances:
 - 1. Variation From Plane or Location: 1/4 inch in 20 feet of length and up to 1/2" in any building elevation feet, maximum.
 - 2. Variatino from Plane or Location: 1/4" in 20 feet in length vertically or horizontally and up to 1/2" in any building elevation.
 - 3. Deviation of Vertical Member From True Line: 0.1 inch in 25 feet run, maximum.
 - 4. Deviation of Horizontal Member From True Line: 0.1 inch in 25 feet run, maximum.
 - 5. Offset From True Alignment Between Two Adjacent Members Abutting End To End, In Line: 0.03 inch, maximum.
- J. Replace damaged products.
 - 1. Exception: Field repairs of minor damage to finishes are permitted only when approved in writing by Sammel Architecture, panel manufacturer, and fabricator.
 - 2. Field Repairs to Finishes: Using materials and methods sufficient that repairs are not discernible when viewed at distance of 10 feet under all typical light conditions experienced at the project.
- K. Caulk Installation:
 - 1. Use only approved sealants as described in manufacturers installation guidelines.
 - 2. The sealant manufacturers instructions shall be followed in preparing and installing sealants.
 - 3. Joints to receive sealant shall be clean, dry and free from dust, grit and contaminants.
 - 4. The sealant shall completely fill the glazing pockets.

3.04 FIELD QUALITY CONTROL

- A. Wall System Manufacturer's Field Services: Provide field services consisting of product use recommendations and periodic site visits for inspection of product installation in accordance with instructions.
- B. Site Visits: Schedule every three weeks during execution of installation.

3.05 CLEANING

- A. Ensure weep holes and drainage channels are unobstructed and free of dirt and sealants.
- B. Remove protective film after installation of joint sealers, after cleaning of adjacent materials, and immediately prior to completion of work.
- C. Remove temporary coverings and protection of adjacent work areas.
- D. Clean installed products in accordance with manufacturer's instructions.

3.06 PROTECTION

- A. Protect installed panel system from damage during construction.

END OF SECTION

SECTION 075323 - ETHYLENE-PROPYLENE-DIENE-MONOMER (EPDM) ROOFING

PART 1 - GENERAL

1.1 SUMMARY

- A. Section Includes:
 - 1. Adhered EPDM membrane roofing system.
 - 2. Substrate board.
 - 3. Roof insulation.
 - 4. Cover board.
- B. Related Sections:
 - 1. Division 06 Section "Miscellaneous Rough Carpentry" for wood nailers, curbs, and blocking.
 - 2. Division 07 Section "Roof Specialties" for roof edge fascia
 - 3. Division 07 Section "Roof Accessories" for roof mounted accessories
 - 4. Division 07 Section "Joint Sealants" for joint sealants, joint fillers, and joint preparation.

1.2 DEFINITIONS

- A. Roofing Terminology: Definitions in ASTM D 1079 and glossary of NRCA's "The NRCA Roofing and Waterproofing Manual" apply to work of this Section.

1.3 PERFORMANCE REQUIREMENTS

- A. General Performance: Installed membrane roofing and base flashings shall withstand specified uplift pressures, thermally induced movement, and exposure to weather without failure due to defective manufacture, fabrication, installation, or other defects in construction. Membrane roofing and base flashings shall remain watertight.
- B. Material Compatibility: Provide roofing materials that are compatible with one another under conditions of service and application required, as demonstrated by membrane roofing manufacturer based on testing and field experience.
- C. Roofing System Design: Provide membrane roofing system that is identical to systems that have been successfully tested by a qualified testing and inspecting agency to resist uplift pressure calculated according to ASCE/SEI 7.
 - 1. Corner Uplift Pressure: 35 lbf/sf.
 - 2. Perimeter Uplift Pressure: -30 lbf/sq. ft.
 - 3. Field-of-Roof Uplift Pressure: -20 lbf/sq. ft.
 - 4. Above design values, per Chapter 16 of the BCNYS, based on the following:
 - a. Basic Wind Speed: 90 mph, 3-second gust as measured 33 ft above ground.
 - b. Exposure Category: C.
 - c. Importance Factor: 1.15
- D. FM Approvals Listing: Provide membrane roofing, base flashings, and component materials that comply with requirements in FM Approvals 4450 and FM Approvals 4470 as part of a membrane roofing system, and that are listed in FM Approvals' "RoofNav" for Class 1 or noncombustible construction, as applicable. Identify materials with FM Approvals' markings.
 - 1. Fire/Windstorm Classification: Class 1A-90.
 - 2. Hail Resistance: MH.

1.4 SUBMITTALS

- A. Product Data: For each type of product indicated.
- B. Shop Drawings: For roofing system. Include plans, elevations, sections, details, and attachments to other work.
 - 1. Base flashings and membrane terminations.
 - 2. Tapered insulation, including slopes.
 - 3. Insulation fastening patterns for corner, perimeter, and field-of-roof locations.
- C. Qualification Data: For qualified Installer and manufacturer.
- D. Manufacturer Certificate: Signed by roofing manufacturer certifying that membrane roofing system complies with requirements specified in "Performance Requirements" Article.
 - 1. Submit evidence of complying with performance requirements.
- E. Product Test Reports: Based on evaluation of comprehensive tests performed by manufacturer and witnessed by a qualified testing agency, for components of membrane roofing system.
- F. Field quality-control reports.
- G. Maintenance Data: For membrane roofing system to include in maintenance manuals.
- H. Warranty:
 - 1. Sample of Total System Warranty.
 - 2. Certification of the manufacturer's warranty reserve.
- I. Upon completion of the installed work, submit copies of the manufacturer's final inspection to the Architect prior to the issuance of the manufacturer's warranty.

1.5 QUALITY ASSURANCE

- A. Manufacturer Qualifications: A qualified manufacturer that is UL listed and FM Approvals approved for membrane roofing system identical to that used for this Project.
 - 1. The manufacturer must have a minimum of 20 years' experience in the manufacturing of vulcanized thermal set sheeting, and be the primary manufacturer of the EPDM membrane.
- B. Installer Qualifications: A qualified firm that is approved, authorized, or licensed by membrane roofing system manufacturer to install manufacturer's product and that is eligible to receive manufacturer's special warranty.
- C. The installer shall be fully knowledgeable of all requirements of the contract documents and shall make themselves aware of all job site conditions that will affect their work.
- D. Installer Qualifications: A qualified firm that is approved, authorized, or licensed by membrane roofing system manufacturer to install manufacturer's product and that is eligible to receive manufacturer's special warranty.
 - 1. The roofing system must be installed by an applicator authorized and trained by the manufacturer in compliance with shop drawings as approved by the manufacturer. The roofing applicator shall be thoroughly experienced and upon request be able to provide evidence of having at least ten years' successful experience installing single-ply EPDM roofing systems and having installed at least one roofing application of similar or equal scope. Unless otherwise noted in this specification, the roofing contractor must strictly comply with the manufacturer's current specifications and details.
 - 2. Provide adequate number of experienced workmen regularly engaged in this type of work who are skilled in the application techniques of the materials specified. Provide at least

- one thoroughly trained and experienced superintendent on the job at all times roofing work is in progress.
3. There shall be a supervisor on the job site at all times while work is in progress.
- E. Source Limitations: Obtain components including roof insulation fasteners for membrane roofing system from same manufacturer as membrane roofing or approved by membrane roofing manufacturer.
- F. Exterior Fire-Test Exposure: ASTM E 108, Class A; for application and roof slopes indicated, as determined by testing identical membrane roofing materials by a qualified testing agency. Materials shall be identified with appropriate markings of applicable testing agency.
- G. Fire-Resistance Ratings: Where indicated, provide fire-resistance-rated roof assemblies identical to those of assemblies tested for fire resistance per ASTM E 119 by a qualified testing agency. Identify products with appropriate markings of applicable testing agency.
- H. Preinstallation Roofing Conference: Conduct conference at Project site.
1. Meet with Owner, Architect, Owner's insurer if applicable, testing and inspecting agency representative, roofing Installer, roofing system manufacturer's representative, deck Installer, and installers whose work interfaces with or affects roofing, including installers of roof accessories and roof-mounted equipment.
 2. Review methods and procedures related to roofing installation, including manufacturer's written instructions.
 3. Review and finalize construction schedule and verify availability of materials, Installer's personnel, equipment, and facilities needed to make progress and avoid delays.
 4. Examine deck substrate conditions and finishes for compliance with requirements, including flatness and fastening.
 5. Review structural loading limitations of roof deck during and after roofing.
 6. Review base flashings, special roofing details, roof drainage, roof penetrations, equipment curbs, and condition of other construction that will affect roofing system.
 7. Review governing regulations and requirements for insurance and certificates if applicable.
 8. Review temporary protection requirements for roofing system during and after installation.
 9. Review roof observation and repair procedures after roofing installation.

1.6 DELIVERY, STORAGE, AND HANDLING

- A. Deliver roofing materials to Project site in original containers with seals unbroken and labeled with manufacturer's name, product brand name and type, date of manufacture, approval or listing agency markings, and directions for storing and mixing with other components.
- B. Store liquid materials in their original undamaged containers in a clean, dry, protected location and within the temperature range required by roofing system manufacturer. Protect stored liquid material from direct sunlight.
1. Discard and legally dispose of liquid material that cannot be applied within its stated shelf life.
- C. Protect roof insulation materials from physical damage and from deterioration by sunlight, moisture, soiling, and other sources. Store in a dry location. Comply with insulation manufacturer's written instructions for handling, storing, and protecting during installation.
- D. Handle and store roofing materials, and place equipment in a manner to avoid permanent deflection of deck.

1.7 FIELD CONDITIONS

- A. Weather Limitations: Proceed with installation only when existing and forecasted weather conditions permit roofing system to be installed according to manufacturer's written instructions and warranty requirements.

1.8 WARRANTY

- A. Special Warranty: Manufacturer agrees to repair or replace components of roofing system that fail in materials or workmanship within specified warranty period.
1. Special warranty includes membrane roofing, base flashings, roof insulation, fasteners, fascia, cover boards, substrate board, roofing accessories, and other components of roofing system.
 2. **Warranty Period:**
 - a. 30 years from date of Substantial Completion.
- B. Special Project Warranty: Submit roofing Installer's warranty, on warranty form at end of this Section, signed by Installer, covering Work of this Section, including all components of roofing system such as membrane roofing, base flashing, roof insulation, fasteners, fascia, cover boards, substrate boards, vapor retarders, roof pavers, and walkway products, for the following warranty period:
1. Warranty Period: Two years from date of Substantial Completion.

PART 2 - PRODUCTS

2.1 MANUFACTURERS

- A. Source Limitations: Obtain components including roof insulation fasteners for roofing system from same manufacturer as membrane roofing or manufacturer approved by membrane roofing manufacturer.

2.2 PERFORMANCE REQUIREMENTS

- A. General Performance: Installed roofing and base flashings shall withstand specified uplift pressures, thermally induced movement, and exposure to weather without failure due to defective manufacture, fabrication, installation, or other defects in construction. Roofing and base flashings shall remain watertight.
1. Accelerated Weathering: Roofing system shall withstand 2000 hours of exposure when tested according to ASTM G 152, ASTM G 154, or ASTM G 155.
 2. Impact Resistance: Roofing system shall resist impact damage when tested according to ASTM D 3746 or ASTM D 4272.
- B. Material Compatibility: Roofing materials shall be compatible with one another and adjacent materials under conditions of service and application required, as demonstrated by roofing manufacturer based on testing and field experience.
- C. FM Global Listing: Roofing, base flashings, and component materials shall comply with requirements in FM Global 4450 or FM Global 4470 as part of a roofing system, and shall be listed in FM Global's "RoofNav" for Class 1 or noncombustible construction, as applicable. Identify materials with FM Global markings.

1. Fire/Windstorm Classification: Class 1A-60.
 2. Hail-Resistance Rating: MH.
- D. Exterior Fire-Test Exposure: ASTM E 108 or UL 790, Class A; for application and roof slopes indicated; testing by a qualified testing agency. Identify products with appropriate markings of applicable testing agency.
- E. Fire-Resistance Ratings: Comply with fire-resistance-rated assembly designs indicated. Identify products with appropriate markings of applicable testing agency.

2.3 EPDM ROOFING

- A. EPDM: ASTM D 4637, Type I, non-reinforced, uniform, flexible EPDM sheet.
1. Manufacturers: Subject to compliance with requirements, provide products by one of the following:
 - a. Carlisle SynTec Incorporated. (Basis of Design)
 - b. Firestone
 - c. Versico Incorporated.
 2. Thickness:
 - a. 90 mils, nominal.
 3. Exposed Face Color: Black.
 4. Membrane to have factory applied 6" seam tape

2.4 AUXILIARY ROOFING MATERIALS

- A. General: Auxiliary materials recommended by roofing system manufacturer for intended use and compatible with roofing.
1. Liquid-type auxiliary materials shall comply with VOC limits of authorities having jurisdiction.
 2. Adhesives and sealants that are not on the exterior side of weather barrier shall comply with the following limits for VOC content:
 - a. Plastic Foam Adhesives: 50 g/L.
 - b. Gypsum Board and Panel Adhesives: 50 g/L.
 - c. Multipurpose Construction Adhesives: 70 g/L.
 - d. Fiberglass Adhesives: 80 g/L.
 - e. Single-Ply Roof Membrane Adhesives: 250 g/L.
 - f. Single-Ply Roof Membrane Sealants: 450 g/L.
 - g. Nonmembrane Roof Sealants: 300 g/L.
 - h. Sealant Primers for Nonporous Substrates: 250 g/L.
 - i. Sealant Primers for Porous Substrates: 775 g/L.
 - j. Other Adhesives and Sealants: 250 g/L.
- B. Sheet Flashing: 60-mil- thick EPDM (90 mil for Bid Alternate RC-01), partially cured or cured, according to application.
- C. Bonding Adhesive: Manufacturer's standard.
- D. Low-Rise, Urethane, Fabric-Backed Membrane Adhesive: Roof system manufacturer's standard spray-applied, low-rise, two-component urethane adhesive formulated for compatibility and use with fabric-backed membrane roofing.
- E. Seaming Material: Manufacturer's standard, synthetic-rubber polymer primer and 6-inch- wide minimum, butyl splice tape with release film.

- F. Lap Sealant: Manufacturer's standard, single-component sealant.
- G. Water Cutoff Mastic: Manufacturer's standard butyl mastic sealant.
- H. Metal Termination Bars: Manufacturer's standard, predrilled stainless-steel or aluminum bars, approximately 1 by 1/8 inch thick; with anchors.
- I. Fasteners: Factory-coated steel fasteners and metal or plastic plates complying with corrosion-resistance provisions in FM Global 4470, designed for fastening membrane to substrate, and acceptable to roofing system manufacturer.
- J. Miscellaneous Accessories: Provide pourable sealers, preformed cone and vent sheet flashings, molded pipe boot flashings, preformed inside and outside corner sheet flashings, reinforced EPDM securement strips, T-joint covers, in-seam sealants, termination reglets, cover strips, and other accessories.

2.5 SUBSTRATE BOARDS

- A. Substrate Board: ASTM C 1396/C 1396M, Type X gypsum board, 5/8 inch thick.
- B. Fasteners: Factory-coated steel fasteners and metal or plastic plates complying with corrosion-resistance provisions in FM Global 4470, designed for fastening substrate panel to existing tectum roof deck.

2.6 ROOF INSULATION

- A. General: Preformed roof insulation boards manufactured by EPDM roofing manufacturer, selected from manufacturer's standard sizes suitable for application, of thicknesses indicated.
- B. Polyisocyanurate Board Insulation: ASTM C 1289, Type II, Class 1, Grade 2, felt or glass-fiber mat facer on both major surfaces.
- C. Tapered Insulation: Provide factory-tapered insulation boards fabricated to slope of 1/8 inch per 12 inches unless otherwise indicated.
- D. High Density Composite Insulation: 2" Secureshield HD composite. The board is comprised of 1/2" high density polyiso with 100 psi compressive strength and 1.5" of 20 psi polyisocyanurate meeting ASTM 1289, Type II, Class 2, Grade 2. Insulation to have a coated glass facer.
- E. Provide minimum R-Value of R-30 continuous insulation per New York State Energy Code. Tapered Insulation shall be in addition to the required minimum continuous insulation."
- F. Provide preformed saddles, crickets, tapered edge strips, and other insulation shapes where indicated for sloping to drain. Fabricate to slopes indicated.

2.7 COVER BOARD

- A. High Density Cover board: 100 psi compressive strength 1/2" High Density Polyisocyanurate cover board with a coated fiberglass facer.

2.8 INSULATION ACCESSORIES

- A. General: Roof insulation accessories recommended by insulation manufacturer for intended use and compatibility with roofing.
- B. Fasteners: Factory-coated steel fasteners and metal or plastic plates complying with corrosion-resistance provisions in FM Global 4470, designed for fastening roof insulation and cover boards to substrate, and acceptable to roofing system manufacturer.

- C. Insulation Adhesive: Insulation manufacturer's recommended adhesive formulated to attach roof insulation to substrate or to another insulation layer as follows:
 - 1. Full-spread spray-applied, low-rise, two-component urethane adhesive.

PART 3 - EXECUTION

3.1 EXAMINATION

- A. Examine substrates, areas, and conditions, with Installer present, for compliance with requirements and other conditions affecting performance of the Work:
 - 1. Verify that roof openings and penetrations are in place, curbs are set and braced, and roof-drain bodies are securely clamped in place.
 - 2. Verify that wood blocking, curbs, and nailers are securely anchored to roof deck at penetrations and terminations and that nailers match thicknesses of insulation.
 - 3. Verify that minimum concrete drying period recommended by roofing system manufacturer has passed.
 - 4. Verify that tectum substrate is visibly dry and free of moisture. Test for capillary moisture.
 - 5. Verify that concrete-curing compounds that will impair adhesion of roofing components to roof deck have been removed.
- B. Proceed with installation only after unsatisfactory conditions have been corrected.

3.2 PREPARATION

- A. Clean substrate of dust, debris, moisture, and other substances detrimental to roofing installation according to roofing system manufacturer's written instructions. Remove sharp projections.
- B. Prevent materials from entering and clogging roof drains and conductors and from spilling or migrating onto surfaces of other construction. Remove roof-drain plugs when no work is taking place or when rain is forecast.
- C. Install insulation strips according to manufacturer's written instructions.

3.3 ROOFING INSTALLATION, GENERAL

- A. Install roofing system according to roofing system manufacturer's written instructions.
- B. Complete terminations and base flashings and provide temporary seals to prevent water from entering completed sections of roofing system at the end of the workday or when rain is forecast. Remove and discard temporary seals before beginning work on adjoining roofing.
- C. Install roofing and auxiliary materials to tie in to existing roofing to maintain weathertightness of transition and to not void warranty for existing roofing system.

3.4 SUBSTRATE BOARD INSTALLATION

- A. Install substrate board with long joints in continuous straight lines, perpendicular to roof slopes with end joints staggered between rows. Tightly butt substrate boards together.
 - 1. Fasten substrate board to existing tectum deck according to recommendations in FM Global's "RoofNav" and FM Global Loss Prevention Data Sheet 1-29 for specified Windstorm Resistance Classification.

2. Fasten substrate board to existing tectum deck to resist uplift pressure at corners, perimeter, and field of roof according to roofing system manufacturers' written instructions.

3.5 INSULATION INSTALLATION

- A. Coordinate installing roofing system components so insulation is not exposed to precipitation or left exposed at the end of the workday.
- B. Comply with roofing system and insulation manufacturer's written instructions for installing roof insulation.
- C. Install tapered insulation under area of roofing to conform to slopes indicated.
- D. Install insulation under area of roofing to achieve required thickness. Where overall insulation thickness is 2.7 inches or greater, install two or more layers with joints of each succeeding layer staggered from joints of previous layer a minimum of 6 inches in each direction.
 1. Where installing composite and noncomposite insulation in two or more layers, install noncomposite board insulation for bottom layer and intermediate layers, if applicable, and install composite board insulation for top layer.
- E. Trim surface of insulation where necessary at roof drains so completed surface is flush and does not restrict flow of water.
- F. Install insulation with long joints of insulation in a continuous straight line with end joints staggered between rows, abutting edges and ends between boards. Fill gaps exceeding 1/4 inch with insulation.
 1. Cut and fit insulation within 1/4 inch of nailers, projections, and penetrations.
- G. Adhered Insulation: Install each layer of insulation and adhere to substrate as follows based on manufacturer's written instructions:
 1. Set each layer of insulation in ribbons of bead-applied insulation adhesive, firmly pressing and maintaining insulation in place.
 2. Set each layer of insulation in a uniform coverage of full-spread insulation adhesive, firmly pressing and maintaining insulation in place.
- H. Mechanically Fastened Insulation: Install each layer of insulation and secure to deck using mechanical fasteners specifically designed and sized for fastening specified board-type roof insulation to deck type.
 1. Fasten insulation according to requirements in FM Global's "RoofNav" for specified Windstorm Resistance Classification.
 2. Fasten insulation to resist uplift pressure at corners, perimeter, and field of roof.
- I. Mechanically Fastened and Adhered Insulation: Install first layer of insulation to deck using mechanical fasteners specifically designed and sized for fastening specified board-type roof insulation to deck type.
 1. Fasten first layer of insulation according to requirements in FM Global's "RoofNav" for specified Windstorm Resistance Classification.
 2. Fasten first layer of insulation to resist uplift pressure at corners, perimeter, and field of roof.
 3. Set each subsequent layer of insulation in a solid mopping of hot roofing asphalt, applied within plus or minus 25 deg F of equiviscous temperature.

4. Set each subsequent layer of insulation in ribbons of bead-applied insulation adhesive, firmly pressing and maintaining insulation in place.
 5. Set each subsequent layer of insulation in a uniform coverage of full-spread insulation adhesive, firmly pressing and maintaining insulation in place.
- J. Install cover boards over insulation with long joints in continuous straight lines with end joints staggered between rows. Offset joints of insulation below a minimum of 6 inches in each direction.
1. Fasten cover boards according to requirements in FM Global's "RoofNav" for specified Windstorm Resistance Classification.
 2. Fasten cover boards to resist uplift pressure at corners, perimeter, and field of roof.

3.6 ADHERED MEMBRANE ROOFING INSTALLATION

- A. Adhere roofing over area to receive roofing according to membrane roofing system manufacturer's written instructions. Unroll membrane roofing and allow to relax before installing.
- B. Start installation of roofing in presence of roofing system manufacturer's technical personnel.
- C. Accurately align roofing, and maintain uniform side and end laps of minimum dimensions required by manufacturer. Stagger end laps.
- D. Bonding Adhesive: Apply to substrate and underside of roofing at rate required by manufacturer, and allow to partially dry before installing roofing. Do not apply to splice area of roofing.
- E. In addition to adhering, mechanically fasten roofing securely at terminations, penetrations, and perimeters.
- F. Apply roofing with side laps shingled with slope of roof deck where possible.
- G. Tape Seam Installation: Clean and prime both faces of splice areas, apply splice tape, and firmly roll side and end laps of overlapping roofing according to manufacturer's written instructions to ensure a watertight seam installation. Apply lap sealant and seal exposed edges of roofing terminations.
- H. Repair tears, voids, and lapped seams in roofing that do not comply with requirements.
- I. Spread sealant or mastic bed over deck-drain flange at roof drains, and securely seal membrane roofing in place with clamping ring.
- J. Adhere protection sheet over membrane roofing at locations indicated.

3.7 BASE FLASHING INSTALLATION

- A. Install sheet flashings and preformed flashing accessories, and adhere to substrates according to roofing system manufacturer's written instructions.
- B. Apply bonding adhesive to substrate and underside of sheet flashing at required rate, and allow to partially dry. Do not apply to seam area of flashing.
- C. Flash penetrations and field-formed inside and outside corners with cured or uncured sheet flashing.
- D. Clean splice areas, apply splicing cement, and firmly roll side and end laps of overlapping sheets to ensure a watertight seam installation. Apply lap sealant and seal exposed edges of sheet flashing terminations.

- E. Terminate and seal top of sheet flashings and mechanically anchor to substrate through termination bars.

3.8 FIELD QUALITY CONTROL

- A. Flood Testing: Flood test each roofing area for leaks, according to recommendations in ASTM D 5957, after completing roofing and flashing but before overlying construction is placed. Install temporary containment assemblies, plug or dam drains, and flood with potable water.
 - 1. Flood to an average depth of 2-1/2 inches with a minimum depth of 1 inch and not exceeding a depth of 4 inches. Maintain 2 inches of clearance from top of base flashing.
 - 2. Flood each area for 24 hours.
 - 3. After flood testing, repair leaks, repeat flood tests, and make further repairs until roofing and flashing installations are watertight.
- B. Final Roof Inspection: Arrange for roofing system manufacturer's technical personnel to inspect roofing installation on completion.
- C. Repair or remove and replace components of roofing system where inspections indicate that they do not comply with specified requirements.
- D. Additional testing and inspecting, at Contractor's expense, will be performed to determine if replaced or additional work complies with specified requirements.

3.9 PROTECTING AND CLEANING

- A. Protect membrane roofing system from damage and wear during remainder of construction period. When remaining construction does not affect or endanger roofing, inspect roofing for deterioration and damage, describing its nature and extent in a written report, with copies to Architect and Owner.
- B. Correct deficiencies in or remove membrane roofing system that does not comply with requirements, repair substrates, and repair or reinstall membrane roofing system to a condition free of damage and deterioration at time of Substantial Completion and according to warranty requirements.
- C. Clean overspray and spillage from adjacent construction using cleaning agents and procedures recommended by manufacturer of affected construction.

3.10 ROOFING INSTALLER'S WARRANTY

- A. WHEREAS _____ of _____, herein called the "Roofing Installer," has performed roofing and associated work ("work") on the following project:
 - 1. Owner: Spackenkill Union Free School District
 - 2. Address: 15 Croft Road
 - 3. Building Name:
 - a. Nassau Elementary School, 7 Nassau Rd., Poughkeepsie, NY 12601
 - b. Hagan Elementary School, 42 Hagan Dr., Poughkeepsie, NY 12603
 - 4. Area of Work: As shown on the Contract Documents.
 - 5. Acceptance Date: _____.
 - 6. Warranty Period:
 - a. Base Bid: 20 Years
 - b. Bid Alternate RC-01: 30 Years

7. Expiration Date: _____.
- B. AND WHEREAS Roofing Installer has contracted (either directly with Owner or indirectly as a subcontractor) to warrant said work against leaks and faulty or defective materials and workmanship for designated Warranty Period,
- C. NOW THEREFORE Roofing Installer hereby warrants, subject to terms and conditions herein set forth, that during Warranty Period he will, at his own cost and expense, make or cause to be made such repairs to or replacements of said work as are necessary to correct faulty and defective work and as are necessary to maintain said work in a watertight condition.
- D. This Warranty is made subject to the following terms and conditions:
1. Specifically excluded from this Warranty are damages to work and other parts of the building, and to building contents, caused by:
 - a. lightning;
 - b. peak gust wind speed exceeding 90 mph;
 - c. fire;
 - d. failure of roofing system substrate, including cracking, settlement, excessive deflection, deterioration, and decomposition;
 - e. faulty construction of parapet walls, copings, chimneys, skylights, vents, equipment supports, and other edge conditions and penetrations of the work;
 - f. vapor condensation on bottom of roofing; and
 - g. activity on roofing by others, including construction contractors, maintenance personnel, other persons, and animals, whether authorized or unauthorized by Owner.
 2. When work has been damaged by any of foregoing causes, Warranty shall be null and void until such damage has been repaired by Roofing Installer and until cost and expense thereof have been paid by Owner or by another responsible party so designated.
 3. Roofing Installer is responsible for damage to work covered by this Warranty but is not liable for consequential damages to building or building contents resulting from leaks or faults or defects of work.
 4. During Warranty Period, if Owner allows alteration of work by anyone other than Roofing Installer, including cutting, patching, and maintenance in connection with penetrations, attachment of other work, and positioning of anything on roof, this Warranty shall become null and void on date of said alterations, but only to the extent said alterations affect work covered by this Warranty. If Owner engages Roofing Installer to perform said alterations, Warranty shall not become null and void unless Roofing Installer, before starting said work, shall have notified Owner in writing, showing reasonable cause for claim, that said alterations would likely damage or deteriorate work, thereby reasonably justifying a limitation or termination of this Warranty.
 5. During Warranty Period, if original use of roof is changed and it becomes used for, but was not originally specified for, a promenade, work deck, spray-cooled surface, flooded basin, or other use or service more severe than originally specified, this Warranty shall become null and void on date of said change, but only to the extent said change affects work covered by this Warranty.
 6. Owner shall promptly notify Roofing Installer of observed, known, or suspected leaks, defects, or deterioration and shall afford reasonable opportunity for Roofing Installer to inspect work and to examine evidence of such leaks, defects, or deterioration.

7. This Warranty is recognized to be the only warranty of Roofing Installer on said work and shall not operate to restrict or cut off Owner from other remedies and resources lawfully available to Owner in cases of roofing failure. Specifically, this Warranty shall not operate to relieve Roofing Installer of responsibility for performance of original work according to requirements of the Contract Documents, regardless of whether Contract was a contract directly with Owner or a subcontract with Owner's General Contractor.

E. IN WITNESS THEREOF, this instrument has been duly executed this _____ day of _____, _____.

1. Authorized Signature: _____.
2. Name: _____.
3. Title: _____.

END OF SECTION 075323

SECTION 077100 - ROOF SPECIALTIES

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

- A. Drawings and general provisions of the Contract, including General and Supplementary Conditions and Division 01 Specification Sections, apply to this Section.

1.2 SUMMARY

- A. Section Includes:
1. Roof-edge flashings.
 2. Roof-edge drainage systems.
 3. Reglets and counterflashings.
- B. Related Sections:
1. Section 061053 "Miscellaneous Rough Carpentry" for wood nailers, curbs, and blocking.
 2. Section 077200 "Roof Accessories" for set-on-type curbs, equipment supports, roof hatches, vents, and other manufactured roof accessory units.
 3. Section 079200 "Joint Sealants" for field-applied sealants between roof specialties and adjacent materials.

1.3 PERFORMANCE REQUIREMENTS

- A. General Performance: Roof specialties shall withstand exposure to weather and resist thermally induced movement without failure, rattling, leaking, or fastener disengagement due to defective manufacture, fabrication, installation, or other defects in construction.
- B. FM Approvals' Listing: Manufacture and install roof-edge flashings that are listed in FM Approvals' "RoofNav" and approved for windstorm classification, Class 1-60. Identify materials with FM Approvals' markings.
- C. SPRI Wind Design Standard: Manufacture and install roof-edge flashings tested according to SPRI ES-1.
- D. Thermal Movements: Allow for thermal movements from ambient and surface temperature changes to prevent buckling, opening of joints, hole elongation, overstressing of components, failure of joint sealants, failure of connections, and other detrimental effects. Provide clips that resist rotation and avoid shear stress as a result of thermal movements. Base calculations on surface temperatures of materials due to both solar heat gain and nighttime-sky heat loss.
1. Temperature Change (Range): 120 deg F, ambient; 180 deg F, material surfaces.

1.4 ACTION SUBMITTALS

- A. Product Data: For each type of product indicated. Include construction details, material descriptions, dimensions of individual components and profiles, and finishes.
- B. Shop Drawings: For roof specialties. Include plans, elevations, expansion-joint locations, keyed details, and attachments to other work. Distinguish between plant- and field-assembled work. Include the following:
1. Details for expansion and contraction; locations of expansion joints, including direction of expansion and contraction.
 2. Pattern of seams and layout of fasteners, cleats, clips, and other attachments.

3. Details of termination points and assemblies, including fixed points.
 4. Details of special conditions.
 - C. Samples for Initial Selection: For each type of roof specialty indicated with factory-applied color finishes.
 - D. Samples for Verification: For roof-edge flashings roof-edge drainage systems reglets and counterflashings made from 12-inch lengths of full-size components including fasteners, cover joints, accessories, and attachments.
- 1.5 INFORMATIONAL SUBMITTALS
- A. Product Test Reports: Based on evaluation of comprehensive tests performed by a qualified testing agency, for roof-edge flashings.
 - B. Warranty: Sample of special warranty.
- 1.6 CLOSEOUT SUBMITTALS
- A. Maintenance Data: For roofing specialties to include in maintenance manuals.
- 1.7 QUALITY ASSURANCE
- A. Preinstallation Conference: Conduct conference at Project site.
 1. Meet with Owner, Architect, Owner's insurer if applicable, Installer, and installers whose work interfaces with or affects roof specialties including installers of roofing materials and accessories.
 2. Examine substrate conditions for compliance with requirements, including flatness and attachment to structural members.
 3. Review special roof details, roof drainage, and condition of other construction that will affect roof specialties.
- 1.8 DELIVERY, STORAGE, AND HANDLING
- A. Do not store roof specialties in contact with other materials that might cause staining, denting, or other surface damage. Store roof specialties away from uncured concrete and masonry.
 - B. Protect strippable protective covering on roof specialties from exposure to sunlight and high humidity, except to extent necessary for the period of roof specialties installation.
- 1.9 WARRANTY
- A. Special Warranty on Painted Finishes: Manufacturer's standard form in which manufacturer agrees to repair finish or replace roof specialties that show evidence of deterioration of factory-applied finishes within specified warranty period.
 1. Fluoropolymer Finish: Deterioration includes, but is not limited to, the following:
 - a. Color fading more than 5 Hunter units when tested according to ASTM D 2244.
 - b. Chalking in excess of a No. 8 rating when tested according to ASTM D 4214.
 - c. Cracking, checking, peeling, or failure of paint to adhere to bare metal.
 2. Finish Warranty Period: 20 years from date of Substantial Completion.

PART 2 - PRODUCTS

2.1 EXPOSED METALS

- A. Aluminum Sheet: ASTM B 209, alloy as standard with manufacturer for finish required, with temper to suit forming operations and performance required.
 - 1. Surface: Smooth, flat finish.
 - 2. Aluminum Finish:
 - a. Clear anodic:
 - 1) Location: All areas, unless noted otherwise.
 - b. Color anodic:
 - 1) Middle School Gym:
 - a) Color: Match color of existing fascia at 'old' High School Building (dark bronze).
 - 2) Elementary School:
 - a) Match color of existing fascia at Elementary School ('green').
 - 3) Gym Lobby Addition:
 - a) Match color of existing fascia at High School Gym ('limestone').
 - c. Exposed Coil-Coated Finishes: Prepare, pretreat, and apply coating to exposed metal surfaces to comply with coating and resin manufacturers' written instructions.
 - 1) Two-Coat Fluoropolymer: AAMA 620. System consisting of primer and fluoropolymer color topcoat containing not less than 70 percent PVDF resin by weight.
 - 2) Two-Coat Fluoropolymer: AAMA 620. System consisting of primer and fluoropolymer color topcoat containing not less than 70 percent PVDF resin by weight.
 - 3) Location:

2.2 CONCEALED METALS

- A. Aluminum Sheet: ASTM B 209, alloy and temper recommended by manufacturer for type of use and structural performance indicated, mill finished.
- B. Zinc-Coated (Galvanized) Steel Sheet: ASTM A 653/A 653M, G90 coating designation.

2.3 MISCELLANEOUS MATERIALS

- A. General: Provide materials and types of fasteners, protective coatings, sealants, and other miscellaneous items required by manufacturer for a complete installation.
- B. Fasteners: Manufacturer's recommended fasteners, suitable for application and designed to meet performance requirements. Furnish the following unless otherwise indicated:
 - 1. Fasteners for Aluminum: Aluminum or Series 300 stainless steel.
 - 2. Fasteners for Zinc-Coated (Galvanized) Steel Sheet: Series 300 stainless steel or hot-dip zinc-coated steel according to ASTM A 153/A 153M or ASTM F 2329.
- C. Elastomeric Sealant: ASTM C 920, elastomeric silicone polymer sealant of type, grade, class, and use classifications required by roofing-specialty manufacturer for each application.
- D. Bituminous Coating: Cold-applied asphalt emulsion complying with ASTM D 1187.

2.4 ROOF-EDGE FLASHINGS

- A. Roof-Edge Fascia: Manufactured, two-piece, roof-edge fascia consisting of snap-on metal fascia cover in section lengths not exceeding 12 feet and a continuous formed- or extruded-aluminum anchor bar with integral drip-edge cleat to engage fascia cover. Provide matching corner units.
1. Basis-of-Design Product: Subject to compliance with requirements, the following:
 - a. Carlisle Secure Edge 3000.
 2. Fascia Cover: Fabricated from the following exposed metal:
 - a. Formed Aluminum: 0.050 inch thick.
 3. Corners: Factory mitered and continuously welded.
 4. Splice Plates: Concealed, of same material, finish, and shape as fascia cover.
 5. Fascia Accessories:
 - a. Fascia extenders with continuous hold-down cleats
 - b. Overflow scuppers.

2.5 REGLETS AND COUNTERFLASHINGS

- A. Manufacturers: Subject to compliance with requirements, available manufacturers offering products that may be incorporated into the Work include, but are not limited to, the following:
- B. Basis-of-Design Product: Subject to compliance with requirements, provide the following:
1. Fry Reglet Corporation.
- C. Reglets: Manufactured units formed to provide secure interlocking of separate reglet and counterflashing pieces, from the following exposed metal:
1. Formed Aluminum: 0.050 inch thick.
 2. Corners: Factory mitered and continuously welded.
 3. Masonry Type, Embedded: Provide reglets with offset top flange for embedment in masonry mortar joint.
 - a. Product Fry Reglet Type MA
- D. Counterflashings: Manufactured units of heights to overlap top edges of base flashings by 4 inches and in lengths not exceeding 12 feet designed to snap into reglets and compress against base flashings with joints lapped, from the following exposed metal:
1. Formed Aluminum: 0.50 inch thick.
 2. Product: Fry Reglet Springlok flashing system
- E. Accessories:
1. Flexible-Flashing Retainer: Provide resilient plastic or rubber accessory to secure flexible flashing in reglet where clearance does not permit use of standard metal counterflashing or where reglet is provided separate from metal counterflashing.
- F. Aluminum Finish: Polyester.
1. Color: Gray.

2.6 GENERAL FINISH REQUIREMENTS

- A. Comply with NAAMM's "Metal Finishes Manual for Architectural and Metal Products" for recommendations for applying and designating finishes.
- B. Protect mechanical and painted finishes on exposed surfaces from damage by applying a strippable, temporary protective covering before shipping.
- C. Appearance of Finished Work: Noticeable variations in same piece are not acceptable. Variations in appearance of adjoining components are acceptable if they are within the range of approved Samples and are assembled or installed to minimize contrast.

PART 3 - EXECUTION

3.1 EXAMINATION

- A. Examine substrates, areas, and conditions, with Installer present, to verify actual locations, dimensions, and other conditions affecting performance of the Work.
- B. Examine walls, roof edges, and parapets for suitable conditions for roof specialties.
- C. Verify that substrate is sound, dry, smooth, clean, sloped for drainage, and securely anchored.
- D. Proceed with installation only after unsatisfactory conditions have been corrected.

3.2 INSTALLATION, GENERAL

- A. General: Install roof specialties according to manufacturer's written instructions. Anchor roof specialties securely in place, with provisions for thermal and structural movement. Use fasteners, solder, protective coatings, separators, sealants, and other miscellaneous items as required to complete roof-specialty systems.
 - 1. Install roof specialties level, plumb, true to line and elevation; with limited oil-canning and without warping, jogs in alignment, buckling, or tool marks.
 - 2. Provide uniform, neat seams with minimum exposure of solder and sealant.
 - 3. Install roof specialties to fit substrates and to result in watertight performance. Verify shapes and dimensions of surfaces to be covered before manufacture.
 - 4. Torch cutting of roof specialties is not permitted.
 - 5. Do not use graphite pencils to mark metal surfaces.
- B. Metal Protection: Protect metals against galvanic action by separating dissimilar metals from contact with each other or with corrosive substrates by painting contact surfaces with bituminous coating or by other permanent separation as recommended by manufacturer.
 - 1. Underlayment: Where installing metal flashing directly on cementitious or wood substrates, install a course of self-adhering, high-temperature sheet underlayment.
- C. Expansion Provisions: Allow for thermal expansion of exposed roof specialties.
 - 1. Space movement joints at a maximum of 12 feet with no joints within 24" of corners or intersections unless otherwise shown on Drawings.
 - 2. When ambient temperature at time of installation is between 40 and 70 deg F, set joint members for 50 percent movement each way. Adjust setting proportionately for installation at higher ambient temperatures.
- D. Fastener Sizes: Use fasteners of sizes that will penetrate wood blocking or sheathing not less than 1-1/4 inches for nails and not less than 3/4 inch for wood screws.
- E. Seal joints with elastomeric sealant as required by roofing-specialty manufacturer.
- F. Seal joints as required for watertight construction. Place sealant to be completely concealed in joint. Do not install sealants at temperatures below 40 deg F.

3.3 ROOF-EDGE FLASHING INSTALLATION

- A. Install cleats, cants, and other anchoring and attachment accessories and devices with concealed fasteners.
- B. Anchor roof edgings with manufacturer's required devices, fasteners, and fastener spacing to meet performance requirements.

3.4 REGLET AND COUNTERFLASHING INSTALLATION

- A. General: Coordinate installation of reglets and counterflashings with installation of base flashings.
- B. Embedded Reglets install with material and system compatible with existing construction.
- C. Counterflashings: Insert counterflashings into reglets or other indicated receivers; ensure that counterflashings overlap 4 inches over top edge of base flashings. Lap counterflashing joints a minimum of 4 inches and bed with elastomeric sealant. Fit counterflashings tightly to base flashings.

3.5 CLEANING AND PROTECTION

- A. Clean exposed metal surfaces of substances that interfere with uniform oxidation and weathering.
- B. Remove temporary protective coverings and strippable films as roof specialties are installed. On completion of installation, clean finished surfaces including removing unused fasteners, metal filings, pop rivet stems, and pieces of flashing. Maintain roof specialties in a clean condition during construction.
- C. Replace roof specialties that have been damaged or that cannot be successfully repaired by finish touchup or similar minor repair procedures.

END OF SECTION 077100

SECTION 078413 - PENETRATION FIRESTOPPING

PART 1 - GENERAL

1.1 SUMMARY

- A. Section Includes:
 - 1. Penetrations in fire-resistance-rated walls.
 - 2. Penetrations in horizontal assemblies.

1.2 ACTION SUBMITTALS

- A. Product Data: For each type of product indicated.
- B. Product Schedule: For each penetration firestopping system. Include location and design designation of qualified testing and inspecting agency.
 - 1. Where Project conditions require modification to a qualified testing and inspecting agency's illustration for a particular penetration firestopping condition, submit illustration, with modifications marked, approved by penetration firestopping manufacturer's fire-protection engineer as an engineering judgment or equivalent fire-resistance-rated assembly.

1.3 INFORMATIONAL SUBMITTALS

- A. Qualification Data: For qualified Installer.
- B. Installer Certificates: From Installer indicating penetration firestopping has been installed in compliance with requirements and manufacturer's written recommendations.
- C. Product Test Reports: Based on evaluation of comprehensive tests performed by a qualified testing agency, for penetration firestopping.

1.4 QUALITY ASSURANCE

- A. Installer Qualifications: A firm that has been approved by FM Global according to FM Global 4991, "Approval of Firestop Contractors," or been evaluated by UL and found to comply with its "Qualified Firestop Contractor Program Requirements."
 - 1. Be a member in good standing of the Fire Stop Contractors International Association
 - 2. Licensed by a state or local authority , where applicable
 - 3. Shown to have successfully completed not less than 5 comparable size projects.
- B. Fire-Test-Response Characteristics: Penetration firestopping shall comply with the following requirements:
 - 1. Penetration firestopping tests are performed by a qualified testing agency acceptable to authorities having jurisdiction.
 - 2. Penetration firestopping is identical to those tested per testing standard referenced in "Penetration Firestopping" Article. Provide rated systems complying with the following requirements:
 - a. Penetration firestopping products bear classification marking of qualified testing and inspecting agency.
 - b. Classification markings on penetration firestopping correspond to designations listed by the following:
 - 1) UL in its "Fire Resistance Directory."
- C. Preinstallation Conference: Conduct conference at Project site.

1.5 PROJECT CONDITIONS

- A. Environmental Limitations: Do not install penetration firestopping when ambient or substrate temperatures are outside limits permitted by penetration firestopping manufacturers or when substrates are wet because of rain, frost, condensation, or other causes.
- B. Install and cure penetration firestopping per manufacturer's written instructions using natural means of ventilations or, where this is inadequate, forced-air circulation.

1.6 COORDINATION

- A. Coordinate construction of openings and penetrating items to ensure that penetration firestopping is installed according to specified requirements.
- B. Coordinate sizing of sleeves, openings, core-drilled holes, or cut openings to accommodate penetration firestopping.
- C. Notify Owner's testing agency at least seven days in advance of penetration firestopping installations; confirm dates and times on day preceding each series of installations.

PART 2 - PRODUCTS

2.1 MANUFACTURERS

- A. Basis-of-Design Product: Subject to compliance with requirements, provide Hilti, Inc.

2.2 PENETRATION FIRESTOPPING

- A. Provide penetration firestopping that is produced and installed to resist spread of fire according to requirements indicated, resist passage of smoke and other gases, and maintain original fire-resistance rating of construction penetrated. Penetration firestopping systems shall be compatible with one another, with the substrates forming openings, and with penetrating items if any.
- B. Penetrations in Fire-Resistance-Rated Walls: Provide penetration firestopping with ratings determined per ASTM E 814 or UL 1479, based on testing at a positive pressure differential of 0.01-inch wg.
 - 1. Fire-resistance-rated walls include fire-barrier walls.
 - 2. F-Rating: Not less than the fire-resistance rating of constructions penetrated.
- C. Penetrations in Horizontal Assemblies: Provide penetration firestopping with ratings determined per ASTM E 814 or UL 1479, based on testing at a positive pressure differential of 0.01-inch wg.
 - 1. Horizontal assemblies include floors.
 - 2. F-Rating: At least 1 hour, but not less than the fire-resistance rating of constructions penetrated.
 - 3. T-Rating: At least 1 hour, but not less than the fire-resistance rating of constructions penetrated except for floor penetrations within the cavity of a wall.
- D. Penetrations in Smoke Barriers: Provide penetration firestopping with ratings determined per UL 1479.
 - 1. L-Rating: Not exceeding 5.0 cfm/sq. ft. of penetration opening at 0.30-inch wg at both ambient and elevated temperatures.
- E. W-Rating: Provide penetration firestopping showing no evidence of water leakage when tested according to UL 1479.
- F. Exposed Penetration Firestopping: Provide products with flame-spread and smoke-developed indexes of less than 25 and 450, respectively, as determined per ASTM E 84.

- G. VOC Content: Penetration firestopping sealants and sealant primers shall comply with the following limits for VOC content when calculated according to 40 CFR 59, Subpart D (EPA Method 24):
 - 1. Sealants: 250 g/L.
 - 2. Sealant Primers for Nonporous Substrates: 250 g/L.
 - 3. Sealant Primers for Porous Substrates: 775 g/L.
- H. Low-Emitting Materials: Penetration firestopping sealants and sealant primers shall comply with the testing and product requirements of the California Department of Health Services' "Standard Practice for the Testing of Volatile Organic Emissions from Various Sources Using Small-Scale Environmental Chambers."
- I. Accessories: Provide components for each penetration firestopping system that are needed to install fill materials and to maintain ratings required. Use only those components specified by penetration firestopping manufacturer and approved by qualified testing and inspecting agency for firestopping indicated.
 - 1. Permanent forming/damming/backing materials, including the following:
 - a. Slag-wool-fiber or rock-wool-fiber insulation.
 - b. Sealants used in combination with other forming/damming/backing materials to prevent leakage of fill materials in liquid state.
 - c. Fire-rated form board.
 - d. Fillers for sealants.
 - 2. Temporary forming materials.
 - 3. Substrate primers.
 - 4. Collars.
 - 5. Steel sleeves.

2.3 FILL MATERIALS

- A. Cast-in-Place Firestop Devices: Factory-assembled devices for use in cast-in-place concrete floors and consisting of an outer metallic sleeve lined with an intumescent strip, a radial extended flange attached to one end of the sleeve for fastening to concrete formwork, and a neoprene gasket.
- B. Latex Sealants: Single-component latex formulations that do not re-emulsify after cure during exposure to moisture.
- C. Firestop Devices: Factory-assembled collars formed from galvanized steel and lined with intumescent material sized to fit specific diameter of penetrant.
- D. Intumescent Composite Sheets: Rigid panels consisting of aluminum-foil-faced elastomeric sheet bonded to galvanized-steel sheet.
- E. Intumescent Putties: Nonhardening dielectric, water-resistant putties containing no solvents, inorganic fibers, or silicone compounds.
- F. Intumescent Wrap Strips: Single-component intumescent elastomeric sheets with aluminum foil on one side.
- G. Mortars: Prepackaged dry mixes consisting of a blend of inorganic binders, hydraulic cement, fillers, and lightweight aggregate formulated for mixing with water at Project site to form a nonshrinking, homogeneous mortar.
- H. Silicone Foams: Multicomponent, silicone-based liquid elastomers that, when mixed, expand and cure in place to produce a flexible, nonshrinking foam.

- I. Silicone Sealants: Single-component, silicone-based, neutral-curing elastomeric sealants of grade indicated below:
 - 1. Grade: Pourable (self-leveling) formulation for openings in floors and other horizontal surfaces, and nonsag formulation for openings in vertical and sloped surfaces, unless indicated firestopping limits use of nonsag grade for both opening conditions.

2.4 MIXING

- A. For those products requiring mixing before application, comply with penetration firestopping manufacturer's written instructions for accurate proportioning of materials, water (if required), type of mixing equipment, selection of mixer speeds, mixing containers, mixing time, and other items or procedures needed to produce products of uniform quality with optimum performance characteristics for application indicated.

PART 3 - EXECUTION

3.1 EXAMINATION

- A. Examine substrates and conditions, with Installer present, for compliance with requirements for opening configurations, penetrating items, substrates, and other conditions affecting performance of the Work.
- B. Proceed with installation only after unsatisfactory conditions have been corrected.

3.2 PREPARATION

- A. Surface Cleaning: Clean out openings immediately before installing penetration firestopping to comply with manufacturer's written instructions and with the following requirements:
 - 1. Remove from surfaces of opening substrates and from penetrating items foreign materials that could interfere with adhesion of penetration firestopping.
 - 2. Clean opening substrates and penetrating items to produce clean, sound surfaces capable of developing optimum bond with penetration firestopping. Remove loose particles remaining from cleaning operation.
 - 3. Remove laitance and form-release agents from concrete.
- B. Priming: Prime substrates where recommended in writing by manufacturer using that manufacturer's recommended products and methods. Confine primers to areas of bond; do not allow spillage and migration onto exposed surfaces.
- C. Masking Tape: Use masking tape to prevent penetration firestopping from contacting adjoining surfaces that will remain exposed on completion of the Work and that would otherwise be permanently stained or damaged by such contact or by cleaning methods used to remove stains. Remove tape as soon as possible without disturbing firestopping's seal with substrates.

3.3 INSTALLATION

- A. General: Install penetration firestopping to comply with manufacturer's written installation instructions and published drawings for products and applications indicated.
- B. Install forming materials and other accessories of types required to support fill materials during their application and in the position needed to produce cross-sectional shapes and depths required to achieve fire ratings indicated.
 - 1. After installing fill materials and allowing them to fully cure, remove combustible forming materials and other accessories not indicated as permanent components of firestopping.

- C. Install fill materials for firestopping by proven techniques to produce the following results:
 - 1. Fill voids and cavities formed by openings, forming materials, accessories, and penetrating items as required to achieve fire-resistance ratings indicated.
 - 2. Apply materials so they contact and adhere to substrates formed by openings and penetrating items.
 - 3. For fill materials that will remain exposed after completing the Work, finish to produce smooth, uniform surfaces that are flush with adjoining finishes.

3.4 IDENTIFICATION

- A. Identify penetration firestopping with preprinted metal or plastic labels. Attach labels permanently to surfaces adjacent to and within 6 inches of firestopping edge so labels will be visible to anyone seeking to remove penetrating items or firestopping. Use mechanical fasteners or self-adhering-type labels with adhesives capable of permanently bonding labels to surfaces on which labels are placed. Include the following information on labels:
 - 1. The words "Warning - Penetration Firestopping - Do Not Disturb. Notify Building Management of Any Damage."
 - 2. Contractor's name, address, and phone number.
 - 3. Designation of applicable testing and inspecting agency.
 - 4. Date of installation.
 - 5. Manufacturer's name.
 - 6. Installer's name.

3.5 FIELD QUALITY CONTROL

- A. Owner will engage a qualified testing agency to perform tests and inspections.
- B. Where deficiencies are found or penetration firestopping is damaged or removed because of testing, repair or replace penetration firestopping to comply with requirements.
- C. Proceed with enclosing penetration firestopping with other construction only after inspection reports are issued and installations comply with requirements.

3.6 CLEANING AND PROTECTION

- A. Clean off excess fill materials adjacent to openings as the Work progresses by methods and with cleaning materials that are approved in writing by penetration firestopping manufacturers and that do not damage materials in which openings occur.
- B. Provide final protection and maintain conditions during and after installation that ensure that penetration firestopping is without damage or deterioration at time of Substantial Completion. If, despite such protection, damage or deterioration occurs, immediately cut out and remove damaged or deteriorated penetration firestopping and install new materials to produce systems complying with specified requirements.

3.1 THROUGH-PENETRATION FIRESTOP SYSTEM SCHEDULE

- A. Firestop Systems with No Penetrating Items: Comply with the following:
 - 1. Available UL-Classified Systems:
 - a. C-AJ-0001-0999.
 - b. W-L-0001-0999.
 - 2. Type of Fill Materials: One or more of the following:
 - a. Latex sealant.
 - b. Silicone sealant.

- c. Intumescent putty.
 - d. Mortar.
- B. Firestop Systems for Metallic Pipes, Conduit, or Tubing: Comply with the following:
 - 1. Available UL-Classified Systems:
 - a. C-AJ-1001-1999.
 - b. W-L-1001-1999.
 - 2. Type of Fill Materials: One or more of the following:
 - a. Latex sealant.
 - b. Silicone sealant.
 - c. Intumescent putty.
 - d. Mortar.
- C. Firestop Systems for Nonmetallic Pipe, Conduit, or Tubing: Comply with the following:
 - 1. Available UL-Classified Systems:
 - a. C-AJ-2001-2999.
 - b. W-L-2001-2999.
 - 2. Type of Fill Materials: One or more of the following:
 - a. Latex sealant.
 - b. Silicone sealant.
 - c. Intumescent putty.
 - d. Intumescent wrap strips.
 - e. Firestop device.
- D. Firestop Systems for Electrical Cables: Comply with the following:
 - 1. Available UL-Classified Systems:
 - a. C-AJ-3001-3999.
 - b. W-L-3001-3999.
 - 2. Type of Fill Materials: One or more of the following:
 - a. Latex sealant.
 - b. Silicone sealant.
 - c. Intumescent putty.
 - d. Silicone foam.
- E. Firestop Systems for Cable Trays: Comply with the following:
 - 1. Available UL-Classified Systems:
 - a. C-AJ-4001-4999.
 - b. W-L-4001-4999.
 - 2. Type of Fill Materials: One or more of the following:
 - a. Latex sealant.
 - b. Intumescent putty.
 - c. Silicone foam.
- F. Firestop Systems for Insulated Pipes: Comply with the following:
 - 1. Available UL-Classified Systems:
 - a. C-AJ-5001-5999.
 - b. W-L-5001-5999.
 - 2. Type of Fill Materials: One or more of the following:
 - a. Latex sealant.
 - b. Intumescent putty.
 - c. Silicone foam.
 - d. Intumescent wrap strips.

- G. Firestop Systems for Miscellaneous Electrical Penetrants: Comply with the following:
 - 1. Available UL-Classified Systems:
 - a. C-AJ-6001-6999.
 - b. W-L-6001-6999.
 - 2. Type of Fill Materials: One or more of the following:
 - a. Latex sealant.
 - b. Intumescent putty.
 - c. Mortar.
- H. Firestop Systems for Miscellaneous Mechanical Penetrations: Comply with the following:
 - 1. Available UL-Classified Systems:
 - a. C-AJ-7001-7999.
 - b. W-L-7001-7999.
 - 2. Type of Fill Materials: One or both of the following:
 - a. Latex sealant.
 - b. Mortar.
- I. Firestop Systems for Groupings of Penetrations: Comply with the following:
 - 1. Available UL-Classified Systems:
 - a. C-AJ-8001-8999.
 - b. W-L-8001-8999.
 - 2. Type of Fill Materials: One or more of the following:
 - a. Latex sealant.
 - b. Mortar.
 - c. Intumescent wrap strips.
 - d. Firestop device.
 - e. Intumescent composite sheet.
- J. Smoke-stop Systems
 - 1. For all non-rated partitions required to control smoke only provide the following:
 - a. Mineral wool
 - b. Fire and smoke stopping sealant

END OF SECTION 078413

SECTION 079200 - JOINT SEALANTS

PART 1 - GENERAL

1.1 SUMMARY

- A. Section Includes:
1. Silicone joint sealants.
 2. Latex joint sealants.
 3. Acoustical joint sealants.

1.2 SUBMITTALS

- A. Product Data: For each joint-sealant product indicated.
- B. Samples for Initial Selection: Manufacturer's color charts consisting of strips of cured sealants showing the full range of colors available for each product exposed to view.
- C. Joint-Sealant Schedule: Include the following information:
1. Joint-sealant application, joint location, and designation.
 2. Joint-sealant manufacturer and product name.
 3. Joint-sealant formulation.
 4. Joint-sealant color.

1.3 QUALITY ASSURANCE

- A. Installer Qualifications: Manufacturer's authorized representative who is trained and approved for installation of units required for this Project.
- B. Source Limitations: Obtain each kind of joint sealant from single source from single manufacturer.

1.4 PROJECT CONDITIONS

- A. Do not proceed with installation of joint sealants under the following conditions:
1. When ambient and substrate temperature conditions are outside limits permitted by joint-sealant manufacturer or are below 40 deg F.
 2. When joint substrates are wet.
 3. Where joint widths are less than those allowed by joint-sealant manufacturer for applications indicated.
 4. Where contaminants capable of interfering with adhesion have not yet been removed from joint substrates.

PART 2 - PRODUCTS

2.1 MATERIALS, GENERAL

- A. Compatibility: Provide joint sealants, backings, and other related materials that are compatible with one another and with joint substrates under conditions of service and application, as demonstrated by joint-sealant manufacturer, based on testing and field experience.
- B. VOC Content of Interior Sealants: Provide sealants and sealant primers for use inside the weatherproofing system that comply with the following limits for VOC content when calculated according to 40 CFR 59, Part 59, Subpart D (EPA Method 24):
1. Architectural Sealants: 250 g/L.

2. Sealant Primers for Nonporous Substrates: 250 g/L.
3. Sealant Primers for Porous Substrates: 775 g/L.
- C. Liquid-Applied Joint Sealants: Comply with ASTM C 920 and other requirements indicated for each liquid-applied joint sealant specified, including those referencing ASTM C 920 classifications for type, grade, class, and uses related to exposure and joint substrates.
- D. Stain-Test-Response Characteristics: Where sealants are specified to be nonstaining to porous substrates, provide products that have undergone testing according to ASTM C 1248 and have not stained porous joint substrates indicated for Project.
- E. Suitability for Contact with Food: Where sealants are indicated for joints that will come in repeated contact with food, provide products that comply with 21 CFR 177.2600.
- F. Colors of Exposed Joint Sealants: As selected by Architect from manufacturer's full range.

2.2 SILICONE JOINT SEALANTS

- A. Single-Component, Nonsag, Neutral-Curing Silicone Joint Sealant: ASTM C 920, Type S, Grade NS, Class 100/50, for Use NT.
 1. Products: Subject to compliance with requirements, provide one of the following:
 - a. Dow Corning Corporation; 790.
 - b. GE Advanced Materials - Silicones; SilPruf LM SCS2700.
 - c. Sika Corporation, Construction Products Division; SikaSil-C990.
 - d. Tremco Incorporated; Spectrem 1.

2.3 LATEX JOINT SEALANTS

- A. Latex Joint Sealant: Acrylic latex or siliconized acrylic latex, ASTM C 834, Type OP, Grade NF.
 1. Products: Subject to compliance with requirements, provide one of the following:
 - a. BASF Building Systems; Sonolac.
 - b. Bostik, Inc.; Chem-Calk 600.
 - c. Tremco Incorporated; Tremflex 834.

2.4 JOINT SEALANT BACKING

- A. General: Provide sealant backings of material that are nonstaining; are compatible with joint substrates, sealants, primers, and other joint fillers; and are approved for applications indicated by sealant manufacturer based on field experience and laboratory testing.
- B. Cylindrical Sealant Backings: ASTM C 1330, Type O (open-cell material), and of size and density to control sealant depth and otherwise contribute to producing optimum sealant performance.
- C. Bond-Breaker Tape: Polyethylene tape or other plastic tape recommended by sealant manufacturer for preventing sealant from adhering to rigid, inflexible joint-filler materials or joint surfaces at back of joint. Provide self-adhesive tape where applicable.

2.5 MISCELLANEOUS MATERIALS

- A. Primer: Material recommended by joint-sealant manufacturer where required for adhesion of sealant to joint substrates indicated, as determined from preconstruction joint-sealant-substrate tests and field tests.
- B. Cleaners for Nonporous Surfaces: Chemical cleaners acceptable to manufacturers of sealants and sealant backing materials, free of oily residues or other substances capable of staining or harming

joint substrates and adjacent nonporous surfaces in any way, and formulated to promote optimum adhesion of sealants to joint substrates.

- C. Masking Tape: Nonstaining, nonabsorbent material compatible with joint sealants and surfaces adjacent to joints.

PART 3 - EXECUTION

3.1 EXAMINATION

- A. Examine joints indicated to receive joint sealants, with Installer present, for compliance with requirements for joint configuration, installation tolerances, and other conditions affecting joint-sealant performance.
- B. Proceed with installation only after unsatisfactory conditions have been corrected.

3.2 PREPARATION

- A. Surface Cleaning of Joints: Clean out joints immediately before installing joint sealants to comply with joint-sealant manufacturer's written instructions and the following requirements:
 - 1. Remove all foreign material from joint substrates that could interfere with adhesion of joint sealant, including dust, paints (except for permanent, protective coatings tested and approved for sealant adhesion and compatibility by sealant manufacturer), old joint sealants, oil, grease, waterproofing, water repellents, water, surface dirt, and frost.
 - 2. Clean porous joint substrate surfaces by brushing, grinding, mechanical abrading, or a combination of these methods to produce a clean, sound substrate capable of developing optimum bond with joint sealants. Remove loose particles remaining after cleaning operations above by vacuuming or blowing out joints with oil-free compressed air. Porous joint substrates include the following:
 - a. Concrete.
 - b. Masonry.
 - c. Unglazed surfaces of ceramic tile.
 - 3. Remove laitance and form-release agents from concrete.
 - 4. Clean nonporous joint substrate surfaces with chemical cleaners or other means that do not stain, harm substrates, or leave residues capable of interfering with adhesion of joint sealants. Nonporous joint substrates include the following:
 - a. Metal.
 - b. Glass.
 - c. Glazed surfaces of ceramic tile.
- B. Joint Priming: Prime joint substrates where recommended by joint-sealant manufacturer or as indicated by preconstruction joint-sealant-substrate tests or prior experience. Apply primer to comply with joint-sealant manufacturer's written instructions. Confine primers to areas of joint-sealant bond; do not allow spillage or migration onto adjoining surfaces.
- C. Masking Tape: Use masking tape where required to prevent contact of sealant or primer with adjoining surfaces that otherwise would be permanently stained or damaged by such contact or by cleaning methods required to remove sealant smears. Remove tape immediately after tooling without disturbing joint seal.

3.3 INSTALLATION OF JOINT SEALANTS

- A. General: Comply with joint-sealant manufacturer's written installation instructions for products and applications indicated, unless more stringent requirements apply.

- B. Sealant Installation Standard: Comply with recommendations in ASTM C 1193 for use of joint sealants as applicable to materials, applications, and conditions indicated.
- C. Install sealant backings of kind indicated to support sealants during application and at position required to produce cross-sectional shapes and depths of installed sealants relative to joint widths that allow optimum sealant movement capability.
 - 1. Do not leave gaps between ends of sealant backings.
 - 2. Do not stretch, twist, puncture, or tear sealant backings.
 - 3. Remove absorbent sealant backings that have become wet before sealant application and replace them with dry materials.
- D. Install bond-breaker tape behind sealants where sealant backings are not used between sealants and backs of joints.
- E. Install sealants using proven techniques that comply with the following and at the same time backings are installed:
 - 1. Place sealants so they directly contact and fully wet joint substrates.
 - 2. Completely fill recesses in each joint configuration.
 - 3. Produce uniform, cross-sectional shapes and depths relative to joint widths that allow optimum sealant movement capability.
- F. Tooling of Nonsag Sealants: Immediately after sealant application and before skinning or curing begins, tool sealants according to requirements specified in subparagraphs below to form smooth, uniform beads of configuration indicated; to eliminate air pockets; and to ensure contact and adhesion of sealant with sides of joint.
 - 1. Remove excess sealant from surfaces adjacent to joints.
 - 2. Use tooling agents that are approved in writing by sealant manufacturer and that do not discolor sealants or adjacent surfaces.
 - 3. Provide concave joint profile per Figure 8A in ASTM C 1193, unless otherwise indicated.

3.4 CLEANING

- A. Clean off excess sealant or sealant smears adjacent to joints as the Work progresses by methods and with cleaning materials approved in writing by manufacturers of joint sealants and of products in which joints occur.

3.5 PROTECTION

- A. Protect joint sealants during and after curing period from contact with contaminating substances and from damage resulting from construction operations or other causes so sealants are without deterioration or damage at time of Substantial Completion. If, despite such protection, damage or deterioration occurs, cut out and remove damaged or deteriorated joint sealants immediately so installations with repaired areas are indistinguishable from original work.

3.6 JOINT-SEALANT SCHEDULE

- A. Joint-Sealant Application: Exterior joints in vertical surfaces and horizontal nontraffic surfaces.
 - 1. Joint Locations:
 - a. Construction joints in cast-in-place concrete.
 - b. Control and expansion joints in unit masonry.
 - c. Joints between different materials listed above.
 - d. Perimeter joints between materials listed above and frames of doors, windows and louvers.
 - e. Control and expansion joints in overhead surfaces.

- f. Site work expansion joints as indicated on plans.
 - g. Other joints as indicated.
 - 2. Silicone Joint Sealant: Single component, nonsag, neutral curing, Class 100/50.
 - 3. Joint-Sealant Color: As selected by Architect from manufacturer's full range of colors.
- B. Joint-Sealant Application: Interior joints in vertical surfaces and horizontal nontraffic surfaces.
 - 1. Joint Locations:
 - a. Control and expansion joints on exposed interior surfaces of exterior walls.
 - b. Perimeter joints between interior wall surfaces and frames of interior doors.
 - c. Other joints as indicated.
 - 2. Joint Sealant: Latex.
 - 3. Joint-Sealant Color: As selected by Architect from manufacturer's full range of colors.

END OF SECTION 079200

SECTION 079500 - EXPANSION CONTROL

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

- A. Drawings and general provisions of the Contract, including General and Supplementary Conditions and Division 01 Specification Sections, apply to this Section.

1.2 SUMMARY

- A. Section Includes:
 - 1. Interior expansion control systems.
 - 2. Exterior wall expansion control systems.

1.3 ACTION SUBMITTALS

- A. Shop Drawings: For each expansion control system specified. Include plans, elevations, sections, details, splices, blockout requirement, attachments to other work, and line diagrams showing entire route of each expansion control system. Where expansion control systems change planes, provide isometric or clearly detailed drawing depicting how components interconnect.
- B. Samples: For each exposed expansion control system and for each color and texture specified, full width by 6 inches (150 mm) long in size.
- C. Product Schedule: Prepared by or under the supervision of the supplier. Include the following information in tabular form:
 - 1. Manufacturer and model number for each expansion control system.
 - 2. Expansion control system location cross-referenced to Drawings.
 - 3. Nominal joint width.
 - 4. Movement capability.
 - 5. Classification as thermal or seismic.
 - 6. Materials, colors, and finishes.
 - 7. Product options.
 - 8. Fire-resistance ratings.

1.4 INFORMATIONAL SUBMITTALS

- A. Product Test Reports: For each fire barrier provided as part of an expansion control system, for tests performed by a qualified testing agency.

PART 2 - PRODUCTS

2.1 SYSTEM DESCRIPTION

- A. General: Provide expansion control systems of design, basic profile, materials, and operation indicated. Provide units with capability to accommodate variations in adjacent surfaces.
 - 1. Furnish units in longest practicable lengths to minimize field splicing. Install with hairline mitered corners where expansion control systems change direction or abut other materials.
 - 2. Include factory-fabricated closure materials and transition pieces, T-joints, corners, curbs, cross-connections, and other accessories as required to provide continuous expansion control systems.
- B. Coordination: Coordinate installation of exterior wall expansion control systems with roof expansion control systems to ensure that wall transitions are watertight. Roof expansion joint assemblies are specified in Division 07 Sections.

2.2 PERFORMANCE REQUIREMENTS

- A. Fire-Resistance Ratings: Where indicated, provide expansion control systems with fire barriers identical to those of systems tested for fire resistance per UL 2079 or ASTM E 1966 by a testing and inspecting agency acceptable to authorities having jurisdiction.
 - 1. Hose Stream Test: Wall-to-wall and wall-to-ceiling systems shall be subjected to hose stream testing.

2.3 INTERIOR EXPANSION CONTROL SYSTEMS

- A. Manufacturers: Subject to compliance with requirements, available manufacturers offering products that may be incorporated into the Work include, but are not limited to, the following:
 - 1. Architectural Art Mfg., Inc.; Division of Pittcon Industries.
 - 2. Construction Specialties, Inc.
 - 3. MM Systems Corporation.
 - 4. Emseal Joint Systems, LTD.
- B. Source Limitations: Obtain expansion control systems from single source from single manufacturer.
- C. Floor-to-Floor "LASD", "SP" and "FSN 50/15":
 - 1. Basis-of-Design Products: MM Systems Corporation: Model LASD, and Series SP; and Emseal Joint Systems, LTD: Model FSN 50/15. See Drawings for locations.
 - 2. Design Criteria:
 - a. Nominal Joint Width: As indicated on Drawings.

- b. Fire-Resistance Rating: Provide expansion control system and fire-barrier assembly with a rating not less than that indicated, or if not indicated, that of adjacent construction.
 - 3. Type: Cover plate.
 - a. Cover-Plate Design: Plain.
 - b. Metal: Aluminum.
 - 1) Finish: Mill.
- D. Floor-to-Wall “LASDE”:
 - 1. Basis-of-Design Product: MM Systems, Model LASDE.
 - 2. Design Criteria:
 - a. Nominal Joint Width: As indicated on Drawings.
 - b. Fire-Resistance Rating: Provide expansion control system and fire-barrier assembly with a rating not less than that indicated, or if not indicated, that of adjacent construction.
 - 3. Type: Cover plate.
 - a. Cover-Plate Design: Plain.
 - b. Metal: Aluminum.
 - 1) Finish: Mill.
- E. Wall-to-Wall “X-M”:
 - 1. Basis-of-Design Product: MM Systems Model X-M.
 - 2. Design Criteria:
 - a. Nominal Joint Width: As indicated on Drawings.
 - b. Movement Capability: -25 percent/+75 percent.
 - c. Type of Movement: Thermal.
 - d. Fire-Resistance Rating: Provide expansion control system and fire-barrier assembly with a rating not less than 2 hours.
 - 3. Type: Glide plate.
 - a. Metal: Aluminum.
 - 1) Finish: Mill.
- F. Wall Corner “FSAL”:
 - 1. Basis-of-Design Product: MM Systems Model FSAL.
 - 2. Design Criteria:

- a. Nominal Joint Width: As indicated on Drawings.
 - b. Movement Capability: -25 percent/+75 percent.
 - c. Type of Movement: Thermal.
 - d. Fire-Resistance Rating: Provide expansion control system and fire-barrier assembly with a rating not less than 2 hours.
- 3. Type: Elastomeric seal.
 - a. Metal: Aluminum.
 - 1) Finish: Mill.
 - b. Seal Material: Manufacturer's standard.
 - 1) Color: As selected by Architect from manufacturer's full range.
- G. Wall Corner / Concealed Mud Frame "FSWL":
 - 1. Basis of Design Product: MM Systems Model FSWL.
 - 2. Design Criteria:
 - a. Nominal Joint Width: 1".
 - b. Movement Capability: -25 percent/+75 percent.
 - c. Type of Movement: Thermal.
 - 3. Type: Gasket, in color as selected by Architect from manufacturer's full range.
- H. Wall-to-Wall "X-N":
 - 1. Basis-of-Design Product: MM Systems Model X-N.
 - 2. Design Criteria:
 - a. Nominal Joint Width: As indicated on Drawings.
 - b. Movement Capability: -25 percent/+75 percent.
 - c. Type of Movement: Thermal.
 - d. Fire-Resistance Rating: Provide expansion control system and fire-barrier assembly with a rating not less than 2 hours.
 - 3. Type: Glide plate.
 - a. Metal: Aluminum.
 - 1) Finish: Mill.

2.4 EXTERIOR WALL EXPANSION CONTROL SYSTEMS

- A. Manufacturers: Subject to compliance with requirements, available manufacturers offering products that may be incorporated into the Work include, but are not limited to, the following:
 - 1. Architectural Art Mfg., Inc.; Division of Pittcon Industries.
 - 2. Construction Specialties, Inc.
 - 3. EMSEAL Corporation.
 - 4. MM Systems Corporation.

- B. Source Limitations: Obtain expansion control systems from single source from single manufacturer.
- C. Wall-to-Wall "VSS":
 - 1. Basis-of-Design Product: MM Systems, Series ESS.
 - 2. Design Criteria:
 - a. Nominal Joint Width: As indicated on Drawings.
 - b. Movement Capability: -25 percent/+75 percent.
 - c. Type of Movement: Thermal.
 - d. Fire-Resistance Rating: Provide expansion control system and fire-barrier assembly with a rating not less than 2 hours.
 - 3. Type: Silicone Sealing System.
 - a. Product: MM Systems, Series ESS.
 - b. Backer Block Material: Manufacturer's standard, with pre-formed silicone sealing strip, and field-applied silicone sealant.
 - 1) Color: As selected by Architect from manufacturer's full range.

2.5 MATERIALS

- A. Aluminum: ASTM B 221 (ASTM B 221M), Alloy 6063-T5 for extrusions; ASTM B 209 (ASTM B 209M), Alloy 6061-T6 for sheet and plate.
 - 1. Apply manufacturer's standard protective coating on aluminum surfaces to be placed in contact with cementitious materials.
- B. Elastomeric Seals: ASTM E 1783; preformed elastomeric membranes or extrusions to be installed in metal frames.
- C. Compression Seals: ASTM E 1612; preformed elastomeric extrusions having an internal baffle system and designed to function under compression.
- D. Cellular Foam Seals: Extruded, compressible foam designed to function under compression.
- E. Fire Barriers: Any material or material combination, when fire tested after cycling, designated to resist the passage of flame and hot gases through a movement joint and to meet performance criteria for required fire-resistance rating.
- F. Nonmetallic, Shrinkage-Resistant Grout: ASTM C 1107/C 1107M, factory-packaged, nonmetallic aggregate grout, noncorrosive, nonstaining, mixed with water to consistency suitable for application and a 30-minute working time.
- G. Accessories: Manufacturer's standard anchors, clips, fasteners, set screws, spacers, and other accessories compatible with material in contact, as indicated or required for complete installations.

2.6 GENERAL FINISH REQUIREMENTS

- A. Comply with NAAMM's "Metal Finishes Manual for Architectural and Metal Products" for recommendations for applying and designating finishes.
- B. Protect mechanical finishes on exposed surfaces from damage by applying a strippable, temporary protective covering before shipping.
- C. Appearance of Finished Work: Noticeable variations in same piece are not acceptable. Variations in appearance of adjoining components are acceptable if they are within the range of approved Samples and are assembled or installed to minimize contrast.

2.7 ALUMINUM FINISHES

- A. Mill finish.

PART 3 - EXECUTION

3.1 EXAMINATION

- A. Examine surfaces where expansion control systems will be installed for installation tolerances and other conditions affecting performance of work.
 - 1. Proceed with installation only after unsatisfactory conditions have been corrected.

3.2 PREPARATION

- A. Prepare substrates according to expansion control system manufacturer's written instructions.
- B. Coordinate and furnish anchorages, setting drawings, and instructions for installing expansion control systems. Provide fasteners of metal, type, and size to suit type of construction indicated and to provide for secure attachment of expansion control systems.
- C. Cast-In Frames: Coordinate and furnish frames to be cast into concrete.

3.3 INSTALLATION

- A. Comply with manufacturer's written instructions for storing, handling, and installing expansion control systems and materials unless more stringent requirements are indicated.
- B. Metal Frames: Perform cutting, drilling, and fitting required to install expansion control systems.
 - 1. Install in true alignment and proper relationship to joints and adjoining finished surfaces measured from established lines and levels.

2. Adjust for differences between actual structural gap and nominal design gap due to ambient temperature at time of installation. Notify Architect where discrepancies occur that will affect proper expansion control system installation and performance.
 3. Cut and fit ends to accommodate thermal expansion and contraction of metal without buckling of frames.
 4. Repair or grout blockout as required for continuous frame support using nonmetallic, shrinkage-resistant grout.
 5. Install frames in continuous contact with adjacent surfaces.
 - a. Shimming is not permitted.
 6. Locate anchors at interval recommended by manufacturer, but not less than 3 inches (75 mm) from each end and not more than 24 inches (600 mm) o.c.
- C. Seals in Metal Frames: Install elastomeric seals and membranes in frames to comply with manufacturer's written instructions. Install with minimum number of end joints.
1. Provide in continuous lengths for straight sections.
 2. Seal transitions according to manufacturer's written instructions. Vulcanize or heat-weld field-spliced joints as recommended by manufacturer.
 3. Installation: Mechanically lock seals into frames or adhere to frames with adhesive or pressure-sensitive tape as recommended by manufacturer.
- D. Compression Seals: Apply adhesive or lubricant adhesive as recommended by manufacturer before installing compression seals.
- E. Foam Seals: Install with adhesive recommended by manufacturer.
- F. Terminate exposed ends of expansion control systems with field- or factory-fabricated termination devices.
- G. Fire-Resistance-Rated Assemblies: Coordinate installation of expansion control system materials and associated work so complete assemblies comply with assembly performance requirements.
1. Fire Barriers: Install fire barriers to provide continuous, uninterrupted fire resistance throughout length of joint, including transitions and field splices.

3.4 PROTECTION

- A. Do not remove protective covering until finish work in adjacent areas is complete. When protective covering is removed, clean exposed metal surfaces to comply with manufacturer's written instructions.
- B. Protect the installation from damage by work of other Sections. Where necessary due to heavy construction traffic, remove and properly store cover plates or seals and install temporary protection over expansion control systems. Reinstall cover plates or seals prior to Substantial Completion of the Work.

END OF SECTION 079500

SECTION 081113 - HOLLOW METAL DOORS AND FRAMES

PART 1 - GENERAL

1.1 SUMMARY

A. Related Sections:

1. Division 04 Section "Unit Masonry" for embedding anchors for hollow metal work into masonry construction.
2. Division 08 Section "Flush Wood Doors".
3. Division 08 Section "Glazing" for glass view panels in hollow metal doors.
4. Division 08 Section "Door Hardware".
5. Division 08 Section "Access Control Hardware".
6. Division 09 Sections "Exterior Painting" and "Interior Painting" for field painting hollow metal doors and frames.

B. Codes and References: Comply with the version year adopted by the Authority Having Jurisdiction.

1. ANSI/SDI A250.8 - Recommended Specifications for Standard Steel Doors and Frames.
2. ANSI/SDI A250.4 - Test Procedure and Acceptance Criteria for Physical Endurance for Steel Doors, Frames, Frames Anchors and Hardware Reinforcing.
3. ANSI/SDI A250.6 - Recommended Practice for Hardware Reinforcing on Standard Steel Doors and Frames.
4. ANSI/SDI A250.10 - Test Procedure and Acceptance Criteria for Prime Painted Steel Surfaces for Steel Doors and Frames.
5. ANSI/SDI A250.11 - Recommended Erection Instructions for Steel Frames.
6. ASTM A1008 - Standard Specification for Steel Sheet, Cold-Rolled, Carbon, Structural, High-Strength Low-Alloy and High-Strength Low-Alloy with Improved Formability.
7. ASTM A653 - Standard Specification for Steel Sheet, Zinc-Coated (Galvanized) or Zinc-Iron Alloy-Coated (Galvannealed) by the Hot-Dip Process.
8. ASTM A924 - Standard Specification for General Requirements for Steel Sheet, Metallic-Coated by the Hot-Dip Process.
9. ASTM E330 - Standard Test Method for Structural Performance of Exterior Windows, Curtain Walls, and Doors by Uniform Static Air Pressure Difference.
10. ANSI/BHMA A156.15 - Hardware Preparation in Steel Doors and Frames.
11. ANSI/SDI 122 - Installation and Troubleshooting Guide for Standard Steel Doors and Frames.
12. ANSI/NFPA 80 - Standard for Fire Doors and Fire Windows; National Fire Protection Association.
13. ANSI/NFPA 105: Standard for the Installation of Smoke Door Assemblies.
14. NFPA 252 - Standard Methods of Fire Tests of Door Assemblies; National Fire Protection Association.
15. UL 10C - Positive Pressure Fire Tests of Door Assemblies.
16. UL 1784 - Standard for Air Leakage Tests of Door Assemblies.

1.2 DELIVERY, STORAGE, AND HANDLING

A. Deliver hollow metal work palletized, wrapped, or crated to provide protection during transit and Project site storage. Do not use non-vented plastic.

- B. Deliver welded frames with two removable spreader bars across bottom of frames, tack welded to jambs and mullions.
- C. Store hollow metal work under cover at Project site. Place in stacks of five units maximum in a vertical position with heads up, spaced by blocking, on minimum 4-inch high wood blocking. Do not store in a manner that traps excess humidity.
 - 1. Provide minimum 1/4-inch space between each stacked door to permit air circulation. Door and frames to be stacked in a vertical upright position.

1.3 PROJECT CONDITIONS

- A. Field Measurements: Verify actual dimensions of openings by field measurements before fabrication.

1.4 COORDINATION

- A. Coordinate installation of anchorages for hollow metal frames. Furnish setting drawings, templates, and directions for installing anchorages, including sleeves, concrete inserts, anchor bolts, and items with integral anchors. Deliver such items to Project site in time for installation.

1.5 WARRANTY

- A. Special Warranty: Manufacturer's standard form in which manufacturer agrees to repair or replace doors that fail in materials or workmanship within specified warranty period.
- B. Warranty includes installation and finishing that may be required due to repair or replacement of defective doors.

PART 2 - PRODUCTS

2.1 MANUFACTURERS

- A. Manufacturers: Subject to compliance with requirements, provide products by one of the following:
 - 1. CECO Door Products.
 - 2. Curries Company.
 - 3. Steelcraft.

2.2 MATERIALS

- A. Cold-Rolled Steel Sheet: ASTM A 1008/A 1008M, Commercial Steel (CS), Type B; suitable for exposed applications.
- B. Metallic-Coated Steel Sheet: ASTM A 653/A 653M, Commercial Steel (CS), Type B; with minimum G60 (Z180) or A60 (ZF180) metallic coating.
- C. Frame Anchors: ASTM A 653/A 653M, Commercial Steel (CS), Commercial Steel (CS), Type B; with minimum G60 (Z180) or A60 (ZF180) metallic coating.

2.3 STANDARD HOLLOW METAL DOORS

- A. General: Provide 1-3/4 inch doors of design indicated, not less than thickness indicated; fabricated with smooth surfaces, without visible joints or seams on exposed faces unless otherwise indicated. Comply with ANSI/SDI A250.8.

- B. Interior Doors: Face sheets fabricated of commercial quality cold rolled steel that complies with ASTM A 1008/A 1008M. Provide doors complying with requirements indicated below by referencing ANSI/SDI A250.8 for level and model and ANSI/SDI A250.4 for physical performance level:
1. Design: Flush panel.
 2. Core Construction: Manufacturer's standard vertical steel-stiffener core. Minimum 18 gauge steel-stiffeners at 6 inches on-center construction attached by spot welds spaced not more than 5" on centers. Spaces between stiffeners filled with fiberglass insulation (minimum density 0.8#/cubic ft.).
 - a. Fire Door Core: As required to provide fire-protection and temperature-rise ratings indicated.
 3. Top and Bottom Edges: Reinforce tops and bottoms of doors with a continuous steel channel not less than 16 gauge, extending the full width of the door and welded to the face sheet.
 4. Hinge Reinforcement: Minimum 7 gauge (3/16") plate 1-1/4" x 9" or minimum 14 gauge continuous channel with pierced holes, drilled and tapped.
 5. Hardware Reinforcements: Fabricate according to ANSI/SDI A250.6 with reinforcing plates from same material as door face sheets.
- C. Manufacturers Basis of Design:
1. CECO Door Products Imperial Series.
 2. CECO Door Products Steel-Stiffened: Medallion Series.
 3. Curries Company Steel-Stiffened: 747 Series.

2.4 STANDARD HOLLOW METAL FRAMES

- A. General: Comply with ANSI/SDI A250.8 and with details indicated for type and profile.
- B. Exterior Frames: Fabricated of hot-dipped zinc coated steel that complies with ASTM A 653/A 653M, Coating Designation A60.
1. Fabricate frames with mitered or coped corners.
 2. Fabricate frames, with the exception of knock down types, with "closed and tight" miter seams continuously welded on face, finished smooth with no visible seam unless otherwise indicated.
 3. Frames for Level 3 Steel Doors (up to 48 inches in width): Minimum 14 gauge (0.067-inch -1.7-mm) thick steel sheet.
 4. Frames for Level 3 Steel Doors (48 inches and up in width): Minimum 12 gauge (0.081-inch -2.7-mm) thick steel sheet.
 5. Frames for Level 2 Steel Doors: Minimum 16 gauge (0.053-inch -1.3-mm) thick steel sheet.
 6. Manufacturers Basis of Design:
 - a. CECO Door Products SQ/SU/SR Series.
 - b. Curries Company M/G Series.
- C. Interior Frames: Fabricated from cold-rolled steel sheet that complies with ASTM A 1008/A 1008M.

1. Fabricate frames with mitered or coped corners.
 2. Fabricate frames, with the exception of slip-on drywall types, with "closed and tight" miter seams continuously welded on face, finished smooth with no visible seam unless otherwise indicated.
 3. Frames for Level 2 Steel Doors: Minimum 16 gauge (0.053-inch -1.3-mm) thick steel sheet.
 4. Frames for Level 3 Steel Doors (up to 48 inches in width): Minimum 16 gauge (0.053-inch -1.3-mm) thick steel sheet.]
 5. Frames for Level 3 Steel Doors (48 inches and up in width): Minimum 14 gauge (0.067-inch -1.7-mm) thick steel sheet.]
 6. Frames for Wood Doors: Minimum 16 gauge (0.053-inch-1.3-mm-) thick steel sheet.
 7. Frames for Borrowed Lights: Minimum 16 gauge (0.053-inch-1.3-mm-) thick steel sheet.
 8. Manufacturers Basis of Design:
 - a. CECO Door Products BQ/BU/DQ/DU/BR/DR Series (Drywall Profile).
 - b. CECO Door Products SQ/SU/SR Series (Masonry Profile).
 - c. Curries Company C/CM/CG Series (Drywall Profile).
 - d. Curries Company M/G Series (Masonry Profile).
- D. Fire rated frames: Fabricate frames in accordance with NFPA 80, listed and labeled by a qualified testing agency, for fire-protection ratings indicated.
- E. Hardware Reinforcement: Fabricate according to ANSI/SDI A250.6 Table 4 with reinforcement plates from same material as frames.

2.5 FRAME ANCHORS

- A. Jamb Anchors:
1. Masonry Type: Adjustable strap-and-stirrup or T-shaped anchors to suit frame size, formed from A60 metallic coated material, not less than 0.042 inch thick, with corrugated or perforated straps not less than 2 inches wide by 10 inches long; or wire anchors not less than 0.177 inch thick.
 2. Stud Wall Type: Designed to engage stud and not less than 0.042 inch thick.
 3. Compression Type for Drywall Slip-on (Knock-Down) Frames: Adjustable compression anchors.
 4. Windstorm Opening Anchors: Types as tested and required for indicated wall types to meet specified wind load design criteria.
 5. FEMA 361 Storm Shelter Anchors: Masonry T-shaped, wire masonry type, or existing opening type anchors.
- B. Floor Anchors: Floor anchors to be provided at each jamb, formed from A60 metallic coated material, not less than 0.042 inches thick.
- C. Mortar Guards: Formed from same material as frames, not less than 0.016 inches thick.

2.6 LIGHT OPENINGS AND GLAZING

- A. Stops and Moldings: Provide stops and moldings around glazed lites where indicated. Form corners of stops and moldings with butted or mitered hairline joints at fabricator's shop. Fixed and removable stops to allow multiple glazed lites each to be removed independently. Coordinate frame rabbet widths between fixed and removable stops with the type of glazing and installation indicated.

- B. Moldings for Glazed Lites in Doors and Loose Stops for Glazed Lites in Frames: Minimum 20 gauge thick, fabricated from same material as door face sheet in which they are installed.
- C. Fixed Frame Moldings: Formed integral with hollow metal frames, a minimum of 5/8 inch (16 mm) high unless otherwise indicated. Provide fixed frame moldings and stops on outside of exterior and on secure side of interior doors and frames
- D. Preformed Metal Frames for Light Openings: Manufacturer's standard frame formed of 0.048-inch-thick, cold rolled steel sheet; with baked enamel or powder coated finish; and approved for use in doors of fire protection rating indicated. Match pre-finished door paint color where applicable.
- E. Glazing: Comply with requirements in Division 08 Section "Glazing" and with the hollow metal door manufacturer's written instructions.
 - 1. Factory Glazing: Factory install glazing in doors as indicated. Doors with factory installed glass to include all of the required glazing material.

2.7 ACCESSORIES

- A. Mullions and Transom Bars: Join to adjacent members by welding or rigid mechanical anchors.
- B. Grout Guards: Formed from same material as frames, not less than 0.016 inches thick.

2.8 FABRICATION

- A. Fabricate hollow metal work to be rigid and free of defects, warp, or buckle. Accurately form metal to required sizes and profiles, with minimum radius for thickness of metal. Where practical, fit and assemble units in manufacturer's plant. When shipping limitations so dictate, frames for large openings are to be fabricated in sections for splicing or splining in the field by others.
- B. Tolerances: Fabricate hollow metal work to tolerances indicated in ANSI/SDI A250.8.
- C. Hollow Metal Doors:
 - 1. Exterior Doors: Provide optional weep-hole openings in bottom of exterior doors to permit moisture to escape where specified.
 - 2. Glazed Lites: Factory cut openings in doors with applied trim or kits to fit. Factory install glazing where indicated.
 - 3. Astragals: Provide overlapping astragals as noted in door hardware sets in Division 08 Section "Door Hardware" on one leaf of pairs of doors where required by NFPA 80 for fire-performance rating or where indicated. Extend minimum 3/4 inch beyond edge of door on which astragal is mounted.
 - 4. Continuous Hinge Reinforcement: Provide welded continuous 12 gauge strap for continuous hinges specified in hardware sets in Division 08 Section "Door Hardware".
- D. Hollow Metal Frames:
 - 1. Shipping Limitations: Where frames are fabricated in sections due to shipping or handling limitations, provide alignment plates or angles at each joint, fabricated of same thickness metal as frames.
 - 2. Welded Frames: Weld flush face joints continuously; grind, fill, dress, and make smooth, flush, and invisible.
 - a. Welded frames are to be provided with two steel spreaders temporarily attached to the bottom of both jambs to serve as a brace during shipping and handling.

Spreader bars are for bracing only and are not to be used to size the frame opening.

3. Sidelight and Transom Bar Frames: Provide closed tubular members with no visible face seams or joints, fabricated from same material as door frame. Fasten members at crossings and to jambs by butt welding.
 4. High Frequency Hinge Reinforcement: Provide high frequency hinge reinforcements at door openings 48-inches and wider with mortise butt type hinges at top hinge locations.
 5. Continuous Hinge Reinforcement: Provide welded continuous 12 gauge straps for continuous hinges specified in hardware sets in Division 08 Section "Door Hardware".
 6. Provide countersunk, flat- or oval-head exposed screws and bolts for exposed fasteners unless otherwise indicated for removable stops, provide security screws at exterior locations.
 7. Mortar Guards: Provide guard boxes at back of hardware mortises in frames at all hinges and strike preps regardless of grouting requirements.
 8. Floor Anchors: Weld anchors to bottom of jambs and mullions with at least four spot welds per anchor.
 9. Jamb Anchors: Provide number and spacing of anchors as follows:
 - a. Masonry Type: Locate anchors not more than 18 inches from top and bottom of frame. Space anchors not more than 32 inches o.c. and as follows:
 - 1) Two anchors per jamb up to 60 inches high.
 - 2) Three anchors per jamb from 60 to 90 inches high.
 - 3) Four anchors per jamb from 90 to 120 inches high.
 - 4) Four anchors per jamb plus 1 additional anchor per jamb for each 24 inches or fraction thereof above 120 inches high.
 - b. Stud Wall Type: Locate anchors not more than 18 inches from top and bottom of frame. Space anchors not more than 32 inches o.c. and as follows:
 - 1) Three anchors per jamb up to 60 inches high.
 - 2) Four anchors per jamb from 60 to 90 inches high.
 - 3) Five anchors per jamb from 90 to 96 inches high.
 - 4) Five anchors per jamb plus 1 additional anchor per jamb for each 24 inches or fraction thereof above 96 inches high.
 - 5) Two anchors per head for frames above 42 inches wide and mounted in metal stud partitions.
 10. Door Silencers: Except on weatherstripped or gasketed doors, drill stops to receive door silencers. Silencers to be supplied by frame manufacturer regardless if specified in Division 08 Section "Door Hardware".
- E. Hardware Preparation: Factory prepare hollow metal work to receive template mortised hardware; include cutouts, reinforcement, mortising, drilling, and tapping according to the Door Hardware Schedule and templates furnished as specified in Division 08 Section "Door Hardware."
1. Locate hardware as indicated, or if not indicated, according to ANSI/SDI A250.8.
 2. Reinforce doors and frames to receive non-template, mortised and surface mounted door hardware.

3. Comply with applicable requirements in ANSI/SDI A250.6 and ANSI/DHI A115 Series specifications for preparation of hollow metal work for hardware.
4. Coordinate locations of conduit and wiring boxes for electrical connections with Division 26 Sections.

2.9 STEEL FINISHES

- A. Prime Finishes: Doors and frames to be cleaned, and chemically treated to insure maximum finish paint adhesion. Surfaces of the door and frame exposed to view to receive a factory applied coat of rust inhibiting shop primer.
 1. Shop Primer: Manufacturer's standard, fast-curing, lead and chromate free primer complying with ANSI/SDI A250.10 acceptance criteria; recommended by primer manufacturer for substrate; and compatible with substrate and field-applied coatings.
- B. Factory Pre-Finished: Factory apply electrostatic paint finish to doors and frames in accordance with ANSI A250.3 test procedure acceptance criteria for steel doors and frames with factory applied finished coatings.

PART 3 - EXECUTION

3.1 EXAMINATION

- A. Examine substrates, areas, and conditions, with Installer present, for compliance with requirements for installation tolerances and other conditions affecting performance of the Work.
- B. General Contractor to verify the accuracy of dimensions given to the steel door and frame manufacturer for existing openings or existing frames (strike height, hinge spacing, hinge back set, etc.).
- C. Proceed with installation only after unsatisfactory conditions have been corrected.

3.2 PREPARATION

- A. Remove welded in shipping spreaders installed at factory. Restore exposed finish by grinding, filling, and dressing, as required to make repaired area smooth, flush, and invisible on exposed faces.
- B. Prior to installation, adjust and securely brace welded hollow metal frames for squareness, alignment, twist, and plumbness.
- C. Tolerances shall comply with SDI-117 "Manufacturing Tolerances Standard Steel Doors and Frames."
- D. Drill and tap doors and frames to receive non-template, mortised, and surface-mounted door hardware.

3.3 INSTALLATION

- A. General: Install hollow metal work plumb, rigid, properly aligned, and securely fastened in place; comply with Drawings and manufacturer's written instructions.
- B. Hollow Metal Frames: Install hollow metal frames of size and profile indicated. Comply with ANSI/SDI A250.11 and NFPA 80 at fire rated openings.

1. Set frames accurately in position, plumbed, aligned, and braced securely until permanent anchors are set. After wall construction is complete and frames properly set and secured, remove temporary braces, leaving surfaces smooth and undamaged. Shim as necessary to comply with installation tolerances.
 2. Floor Anchors: Provide floor anchors for each jamb and mullion that extends to floor, and secure with post-installed expansion anchors.
 3. Masonry Walls: Coordinate installation of frames to allow for solidly filling space between frames and masonry with mortar.
 4. Grout Requirements: Do not grout head of frames unless reinforcing has been installed in head of frame. Do not grout vertical or horizontal closed mullion members.
- C. Hollow Metal Doors: Fit hollow metal doors accurately in frames, within clearances specified below. Shim as necessary.
1. Non-Fire-Rated Standard Steel Doors:
 - a. Jambs and Head: 1/8 inch plus or minus 1/16 inch.
 - b. Between Edges of Pairs of Doors: 1/8 inch plus or minus 1/16 inch.
 - c. Between Bottom of Door and Top of Threshold: Maximum 3/8 inch.
 - d. Between Bottom of Door and Top of Finish Floor (No Threshold): Maximum 3/4 inch.
 2. Fire-Rated Doors: Install doors with clearances according to NFPA 80.
- D. Field Glazing: Comply with installation requirements in Division 08 Section "Glazing" and with hollow metal manufacturer's written instructions.

3.4 ADJUSTING AND CLEANING

- A. Final Adjustments: Check and readjust operating hardware items immediately before final inspection. Leave work in complete and proper operating condition. Remove and replace defective work, including hollow metal work that is warped, bowed, or otherwise unacceptable.
- B. Remove grout and other bonding material from hollow metal work immediately after installation.
- C. Prime-Coat and Painted Finish Touchup: Immediately after erection, sand smooth rusted or damaged areas of prime coat, or painted finishes, and apply touchup of compatible air drying, rust-inhibitive primer, zinc rich primer (exterior and galvanized openings) or finish paint.

END OF SECTION 081113

SECTION 08 1216 - ALUMINUM FRAMES

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

- A. Drawings and general provisions of the Contract, including General and Supplementary Conditions and Division 01 Specification Sections, apply to this Section.

1.2 SUMMARY

- A. Section includes interior aluminum frames for doors and glazing installed in gypsum board partitions.
- B. Related Sections:
1. Division 08 Section "Flush Wood Doors" for wood doors installed in interior aluminum frames.
 2. Division 08 Section "Aluminum-Framed Entrances and Storefronts" for aluminum-framed glass doors installed in interior aluminum frames.
 3. Division 26 Sections for electrical connections including conduit and wiring for door controls and operators.

1.3 SUBMITTALS

- A. Product Data: For each type of product indicated. Include construction details, material descriptions, dimensions of individual components and profiles, fire-resistance rating, and finishes.
- B. Shop Drawings: Include the following:
1. Frame details for each frame type, including dimensioned profiles and metal thicknesses.
 2. Locations of reinforcements and preparations for hardware.
 3. Details of each different wall-opening condition.
 4. Details of anchorages, joints, field splices, and connections.
 5. Details of accessories.
 6. Details of moldings, removable stops, and glazing.
 7. Details of conduits and preparations for power, signal, and control systems.
- C. Samples for Initial Selection: For units with factory-applied finishes.
1. Include similar Samples of seals, gaskets, and accessories involving color selection.
- D. Schedule: For interior aluminum frames. Use same designations indicated on Drawings. Coordinate with door hardware schedule and glazing.
- E. Product Test Reports: Based on evaluation of comprehensive tests performed by a qualified testing agency, for each type of interior aluminum frame.
- F. Maintenance Data: For interior aluminum frames to include in maintenance manuals.

1.4 QUALITY ASSURANCE

- A. Source Limitations: Obtain interior aluminum frames from single source from single manufacturer.
- B. Fire-Rated Assemblies: Assemblies complying with NFPA 80 that are listed and labeled by a qualified testing agency, for fire-protection ratings indicated, based on testing at positive pressure according to NFPA 252 or UL 10C.

- C. Smoke- and Draft-Control Assemblies: At fire-rated corridors, smoke barriers, and smoke partitions, provide assemblies tested according to UL 1784 and installed in compliance with NFPA 105.
 - 1. Air Leakage Rate: Maximum air leakage of **0.3 cfm/sq. ft.** at the tested pressure differential of **0.3-inch wg** of water.
- D. Mockups: Build mockups to verify selections made under sample submittals and to demonstrate aesthetic effects and set quality standards for fabrication and installation.
 - 1. Build mockup of typical wall area as shown on Drawings.
 - 2. Approved mockups may become part of the completed Work if undisturbed at time of Substantial Completion.
- E. Preinstallation Conference: Conduct conference at Project site.

1.5 DELIVERY, STORAGE, AND HANDLING

- A. Deliver interior aluminum frames palletized, wrapped, or crated to provide protection during transit and Project-site storage. Do not use nonvented plastic. Store interior aluminum frames under cover at Project site.

PART 2 - PRODUCTS

2.1 MANUFACTURERS

- A. Basis-of-Design Product: Subject to compliance with requirements, provide products as manufactured by Wilson Partitions or comparable product by one of the following:
 - 1. Advanced Architectural Frames.
 - 2. Custom Components Company.
 - 3. Dual Lock Partition Systems, Inc.; Avalon International Aluminum.
 - 4. Frameworks Manufacturing.
 - 5. Interior Components Inc.
 - 6. Modulex, Inc; Division of Pacific National Group.
 - 7. RACO Interior Products, Inc.
 - 8. Versatrac.
 - 9. Western Integrated Materials, Inc.
 - 10. Wilson Partitions.

2.2 COMPONENTS

- A. Aluminum Framing: **ASTM B 221**, Alloy 6063-T5 or alloy and temper required to suit structural and finish requirements, not less than **0.062 inch** thick.
- B. Door Frames: Extruded aluminum, reinforced for hinges, strikes, and closers.
- C. Glazing Frames: Extruded aluminum, for glazing thickness indicated.
- D. Ceiling Tracks: Extruded aluminum.
- E. Trim: Extruded aluminum, not less than **0.062 inch** thick, with removable snap-in casing trim and glazing stops without exposed fasteners.
 - 1. Casing Width: **[1 inch][1-1/2 inches][2 inches]**.
 - 2. Throat Width: As indicated.

2.3 ACCESSORIES

- A. Fasteners: Aluminum, nonmagnetic, stainless-steel or other noncorrosive metal fasteners compatible with frames, stops, panels, reinforcement plates, hardware, anchors, and other items being fastened.
- B. Door Silencers: Manufacturer's standard continuous mohair, wool pile, or vinyl seals.
- C. Smoke Seals: Intumescent strip or fire-rated gaskets.
- D. Glazing: Comply with requirements in Division 08 Section "[Glazing] [Decorative Glass Glazing]."
- E. Hardware: Comply with requirements in Division 08 door hardware Sections.

2.4 FABRICATION

- A. Provide concealed corner reinforcements and alignment clips for accurately fitted hairline joints at butted or mitered connections.
- B. Factory prepare interior aluminum frames to receive templated mortised hardware; include cutouts, reinforcements, mortising, drilling, and tapping, according to the Door Hardware Schedule and templates furnished as specified in Division 08 Section "Door Hardware."
 - 1. Locate hardware as required by fire-rated label for assembly.
- C. Fabricate frames for glazing with removable stops to allow glazing replacement without dismantling frame.
 - 1. Locate removable stops on the inside of spaces accessed by keyed doors.
- D. Fabricate components to allow secure installation without exposed fasteners.

2.5 GENERAL FINISH REQUIREMENTS

- A. Comply with NAAMM's "Metal Finishes Manual for Architectural and Metal Products" for recommendations for applying and designating finishes.
- B. Appearance of Finished Work: Noticeable variations in same piece are not acceptable. Variations in appearance of adjoining components are acceptable if they are within the range of approved Samples and are assembled or installed to minimize contrast.

2.6 ALUMINUM FINISHES

- A. Clear Anodic Finish: AAMA 611, AA-M12C2241, Class I, 0.018 mm or thicker.

PART 3 - EXECUTION

3.1 EXAMINATION

- A. Examine walls, floors, and ceilings, with Installer present, for conditions affecting performance of the Work.
- B. Verify that wall thickness does not exceed standard tolerances allowed by throat size indicated.
- C. Proceed with installation only after unsatisfactory conditions have been corrected.

3.2 INSTALLATION

- A. General: Install interior aluminum frames plumb, rigid, properly aligned, and securely fastened in place; comply with manufacturer's written instructions.

- B. Set frames accurately in position and plumbed, aligned, and securely anchored to substrates.
 - 1. At fire-protection-rated openings, install interior aluminum frames according to NFPA 80[**and NFPA 105**].
- C. Install frame components in the longest possible lengths; components up to **96 inches** long must be one piece.
 - 1. Use concealed installation clips to produce tightly fitted and aligned splices and connections.
 - 2. Secure clips to extruded main-frame components and not to snap-in or trim members.
 - 3. Do not leave screws or other fasteners exposed to view when installation is complete.

3.3 CLEANING

- A. Clean exposed frame surfaces promptly after installation, using cleaning methods recommended by frame manufacturer and according to AAMA 609 & 610.
- B. Remove and replace frames with damaged finish.

END OF SECTION 08 1216

SECTION 081416 - FLUSH WOOD DOORS

PART 1 - GENERAL

1.1 SUBMITTALS

- A. Product Data: For each type of door indicated. Include details of core and edge construction, louvers, trim for openings, and WDMA I.S.1-A or AWS classifications. Include factory finishing specifications.
- B. Door hardware supplier is to furnish templates, template reference number and/or physical hardware to the wood door supplier in order to prepare the doors and frames to receive the finish hardware items.
- C. Shop Drawings: Indicate location, size, and hand of each door; elevation of each kind of door; construction details not covered in Product Data; location and extent of hardware blocking; and other pertinent data.
 - 1. Indicate dimensions and locations of mortises and holes for hardware.
 - 2. Indicate dimensions and locations of cutouts.
 - 3. Indicate requirements for veneer matching.
 - 4. Indicate doors to be factory finished and finish requirements.
 - 5. Indicate fire protection ratings for fire rated doors.
- D. Samples for Initial Selection: For factory finished doors.
 - 1. Factory finishes applied to actual door face materials, approximately 8 by 10 inches, for each material and finish. For each wood species and transparent finish, provide set of three samples showing typical range of color and grain to be expected in the finished work.
 - 2. Corner sections of doors, 8 by 10 inches, with door faces and edges representing actual materials to be used.
 - a. Provide samples for each species of veneer and solid lumber required.
 - b. Finish veneer faced door samples with same materials proposed for factory finished doors.
 - 3. Frames for light openings, 6 inches long, for each material, type, and finish required.
- E. Informational Submittals:
 - 1. Submit manufacturer's environmental documentation and applicable sustainability program credits that are available to contribute towards a LEED rated project certification.
- F. Warranty: Sample of special warranties.

1.2 DELIVERY, STORAGE, AND HANDLING

- A. Comply with requirements of referenced standard and manufacturer's written instructions.

- B. Package pre-finished doors individually in plastic bags or cardboard cartons and wrap bundles of doors in plastic sheeting.
- C. Mark each door on top rail with opening number used on Shop Drawings.

1.3 PROJECT CONDITIONS

- A. Environmental Limitations: Do not deliver or install doors until spaces are enclosed and weather tight, wet work in spaces is complete and dry, and HVAC system is operating and maintaining ambient temperature and humidity conditions at occupancy levels during the remainder of the construction period.

1.4 WARRANTY

- A. Special Warranty: Manufacturer's standard form in which manufacturer agrees to repair or replace doors that fail in materials or workmanship within specified warranty period.
 - 1. Failures include, but are not limited to, the following:
 - a. Warping (bow, cup, or twist) more than 1/4 inch in a 42-by-84-inch section.
 - b. Telegraphing of core construction in wood face veneers exceeding 0.01 inch in a 3-inch span.
 - c. Telegraphing of core construction and delaminating of face in decorative laminate-faced doors.
 - 2. Warranty includes installation and finishing that may be required due to repair or replacement of defective doors.
 - 3. Warranty Period for Solid Core Interior Doors: Life of installation according to manufacturer's written warranty.

PART 2 - PRODUCTS

2.1 VENEERED DOORS FOR TRANSPARENT FINISH

- A. Manufacturers: Subject to compliance with requirements, provide products by one of the following:
 - 1. Graham.
 - 2. Marshfield.
 - 3. VT Industries.
- B. Interior Solid Core Doors:
 - 1. Grade and Faces: Face grades as note below; veneer minimum 1/50-inch (0.5mm) thickness at moisture content of 12% or less.
 - a. Door face veneer to be, AA grade faces, and color selected by Architect from manufacturers full range of colors.
 - 2. Match between Veneer Leaves:

- a. Book match.
 - b. Slip match.
- 3. Assembly of Veneer Leaves on Door Faces:
 - a. Running Match.
 - b. Balance match.
 - c. Center Balance Match.
- 4. Pair and Set Match: Provide for doors hung in same opening or separated only by mullions.
- 5. Room Match: Match door faces within each separate room or area of building. Corridor door faces do not need to match where they are separated by 10 feet or more.
- 6. Transom Match: Continuous match.
- 7. Vertical Edges: Matching same species as faces. Wood or composite material, one piece, laminated, or veneered. Minimum requirements per WDMA section P-1, Performance Standards for Architectural Wood Flush Doors.
- 8. Horizontal Edges: Solid wood or structural composite material meeting the minimum requirements per WDMA section P-1, Performance Standards for Architectural Wood Flush Doors
- 9. Construction: Five plies. Stiles and rails are bonded to core, then entire unit sanded before applying face veneers.
- 10. At doors over 40% of the face cut-out for lights and or louvers, furnish engineered composite lumber core.

2.2 LIGHT FRAMES AND GLAZING

- A. Wood Beads for Light Openings in Wood Doors up to and including 20-minute rating:
 - 1. Wood Species: Same species as door faces.
 - 2. Profile: Manufacturer's standard lipped profile. At wood core doors with 20-minute fire protection ratings, provide wood beads and metal glazing clips approved for such use.
- B. Metal Frames for Light Openings in Fire Rated Doors over 20-minute rating: Manufacturer's standard frame formed of 0.048-inch-thick, cold rolled steel sheet; with baked enamel or powder coated finish; and approved for use in doors of fire protection rating indicated.

2.3 FABRICATION

- A. Factory fit doors to suit frame opening sizes indicated. Comply with clearance requirements of referenced quality standard for fitting unless otherwise indicated.
 - 1. Fire Rated doors must comply with either UL10C or NFPA 252.
- B. Factory machine doors for hardware that is not surface applied. Comply with final hardware schedules, door frame Shop Drawings, DHI A115-W series standards, and hardware templates.
 - 1. Coordinate with hardware mortises in metal frames to verify dimensions and alignment before factory machining.
 - 2. Metal Astragals: Factory machine astragals and formed steel edges for hardware for pairs of fire rated doors.

- C. Transom and Side Panels: Fabricate matching panels with same construction, exposed surfaces, and finish as specified for associated doors. Finish bottom edges of transoms and top edges of rabbeted doors same as door stiles.
- D. Openings: Cut and trim openings through doors in factory.
 - 1. Light Openings: Trim openings with moldings of material and profile indicated.
 - 2. Glazing: Comply with applicable requirements in Division 08 Section "Glazing."
 - 3. Louvers: Factory install louvers in prepared openings.
- E. Electrical Raceways: Provide flush wood doors receiving electrified hardware with concealed wiring harness and standardized Molex™ plug connectors on both ends to accommodate up to twelve wires. Coordinate connectors on end of the wiring harness to plug directly into the electrified hardware and the through wire transfer hardware or wiring harness specified in hardware sets in Division 08 "Door Hardware". Wire nut connections are not acceptable.

2.4 FACTORY FINISHING

- A. General: Comply with referenced quality standard for factory finishing. Complete fabrication, including fitting doors for openings and machining for hardware that is not surface applied, before finishing.
 - 1. Finish faces, all four edges, edges of cutouts, and mortises. Stains and fillers may be omitted on top and bottom edges, edges of cutouts, and mortises.
- B. Transparent Finish: Provide a clear protective coating over the wood veneer allowing the natural color and grain of the selected wood species to provide the appearance specified. Stain is applied to the wood surface underneath the transparent finish to add color and design flexibility.
 - 1. Grade: Premium.
 - 2. Finish: Meet or exceed WDMA I.S. 1A TR6 Catalyzed Polyurethane finish performance requirements.
 - 3. Staining: As selected by Architect from manufacturer's full range.
 - 4. Sheen: Satin.

PART 3 - EXECUTION

3.1 EXAMINATION

- A. Examine doors and installed door frames before hanging doors.
 - 1. Verify that frames comply with indicated requirements for type, size, location, and swing characteristics and have been installed with level heads and plumb jambs.
 - 2. Reject doors with defects.
- B. Proceed with installation only after unsatisfactory conditions have been corrected.

3.2 INSTALLATION

- A. Hardware: For installation, see Division 8 Section "Door Hardware."

- B. Installation Instructions: Install doors to comply with manufacturer's written instructions and the referenced quality standard, and as indicated.
 - 1. Install fire rated doors in corresponding fire rated frames according to NFPA 80.
- C. Factory Fitted Doors: Align in frames for uniform clearance at each edge.
- D. Factory Finished Doors: Restore finish before installation if fitting or machining is required at Project site.

3.3 ADJUSTING

- A. Operation: Re-hang or replace doors that do not swing or operate freely.
- B. Finished Doors: Replace doors that do not comply with requirements. Doors may be repaired or refinished if work complies with requirements and shows no evidence of repair or refinishing.

END OF SECTION 081416

SECTION 08 17 43
Fire-Rated FRP Doors and Frames

PART 1 GENERAL

1.01 SECTION INCLUDES

- A. SL-17FR Pebble Grain Fire-Rated Fiberglass Door.
- B. SL-17FR Pebble Grain Fire-Rated Fiberglass Door in Fire-Rated Metal Frame.
- C. SL-17FR Pebble Grain Fire-Rated Fiberglass Door in Fire-Rated Fiberglass Frame.

1.02 RELATED SECTIONS

- A. Section 04 00 00 – Masonry Mortar.
- B. Section 05 50 00 – Metal Fabrications.
- C. Section 08 01 17 – Operation and Maintenance of Integrated Door Opening Assemblies.
- D. Section 08 06 71 – Door Hardware Schedule.
- E. Section 08 06 80 – Glazing Schedule.
- F. Section 08 10 00 – Doors and Frames.
- G. Section 08 71 00 – Door Hardware.
- H. Section 08 80 00 – Glazing.

1.03 REFERENCES

- A. ASTM-D256 – Standard Test Methods for Determining the Pendulum Impact Resistance of Plastics.
- B. ASTM-D570 – Standard Test Method for Water Absorption of Plastics.
- C. ASTM-D638 – Standard Test Method for Tensile Properties of Plastics.
- D. ASTM-D790 – Standard Test Methods for Flexural Properties of Unreinforced and Reinforced Plastics and Electrical Insulating Materials.
- E. ASTM-D2583 – Standard Test Method for Indentation Hardness of Rigid Plastics by Means of a Barcol Impressor.
- F. ASTM D2794 – Standard Test Method for Resistance of Organic Coatings to the Effects of Rapid Deformation (Impact).
- G. ASTM-E84 – Standard Test Method for Surface Burning Characteristics of Building Materials.
- H. CAN / ULC S104 – Standard Method for Fire Tests of Door Assemblies.
- I. UL 10B – Standard for Fire Tests of Door Assemblies.
- J. UL 10C – Standard for Positive Pressure Fire Tests of Door Assemblies.
- K. NFPA 80 – Standard for Fire Doors and Other Opening Protectives.
- L. NFPA 252 – Fire Tests of Door Assemblies.

1.04 SUBMITTALS

- A. Must comply with Section 01 33 00 – Submittal Procedures.
- B. Action Submittals/ Informational Submittals.
 - 1. Product Data.
 - a. Submit manufacturer's product data sheets, catalog pages illustrating the products, description of materials, components, fabrication, finishes, installation instructions, and applicable test reports.
 - 2. Shop Drawings.
 - a. Submit manufacturer's shop drawings, including elevations, sections, and details indicating dimensions, tolerances, materials, fabrication, doors, panels, framing, hardware schedule, and finish.

3. Samples.
 - a. Submit manufacturer's door sample composed of door face sheet, core, framing and finish.
 - b. Submit manufacturer's sample of standard colors for door face and frame.
4. Testing and Evaluation Reports.
 - a. Submit testing reports and evaluations provided by manufacturer conducted by and accredited independent testing agency certifying doors and frames comply with specified performance requirements listed in Section 2.01 C.
5. Manufacturer Reports.
 - a. Manufacturer's Project References.
 1. Submit list of successfully completed projects including project name, location, name of architect, type, and quantity of doors manufactured.
- C. Closeout Submittals.
 1. Operation and Maintenance Manual.
 - a. Submit manufacturer's maintenance and cleaning instructions for doors and frames, including maintenance and operating instructions for hardware.
 2. Warranty Documentation.
 - a. Submit manufacturer's standard warranty.

1.05 QUALITY ASSURANCE

- A. Manufacturer's Qualifications.
 1. Continuously engaged in manufacturing of doors of similar type to that specified, with a minimum of 25 years concurrent successful experience.
 2. Door and frame components must be fabricated by same manufacturer.
 3. Evidence of a documented complaint resolution quality management system.

1.06 DELIVERY, STORAGE, AND HANDLING

- A. Delivery.
 1. Deliver materials to site in manufacturer's original, unopened, containers and packaging.
 2. Labels clearly identifying opening, door mark, and manufacturer.
- B. Storage.
 1. Store materials in a clean, dry area, indoors in accordance with manufacturer's instructions.
- C. Handling.
 1. Protect materials and finish from damage during handling and installation.

1.07 WARRANTY

- A. Warrant doors, frames, and factory installed hardware against failure in materials and workmanship, including excessive deflection, faulty operation, defects in hardware installation, and deterioration of finish or construction in excess of normal weathering.
- B. Standard Period.
 1. Ten years starting on date of shipment.
- C. Limited lifetime
 1. Covers failure of corner joinery, core deterioration, and delamination or bubbling of door skin and corrosion of all-fiberglass products while the door is in its specified application in its original installation.
- D. Finish
 1. Through color with SpecLite 3[®] integral surfaseal film FRP sheet: 10 years.
 2. Painted SL-17FR face sheets: 5 years.
 3. Painted FR frames: 3 years.

PART 2 PRODUCTS

2.01 FRP/ALUMINUM HYBRID DOORS

- A. Basis-of-Design Product: Subject to compliance with requirements, provide the product listed below or a comparable approved product by an approved manufacturer:
1. Special-Lite, Inc.

2.02 DESCRIPTION

- A. SL-17FR Pebble Grain Fire-Rated Fiberglass Door.
1. Rated for 20 to 90 min maximum duration.
 2. Door Opening Size.
 - a. 4'0" x 8'0" maximum size single swing.
 - b. 8'0" x 8'0" maximum size standard pairs.
 3. Construction.
 - a. Door Thickness.
 1. 1-7/8" at door edge.
 - b. Stiles.
 1. Single Swing.
 - a. Hinge and lock stile, 2" minimum tectonite.
 2. Standard Pairs.
 - a. Hinge stile, 2" minimum tectonite.
 - b. Meeting edge, 3" minimum.
 - c. Rails.
 1. Top rail, 6" minimum tectonite.
 2. Bottom rail, 4" minimum for single swing, 4-1/2" minimum for pairs tectonite.
 - d. Core.
 1. WSCP-412 proprietary mineral core.
 2. 1-1/2" nominal thickness.
 3. 18 pcf minimum density.
 - e. Face Sheet.
 1. Exterior
 - a. 0.120" thick, pebble texture, through color with SpecLite 3[®] integral surfaseal film FRP sheet.
 - b. Optional painted finish consult manufacturer.
 - c. Class C standard.
 2. Interior
 - a. 0.120" thick, pebble texture, through color with SpecLite 3[®] integral surfaseal film FRP sheet.
 - b. Optional painted finish consult manufacturer.
 - c. Class C standard optional Class A available consult manufacturer.
 - f. Edge Channels.
 1. 0.062" thick, 3/4" leg, stainless steel edge channel.
 2. Applied to entire perimeter of the door.
 3. Sealed by 3M CP 25WB + Fire Barrier caulk applied to the inside edges of all the steel edge channels.
 - g. Cutouts.
 1. Manufacture doors with cutouts for required vision lites per the manufactures listing.

- h. Hardware.
 - 1. Pre-machine doors in accordance with templates from specified hardware manufacturers.
 - 2. Field apply factory supplied gaskets and seals, full width intumescent and smoke seal required at top of door, smoke seals required on both jambs.

2.03 FRAMING

A. Framing

- 1. FR-Series Fiberglass Framing.
 - a. Maximum of 45 min fire rating when installed in fiberglass frames.
 - b. Materials.
 - 1. 1/4" thick, solid, pultruded, FRP profiles.
 - 2. No corrosive components or reinforcements.
 - 3. Solid tectonite filler.
 - 4. No steel or aluminum filler is allowed.
 - c. Perimeter Frame Members.
 - 1. Factory fabricated.
 - 2. Integral 5/8" x 2-1/4" doorstop.
 - 3. Mitered with 4" x 4" x 3/8" pultruded FRP angle reinforcement with interlocking pultruded FRP brackets.
 - 4. 5-3/4" or 6-3/4" jamb depth.
 - 5. 2" face on jambs.
 - 6. 2" or 4" face on header.
 - 7. Knocked down for field assembly.
 - d. Anchors
 - 1. Factory furnished as specified by drawings.
 - 2. Drywall tuck available.
- 2. Any category C standard frame.
- 3. Any category C proprietary frame.

2.04 PERFORMANCE

A. Face Sheet.

- 1. Standard Interior and Exterior Class C 0.120" thick, pebble texture, through color with SpecLite 3[®] integral surfaseal film FRP sheet.
 - a. Flexural Strength, ASTM-D790: 21×10^3 psi.
 - b. Flexural Modulus, ASTM-D790: 0.7×10^6 psi.
 - c. Tensile Strength, ASTM-D638: 13×10^3 psi.
 - d. Tensile Modulus, ASTM-D638: 1.2×10^6 psi.
 - e. Barcol Hardness, ASTM-D2583: 55.
 - f. Izod Impact, ASTM-D256: 14.0 ft-lb/in.
 - g. Gardner Impact Strength, ASTM-D5420: 120 in-lb.
 - h. Water Absorption, ASTM-D570: 0.20%/24hrs at 77°F.
 - i. Surface Burning, ASTM-E84: Flame Spread ≤ 200 , Smoke Developed ≤ 450 .
 - j. Taber Abrasion Resistance, Taber Test: 0.007% Max Wt. Loss, cs-17 wheels, 1000g. Wt., 25 cycles.
 - k. Chemical Resistance.
 - 1. Excellent Rating.
 - a. Acetic Acid, Concentrated.
 - b. Acetic Acid, 5%.
 - c. Bleach Solution.
 - d. Detergent Solution.
 - e. Distilled Water.

- f. Ethyl Acetate.
 - g. Formaldehyde.
 - h. Heptane.
 - i. Hydrochloric Acid, 10%.
 - j. Hydrogen Peroxide, 3%.
 - k. Isooctane.
 - l. Lactic Acid, 10%.
 - l. USDA/FSIS Requirements.
 - 1. FRP face sheet with SpecLite 3[®] integral surfaseal is a finished outer surface material that is rigid; durable; non-toxic; non-corrosive; moisture resistant; a light, solid color such as white; easily inspected; smooth or an easily cleaned texture.
 - 2. FRP face sheet with SpecLite 3[®] integral surfaseal does not contain any known carcinogen, mutagen, or teratogen classified as hazardous substances; heavy metals or toxic substances; antimicrobials; pesticides or substances with pesticidal characteristics.
- B. Door Assembly.
 - 1. 60 min pp category A door.
 - 2. 90 min pp category B door.
 - 3. 90 min pp category A door.
 - 4. Temperature rise @ 30 min, 250 °F when vision lites do not exceed 100 in².
 - 5. Temperature rise @ 60 min, 450 °F max.

2.05 MATERIALS

- A. Fiberglass.
 - 1. See 2.02.A.2.e.
 - 2. See 2.02.B.2.e.
 - 3. See 2.02.C.2.e
- B. Fasteners.
 - 1. All exposed fasteners will have a finish to match material being fastened.
 - 2. 410 stainless steel or other non-corrosive metal.
 - 3. Must be compatible with items being fastened.

2.06 FABRICATION

- A. Factory Assembly.
 - 1. Door and frame components from the same manufacturer.
 - 2. Required size for door and frame units, shall be as indicated on the drawings.
 - 3. Maintain continuity of line and accurate relation of planes and angles.
 - 4. Secure attachments and support at mechanical joints with hairline fit at contact surfaces.
- B. Shop Fabrication
 - 1. All shop fabrication to be completed in accordance with manufactures process work instructions.
 - 2. Quality control to be performed before leaving each department.

2.07 FINISHES

- A. Door.
 - 1. FRP Face Sheets
 - a. Through color.
 - b. Color selected by Owner and Architect.
- B. Frame
 - 1. Fiberglass.

- a. Two-part aliphatic polyurethane paint.
 1. Color selected by Owner and Architect
 2. Custom colors available consult manufacturer.
 3. Unique, high-solids, high-build, multifunctional coating.
 4. Low VOC, high-gloss, self-priming coating.
 5. Impact Resistance, ASTM-D2794: 140 in·lbs (direct), 50 in·lbs (reverse) @ 5 mils thickness.
 6. Taber Abrasion, 1 kg load, 1000 cycles, CS-17 wheel: 60.2 mg.
 7. Graffiti cleaning with Amerase with gloss retention: 100 cycles.
 8. Chemical Resistance.
 - a. Excellent.
 1. Acidic.
 2. Alkaline.
 3. Salt Solutions.
 4. Seawater.
 5. Fresh Water.
 6. Petroleum Products.

2.08 ACCESSORIES

- A. Vision Lites.
 1. Factory Glazing.
 2. Stainless Steel vision kit with 3/16" NGP Firelite NT, clear.
 3. Size as indicated on the drawings.
 4. 60 to 90-minute rated doors.
 - a. Maximum 704 in² in listed and labeled kit for positive pressure applications using listed glazing. Minimum 5" from top or edge of door to lite cutout and minimum 5" from latch cutout to lite cutout.
 - b. Maximum 32" high.
 - c. Maximum 22" wide.
 - d. Multiple lights are allowed when the sum of the areas does not exceed the tested area with the maximum length and width limitations.
 5. 20 to 45-minute rate doors.
 - a. Listed metal vision frames and listed glazing are limited to a maximum clear view area of 616 in² per lite with a maximum of 1232 in². Lite kits exceeding 100 in² void the temperature requirements per NFPA 80 unless temperature resistive glazing is used.
- B. Louvers.
 1. Listed and labeled louvers.
 2. Maximum 576 in².
 3. Maximum width 24".
 4. Maximum height 24".
- C. Hardware.
 1. All hardware must be listed and labeled for use in mineral core fire doors.
 2. Pre-machine doors in accordance with templates from specified hardware manufactures and hardware schedule.
 3. Factory install hardware.
 4. Hardware Schedule.
 - a. As specified in Section 08 71 00.

PART 3 EXECUTION

3.01 EXAMINATION

- A. Examine areas to receive doors.
- B. Notify architect of conditions that would adversely affect installation or subsequent use.
- C. Do not proceed with installation until unsatisfactory conditions are corrected.

3.02 PREPARATION

- A. Ensure openings to receive frames are plumb, level, square, and in tolerance.

3.03 ERECTION

- A. Install doors in accordance with manufacturer's instructions.
- B. Install doors plumb, level, square, true to line, and without warp or rack.
- C. Anchor frames securely in place.
- D. Separate aluminum from other metal surfaces with bituminous coatings or other means approved by architect.
- E. Set thresholds in bed of mastic and back seal.
- F. Install exterior doors to be weathertight in closed position.
- G. Repair minor damages to finish in accordance with manufacturer's instructions and as approved by architect.
- H. Remove and replace damaged components that cannot be successfully repaired as determined by architect.

3.04 FIELD QUALITY CONTROL

- A. Manufacturer's Field Services.
 - 1. Manufacturer's representative shall provide technical assistance and guidance for installation of doors.

3.05 ADJUSTING

- A. Adjust doors, hinges, and locksets for smooth operation without binding.

3.06 CLEANING

- A. Clean doors promptly after installation in accordance with manufacturer's instructions.
- B. Do not use harsh cleaning materials or methods that would damage finish.

3.07 PROTECTION

- A. Protect installed doors to ensure that, except for normal weathering, doors will be without damage or deterioration at time of substantial completion.

END OF SECTION

SECTION 083313 - COILING COUNTER DOORS

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

- A. Drawings and general provisions of the Contract, including General and Supplementary Conditions and Division 01 Specification Sections, apply to this Section.

1.2 SUMMARY

- A. Section Includes:
 - 1. Fire-rated counter doors.

1.3 ACTION SUBMITTALS

- A. Product Data: For each type and size of coiling counter door and accessory.
 - 1. Include construction details, material descriptions, dimensions of individual components, profiles for slats, and finishes.
 - 2. Include rated capacities, operating characteristics, electrical characteristics, and furnished accessories.
 - 3. Include description of automatic closing device and testing and resetting instructions.
- B. Shop Drawings: For each installation and for special components not dimensioned or detailed in manufacturer's product data.
 - 1. Include plans, elevations, sections, and mounting details.
 - 2. Include details of equipment assemblies, and indicate dimensions, required clearances, method of field assembly, components, and location and size of each field connection.
 - 3. Include points of attachment and their corresponding static and dynamic loads imposed on structure.
 - 4. Show locations of controls, locking devices, activation devices, and other accessories.
 - 5. Include diagrams for power, signal, and control wiring.
- C. Samples for Initial Selection: Manufacturer's finish charts showing full range of colors and textures available for units with factory-applied finishes.
 - 1. Include similar Samples of accessories involving color selection.
- D. Samples for Verification: For each type of exposed finish on the following components, in manufacturer's standard sizes:
 - 1. Curtain slats.
 - 2. Bottom bar with sensor edge.
 - 3. Guides.
 - 4. Brackets.

5. Hood.
6. Locking device(s).
7. Counter.
8. Include similar Samples of accessories involving color selection.

1.4 INFORMATIONAL SUBMITTALS

- A. Qualification Data: For Installer and testing and inspecting agency.
 1. Submit copy of DHI Fire and Egress Door Assembly Inspector (FDAI) certificate.

1.5 CLOSEOUT SUBMITTALS

- A. Maintenance Data: For coiling counter doors to include in maintenance manuals.
- B. Record Documents: For fire-rated doors, list of door numbers and applicable room name and number to which door accesses.

1.6 QUALITY ASSURANCE

- A. Installer Qualifications: An entity that employs installers and supervisors who are trained and approved by manufacturer for both installation and maintenance of units required for this Project.
 1. Maintenance Proximity: Not more than **two** hours' normal travel time from Installer's place of business to Project site.
- B. Fire-Rated Door Inspector Qualifications: Inspector for field quality control inspections of fire-rated door assemblies shall meet the qualifications set forth in NFPA 80, section 5.2.3.1 and the following:
 1. Door and Hardware Institute Fire and Egress Door Assembly Inspector (FDAI) certification.

PART 2 - PRODUCTS

2.1 MANUFACTURERS

- A. Source Limitations: Obtain coiling counter doors from single source from single manufacturer.
 1. Obtain operators and controls from coiling counter door manufacturer.

2.2 PERFORMANCE REQUIREMENTS

- A. Fire-Rated Door Assemblies: Complying with NFPA 80; listed and labeled by a qualified testing agency, for fire-protection ratings indicated, based on testing at as close to neutral pressure as possible according to NFPA 252 or UL 10B.

1. Smoke Control: Provide doors that are listed and labeled with the letter "S" on the fire-rating label by a qualified testing agency for smoke- and draft-control based on testing according to UL 1784; with maximum air-leakage rate of 3.0 cfm/sq. ft. (0.01524 cu. m/s x sq. m) of door opening at 0.10 inch wg (24.9 Pa) for both ambient and elevated temperature tests.

2.3 FIRE-RATED COUNTER DOOR ASSEMBLY

- A. Fire-Rated Counter Door: Overhead fire-rated coiling door formed with curtain of interlocking metal slats.
 1. Basis of Design:
 - a. CornellCookson, Inc., 24 Elmwood Avenue, Mountain Top, PA 18707. Telephone: (800) 233-8366.
 - b. Model: ERC10, with AlarmGard Closing System, battery backup, SmokeShield smoke and draft control.
- B. Operation Cycles: Door components and operators capable of operating for not less than **20,000**. One operation cycle is complete when a door is opened from the closed position to the fully open position and returned to the closed position.
- C. Fire Rating: As indicated on drawings, with smoke control.
- D. Door Curtain Material: Stainless steel.
- E. Door Curtain Slats: Flat profile slats of 1-1/2-inch (38-mm) center-to-center height.
- F. Curtain Jamb Guides: Stainless steel with exposed finish matching curtain slats.
- G. Hood: Stainless steel.
 1. Mounting: Face of wall.
- H. Integral Frame, Hood, and Fascia: Stainless steel.
 1. Mounting: Face of wall.
- I. Countertop: 2" thick, 14 gauge stainless steel in #4 finish, with a refractory fiber core, UL 1-1/2 hour label.
- J. Locking Devices: Equip door with locking device assembly.
 1. Locking Device Assembly: Single-jamb side locking bars, operable from inside with thumbturn.
- K. Electric Door Operator:
 1. Usage Classification: Standard duty, up to 25 cycles per hour and up to 90 cycles per day.
 2. Operator Location: Top of hood.
 3. Motor Exposure: Interior.
 4. Motor Electrical Characteristics:

- a. Horsepower: As recommended by door manufacturer.
 - b. Voltage: 115-V ac, single phase, 60 Hz.
- 5. Emergency Manual Operation: Crank type.
- 6. Obstruction-Detection Device: Automatic electric sensor edge on bottom bar.
 - a. Sensor Edge Bulb Color: Black.
- 7. Control Station(s): Interior-side mounted. Coordinate actual location with Owner.
- 8. Other Equipment:
 - a. Provide AlarmGard Closing System connected to existing fire alarm system and new smoke detectors, with:
 - 1) Battery Backup.
 - 2) Sensing edge.
 - 3) Operator cover.
 - 4) Provide smoke detectors on each side of the opening.
 - 5) AlarmGard System to also activate during power failure.
- L. Curtain Accessories: Equip door with smoke seals, automatic closing device, astragal, and push/pull handles.
- M. Door Finish:
 - 1. Stainless Steel Finish: ASTM A480/A480M No. 4 (polished directional satin).
 - 2. Interior Curtain-Slat Facing: Match finish of exterior curtain-slat face.

2.4 MATERIALS, GENERAL

- A. Electrical Components, Devices, and Accessories: Listed and labeled as defined in NFPA 70, by a qualified testing agency, and marked for intended location and application.

2.5 DOOR CURTAIN MATERIALS AND CONSTRUCTION

- A. Door Curtains: Fabricate coiling counter door curtain of interlocking metal slats in a continuous length for width of door without splices. Unless otherwise indicated, provide slats of thickness and mechanical properties recommended by door manufacturer for performance, size, and type of door indicated, and as follows:
 - 1. Stainless Steel Door Curtain Slats: ASTM A 666, Type 304; sheet thickness of 0.025 inch (0.64 mm); and as required.
 - 2. Metal Interior Curtain-Slat Facing: Match metal of exterior curtain-slat face.
- B. Curtain Jamb Guides: Manufacturer's standard angles or channels and angles of same material and finish as curtain slats unless otherwise indicated, with sufficient depth and strength to retain curtain, to allow curtain to operate smoothly, and to withstand loading. Slot bolt holes for guide adjustment. Provide removable stops on guides to prevent overtravel of curtain.

2.6 HOODS

- A. General: Form sheet metal hood to entirely enclose coiled curtain and operating mechanism at opening head. Contour to fit end brackets to which hood is attached. Roll and reinforce top and bottom edges for stiffness. Form closed ends for surface-mounted hoods and fascia for any portion of between-jamb mounting that projects beyond wall face. Equip hood with intermediate support brackets as required to prevent sagging.
 - 1. Stainless Steel: 0.025-inch- (0.64-mm-) thick, stainless steel sheet, Type 304, complying with ASTM A 666.
 - 2. Include automatic drop baffle on fire-rated doors to guard against passage of smoke or flame.
- B. Integral Frame, Hood, and Fascia: Welded sheet metal assembly of the following sheet metal(s):
 - 1. Stainless Steel: Type 304, complying with ASTM A 666.
- C. Removable Metal Soffit: Formed or extruded from same metal and with same finish as curtain if hood is mounted above ceiling unless otherwise indicated.

2.7 LOCKING DEVICES

- A. Locking Device Assembly: Fabricate with cylinder lock, spring-loaded dead bolt, operating handle, cam plate, and adjustable locking bars to engage through slots in tracks.
 - 1. Lock Cylinders: As standard with manufacturer.
 - 2. Keys: Three for each cylinder.
- B. Safety Interlock Switch: Equip power-operated doors with safety interlock switch to disengage power supply when door is locked.

2.8 CURTAIN ACCESSORIES

- A. Smoke Seals: Equip each fire-rated door with replaceable smoke-seal perimeter gaskets or brushes for smoke and draft control as required for door listing and labeling by a qualified testing agency.
- B. Astragal: Equip each door bottom bar with a replaceable, adjustable, continuous, compressible gasket of flexible vinyl, rubber, or neoprene as a cushion bumper.
- C. Push/Pull Handles: Equip each push-up-operated or emergency-operated door with lifting handles on each side of door, finished to match door.
- D. Pull-Down Strap: Provide pull-down straps for doors more than 84 inches (2130 mm) high.
- E. Poll Hooks: Provide pole hooks and poles for doors more than 84 inches (2130 mm) high.
- F. Automatic-Closing Device: Equip each fire-rated door with an automatic-closing device or holder-release mechanism and governor unit complying with NFPA 80 and an easily tested and reset release mechanism. Release mechanism for motor-operated doors shall allow testing without mechanical release of the door. Automatic-closing device shall be designed for activation by the following:

1. Basis of Design: Cornell AlarmGard Closing Systems connected to a smoke detector located on each side of the door, and connected to the building's fire alarm system. Contractor to provide all equipment, devices, and power and fire alarm connections.

2.9 COUNTERBALANCE MECHANISM

- A. General: Counterbalance doors by means of manufacturer's standard mechanism with an adjustable-tension, steel helical torsion spring mounted around a steel shaft and contained in a spring barrel connected to top of curtain with barrel rings. Use grease-sealed bearings or self-lubricating graphite bearings for rotating members.
- B. Counterbalance Barrel: Fabricate spring barrel of manufacturer's standard hot-formed, structural-quality, seamless carbon-steel pipe, of sufficient diameter and wall thickness to support rolled-up curtain without distortion of slats and to limit barrel deflection to not more than 0.03 in./ft. (2.5 mm/m) of span under full load.
- C. Counterbalance Spring: One or more oil-tempered, heat-treated steel helical torsion springs. Size springs to counterbalance weight of curtain, with uniform adjustment accessible from outside barrel. Secure ends of springs to barrel and shaft with cast-steel barrel plugs.
 1. Fire-Rated Doors: Equip with auxiliary counterbalance spring and prevent tension release from main counterbalance spring when automatic closing device operates.
- D. Torsion Rod for Counterbalance Shaft: Fabricate of manufacturer's standard cold-rolled steel, sized to hold fixed spring ends and carry torsional load.
- E. Brackets: Manufacturer's standard mounting brackets of either cast iron or cold-rolled steel plate.

2.10 ELECTRIC DOOR OPERATORS

- A. General: Electric door operator assembly of size and capacity recommended and provided by door manufacturer for door and operation-cycles requirement specified, with electric motor and factory-prewired motor controls, starter, gear-reduction unit, solenoid-operated brake, clutch, control stations, control devices, integral gearing for locking door, and accessories required for proper operation.
 1. Comply with NFPA 70.
 2. Control equipment complying with NEMA ICS 1, NEMA ICS 2, and NEMA ICS 6, with NFPA 70 Class 2 control circuit, maximum 24-V ac or dc.
- B. Usage Classification: Electric operator and components capable of operating for not less than number of cycles per hour indicated for each door.
- C. Door Operator Location(s): Operator location indicated for each door.
 1. Top-of-Hood Mounted: Operator is mounted to the right or left door head plate with the operator on top of the door-hood assembly and connected to the door drive shaft with drive chain and sprockets. Headroom is required for this type of mounting.

- D. Motors: Reversible-type motor with controller (disconnect switch) for motor exposure indicated for each door assembly.
 - 1. Electrical Characteristics: Minimum as indicated for each door assembly. If not indicated, large enough to start, accelerate, and operate door in either direction from any position, at a speed not less than 8 in./sec. (203 mm/s) and not more than 12 in./sec. (305 mm/s), without exceeding nameplate ratings or service factor.
 - 2. Operating Controls, Controllers, Disconnect Switches, Wiring Devices, and Wiring: Manufacturer's standard unless otherwise indicated.
 - 3. Coordinate wiring requirements and electrical characteristics of motors and other electrical devices with building electrical system and each location where installed.
- E. Limit Switches: Equip each motorized door with adjustable switches interlocked with motor controls and set to automatically stop door at fully opened and fully closed positions.
- F. Obstruction-Detection Devices: External entrapment protection consisting of indicated automatic safety sensor capable of protecting full width of door opening. For fire-rated doors, activation delays closing.
 - 1. Electric Sensor Edge: Automatic safety sensor edge, located within astragal mounted to bottom bar. Contact with sensor activates device. Connect to control circuit using manufacturer's standard take-up reel or self-coiling cable.
 - a. Self-Monitoring Type: Four-wire-configured device designed to interface with door operator control circuit to detect damage to or disconnection of sensor edge.
- G. Control Station: Three-button control station in fixed location with momentary-contact push-button controls labeled "Open" and "Stop" and sustained- or constant-pressure push-button control labeled "Close."
 - 1. Type: Full-guarded, surface-mounted, heavy-duty type, with general-purpose NEMA ICS 6, Type 1 enclosure.
- H. Emergency Manual Operation: Equip each electrically powered door with capability for emergency manual operation. Design manual mechanism so required force for door operation does not exceed 25 lbf (111 N).
- I. Emergency Operation Disconnect Device: Equip operator with hand-operated disconnect mechanism for automatically engaging manual operator and releasing brake for emergency manual operation while disconnecting motor without affecting timing of limit switch. Mount mechanism so it is accessible from floor level. Include interlock device to automatically prevent motor from operating when emergency operator is engaged.
- J. Motor Removal: Design operator so motor may be removed without disturbing limit-switch adjustment and without affecting emergency manual operation.

2.11 GENERAL FINISH REQUIREMENTS

- A. Comply with NAAMM/NOMMA 500 for recommendations for applying and designating finishes.

- B. Appearance of Finished Work: Noticeable variations in same piece are not acceptable. Variations in appearance of adjoining components are acceptable if they are within the range of approved Samples and are assembled or installed to minimize contrast.

2.12 STAINLESS STEEL FINISHES

- A. Surface Preparation: Remove tool and die marks and stretch lines, or blend into finish.
- B. Polished Finishes: Grind and polish surfaces to produce uniform finish, free of cross scratches.
 - 1. Run grain of directional finishes with long dimension of each piece.
 - 2. When polishing is completed, passivate and rinse surfaces. Remove embedded foreign matter and leave surfaces chemically clean.
 - 3. Directional Satin Finish: ASTM A480/A480M No. 4.

PART 3 - EXECUTION

3.1 EXAMINATION

- A. Examine substrates areas and conditions, with Installer present, for compliance with requirements for substrate construction and other conditions affecting performance of the Work.
- B. Examine locations of electrical connections.
- C. Proceed with installation only after unsatisfactory conditions have been corrected.

3.2 INSTALLATION

- A. Install coiling counter doors and operating equipment complete with necessary hardware, anchors, inserts, hangers, and equipment supports; according to manufacturer's written instructions and as specified.
- B. Install coiling counter doors, hoods, controls, and operators at the mounting locations indicated for each door.
- C. Fire-Rated Doors: Install according to NFPA 80.
- D. Smoke-Control Doors: Install according to NFPA 80 and NFPA 105.

3.3 FIELD QUALITY CONTROL

- A. Testing Agency: Engage a qualified testing agency to perform tests and inspections and to furnish reports to Architect.
- B. Perform the following tests and inspections with the assistance of a factory-authorized service representative:

1. Test door release, closing, and alarm operations when activated by smoke detector or building's fire-alarm system. Test manual operation of closed door. Reset door-closing mechanism after successful test.
 2. Fire-Rated Door Inspections: Inspect each fire-rated door in accordance with NFPA 80, section 5.2.
- C. Repair or remove and replace installations where inspections indicate that they do not comply with specified requirements.
- D. Reinspect repaired or replaced installations to determine if replaced or repaired door assembly installations comply with specified requirements.
- E. Prepare and submit separate inspection report for each fire-rated door assembly indicating compliance with each item listed in NFPA 80 and NFPA 101.

3.4 STARTUP SERVICE

- A. Engage a factory-authorized service representative to perform startup service.
1. Complete installation and startup checks according to manufacturer's written instructions.
 2. After electrical circuitry has been energized, operate doors to confirm proper motor rotation and door performance.
 3. Test and adjust controls and safety devices. Replace damaged and malfunctioning controls and equipment.

3.5 ADJUSTING

- A. Adjust hardware and moving parts to function smoothly so that doors operate easily, free of warp, twist, or distortion.
- B. Lubricate bearings and sliding parts as recommended by manufacturer.
- C. Adjust seals to provide tight fit around entire perimeter.

3.6 MAINTENANCE SERVICE

- A. Initial Maintenance Service: Beginning at Substantial Completion, maintenance service shall include 12 months' full maintenance by skilled employees of coiling-door Installer. Include quarterly preventive maintenance, repair or replacement of worn or defective components, lubrication, cleaning, and adjusting as required for proper door operation. Parts and supplies shall be manufacturer's authorized replacement parts and supplies.
1. Perform maintenance, including emergency callback service, during normal working hours.

3.7 DEMONSTRATION

- A. Engage a factory-authorized service representative to train Owner's maintenance personnel to adjust, operate, and maintain coiling counter doors.

END OF SECTION 083313

SECTION 08 3320 - OVERHEAD COILING DOORS

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

- A. Drawings and general provisions of the Contract, including General and Supplementary Conditions and Division 01 Specification Sections, apply to this Section.

1.2 SUMMARY

- A. Section Includes:
 - 1. Insulated service doors.

1.3 PERFORMANCE REQUIREMENTS

- A. Structural Performance, Exterior Doors: Exterior overhead coiling doors shall withstand the wind loads, the effects of gravity loads, and loads and stresses within limits and under conditions indicated according to SEI/ASCE 7.
 - 1. Wind Loads: Based on all applicable codes.
 - 2. Deflection Limits: Design overhead coiling doors to withstand design wind load without evidencing permanent deformation or disengagement of door components.
- B. Operability under Wind Load: Design overhead coiling doors to remain operable under design wind load, acting inward and outward.
- C. Windborne-Debris-Impact-Resistance Performance: Provide overhead coiling doors that pass missile-impact and cyclic-pressure tests when tested according to ASTM E 1886 and ASTM E 1996.
 - 1. Large Missile Test: For overhead coiling doors located within 30 feet (9.144 m) of grade.
- D. Operation Cycles: Provide overhead coiling door components and operators capable of operating for not less than number of cycles indicated for each door. One operation cycle is complete when a door is opened from the closed position to the fully open position and returned to the closed position.

1.4 SUBMITTALS

- A. Product Data: For each type and size of overhead coiling door and accessory. Include the following:

1. Construction details, material descriptions, dimensions of individual components, profiles for slats, and finishes.
 2. Rated capacities, operating characteristics, electrical characteristics, and furnished accessories.
 3. For fire-rated doors, description of fire-release system including testing and resetting instructions.
- B. Shop Drawings: For each installation and for special components not dimensioned or detailed in manufacturer's product data. Include plans, elevations, sections, details, and attachments to other work.
1. Detail equipment assemblies and indicate dimensions, weights, loads, required clearances, method of field assembly, components, and location and size of each field connection.
 2. Show locations of replaceable fusible links.
- C. Samples: Manufacturer's finish charts showing full range of colors and textures available for units with factory-applied finishes.
1. Include similar Samples of accessories involving color selection.
- D. Qualification Data: For qualified Installer.
- E. Maintenance Data: For overhead coiling doors to include in maintenance manuals.

1.5 QUALITY ASSURANCE

- A. Installer Qualifications: Manufacturer's authorized representative who is trained and approved for both installation and maintenance of units required for this Project.
- B. Source Limitations: Obtain overhead coiling doors from single source from single manufacturer.
1. Obtain operators and controls from overhead coiling door manufacturer.
- C. Regulatory Requirements: Comply with applicable provisions in the U.S. Architectural & Transportation Barriers Compliance Board's ADA-ABA Accessibility Guidelines and ICC/ANSI A117.1.

PART 2 - PRODUCTS

2.1 DOOR CURTAIN MATERIALS AND CONSTRUCTION

- A. Door Curtains: Fabricate overhead coiling-door curtain of interlocking metal slats, designed to withstand wind loading indicated, in a continuous length for width of door without splices. Unless otherwise indicated, provide slats of thickness and mechanical properties recommended by door manufacturer for performance, size, and type of door indicated, and as follows:

1. Steel Door Curtain Slats: Zinc-coated (galvanized), cold-rolled structural steel sheet; complying with ASTM A 653/A 653M, with G90 (Z275) zinc coating; nominal sheet thickness (coated) of 0.028 inch (0.71 mm) and as required to meet requirements.
 2. Insulation: Fill slats for insulated doors with manufacturer's standard thermal insulation complying with maximum flame-spread and smoke-developed indexes of 75 and 450, respectively, according to ASTM E 84. Enclose insulation completely within slat faces.
 3. Metal Interior Curtain-Slat Facing: Match metal of exterior curtain-slat face.
 4. Gasket Seal: Provide insulated slats with manufacturer's standard interior-to-exterior thermal break or with continuous gaskets between slats.
- B. Endlocks and Windlocks for Service Doors: Malleable-iron casings galvanized after fabrication, secured to curtain slats with galvanized rivets or high-strength nylon. Provide locks on not less than alternate curtain slats for curtain alignment and resistance against lateral movement.
- C. Bottom Bar for Service Doors: Consisting of two angles, each not less than 1-1/2 by 1-1/2 by 1/8 inch (38 by 38 by 3 mm) thick; fabricated from manufacturer's standard hot-dip galvanized steel, stainless steel, or aluminum extrusions to match curtain slats and finish.
- D. Astragal for Interior Doors: Equip each door bottom bar with a replaceable, adjustable, continuous, compressible gasket of flexible vinyl, rubber, or neoprene as a cushion bumper.
- E. Curtain Jamb Guides: Manufacturer's standard angles or channels and angles of same material and finish as curtain slats unless otherwise indicated, with sufficient depth and strength to retain curtain, to allow curtain to operate smoothly, and to withstand loading. Slot bolt holes for guide adjustment. Provide removable stops on guides to prevent overtravel of curtain, and a continuous bar for holding windlocks.

2.2 HOOD

- A. General: Form sheet metal hood to entirely enclose coiled curtain and operating mechanism at opening head. Contour to fit end brackets to which hood is attached. Roll and reinforce top and bottom edges for stiffness. Form closed ends for surface-mounted hoods and fascia for any portion of between-jamb mounting that projects beyond wall face. Equip hood with intermediate support brackets as required to prevent sagging.
1. Galvanized Steel: Nominal 0.028-inch- (0.71-mm-) thick, hot-dip galvanized steel sheet with G90 (Z275) zinc coating, complying with ASTM A 653/A 653M.
 2. Include automatic drop baffle on fire-rated doors to guard against passage of smoke or flame.

2.3 LOCKING DEVICES

- A. Locking Device Assembly: Fabricate with cylinder lock, spring-loaded dead bolt, operating handle, cam plate, and adjustable locking bars to engage through slots in tracks.
1. Lock Cylinders: Provide cylinders standard with manufacturer and keyed to building keying system.
 2. Keys: Provide 3 for each cylinder.

- B. Chain Lock Keeper: Suitable for padlock.

2.4 CURTAIN ACCESSORIES

- A. Smoke Seals: Equip each fire-rated door with smoke-seal perimeter gaskets for smoke and draft control as required for door listing and labeling by a qualified testing agency.
- B. Weatherseals: Equip each exterior door with weather-stripping gaskets fitted to entire perimeter of door for a weathertight installation, unless otherwise indicated.
 - 1. At door head, use 1/8-inch- (3-mm-) thick, replaceable, continuous sheet secured to inside of hood.
 - 2. At door jambs, use replaceable, adjustable, continuous, flexible, 1/8-inch- (3-mm-) thick seals of flexible vinyl, rubber, or neoprene.
- C. Push/Pull Handles: Equip each push-up-operated or emergency-operated door with lifting handles on each side of door, finished to match door.
 - 1. Provide pull-down straps or pole hooks for doors more than 84 inches (2130 mm) high.
- D. Automatic-Closing Device for Fire-Rated Doors: Equip each fire-rated door with an automatic-closing device that is inoperative during normal door operations and that has a governor unit complying with NFPA 80 and an easily tested and reset release mechanism designed to be activated by the following:
 - 1. Replaceable fusible links with temperature rise and melting point of 165 deg F (74 deg C) interconnected and mounted on both sides of door opening.

2.5 COUNTERBALANCING MECHANISM

- A. General: Counterbalance doors by means of manufacturer's standard mechanism with an adjustable-tension, steel helical torsion spring mounted around a steel shaft and contained in a spring barrel connected to top of curtain with barrel rings. Use grease-sealed bearings or self-lubricating graphite bearings for rotating members.
- B. Counterbalance Barrel: Fabricate spring barrel of manufacturer's standard hot-formed, structural-quality, welded or seamless carbon-steel pipe, of sufficient diameter and wall thickness to support rolled-up curtain without distortion of slats and to limit barrel deflection to not more than 0.03 in./ft. (2.5 mm/m) of span under full load.
- C. Spring Balance: One or more oil-tempered, heat-treated steel helical torsion springs. Size springs to counterbalance weight of curtain, with uniform adjustment accessible from outside barrel. Secure ends of springs to barrel and shaft with cast-steel barrel plugs.
- D. Torsion Rod for Counterbalance Shaft: Fabricate of manufacturer's standard cold-rolled steel, sized to hold fixed spring ends and carry torsional load.
- E. Brackets: Manufacturer's standard mounting brackets of either cast iron or cold-rolled steel plate.

2.6 MANUAL DOOR OPERATORS

- A. Equip door with manufacturer's recommended manual door operator unless another type of door operator is indicated.
- B. Chain-Hoist Operator: Consisting of endless steel hand chain, chain-pocket wheel and guard, and gear-reduction unit with a maximum 25 lbf (111 N) force for door operation. Provide alloy-steel hand chain with chain holder secured to operator guide.

2.7 DOOR ASSEMBLY

- A. Insulated Service Door: Overhead coiling door formed with curtain of interlocking metal slats.
 - 1. Basis-of-Design Product: Subject to compliance with requirements, provide product indicated or equivalent:
 - a. Cornell Iron Works, Inc., "Thermiser", Model ESD20.
- B. Operation Cycles: Not less than 20,000.
- C. STC Rating: 26.
- D. Curtain R-Value: 8.0 deg F x h x sq. ft./Btu.
- E. Door Curtain Material: Galvanized steel.
- F. Door Curtain Slats: Flat profile slats of 2-5/8-inch center-to-center height.
 - 1. Insulated-Slat Interior Facing: Metal.
 - 2. Provide vision window slats as indicated on drawings.
- G. Curtain Jamb Guides: Galvanized steel with exposed finish matching curtain slats.
- H. Hood: Match curtain material and finish.
 - 1. Shape: Square.
 - 2. Mounting: Face of wall.
- I. Locking Devices: Equip door with locking device assembly and chain lock keeper.
 - 1. Locking Device Assembly: Cremone type, both jamb sides locking bars, operable from inside with thumb turn and outside with cylinder.
- J. Manual Door Operator: Chain-hoist operator.
- K. Door Finish:
 - 1. Baked-Enamel or Powder-Coated Finish: Color as selected by Architect from manufacturer's full range.
 - 2. Factory Prime Finish: Manufacturer's standard color.
 - 3. Interior Curtain-Slat Facing: Match finish of exterior curtain-slat face.

2.8 GENERAL FINISH REQUIREMENTS

- A. Comply with NAAMM's "Metal Finishes Manual for Architectural and Metal Products" for recommendations for applying and designating finishes.
- B. Appearance of Finished Work: Noticeable variations in same piece are not acceptable. Variations in appearance of adjoining components are acceptable if they are within the range of approved Samples and are assembled or installed to minimize contrast.

2.9 STEEL AND GALVANIZED-STEEL FINISHES

- A. Baked-Enamel or Powder-Coat Finish: Manufacturer's standard baked-on finish consisting of prime coat and thermosetting topcoat. Comply with coating manufacturer's written instructions for cleaning, pretreatment, application, and minimum dry film thickness.

PART 3 - EXECUTION

3.1 EXAMINATION

- A. Examine substrates areas and conditions, with Installer present, for compliance with requirements for substrate construction and other conditions affecting performance of the Work.
- B. Examine locations of electrical connections.
- C. Proceed with installation only after unsatisfactory conditions have been corrected.

3.2 INSTALLATION

- A. Install overhead coiling doors and operating equipment complete with necessary hardware, anchors, inserts, hangers, and equipment supports; according to manufacturer's written instructions and as specified.
- B. Install overhead coiling doors, hoods, and operators at the mounting locations indicated for each door.
- C. Accessibility: Install overhead coiling doors, switches, and controls along accessible routes in compliance with regulatory requirements for accessibility.

3.3 ADJUSTING

- A. Adjust hardware and moving parts to function smoothly so that doors operate easily, free of warp, twist, or distortion.
- B. Lubricate bearings and sliding parts as recommended by manufacturer.
- C. Adjust seals to provide weathertight fit around entire perimeter.

3.4 DEMONSTRATION

- A. Engage a factory-authorized service representative to train Owner's maintenance personnel to adjust, operate, and maintain overhead coiling doors.

END OF SECTION 08 3320

SECTION 08 4113 - ALUMINUM-FRAMED ENTRANCES AND STOREFRONTS

PART 1 - GENERAL

1.1 SUMMARY

- A. Section Includes:
1. Exterior storefront framing.
 2. Storefront framing for window walls.
 3. Exterior manual-swing entrance doors.

1.2 PREINSTALLATION MEETINGS

- A. Preinstallation Conference: Conduct conference at Project site.

1.3 ACTION SUBMITTALS

- A. Product Data: For each type of product.
1. Include construction details, material descriptions, dimensions of individual components and profiles, and finishes.
- B. Shop Drawings: For aluminum-framed entrances and storefronts. Include plans, elevations, sections, full-size details, and attachments to other work. Shop Drawings for curtain wall systems shall be signed and sealed by the qualified New York State Professional Engineer responsible for their preparation.
1. Include details of provisions for assembly expansion and contraction and for draining moisture occurring within the assembly to the exterior.
 2. Include full-size isometric details of each vertical-to-horizontal intersection of aluminum-framed entrances and storefronts, showing the following:
 - a. Joinery, including concealed welds.
 - b. Anchorage.
 - c. Expansion provisions.
 - d. Glazing.
 - e. Flashing and drainage.
 3. Show connection to and continuity with adjacent thermal, weather, air, and vapor barriers.
- C. Samples for Verification: For each type of exposed finish required, in manufacturer's standard sizes.
- D. Fabrication Sample: Of each vertical-to-horizontal intersection of assemblies, made from 12-inch lengths of full-size components and showing details of the following:
1. Joinery, including concealed welds.
 2. Anchorage.
 3. Expansion provisions.
 4. Glazing.
 5. Flashing and drainage.
- E. Entrance Door Hardware Schedule: See Section 08 7100.
- F. Delegated-Design Submittal: For aluminum-framed entrances and storefronts indicated to comply with performance requirements and design criteria, including analysis data signed and sealed by the qualified professional engineer responsible for their preparation.

1.4 INFORMATIONAL SUBMITTALS

- A. Qualification Data: For Installer.
- B. Energy Performance Certificates: For aluminum-framed entrances and storefronts, accessories, and components, from manufacturer.
 - 1. Basis for Certification: NFRC-certified energy performance values for each aluminum-framed entrance and storefront.
- C. Product Test Reports: For aluminum-framed entrances and storefronts, for tests performed by a qualified testing agency.
- D. Quality-Control Program: Developed specifically for Project, including fabrication and installation, according to recommendations in ASTM C 1401. Include periodic quality-control reports.
- E. Source quality-control reports.
- F. Field quality-control reports.
- G. Sample Warranties: For special warranties.

1.5 CLOSEOUT SUBMITTALS

- A. Maintenance Data: For aluminum-framed entrances and storefronts to include in maintenance manuals.

1.6 QUALITY ASSURANCE

- A. Installer Qualifications: An entity that employs installers and supervisors who are trained and approved by manufacturer.
- B. Product Options: Information on Drawings and in Specifications establishes requirements for aesthetic effects and performance characteristics of assemblies. Aesthetic effects are indicated by dimensions, arrangements, alignment, and profiles of components and assemblies as they relate to sightlines, to one another, and to adjoining construction.
 - 1. Do not change intended aesthetic effects, as judged solely by Architect, except with Architect's approval. If changes are proposed, submit comprehensive explanatory data to Architect for review.

1.7 WARRANTY

- A. Special Warranty: Manufacturer agrees to repair or replace components of aluminum-framed entrances and storefronts that do not comply with requirements or that fail in materials or workmanship within specified warranty period.
 - 1. Failures include, but are not limited to, the following:
 - a. Structural failures including, but not limited to, excessive deflection.
 - b. Noise or vibration created by wind and thermal and structural movements.
 - c. Deterioration of metals, metal finishes, and other materials beyond normal weathering.
 - d. Water penetration through fixed glazing and framing areas.
 - e. Failure of operating components.
 - 2. Warranty Period: 10 years from date of Substantial Completion.
- B. Special Finish Warranty: Standard form in which manufacturer agrees to repair finishes or replace aluminum that shows evidence of deterioration of factory-applied finishes within specified warranty period.

1. Deterioration includes, but is not limited to, the following:
 - a. Color fading more than 5 Hunter units when tested according to ASTM D 2244.
 - b. Chalking in excess of a No. 8 rating when tested according to ASTM D 4214.
 - c. Cracking, checking, peeling, or failure of paint to adhere to bare metal.
2. Warranty Period: 20 years from date of Substantial Completion.

PART 2 - PRODUCTS

2.1 PERFORMANCE REQUIREMENTS

- A. Delegated Design: Engage a qualified professional engineer, as defined in Section 014000 "Quality Requirements," to design aluminum-framed entrances and storefronts.
- B. General Performance: Comply with performance requirements specified, as determined by testing of aluminum-framed entrances and storefronts representing those indicated for this Project without failure due to defective manufacture, fabrication, installation, or other defects in construction.
 1. Aluminum-framed entrances and storefronts shall withstand movements of supporting structure including, but not limited to, story drift, twist, column shortening, long-term creep, and deflection from uniformly distributed and concentrated live loads.
 2. Failure also includes the following:
 - a. Thermal stresses transferring to building structure.
 - b. Glass breakage.
 - c. Noise or vibration created by wind and thermal and structural movements.
 - d. Loosening or weakening of fasteners, attachments, and other components.
 - e. Failure of operating units.
- C. Deflection of Framing Members: At design wind pressure, as follows:
 1. Deflection Normal to Wall Plane: Limited to edge of glass in a direction perpendicular to glass plane not exceeding 1/175 of the glass edge length for each individual glazing lite or an amount that restricts edge deflection of individual glazing lites to 3/4 inch, whichever is less.
 2. Deflection Parallel to Glazing Plane: Limited to 1/360 of clear span or 1/8 inch, whichever is smaller.
 - a. Operable Units: Provide a minimum 1/16-inch clearance between framing members and operable units.
- D. Structural: Test according to ASTM E 330 as follows:
 1. When tested at positive and negative wind-load design pressures, assemblies do not evidence deflection exceeding specified limits.
 2. When tested at 150 percent of positive and negative wind-load design pressures, assemblies, including anchorage, do not evidence material failures, structural distress, or permanent deformation of main framing members exceeding 0.2 percent of span.
 3. Test Durations: As required by design wind velocity, but not less than 10 seconds.
- E. Air Infiltration: Test according to ASTM E 283 for infiltration as follows:
 1. Fixed Framing and Glass Area:
 - a. Maximum air leakage of 0.06 cfm/sq. ft. at a static-air-pressure differential of 1.57 lbf/sq. ft..
- F. Energy Performance: Certify and label energy performance according to NFRC as follows:
 1. Thermal Transmittance (U-factor):
 - a. Fixed glazing and framing areas shall have U-factor of not more than **0.38** Btu/sq. ft. x h x deg F.

- b. Entrance Doors shall have U-factor of not more than **0.77** Btu/sq. ft. x h x deg F.

G. Thermal Movements: Allow for thermal movements resulting from ambient and surface temperature changes:

- 1. Temperature Change: 120 deg F, ambient; 180 deg F, material surfaces.

2.2 MANUFACTURERS

A. Basis-of-Design Product: Subject to compliance with requirements, provide EFCO Series 406 2" x 6.5" Thermal Storefront Framing system, or comparable product by one of the following:

- 1. Kawneer.
- 2. TRACO.

B. Source Limitations: Obtain all components of aluminum-framed entrance and storefront system, including framing venting windows and accessories, from single manufacturer.

2.3 FRAMING

A. Framing Members: Manufacturer's extruded- or formed-aluminum framing members of thickness required and reinforced as required to support imposed loads.

- 1. Construction: Thermally broken.
- 2. Glazing System: Retained mechanically with gaskets on four sides.
- 3. Glazing Plane: Center
- 4. Finish: High-performance organic finish.
- 5. Fabrication Method: Field-fabricated stick system.
- 6. Door Frames to be a minimum thickness of 3/16" at the jambs and 1/8" at the header

B. Backer Plates: Manufacturer's standard, continuous backer plates for framing members, if not integral, where framing abuts adjacent construction.

C. Brackets and Reinforcements: Manufacturer's standard high-strength aluminum with nonstaining, nonferrous shims for aligning system components.

D. Materials:

- 1. Aluminum: Alloy and temper recommended by manufacturer for type of use and finish indicated.
 - a. Sheet and Plate: ASTM B 209.
 - b. Extruded Bars, Rods, Profiles, and Tubes: ASTM B 221.
 - c. Extruded Structural Pipe and Tubes: ASTM B 429/B 429M.
 - d. Structural Profiles: ASTM B 308/B 308M.
- 2. Steel Reinforcement: Manufacturer's standard zinc-rich, corrosion-resistant primer complying with SSPC-PS Guide No. 12.00; applied immediately after surface preparation and pretreatment. Select surface preparation methods according to recommendations in SSPC-SP COM, and prepare surfaces according to applicable SSPC standard.
 - a. Structural Shapes, Plates, and Bars: ASTM A 36/A 36M.
 - b. Cold-Rolled Sheet and Strip: ASTM A 1008/A 1008M.
 - c. Hot-Rolled Sheet and Strip: ASTM A 1011/A 1011M.

2.4 ENTRANCE DOOR SYSTEMS

A. Entrance Doors: Manufacturer's standard glazed entrance doors for manual-swing operation.

- 1. Door Construction: 2" overall thickness, with minimum 0.125-inch- thick, extruded-aluminum tubular rail and stile members. Mechanically fasten corners with reinforcing brackets that are deeply penetrated and fillet welded or that incorporate concealed tie rods.

- B. Basis-of-Design Product: Subject to compliance with requirements, provide EFCO Series D318 2" DuraStile Heavy-Duty Aluminum Entrance Doors (with continuous hinges by aluminum door manufacturer) or comparable product by one of the following:
1. Kawneer.
 2. TRACO.

2.5 ACCESSORIES

- A. Fasteners and Accessories: Manufacturer's standard corrosion-resistant, nonstaining, nonbleeding fasteners and accessories compatible with adjacent materials.
1. Use self-locking devices where fasteners are subject to loosening or turning out from thermal and structural movements, wind loads, or vibration.
 2. Reinforce members as required to receive fastener threads.
 3. Use exposed fasteners with countersunk Phillips screw heads, finished to match framing system.
- B. Bituminous Paint: Cold-applied asphalt-mastic paint complying with SSPC-Paint 12 requirements except containing no asbestos, formulated for 30-mil thickness per coat.

2.6 FABRICATION

- A. Form or extrude aluminum shapes before finishing.
- B. Weld in concealed locations to greatest extent possible to minimize distortion or discoloration of finish. Remove weld spatter and welding oxides from exposed surfaces by descaling or grinding.
- C. Fabricate components that, when assembled, have the following characteristics:
1. Profiles that are sharp, straight, and free of defects or deformations.
 2. Accurately fitted joints with ends coped or mitered.
 3. Physical and thermal isolation of glazing from framing members.
 4. Accommodations for thermal and mechanical movements of glazing and framing to maintain required glazing edge clearances.
 5. Provisions for field replacement of glazing from interior.
 6. Fasteners, anchors, and connection devices that are concealed from view to greatest extent possible.
- D. Mechanically Glazed Framing Members: Fabricate for flush glazing without projecting stops.
- E. Structural-Sealant-Glazed Framing Members: Include accommodations for using temporary support device to retain glazing in place while structural sealant cures.
- F. Storefront Framing: Fabricate components for assembly using shear-block system.
- G. Entrance Door Frames: Reinforce as required to support loads imposed by door operation and for installing entrance door hardware.
1. At exterior doors, provide compression weather stripping at fixed stops.
- H. After fabrication, clearly mark components to identify their locations in Project according to Shop Drawings.

2.7 ALUMINUM FINISHES

- A. High-Performance Organic Finish: Two-coat fluoropolymer finish complying with AAMA 2605 and containing not less than 70 percent PVDF or FEVE resin by weight in color coat. Prepare, pretreat, and apply coating to exposed metal surfaces to comply with coating and resin manufacturers' written instructions.
1. Color and Gloss: Match Architect's sample.

PART 3 - EXECUTION

3.1 EXAMINATION

- A. Examine areas, with Installer present, for compliance with requirements for installation tolerances and other conditions affecting performance of the Work.
- B. Proceed with installation only after unsatisfactory conditions have been corrected.

3.2 PREPARATION

- A. Prepare surfaces that are in contact with structural sealant according to sealant manufacturer's written instructions to ensure compatibility and adhesion. Preparation includes, but is not limited to, cleaning and priming surfaces.

3.3 INSTALLATION

- A. General:
 - 1. Comply with manufacturer's written instructions.
 - 2. Do not install damaged components.
 - 3. Fit joints to produce hairline joints free of burrs and distortion.
 - 4. Rigidly secure nonmovement joints.
 - 5. Install anchors with separators and isolators to prevent metal corrosion and electrolytic deterioration and to prevent impeding movement of moving joints.
 - 6. Seal perimeter and other joints watertight unless otherwise indicated.
- B. Metal Protection:
 - 1. Where aluminum is in contact with dissimilar metals, protect against galvanic action by painting contact surfaces with materials recommended by manufacturer for this purpose or by installing nonconductive spacers.
 - 2. Where aluminum is in contact with concrete or masonry, protect against corrosion by painting contact surfaces with bituminous paint.
- C. Set continuous sill members and flashing in full sealant bed as specified in Section 079200 "Joint Sealants" to produce weathertight installation.
- D. Install components plumb and true in alignment with established lines and grades.
- E. Install operable units level and plumb, securely anchored, and without distortion. Adjust weather-stripping contact and hardware movement to produce proper operation.
- F. Install glazing as specified in Section 088000 "Glazing."
- G. Install weatherseal sealant according to Section 079200 "Joint Sealants" and according to sealant manufacturer's written instructions to produce weatherproof joints. Install joint filler behind sealant as recommended by sealant manufacturer.
- H. Entrance Doors: Install doors to produce smooth operation and tight fit at contact points.
 - 1. Exterior Doors: Install to produce weathertight enclosure and tight fit at weather stripping.
 - 2. Field-Installed Entrance Door Hardware: Install surface-mounted entrance door hardware according to entrance door hardware manufacturers' written instructions using concealed fasteners to greatest extent possible.

3.4 ERECTION TOLERANCES

- A. Erection Tolerances: Install aluminum-framed entrances and storefronts to comply with the following maximum tolerances:
1. Plumb: 1/8 inch in 10 feet; 1/4 inch in 40 feet.
 2. Level: 1/8 inch in 20 feet; 1/4 inch in 40 feet.
 3. Alignment:
 - a. Where surfaces abut in line or are separated by reveal or protruding element up to 1/2 inch wide, limit offset from true alignment to 1/16 inch.
 - b. Where surfaces are separated by reveal or protruding element from 1/2 to 1 inch wide, limit offset from true alignment to 1/8 inch.
 - c. Where surfaces are separated by reveal or protruding element of 1 inch wide or more, limit offset from true alignment to 1/4 inch.
 4. Location: Limit variation from plane to 1/8 inch in 12 feet; 1/2 inch over total length.

END OF SECTION 08 4113

SECTION 08 5113
ALUMINUM WINDOWS

PART 1 GENERAL

1.01 SECTION INCLUDES

- A. Extruded aluminum windows with fixed sash, operating sash, and infill panels.
- B. Factory glazing.
- C. Operating hardware.
- D. Insect screens.

1.02 RELATED REQUIREMENTS

- A. Section 06 1000 - Rough Carpentry: Rough opening framing.
- B. Section 06 1000 - Rough Carpentry: Wood perimeter shims.

1.03 REFERENCE STANDARDS

- A. AAMA/WDMA/CSA 101/I.S.2/A440 - North American Fenestration Standard/Specification for windows, doors, and skylights 2011.
- B. AAMA CW-10 - Care and Handling of Architectural Aluminum From Shop to Site 2015.
- C. AAMA 611 - Voluntary Specification for Anodized Architectural Aluminum 2012.
- D. AAMA 1503 - Voluntary Test Method for Thermal Transmittance and Condensation Resistance of Windows, Doors and Glazed Wall Sections 2009.
- E. AAMA 2603 - Voluntary Specification, Performance Requirements and Test Procedures for Pigmented Organic Coatings on Aluminum Extrusions and Panels (with Coil Coating Appendix) 2015.
- F. ASCE 7 - Minimum Design Loads for Buildings and Other Structures 2010, with 2013 Supplements and Errata.
- G. ASTM A123/A123M - Standard Specification for Zinc (Hot-Dip Galvanized) Coatings on Iron and Steel Products 2015.
- H. ASTM B209 - Standard Specification for Aluminum and Aluminum-Alloy Sheet and Plate 2014.
- I. ASTM B221 - Standard Specification for Aluminum and Aluminum-Alloy Extruded Bars, Rods, Wire, Profiles, and Tubes 2014.
- J. ASTM B221M - Standard Specification for Aluminum and Aluminum-Alloy Extruded Bars, Rods, Wire, Profiles, and Tubes [Metric] 2013.
- K. ASTM E283 - Standard Test Method for Determining the Rate of Air Leakage Through Exterior Windows, Curtain Walls, and Doors Under Specified Pressure Differences Across the Specimen 2004 (Reapproved 2012).
- L. ASTM E331 - Standard Test Method for Water Penetration of Exterior Windows, Skylights, Doors, and Curtain Walls by Uniform Static Air Pressure Difference 2000 (Reapproved 2009).
- M. ASTM E1105 - Standard Test Method for Field Determination of Water Penetration of Installed Exterior Windows, Skylights, Doors, and Curtain Walls, by Uniform or Cyclic Static Air Pressure Difference 2015.
- N. ASTM F588 - Standard Test Methods for Measuring the Forced Entry Resistance of Window Assemblies, Excluding Glazing Impact 2014.
- O. SSPC-Paint 20 - Zinc-Rich Primers (Type I, "Inorganic," and Type II, "Organic") 2002 (Ed. 2004).
- P. SGCC - Safety Glazing Certification Council - www.sgcc.org

1. ANSI Z97.1-04 "American National Standard for Safety Glazing Materials used in Buildings - Safety Performance Specifications and Methods of Test"
2. 16 CFR 1201 "Consumer Product Safety Commission Safety Standard for Architectural Glazing Materials - codified at Title 16, Part 1201 of the Code of Federal Regulations"

1.04 PERFORMANCE REQUIREMENTS

- A. Performance Requirements: As specified in PART 2, with the following additional requirements: AAMA Designation: HS-AW70.
- B. Design and size windows to withstand the following load requirements, when tested in accordance with ASTM E 330 using test loads equal to 1.5 times the design wind loads with 10 second duration of maximum load:
 1. Design Wind Loads: Comply with requirements of New York State Building code. 2020
 2. Positive Design Wind Load: 30 lbf/sq ft.
 3. Negative Design Wind Load: 30 lbf/sq ft.
 4. Member Deflection: Limit member deflection to 1/175 in any direction, with full recovery of glazing materials, when tested per ASTM E 330-02 at a static air pressure difference of 50 psf.
- C. Movement: Accommodate movement between window and perimeter framing and deflection of lintel, without damage to components or deterioration of seals.
- D. Air Infiltration: Limit air infiltration through assembly to 0.3 cu ft/min/sq ft of wall area, measured at a reference differential pressure across assembly of 1.57 psf as measured in accordance with ASTM E 283.
- E. Condensation Resistance Factor: CRF of 51 frame and 53 glass when measured in accordance with AAMA 1503.1.
- F. Thermal testing per AAMA 1503.1-98 at the prescribed 6'-0" x 4'-0" test size glazed with 1" insulating glass made with 1/8" clear, Heat Mirror (tm) SC75, argon gas and 1/8" clear lites with the following result:
 1. Thermal Transmittance: Maximum .55 BTU/HR/ swft/F U value
- G. Thermal computer simulation testing per NFRC 100-04 at the prescribed 72" x 48" non-residential size, glazed with 1" insulating glass made with 1/8" clear and 1/8" soft coat low E lites and argon gas:
 1. Thermal Transmittance to be maximum of .55 BTU/HR/sqft/F U value.
- H. Water Leakage: None, when measured in accordance with ASTM E 331 with a test pressure difference of 15 lbf/sq ft.
- I. Air and Vapor Seal: Maintain continuous air barrier and vapor retarder throughout assembly.
- J. System Internal Drainage: Drain to the exterior by means of a weep drainage network any water entering joints, condensation occurring in glazing channel, or migrating moisture occurring within system.
- K. Forced Entry Resistance: Conform to ASTM F 588 requirements for performance level 10 for window type A.
- L. Uniform Load Structural Test: With window sash closed and locked, test unit in accordance with ASTM E 330 at a static air pressure difference of 75 psf. Both positive and negative. At conclusion of the test there shall be no glass breakage, permanent damage to fasteners, hardware parts, support arms or actuating mechanisms, nor any other damage that would cause the window to be inoperable.

1.05 ADMINISTRATIVE REQUIREMENTS

- A. Preinstallation Meeting: Convene one week before starting work of this section.

1.06 SUBMITTALS

- A. See Section 01 3000 - Administrative Requirements, for submittal procedures.
- B. Product Data: Provide component dimensions, information on glass and glazing, internal drainage details, and descriptions of hardware and accessories.
- C. Shop Drawings: Indicate opening dimensions, elevations of different types, framed opening tolerances, method for achieving air and vapor barrier seal to adjacent construction, anchorage locations, and installation requirements.
- D. Samples: Submit two samples, 12 by 12 inch in size illustrating typical corner construction, accessories, and finishes.
- E. Submit two samples of operating hardware.
- F. Grade Substantiation: Prior to submitting shop drawings or starting fabrication, submit one of the following showing compliance with specified grade:
 - 1. Evidence of AAMA Certification.
 - 2. Evidence of WDMA Certification.
 - 3. Evidence of CSA Certification.
 - 4. Test report(s) by independent testing agency itemizing compliance and acceptable to authorities having jurisdiction.
- G. Test Reports: Prior to submitting shop drawings or starting fabrication, submit test report(s) by independent testing agency showing compliance with performance requirements in excess of those prescribed by specified grade.
- H. Manufacturer's Installation Instructions: Include complete preparation, installation, and cleaning requirements.
- I. Manufacturer's Qualification Statement.
- J. Installer's Qualification Statement.
- K. Warranty: Submit manufacturer warranty and ensure that forms have been completed in Pine Bush School District's name and registered with manufacturer.

1.07 QUALITY ASSURANCE

- A. Comply with requirements of AAMA 101 Designation HS-HS60, F-HC65 and C-HC80.
- B. Manufacturer and Installer Qualifications: Company specializing in fabrication of residential aluminum windows of types required, with not fewer than three years of experience.
- C. Installer Qualifications: Company specializing in performing work of type specified and with at least three years of documented experience.

1.08 PRE-INSTALLATION MEETING

- A. Convene one week before starting work of this section.

1.09 DELIVERY, STORAGE, AND HANDLING

- A. Comply with requirements of AAMA CW-10.
- B. Protect finished surfaces with wrapping paper or strippable coating during installation. Do not use adhesive papers or sprayed coatings that bond to substrate when exposed to sunlight or weather.

1.10 FIELD CONDITIONS

- A. Do not install sealants when ambient temperature is less than 40 degrees F.
- B. Maintain this minimum temperature during and 24 hours after installation of sealants.

1.11 WARRANTY

- A. See Section 01 7800 - Closeout Submittals, for additional warranty requirements.
- B. Correct defective Work within a five year period after the Date of Substantial Completion.

- C. Provide five year manufacturer warranty against failure of glass seal on insulating glass units, including interpane dusting or misting. Include provision for replacement of failed units.
- D. Provide five year manufacturer warranty against excessive degradation of exterior finish. Include provision for replacement of units with excessive fading, chalking, or flaking.

PART 2 PRODUCTS

2.01 BASIS OF DESIGN - AW PERFORMANCE CLASS WINDOWS

- A. Grade: AAMA/WDMA/CSA 101/I.S.2/A440 having Performance Class of AW, and Performance Grade at least as high as specified design pressure.
- B. Horizontal Sliding; with Matching Fixed Units:
 - 1. Basis of Design: Kawneer 8470TL.
- C. Other Manufacturers: Provide either the product identified as "Basis of Design" or an equivalent product of one of the manufacturers listed below:
- D. Substitutions: See Section 01 6000 - Product Requirements.
 - 1. For any product not identified as "Basis of Design", submit information as specified for substitutions.

2.02 MANUFACTURERS

- A. Aluminum Windows:
 - 1. TRACO
 - 2. EFCO
 - 3. Substitutions: See Section 01 6000 - Product Requirements.

2.03 ALUMINUM WINDOWS

- A. Aluminum Windows: Extruded aluminum frame and sash, factory fabricated, factory finished, with operating hardware, related flashings, and anchorage and attachment devices.
 - 1. Frame Depth: 4".
 - 2. Provide units factory glazed.
 - 3. Fabrication: Joints and corners flush, hairline, and weatherproof, accurately fitted and secured; prepared to receive anchors; fasteners and attachments concealed from view; reinforced as required for operating hardware and imposed loads.
 - 4. Perimeter Clearance: Minimize space between framing members and adjacent construction while allowing expected movement.
 - 5. Movement: Accommodate movement between window and perimeter framing and deflection of lintel, without damage to components or deterioration of seals.
 - 6. System Internal Drainage: Drain to the exterior by means of a weep drainage network any water entering joints, condensation occurring in glazing channel, and migrating moisture occurring within system.
 - 7. Configuration: Single Slide XO.
 - 8. Thermal Movement: Design to resist thermal movement caused by 180 degrees F surface temperature without buckling stress on glass, joint seal failure, damaging loads on structural elements, damaging loads on fasteners, reduction in performance or other detrimental effects.
- B. Fixed, Non-Operable Type:
 - 1. Construction: Thermally broken.
 - 2. Glazing: Double; clear; low-e.
 - a. Exterior glass lite: thickness: 1/4", tint: clear, tempered.
 - b. Interior glass lite: thickness: 1/4", tint: clear, tempered.

- c. Spacer: extruded thermoplastic butyl with integrated desiccant, black, Secondary seal: silicone. Airspace fill: plain air
 - d. Dual-seal durability: conformance to ASTM E 2190-02; visible, permanent IGCC certification label.
- C. Horizontal Sliding Type:
 - 1. Construction: Thermally broken.
 - 2. Provide screens.
 - 3. Glazing: Double; clear; low-e.
 - a. Exterior glass lite: thickness: 1/4", tint: clear, tempered.
 - b. Interior glass lite: thickness: 1/4", tint: clear, tempered.
 - c. Spacer: extruded thermoplastic butyl with integrated desiccant, black, Secondary seal: silicone. Airspace fill: plain air
 - d. Dual-seal durability: conformance to ASTM E 2190-02; visible, permanent IGCC certification label.

2.04 COMPONENTS

- A. Frames: 4" wide deep profile; thermally broken with interior portion of frame insulated from exterior portion; flush glass stops of screw fastened type.
- B. Reinforced Mullion: 2 inch profile of extruded aluminum with integral reinforcement of shaped steel structural section.
- C. Sills: 0.125" thick, extruded aluminum; sloped for positive wash; fit under sash leg to 1/2 inch beyond wall face; one piece full width of opening jamb angles to terminate sill end.
- D. Insulated Infill Panel:
 - 1. Insulated Panels to be composed thus - 1" total thickness with an R value of +12. Outer Face and Inner Faces- .032" Smooth Aluminum Skins with kynar finish. Architect to choose from manufacturer's standard colors. Inner and outer face colors may vary. Core- 1/4" smooth surface plywood with Polyisocyanurate Insulation Core with .125" Tempered Hardboard Backer.
- E. Insect Screens: Extruded aluminum frame with mitered and reinforced corners; screen mesh taut and secure to frame; secured to window with adjustable hardware allowing screen removal without use of tools.
 - 1. Hardware: Spring loaded steel pins; four per screen unit.
 - 2. Screen Mesh: Vinyl-coated fiberglass, window manufacturer's standard mesh.
 - 3. Frame Finish: Same as frame and sash.
 - 4. NOTE: No screens are to be installed at locations designated as Rescue Windows on the plan.
 - 5. Screens are to be installed at all new windows.
- F. Operable Sash Weatherstripping: Wool pile; permanently resilient, profiled to achieve effective weather seal.
- G. Fasteners: Stainless steel.
- H. Installation Accessories
 - 1. Extruded Aluminum - .062 wall with exposed surfaces finished in clear anodized. Finish performance to match windows. Concealed fasteners and required weatherseals all designed for unrestricted expansion and contraction.
 - 2. Subsills with thermal breaks and end dams.
 - 3. Jamb and Head Receptors
 - 4. Three piece vertical reinforcement mullions
- I. Glazing Materials: As specified in Section 08 8000.
- J. Sealant for Setting Sills and Sill Flashing: Non-curing butyl type.

2.05 MATERIALS

- A. Extruded Aluminum: ASTM B221 (ASTM B221M), 6063 alloy, T6 temper.

2.06 HARDWARE

- A. Sash lock: Lever handle with cam lock.
- B. Operator: Lever action handle fitted to projecting sash arms with limit stops.
- C. Projecting Sash Arms: Cadmium plated steel, friction pivot joints with nylon bearings, removable pivot clips for cleaning.
- D. Window Opening Control Devices (WOCD): Provide operable window sash hardware that limits openings to only allow passage of 4 inch diameter rigid sphere or less, and are easily releasable to fully open without use of keys, tools, or special knowledge.
- E. Pulls: Manufacturer's standard type.
- F. Bottom Rollers: Stainless steel, adjustable.
- G. Limit Stops: Resilient stainless steel bars.
- H. Stock and Spare Parts - Provide 10% of total window count number for the following accessories: Plungers, plunger housing, keeper, plunger spring, Wheel & housing, and screen spring.

2.07 FINISHES

- A. Class I Color Anodized Finish: AAMA 611 AA-M12C22A42 Integrally colored anodic coating not less than 0.7 mils thick.
- B. Superior Performing Organic Coatings System: Polyvinylidene fluoride (PVDF) multi-coat superior performing organic coatings system complying with AAMA 2605, including at least 70 percent PVDF resin, and at least 80 percent of aluminum extrusion and panels surfaces having minimum total dry film thickness (DFT) of 1.2 mils, 0.0012 inch.
 - 1. Manufacturers:
 - a. PPG Metal Coatings; Duranar: www.ppgmetalcoatings.com/#sle.
 - b. Sherwin-Williams Company; Fluoropon: www.coil.sherwin.com/#sle.
 - c. Manufacturers coating system for 70% PVDF.
- C. Finish Color: Painted finish - Match Existing at Pine Bush High School. Other schools to be Anodized Dark Bronze. .
- D. Touch-Up Primer for Galvanized Steel Surfaces: SSPC-Paint 20, zinc rich.

PART 3 EXECUTION

3.01 EXAMINATION

- A. Verify that wall openings and adjoining air and vapor seal materials are ready to receive aluminum windows.
- B. The Contractor shall field verify all opening dimensions.

3.02 INSTALLATION

- A. Install windows in accordance with manufacturer's instructions.
- B. Install window assembly in accordance with AAMA/WDMA/CSA 101/I.S.2/A440.
- C. Attach window frame and shims to perimeter opening to accommodate construction tolerances and other irregularities.
- D. Align window plumb and level, free of warp or twist. Maintain dimensional tolerances and alignment with adjacent work.
- E. Install sill and sill end angles.

- F. Provide thermal isolation where components penetrate or disrupt building insulation. Pack fibrous insulation in shim spaces at perimeter of assembly to maintain continuity of thermal barrier.
- G. Install operating hardware not pre-installed by manufacturer.

3.03 TOLERANCES

- A. Maximum Variation from Level or Plumb: 1/16 inches every 3 ft non-cumulative or 1/8 inches per 10 ft, whichever is less.

3.04 FIELD QUALITY CONTROL

- A. Test installed windows for compliance with performance requirements for water penetration, in accordance with ASTM E1105 using uniform pressure and the same pressure difference as specified for laboratory testing.
 - 1. Test one window of each type, as directed by Sammel Architecture.
 - 2. Cost for all successful tests, both original and retest shall be paid by the Owner. All unsuccessful tests, both original and retest, shall be paid by the responsible Contractor.
 - 3. If any window fails, test additional windows at contractor's expense.
- B. Replace windows that have failed field testing and retest until performance is satisfactory.

3.05 ADJUSTING

- A. Adjust hardware for smooth operation and secure weathertight closure.

3.06 SCHEDULE

- A. Pine Bush All Schools
 - 1. Sliding windows - 4 "" HS-AW70 similar to Model 8470TL by Kawneer,
 - a. 1" Insulated glass - 1/4" thickness interior and exterior lites.
 - b. Ext. Finish: PBHS - 70% PVDF Match Existing, All other schools - Anodized Dark Bronze.

END OF SECTION

SECTION 087100 – DOOR HARDWARE

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

- A. Drawings and general provisions of the contract, including general and supplementary conditions and division 01 specification sections, apply to this section.

1.2 SUMMARY

- A. Section includes mechanical door hardware for the following:
 - 1. Swinging doors.
 - 2. Sliding doors.
 - 3. Folding doors.
 - 4. Cylinders for door hardware specified in other sections.
 - 5. Electrified door hardware.
- B. Hardware shall comply with New York State Education Department 1998 Edition of the Manual of Planning Standards, Section S105 – Door Hardware, and NFPA 101-Life Safety Code.

1.3 RELATED SECTIONS:

- A. Division 08 section "hollow metal doors and frames"
- B. Division 08 section "integrated composite door opening assemblies"
- C. Division 08 section "aluminum-framed entrances and storefronts"
- D. Division 28 section "access control" for access control devices installed at door openings and provided as part of a security system.
- E. Division 28 section "intrusion detection" for detection devices installed at door openings and provided as part of an intrusion-detection system.
- F. Division 28 section "digital, addressable fire-alarm system" for connections to building fire-alarm system.

1.4 SUBMITTALS

- A. Product data: for each item of hardware indicated furnish manufacturer's catalog sheets highlighting information pertaining specifically to product(s) submitted. Include construction and installation details, material descriptions, dimensions of individual components and profiles, and finishes.
- B. Shop drawings: details of electrified door hardware, indicating the following:
 - 1. Wiring diagrams: for power, signal, and control wiring and including the following:
 - a. Details of interface of electrified door hardware and building safety and security systems.
 - 2. Operation narrative: describe the operation of doors controlled by electrified door hardware.
- C. Other action submittals:
 - 1. Door hardware schedule: prepared by or under the supervision of installer, detailing fabrication and assembly of door hardware, as well as installation procedures and diagrams. Coordinate final door hardware schedule with doors, frames, and related work to ensure proper size, thickness, hand, function, and finish of door hardware.
 - a. Format: comply with scheduling sequence and vertical format in dhi's "sequence and format for the hardware schedule." double space entries, and number and date each page.
 - b. Content: include the following information:
 - 1) Identification number, location, hand, fire rating, size, and material of each door and frame.
 - 2) Locations of each door hardware set, cross-referenced to drawings on floor plans and to door and frame schedule.
 - 3) Complete designations, including name and manufacturer, type, style, function, size, quantity, function, and finish of each door hardware product.
 - 4) Description of electrified door hardware sequences of operation and interfaces with other building control systems.
 - 5) Fastenings and other pertinent information.
 - 6) Explanation of abbreviations, symbols, and codes contained in schedule.
 - 7) Mounting locations for door hardware.
 - 8) List of related door devices specified in other sections for each door and frame.
 - 9) Door index – cross referencing door number with page and/or set number. If the sets are not in numerical order the door number, set number and page number are required. The hardware set number shown on a door submittal does not qualify as the door index for hardware.
 - 2. Keying schedule: prepared by or under the supervision of installer, detailing owner's final keying instructions for locks. Include schematic keying diagram and index each key set to unique door designations that are coordinated with the contract documents.
- D. Qualification data: for installer and architectural hardware consultant.
- E. Product certificates: for electrified door hardware, from the manufacturer.

1. Certify that door hardware approved for use on types and sizes of labeled fire-rated doors complies with listed fire-rated door assemblies.
- F. Product test reports: for compliance with accessibility requirements, based on evaluation of comprehensive tests performed by manufacturer and witnessed by a qualified testing agency, for door hardware on doors located in accessible routes.
- G. Maintenance data: for each type of door hardware to include in maintenance manuals. Include final hardware and keying schedule.
- H. Warranty: special warranty specified in this section.

1.5 QUALITY ASSURANCE

- A. Installer qualifications: supplier of products and an employer of workers trained and approved by product manufacturers and an architectural hardware consultant who is available during the course of the work to consult with contractor, architect, and owner about door hardware and keying.
- B. Architectural hardware consultant qualifications: a person who is experienced in providing consulting services for door hardware installations that are comparable in material, design, and extent to that indicated for this project.
- C. Source limitations: obtain each type of door hardware from a single manufacturer.
- D. Fire-rated door assemblies: where fire-rated door assemblies are indicated, provide door hardware rated for use in assemblies complying with NFPA 80 that are listed and labeled by a qualified testing agency, for fire-protection ratings indicated, based on testing at positive pressure according to NFPA 252 or UL 10c, unless otherwise indicated.
- E. Smoke- and draft-control door assemblies: where smoke- and draft-control door assemblies are required, provide door hardware that meet requirements of assemblies tested according to UL 1784 and installed in compliance with NFPA 105.
 1. Air leakage rate: maximum air leakage of 0.3 cfm/sq. Ft. At the tested pressure differential of 0.3-inch wg of water.
- F. Electrified door hardware: listed and labeled as defined in NFPA 70, article 100, by a testing agency acceptable to authorities having jurisdiction.
- G. Means of egress doors: latches do not require more than 15 lbf to release the latch. Locks do not require use of a key, tool, or special knowledge for operation.
- H. Accessibility requirements: for door hardware on doors in an accessible route, comply with the U.S. Architectural & transportation barriers compliance board's ADA-aba accessibility guidelines and icc/ansi a117.1.
 1. Provide operating devices that do not require tight grasping, pinching, or twisting of the wrist and that operate with a force of not more than 5 lbf.
 2. Comply with the following maximum opening-force requirements:

- a. Interior, non-fire-rated hinged doors: 5 lbf applied perpendicular to door.
 - b. Sliding or folding doors: 5 lbf applied parallel to door at latch.
 - c. Fire doors: minimum opening force allowable by authorities having jurisdiction.
3. Bevel raised thresholds with a slope of not more than 1:2. Provide thresholds not more than 1/2 inch high.
 4. Adjust door closer sweep periods so that, from an open position of 70 degrees, the door will take at least 3 seconds to move to a point 3 inches from the latch, measured to the leading edge of the door.
- I. Keying conference: conduct conference at project site to comply with requirements in division 01 section "project management and coordination." incorporate keying conference decisions into final keying schedule after reviewing door hardware keying system including, but not limited to, the following:
1. Plans for future expansion.
 2. Preliminary key system schematic diagram.
 3. Requirements for key control system.
 4. Requirements for access control.
 5. Address for delivery of keys.
- J. Pre-installation conference: conduct conference at project site.
1. Review and finalize construction schedule and verify availability of materials, installer's personnel, equipment, and facilities needed to make progress and avoid delays.
 2. Inspect and discuss preparatory work performed by other trades.
 3. Inspect and discuss electrical roughing-in for electrified door hardware.
 4. Review sequence of operation for each type of electrified door hardware.
 5. Review required testing, inspecting, and certifying procedures.

1.6 DELIVERY, STORAGE, AND HANDLING

- A. Inventory door hardware on receipt and provide secure lock-up for door hardware delivered to project site.
- B. Tag each item or package separately with identification coordinated with the final door hardware schedule, and include installation instructions, templates, and necessary fasteners with each item or package.

1.7 COORDINATION

- A. Installation templates: distribute for doors, frames, and other work specified to be factory prepared. Check shop drawings of other work to confirm that adequate provisions are made for locating and installing door hardware to comply with indicated requirements.
- B. Security: coordinate installation of door hardware, keying, and access control with owner's security consultant.
- C. Electrical system roughing-in: coordinate layout and installation of electrified door hardware with connections to power supplies and building safety and security systems.

- D. Existing openings: where hardware components are scheduled for application to existing construction or where modifications to existing door hardware are required, field verify existing conditions and coordinate installation of door hardware to suit opening conditions and to provide proper door operation.

1.8 WARRANTY

- A. Special warranty: manufacturer's standard form in which manufacturer agrees to repair or replace components of door hardware that fail in materials or workmanship within specified warranty period.
 - 1. Failures include, but are not limited to, the following:
 - 2. Structural failures including excessive deflection, cracking, or breakage.
 - 3. Faulty operation of doors and door hardware.
 - 4. Deterioration of metals, metal finishes, and other materials beyond normal weathering and use.
- B. Warranty period: three years from date of substantial completion, unless otherwise indicated.
 - 1. Exit devices: three years from date of substantial completion.
 - 2. Manual closers: 25 years from date of substantial completion.
 - 3. Locksets: 10 years from date of substantial completion.
 - 4. Continuous hinges: lifetime of opening

1.9 MAINTENANCE SERVICE

- A. Maintenance tools and instructions: furnish a complete set of specialized tools and maintenance instructions for owner's continued adjustment, maintenance, and removal and replacement of door hardware.

PART 2 - PRODUCTS

2.1 SCHEDULED DOOR HARDWARE

- A. Provide door hardware for each door as scheduled on drawings with hardware sets scheduled in part 3 "door hardware schedule" article to comply with requirements in this section.
 - 1. Door hardware sets: provide quantity, item, size, finish or color indicated, and named manufacturers' products.
 - 2. Sequence of operation: provide electrified door hardware function, sequence of operation, and interface with other building control systems indicated.
- B. Designations: requirements for design, grade, function, finish, size, and other distinctive qualities of each type of door hardware are indicated in part 3 "door hardware schedule" article. Products are identified by using door hardware designations, as follows:
 - 1. Named manufacturers' products: manufacturer and product designation are listed for each door hardware type required for the purpose of establishing minimum requirements.

2.2 HINGES

- A. Hinges: BHMA A156.1. Provide template-produced hinges for hinges installed on hollow-metal doors and hollow-metal frames.
 - 1. Basis-of-design product: subject to compliance with requirements, provide product indicated on schedule or comparable product by one of the following:
 - a. McKinney Products Company; an ASSA ABLOY Group Company.
 - b. Stanley Commercial Hardware; Div. of Stanley Black & Decker
 - c. Hager Companies.

2.3 SELF-CLOSING HINGES AND PIVOTS

- A. Self-closing hinges and pivots: BHMA A156.17.
 - 1. Basis-of-design product: subject to compliance with requirements, provide product indicated on schedule or comparable product by one of the following:
 - a. McKinney Products Company; an ASSA ABLOY Group Company.
 - b. Stanley Commercial Hardware; Div. of Stanley Black & Decker
 - c. Hager Companies.

2.4 CONTINUOUS HINGES

- A. Continuous hinges: BHMA A156.26; minimum 0.120-inch- thick, hinge leaves with minimum overall width of 4 inches; fabricated to full height of door and frame and to template screw locations; with components finished after milling and drilling are complete.
- B. Continuous, gear-type hinges: extruded-aluminum, pinless, geared hinge leaves joined by a continuous extruded-aluminum channel cap; with concealed, self-lubricating thrust bearings.
 - 1. Basis-of-design product: subject to compliance with requirements, provide product indicated on schedule or comparable product by one of the following:
 - a. Pemko Mfg. Co; an Assa Abloy Group Company
 - b. Select Products, Ltd.
 - c. Hager Companies.

2.5 MECHANICAL LOCKS AND LATCHES

- A. Lock functions: as indicated in door hardware schedule.
- B. Lock throw: comply with testing requirements for length of bolts required for labeled fire doors, and as follows:
 - 1. Bored locks: minimum 1/2-inch latchbolt throw.
 - 2. Mortise locks: minimum 3/4-inch latchbolt throw.
 - 3. Deadbolts: minimum 1-inch bolt throw.

- C. Lock backset: 2-3/4 inches, unless otherwise indicated.
- D. Lock trim:
 - 1. Description: as indicated in door hardware schedule
 - 2. Levers: zinc alloy
 - 3. Escutcheons (roses): wrought
- E. Strikes: provide manufacturer's standard strike for each lock bolt or latchbolt complying with requirements indicated for applicable lock or latch and with strike box and curved lip extended to protect frame; finished to match lock or latch.
 - 1. Flat-lip strikes: for locks with three-piece antifriction latch bolts, as recommended by manufacturer.
 - 2. Extra-long-lip strikes: for locks used on frames with applied wood casing trim.
- F. Bored locks: BHMA A156.2; grade 1; series 4000.
 - 1. Basis-of-design product: subject to compliance with requirements, provide product indicated on schedule or comparable product by one of the following:
 - a. Best Access Systems; a Dormakaba Holding, Inc. Company (to match existing)

2.6 ELECTRIC STRIKES

- A. Electric strikes: BHMA A156.31; grade 1; with faceplate to suit lock and frame.
 - 1. Basis-of-design product: subject to compliance with requirements, provide product indicated on schedule or comparable product by one of the following:
 - a. HES; an ASSA ABLOY Group Company.
 - b. Trine Access Technology.
 - c. Von Duprin; an Allegion Company.

2.7 MANUAL FLUSH BOLTS

- A. Manual flush bolts: BHMA A156.16; minimum 3/4-inch throw; designed for mortising into door edge.
 - 1. Basis-of-design product: subject to compliance with requirements, provide product indicated on schedule or comparable product by one of the following:
 - a. Rockwood; an ASSA ABLOY Group Company
 - b. Door Controls International, Inc.
 - c. Ives Hardware; an Ingersoll-Rand Company.

2.8 AUTOMATIC AND SELF-LATCHING FLUSH BOLTS

- A. Automatic and self-latching flush bolts: BHMA A156.16; minimum 3/4-inch throw; designed for mortising into door edge.

1. Basis-of-design product: subject to compliance with requirements, provide product indicated on schedule or comparable product by one of the following:
 - a. Rockwood; an ASSA ABLOY Group Company
 - b. Ives Hardware; an Ingersoll-Rand Company.
 - c. Door Controls International, Inc.

2.9 EXIT DEVICES AND AUXILIARY ITEMS

A. Exit devices and auxiliary items: BHMA A156.3.

1. Basis-of-design product: subject to compliance with requirements, provide product indicated on schedule or comparable product by one of the following:
 - a. Von Duprin; an Allegion Company
 - b. Precision Hardware, Inc.; a Dormakaba Holding, Inc. Company
 - c. Sargent Manufacturing Company; an ASSA ABLOY Group Company.

B. Power Transfers:

1. Basis-of-design product: subject to compliance with requirements, provide product indicated on schedule or comparable product by one of the following:
 - a. Von Duprin; an Allegion Company
 - b. ABH; Architectural Builders Hardware Manufacturing, Inc.
 - c. Securitron; an ASSA ABLOY Group Company.

2.10 LOCK CYLINDERS

A. Lock cylinders: tumbler type, constructed from brass or bronze, stainless steel, or nickel silver.

1. Basis-of-design product: subject to compliance with requirements, provide product indicated on schedule or comparable product by one of the following:
 - a. Best Access Systems; a Dormakaba Holding, Inc. Company (to match existing)

B. Standard lock cylinders: BHMA A156.5; grade 1; permanent cores that are interchangeable; face finished to match lockset.

C. Construction cores: provide cylinders with keyed alike construction cores. Cores shall be painted a color for easy identification (blue, orange, etc.). Construction cores shall be returned to the hardware supplier. Provide 10 construction master keys and two construction control keys for removing temporary cores.

D. Provide final permanent cores with visual key control. Stamp keys and (in a concealed location) stamp cores with keyset symbol.

2.11 KEYING

- A. Keying system: factory registered, integrated with existing Best access control key system, complying with guidelines in BHMA A156.28, appendix a. Incorporate decisions made in keying conference.
 - 1. Existing system:
 - a. Master key or grand master key locks to owner's existing Best Access Systems key system.
- B. Keys: nickel silver.
 - 1. Stamping: permanently inscribe each key with a visual key control number and include the following notation:
 - a. Notation: "do not duplicate."
 - 2. Quantity: in addition to one extra key blank for each lock, provide the following unless otherwise directed by owner:
 - a. Cylinder change keys: three.
 - b. Master keys: five.
 - c. Grand master keys: five.
 - d. Great-grand master keys: five.

2.12 KEY CONTROL SYSTEM

- A. Key control cabinet: BHMA A156.5; metal cabinet with baked-enamel finish; containing key-holding hooks, labels, 2 sets of key tags with self-locking key holders, key-gathering envelopes, and temporary and permanent markers; with key capacity of 150 percent of the number of locks.
 - 1. Manufacturers: subject to compliance with requirements, provide products by one of the following:
 - a. Tel-Kee
 - b. HPC, Inc.
 - c. Lund Equipment Co., Inc.
 - d. MMF Industries.

2.13 ACCESSORIES FOR PAIRS OF DOORS

- A. General: provide accessories for pairs of doors as indicated on schedule.
- B. Coordinators: BHMA A156.3; consisting of active-leaf, hold-open lever and inactive-leaf release trigger; fabricated from steel with nylon-coated strike plates; with built-in, adjustable safety release; and with internal override.

- C. Carry-open bars: BHMA A156.3; prevent the inactive leaf from opening before the active leaf; provide polished brass or bronze carry-open bars with strike plate for inactive leaves of pairs of doors unless automatic or self-latching bolts are used.
- D. Astragals: BHMA A156.22.

2.14 SURFACE CLOSERS

- A. Surface closers: BHMA A156.4; rack-and-pinion hydraulic type with adjustable sweep and latch speeds controlled by key-operated valves and forged-steel main arm. Comply with manufacturer's written recommendations for size of door closers depending on size of door, exposure to weather, and anticipated frequency of use. Provide factory-sized closers, adjustable to meet field conditions and requirements for opening force.
 - 1. Basis-of-design product: subject to compliance with requirements, provide product indicated on schedule or comparable product by one of the following:
 - a. LCN Closers; an Allegion Company.
 - b. Sargent Manufacturing Company; an ASSA ABLOY Group Company.
 - c. Dorma Architectural Hardware; a Dormakaba Holding, Inc. Company

2.15 MECHANICAL STOPS AND HOLDERS

- A. Wall- and floor-mounted stops: BHMA A156.16; polished cast brass, bronze, or aluminum base metal.
 - 1. Basis-of-design product: subject to compliance with requirements, provide product indicated on schedule or comparable product by one of the following:
 - a. Rockwood; an ASSA ABLOY Group Company
 - b. Burns Manufacturing Incorporated.
 - c. Ives Hardware; an Allegion Company.

2.16 ELECTROMAGNETIC STOPS AND HOLDERS

- A. Electromagnetic door holders: BHMA A156.15, grade 1; wall-mounted or floor-mounted electromagnet unit with strike plate attached to swinging door; coordinated with fire detectors and interface with fire alarm system for labeled fire-rated door assemblies.
 - 1. Basis-of-design product: subject to compliance with requirements, provide product indicated on schedule or comparable product by one of the following:
 - a. Rixson; an ASSA ABLOY Group Company
 - b. Architectural Builders Hardware Mfg., Inc.
 - c. LCN Closers; an Allegion Company

2.17 OVERHEAD STOPS AND HOLDERS

A. Overhead stops and holders: BHMA A156.8.

1. Basis-of-design product: subject to compliance with requirements, provide product indicated on schedule or comparable product by one of the following:
 - a. Glynn-Johnson; an Ingersoll-Rand Company.
 - b. Sargent Manufacturing Company; an ASSA ABLOY Group Company.
 - c. Architectural Builders Hardware Mfg., Inc.

2.18 DOOR GASKETING

A. Door gasketing: BHMA A156.22; air leakage not to exceed 0.50 cfm per foot of crack length for gasketing other than for smoke control, as tested according to ASTM E 283; with resilient or flexible seal strips that are easily replaceable and readily available from stocks maintained by manufacturer.

1. Basis-of-design product: subject to compliance with requirements, provide product indicated on schedule or comparable product by one of the following:
 - a. Pemko Manufacturing Co.; an ASSA ABLOY Group Company.
 - b. National Guard Products.
 - c. Zero International; an Allegion Company

2.19 THRESHOLDS

A. Thresholds: BHMA A156.21; fabricated to full width of opening indicated.

1. Basis-of-design product: subject to compliance with requirements, provide product indicated on schedule or comparable product by one of the following:
 - a. Pemko Manufacturing Co.; an ASSA ABLOY Group Company.
 - b. National Guard Products.
 - c. Zero International; an Allegion Company

2.20 SLIDING DOOR HARDWARE

A. Sliding door hardware: BHMA A156.14; consisting of complete sets including rails, hangers, supports, bumpers, floor guides, and accessories indicated.

1. Basis-of-design product: subject to compliance with requirements, provide product indicated on schedule or comparable product by one of the following:
 - a. Stanley Commercial Hardware; Div. of Stanley Black & Decker.
 - b. Hager Companies.
 - c. Henderson, PC Inc.
 - d. Johnson, L. E., Products, Inc.

2.21 FOLDING DOOR HARDWARE

- A. General: BHMA A156.14; complete sets including overhead rails, hangers, supports, bumpers, floor guides, and accessories indicated.
 - 1. Basis-of-design product: subject to compliance with requirements, provide product indicated on schedule or comparable product by one of the following:
 - a. Stanley Commercial Hardware; Div. of Stanley Black & Decker
 - b. Hager Companies.
 - c. Henderson, PC Inc.
 - d. Johnson, L. E., Products, Inc.

2.22 METAL PROTECTIVE TRIM UNITS

- A. Metal protective trim units: BHMA A156.6; fabricated from 0.050-inch- thick stainless steel as scheduled; with four beveled edges and countersunk screw holes with manufacturer's standard machine or self-tapping screw fasteners.
 - 1. Basis-of-design product: subject to compliance with requirements, provide product indicated on schedule or comparable product by one of the following:
 - a. Rockwood; an ASSA ABLOY Group Company
 - b. Burns Manufacturing Incorporated.
 - c. Ives Hardware; an Allegion Company.

2.23 FABRICATION

- A. Manufacturer's nameplate: do not provide products that have manufacturer's name or trade name displayed in a visible location except in conjunction with required fire-rated labels and as otherwise approved by architect.
 - 1. Manufacturer's identification is permitted on rim of lock cylinders only.
- B. Base metals: produce door hardware units of base metal indicated, fabricated by forming method indicated, using manufacturer's standard metal alloy, composition, temper, and hardness. Furnish metals of a quality equal to or greater than that of specified door hardware units and BHMA A156.18.
- C. Fasteners: provide door hardware manufactured to comply with published templates prepared for machine, wood, and sheet metal screws. Provide screws that comply with commercially recognized industry standards for application intended, except aluminum fasteners are not permitted.
 - 1. Fire-rated applications:
 - a. Wood or machine screws: for the following:
 - 1) Hinges mortised to doors or frames; use threaded-to-the-head wood screws for wood doors and frames.
 - 2) Strike plates to frames.
 - 3) Closers to doors and frames.

- b. Steel through bolts: do not use through bolts for installation where bolt head or nut on opposite face is exposed unless noted or it is the only means of securely attaching the door hardware and approved by architect.
 - 1) Where through bolts are used on hollow door and frame construction, provide sleeves for each through bolt.
 - 2) Verify that blocking is provide for the following:
 - a) Surface hinges to doors.
 - b) Closers to doors and frames.
 - c) Surface-mounted exit devices.
- c. Spacers or sex bolts: for through bolting of hollow-metal doors.
- 2. Fasteners for wood doors: comply with requirements in DHI wdhs.2, "recommended fasteners for wood doors."
- 3. Gasketing fasteners: provide noncorrosive fasteners for exterior applications and elsewhere as indicated.

2.24 FINISHES

- A. Provide finishes complying with BHMA A156.18 as indicated in door hardware schedule.
- B. Protect mechanical finishes on exposed surfaces from damage by applying a strippable, temporary protective covering before shipping.
- C. Appearance of finished work: variations in appearance of abutting or adjacent pieces are acceptable if they are within one-half of the range of approved samples. Noticeable variations in the same piece are not acceptable. Variations in appearance of other components are acceptable if they are within the range of approved samples and are assembled or installed to minimize contrast.

PART 3 - EXECUTION

3.1 EXAMINATION

- A. Examine doors and frames, with installer present, for compliance with requirements for installation tolerances, labeled fire-rated door assembly construction, wall and floor construction, and other conditions affecting performance.
- B. Examine roughing-in for electrical power systems to verify actual locations of wiring connections before electrified door hardware installation.
- C. Proceed with installation only after unsatisfactory conditions have been corrected.

3.2 PREPARATION

- A. Steel doors and frames: for surface applied door hardware, drill and tap doors and frames according to ANSI/SDI A250.6.

- B. Wood doors: comply with DHI WDHS.5 "Recommended hardware reinforcement locations for mineral core wood flush doors."

3.3 INSTALLATION

- A. Mounting heights: mount door hardware units at heights to comply with the following unless otherwise indicated or required to comply with governing regulations.
 - 1. Standard steel doors and frames: ANSI/SDI A250.8.
 - 2. Wood doors: DHI WDHS.3, "Recommended locations for architectural hardware for wood flush doors."
- B. Install each door hardware item to comply with manufacturer's written instructions. Where cutting and fitting are required to install door hardware onto or into surfaces that are later to be painted or finished in another way, coordinate removal, storage, and reinstallation of surface protective trim units with finishing work specified in division 09 sections. Do not install surface-mounted items until finishes have been completed on substrates involved.
 - 1. Set units level, plumb, and true to line and location. Adjust and reinforce attachment substrates as necessary for proper installation and operation.
 - 2. Drill and countersink units that are not factory prepared for anchorage fasteners. Space fasteners and anchors according to industry standards. Hand tighten screws and fasteners, use of power tools must be limited to preliminary driving screws if permitted by the door and hardware manufacturer.
- C. Hinges: install types and in quantities indicated in door hardware schedule but not fewer than the number recommended by manufacturer for application indicated or one hinge for every 30 inches of door height, whichever is more stringent, unless other equivalent means of support for door, such as spring hinges or pivots, are provided.
- D. Door closers shall be installed to obtain the greatest degree swing allowed by field conditions. Follow manufacturer's instructions for proper door closer adjustment for spring power, back check, closing and latching speed.
- E. Lock cylinders: install construction cores to secure building and areas during construction period.
 - 1. Replace construction cores with permanent cores as indicated in keying schedule.
- F. Key control system: tag keys and place them on markers and hooks in key control system cabinet, as determined by final keying schedule.
- G. Provide and install all low voltage control wiring from power supply to all door hardware. Provide and install 120v power wiring from EC-provided junction box to power supply (supplied under this section). Provide wiring as recommended by device manufacturer.
- H. Boxed power supplies: locate power supplies as indicated or, if not indicated, above accessible ceilings. Verify location with architect.
 - 1. Configuration: provide one power supply for each door opening with electrified door hardware unless otherwise specified

- I. Thresholds: set thresholds for exterior and interior doors in full bed of sealant complying with requirements specified in division 07 section "joint sealants."
- J. Stops: provide floor stops for doors unless wall or other type stops are indicated in door hardware schedule. Do not mount floor stops where they will impede traffic.
- K. Perimeter gasketing: apply to head and jamb, forming seal between door and frame.
- L. Meeting stile gasketing: fasten to meeting stiles, forming seal when doors are closed.
- M. Door bottoms: apply to bottom of door, forming seal with threshold when door is closed.

3.4 ADJUSTING

- A. Initial adjustment: adjust and check each operating item of door hardware and each door to ensure proper operation or function of every unit. Replace units that cannot be adjusted to operate as intended. Adjust door control devices to compensate for final operation of heating and ventilating equipment and to comply with referenced accessibility requirements.
 - 1. Electric strikes: adjust horizontal and vertical alignment of keeper to properly engage lock bolt.
 - 2. Door closers: adjust sweep period to comply with accessibility requirements and requirements of authorities having jurisdiction.
- B. Occupancy adjustment: approximately three months after date of substantial completion, installer's architectural hardware consultant shall examine and readjust each item of door hardware, including adjusting operating forces, as necessary to ensure function of doors, door hardware, and electrified door hardware.

3.5 CLEANING AND PROTECTION

- A. Clean adjacent surfaces soiled by door hardware installation.
- B. Clean operating items as necessary to restore proper function and finish.
- C. Provide final protection and maintain conditions that ensure that door hardware is without damage or deterioration at time of substantial completion.

3.6 DOOR HARDWARE SCHEDULE

- A. Supplier shall assume full responsibility for examination of the drawings and shall be responsible for the accuracy of the quantities, size, finish and proper hardware whether specifically mentioned or not. Hardware not listed specifically must be furnished to match other hardware in similar openings.
- B. Provide all required accessories and options necessary for complete installation of each hardware component, to ensure proper operation of the product.

C. Hardware for aluminum doors shall be shipped to the door manufacturer's factories for installation with the exception of door closers and thresholds, if required or requested.

D. Hardware codes:

001	1 ea.	heavy duty continuous hinge Dark Bronze by Section 084113
001A	1 ea.	heavy duty continuous hinge Dark Bronze Prep EPT by Section 084113
101	1 ea.	continuous hinge CFM HD1
102	3 ea.	hinges T4B3786 US26D 4-1/2 x 4-1/2
102A	3 ea.	hinges T4B3386 US32D 4-1/2 x 4-1/2
103	3 ea.	hinges TB2714 US26D 4-1/2 x 4-1/2

200	1 ea.	closer (pull side) 4011 MC Alum x TB
200A	1 ea.	closer (pull side stop arm) 8916 IS FMC SN1 689
201	1 ea.	closer (push side) 4111EDA MC Alum x TB
202	1 ea.	closer (push side stop arm) 4111-CUSH MC Alum x TB
203	1 ea.	closer (push side stop hold open arm) 4111H-CUSH MC DKBRZ

Provide drop plates, spacers and shoe supports as required

300LD	1 ea.	rim exit device (lockdown) 98L-F-2SI x 996L-R x 17 SNB US26D (Key outside retracts latch, key inside locks and unlocks outside lever, with visible indicator)
301	1 ea.	rim exit device QEL-HD-35A-NL-OP SNB US26D with electric latch retraction & hex key dogging
302	1 ea.	rim exit device CD35A-NL-OP SNB US26D
303	1 ea.	rim exit device CD35A-EO SNB US26D
304	1 ea.	keyed removable mullion KR4954 SP313
304A	1 ea.	fire rated keyed removable mullion KR9954 SP28
305	1 ea.	power transfer EPT-10 SP313
306	1 ea.	power supply PS902 x 900-2RS x 900-BBK with batteries

400	1 ea.	rim cylinder 12E72 or mortise 1E74 626, as required (Provide 613 finish for mullion cylinder)
400A	1 ea.	removable core Best 626
401	1 ea.	lockset (classroom) 9K3-7R14D 626
401LD	1 ea.	lockset (intruder) 9K3-7IN14D 626
402	1 ea.	lockset (storeroom) 9K3-7D14D 626
403	1 ea.	passage 9K3-0N14D 626
404	1 ea.	privacy 9K3-0L14D 626
405	1 ea.	lockset (classroom lockdown/dormitory) 9K3-7T14D 626
406	1 ea.	mortise lockset (keyed restroom) Sargent V20-LB-70-8225OP US26D with occupancy indicator "Vacant/Occupied" & ADA thumb turn (Key allows door to be kept in either locked or unlocked position from secure side and as emergency override) Note: Indicator with "Locked/Unlocked" <u>not</u> acceptable

Note: Provide 3/4" throw latch at Pair of Doors

500	1 set	automatic flush bolts 2842 for HM/D or 2962 for W/D US26D x 570 strike
500A	1 set	self-latching flush bolts 2845 US26D x 570 dust strike
501	1 ea.	coordinator 2600 Series x mounting brackets as required - Black Prime Coat
502	2 ea.	manual flush bolts 550 US26D x 570 dust strike
503	3 ea.	silencers 608-RKW @ Single Doors, 2 @ Pair Doors
504	1 ea.	wall bumper 406 @ exit devices, 409 @ locksets US32D or floor stop 441 US26D
600	1 ea.	kick plate 8" x 2" LDW for Single Doors, 8" x 1"LDW for Pair Doors US32D B4E .050 CSK (countersunk screw holes)
601	1 ea.	door pull BF157 - 1" diameter x 10" CTC US32D
700	1 ea.	smoke seal S44C (Clear) for H&J
700A	1 lg.	smoke seal S771C (Clear) for meeting stile
701	1 set	smoke seal 316AS x Tek for H&J
702	1 ea.	door sweep 315DN x Tek
703	1 set	weatherstrip for H, J & Meeting Stile by Section 084113
704	1 set	gasketing for H&J by Section 081743
800	1 ea.	aluminum threshold 254x4AFG - 1/2"H x 8-1/8"W x MSES25SS
1000	1 ea.	access control - new or existing
1001	1 ea.	reinstall existing door contacts

E. DOORS/CODES:

Note: Access control at RHR leaf unless otherwise noted.

	<u>CIRCLEVILLE ELEMENTARY SCHOOL:</u>
<u>SET 1-CES</u>	
5-135 (2)	001-001A-2/203-301-303-304-305-306-3/400-2/601-2/702-703-800-1000- 2/1001
<u>SET 2-CES</u>	
4-135 (2)	2/001-2/203-302-303-304-4/400-2/601-2/702-703-800-2/1001
<u>SET 3-CES</u>	
3-135 (2)	001-001A-2/203-301-303-304-305-3/400-2/601-703-1000
<u>SET 4-CES</u>	
2-135 (2)	2/001-2/203-302-303-304-4/400-2/601-703

<u>SET 5-CES</u>	
1-135	102-200-405-504-600-700

Note: Doors 3-135 and 5-135 to share a power supply.

Note: Mount closers at back-to-back door leafs at 2-135, 3-135, 4-135 and 5-135 at degree of opening to avoid pulls hitting one another.

	<u>CIRCLEVILLE MIDDLE SCHOOL:</u>
<u>SET 6-CVMS</u>	
4-100 (2)	001-001A-2/203-301-303-304-305-306-3/400-2/601-2/702-703-800-1000-2/1001
<u>SET 7-CVMS</u>	
5-100 (2)	2/001-2/203-302-303-304-4/400-2/601-2/702-703-800-2/1001
<u>SET 8-CVMS</u>	
2-100 (2)	001-001A-2/203-301-303-304-305-3/400-2/601-703-1000
<u>SET 9-CVMS</u>	
3-100 (2)	2/001-2/203-302-303-304-4/400-2/601-703
<u>SET 10-CVMS</u>	
1-135A	102-200-400A-406-504-600-700
1-135C	102-200-400A-406-504-600-700
<u>SET 11-CVMS</u>	
1-135B	102-200A-402-600-700
<u>SET 12-CVMS</u>	
1-100	102-201-405-504-600-700
<u>SET 13-CVMS</u>	
1-078	103-405-503-504

Note: Doors 4-100 and 2-100 to share power supply.

Note: Mount closers at back-to-back door leafs at 2-100, 3-100, 4-100 and 5-100 at degree of opening to avoid pulls hitting one another.

	<u>PAKANASINK ELEMENTARY SCHOOL:</u>
<u>SET 14-PAK</u>	
4-001 (2)	001-001A-2/203-301-303-304-305-306-3/400-2/601-2/702-703-800-1000-2/1001
<u>SET 15-PAK</u>	
5-001 (2)	2/001-2/203-302-303-304-4/400-2/601-2/702-703-800-2/1001 (ACT LHR)

<u>SET 16-PAK</u>	
2-001 (2)	001-001A-2/203-301-303-304-305-3/400-2/601-703-1000
<u>SET 17-PAK</u>	
2-001A	001-203-303-601-703
<u>SET 18-PAK</u>	
3-001	001-203-302-2/400-601-703
<u>SET 19-PAK</u>	
1-141	102-200-400A-406-504-600-700
1-143	102-200-400A-406-504-600-700
<u>SET 20-PAK</u>	
1-102A	102-200-401LD-504-600-700
1-109A	102-200-401LD-504-600-700
<u>SET 21-PAK</u>	
1-136A	102-200A-401LD-600-700
<u>SET 22-PAK</u>	
1-001	102-200A-405-600-700
<u>SET 23-PAK</u>	
2-102A	102A-200(Omit MC)-401LD-504-600-703
<u>SET 24-PAK</u>	
2-109A	102A-201(Omit MC)-401LD-504-600-703

Note: Doors 2-001 and 4-001 to share power supply.

Note: Mount closers at back-to-back door leafs of Doors 2-001, 2-001A, 4-001 and 5-001 at degree of opening to avoid pulls hitting one another

	<u>PINE BUSH HIGH SCHOOL:</u>
<u>SET 25-PBHS</u>	
1-107 (2)	2/101-2/201-2/300LD-304A-5/400-2/600-700A-701
2-107 (2)	2/101-2/201-2/300LD-304A-5/400-2/600-700A-701
<u>SET 26-PBHS</u>	
1-105	102-200-405-504-600-700
<u>SET 27-PBHS</u>	
1-104	102-200A-405-600-700

<u>SET 28-PBHS</u>	
2-002	102-202-401LD-600-700
<u>SET 29-PBHS</u>	
2-105	103-401-503-504
2-110	103-401-503-504
2-111	103-401-503-504
<u>SET 30-PBHS</u>	
1-002	103-405-503-504
1-106	103-405-503-504
1-110	103-405-503-504
1-111	103-405-503-504
2-001	103-405-503-504
3-105	103-405-503-504
<u>SET 31-PBHS</u>	
1-001 (2)	2/103-401-502-503-2/504

END OF SECTION 08 7100

SECTION 08 8000 - GLAZING

PART 1 - GENERAL

1.1 SUMMARY

- A. Section includes glazing for the following products and applications, including those specified in other Sections where glazing requirements are specified by reference to this Section:
1. Windows.
 2. Doors.

1.2 DEFINITIONS

- A. Glass Manufacturers: Firms that produce primary glass, fabricated glass, or both, as defined in referenced glazing publications.
- B. Glass Thicknesses: Indicated by thickness designations in millimeters according to ASTM C 1036.
- C. Interspace: Space between lites of an insulating-glass unit.

1.3 PERFORMANCE REQUIREMENTS

- A. General: Installed glazing systems shall withstand normal thermal movement and wind and impact loads (where applicable) without failure, including loss or glass breakage attributable to the following: defective manufacture, fabrication, or installation; failure of sealants or gaskets to remain watertight and airtight; deterioration of glazing materials; or other defects in construction.
1. Standard: ASTM E 1300.
 2. Vertical Glazing: For glass surfaces sloped 15 degrees or less from vertical, glass shall
Maximum Lateral Deflection: For glass supported on all four edges, limit center-of-glass deflection at design wind pressure to not more than 1/50 times the short-side length or 1 inch, whichever is less.
 3. Differential Shading: Glass shall resist thermal stresses induced by differential shading within individual glass lites.
- B. Thermal Movements: Allow for thermal movements from ambient and surface temperature changes acting on glass framing members and glazing components.
1. Temperature Change: 120 deg F, ambient; 180 deg F, material surfaces.

1.4 SUBMITTALS

- A. Product Data: For each glass product and glazing material indicated.
- B. Glass Samples: For each type of the following products; 12 inches square.
1. Coated glass.
 2. Fire-resistive glazing products.
- C. Glazing Schedule: List glass types and thicknesses for each size opening and location. Use same designations indicated on Drawings.
- D. Qualification Data: For installers.
- E. Product Certificates: For glass and glazing products, from manufacturer.
- F. Warranties: Sample of special warranties.

1.5 QUALITY ASSURANCE

- A. Installer Qualifications: A qualified installer who employs glass installers for this Project who are certified under the National Glass Association's Certified Glass Installer Program.
- B. Source Limitations for Glass: Obtain tinted float glass, coated float glass, laminated glass and insulating glass from single source from single manufacturer for each glass type.
- C. Source Limitations for Glazing Accessories: Obtain from single source from single manufacturer for each product and installation method.
- D. Glazing Publications: Comply with published recommendations of glass product manufacturers and organizations below, unless more stringent requirements are indicated. Refer to these publications for glazing terms not otherwise defined in this Section or in referenced standards.
 - 1. GANA Publications: GANA's "Laminated Glazing Reference Manual" and GANA's "Glazing Manual."
- E. Safety Glazing Labeling: Where safety glazing labeling is indicated, permanently mark glazing with certification label of the SGCC or another certification agency acceptable to authorities having jurisdiction. Label shall indicate manufacturer's name, type of glass, thickness, and safety glazing standard with which glass complies.
- F. Fire-Protection-Rated Glazing Labeling: Permanently mark fire-protection-rated glazing with certification label of a testing agency acceptable to authorities having jurisdiction. Label shall indicate manufacturer's name, test standard, whether glazing is for use in fire doors or other openings, whether or not glazing passes hose-stream test, whether or not glazing has a temperature rise rating of 450 deg F, and the fire-resistance rating in minutes.
- G. Preinstallation Conference: Conduct conference at Project site.
 - 1. Review and finalize construction schedule and verify availability of materials, Installer's personnel, equipment, and facilities needed to make progress and avoid delays.
 - 2. Review temporary protection requirements for glazing during and after installation.

1.6 DELIVERY, STORAGE, AND HANDLING

- A. Protect glazing materials according to manufacturer's written instructions. Prevent damage to glass and glazing materials from condensation, temperature changes, direct exposure to sun, or other causes.
- B. Comply with insulating-glass manufacturer's written recommendations for venting and sealing units to avoid hermetic seal ruptures due to altitude change.

1.7 PROJECT CONDITIONS

- A. Environmental Limitations: Do not proceed with glazing when ambient and substrate temperature conditions are outside limits permitted by glazing material manufacturers and when glazing channel substrates are wet from rain, frost, condensation, or other causes.
 - 1. Do not install glazing sealants when ambient and substrate temperature conditions are outside limits permitted by sealant manufacturer or below 40 deg F.

PART 2 - PRODUCTS

2.1 GLASS PRODUCTS, GENERAL

- A. Thickness: Where glass thickness is indicated, it is a minimum. Provide glass lites in thicknesses as needed to comply with requirements indicated.

- B. Strength: Where float glass is indicated, provide annealed float glass, Kind HS heat-treated float glass, or Kind FT heat-treated float glass. Where heat-strengthened glass is indicated, provide Kind HS heat-treated float glass or Kind FT heat-treated float glass. Where fully tempered glass is indicated, provide Kind FT heat-treated float glass.
- C. Thermal and Optical Performance Properties: Provide glass with performance properties specified, as indicated in manufacturer's published test data, based on procedures indicated below:
 - 1. For monolithic-glass lites, properties are based on units with lites 6.0 mm thick.
 - 2. For laminated-glass lites, properties are based on products of construction indicated.
 - 3. For insulating-glass units, properties are based on units of thickness indicated for overall unit and for each lite.
 - 4. U-Factors: Center-of-glazing values, according to NFRC 100 and based on LBL's WINDOW 5.2 computer program, expressed as Btu/sq. ft. x h x deg F.
 - 5. Solar Heat-Gain Coefficient and Visible Transmittance: Center-of-glazing values, according to NFRC 200 and based on LBL's WINDOW 5.2 computer program.
 - 6. Visible Reflectance: Center-of-glazing values, according to NFRC 300.

2.2 GLASS PRODUCTS

- A. Heat-Treated Float Glass: ASTM C 1048; Type I (transparent flat glass); Quality-Q3; of class, kind, and condition indicated.
 - 1. Fabrication Process: By horizontal (roller-hearth) process with roll-wave distortion parallel to bottom edge of glass as installed, unless otherwise indicated.
 - 2. Provide Kind HS (heat-strengthened) float glass in place of annealed float glass where needed to resist thermal stresses induced by differential shading of individual glass lites and to comply with glass design requirements specified in Part 1 "Performance Requirements" Article.
 - 3. For uncoated glass, comply with requirements for Condition A.
 - 4. Provide Kind FT (fully tempered) float glass in place of annealed or Kind HS (heat-strengthened) float glass where safety glass is indicated.

2.3 LAMINATED GLASS

- A. Laminated Glass: ASTM C 1172, and complying with testing requirements in 16 CFR 1201 for Category II materials, and with other requirements specified. Use materials that have a proven record of no tendency to bubble, discolor, or lose physical and mechanical properties after fabrication and installation.
 - 1. Construction: Laminate glass with polyvinyl butyral interlayer or cast-in-place and cured-transparent-resin interlayer to comply with interlayer manufacturer's written recommendations.
 - 2. Interlayer Thickness: Provide thickness not less than that indicated and as needed to comply with requirements.
 - 3. Interlayer Color: Clear unless otherwise indicated.
- B. Glass: Comply with applicable requirements in "Glass Products" Article as indicated by designations in "Laminated-Glass Types" Article.

2.4 INSULATING GLASS MATERIALS

- A. Insulating-Glass Units: General: Factory-assembled units consisting of sealed lites of glass separated by a dehydrated interspace, and complying with ASTM E 774 for Class CBA units and with requirements specified in this Article and in Part 2 "Insulating-Glass Units" Article.
 - 1. Provide Kind FT (fully tempered) glass lites.

2. Overall Unit Thickness and Thickness of Each Lite: Dimensions indicated for insulating-glass units are nominal and the overall thicknesses of units are measured perpendicularly from outer surfaces of glass lites at unit's edge.
3. Sealing System: Dual seal, with primary and secondary sealants as follows:
4. Manufacturer's standard sealants.
 - a. Spacer Specifications: Manufacturer's standard spacer material and construction.

2.5 SPANDREL GLAZING

- A. Ceramic-Coated Spandrel Glass: ASTM C 1048, Condition B (spandrel glass, one surface ceramic coated), Type I (transparent flat glass), Quality-Q3, and complying with other requirements specified.
 1. Fallout Resistance: Provide spandrel units identical to those passing the fallout-resistance test for spandrel glass specified in ASTM C 1048.

2.6 FIRE-RATED GLAZING MATERIALS:

- A. Manufacturer: Technical Glass Products, Kirkland, Washington, or equal.
 1. Product: FireLite Plus
 2. Properties:
 - a. Thickness: 5/16 inch.
 - b. Weight: 4.0 lbs./sq. ft.
 - c. Approximate Visible Transmission: 85 percent.
 - d. Approximate Visible Reflection: 9 percent.
 - e. Fire-rating: to 3 hours (180 min.)
 - f. Impact Safety Resistance: ANSI Z97.1 and CPSC 16CFR1201 (Cat. I and II).
 - g. Labeling: Permanently label each piece of Fireglass with manufacturer's logo, UL logo and fire rating in sizes up to 6,396 sq. in.
 - h. Fire Rating: Fire rating listed and labeled by UL for fire rating scheduled at opening locations on drawings.

2.7 INSULATED PANELS:

- A. Manufacturer: Mapes. or approved equal.
 1. Product: MapeStop
 2. Properties:
 - a. Exterior Face Material: 70% Kynar 500/Hylar 5000 coil-coated on .032 aluminum, smooth finish-standard colors.
 - b. Exterior Face Substrate Material: cement board.
 - c. Insulating Core: Micore® Class A rated core
 - d. Substrate Material: cement board.
 - e. Interior Face Material: polyester Baked Enamel on Aluminum, smooth finish-standard colors.
 - f. Panel Thickness: 1" nominal
 - g. Panel R-Value: 3.2292

2.8 GLAZING COMPOUND FOR FIRE-RATED GLAZING MATERIALS

- A. Glazing Tape: Closed cell polyvinyl chloride (PVC) foam, coiled on release paper over adhesive on two sides, maximum water absorption by volume of 2 percent. Glass panels that exceed 1,393 sq. inches for 90-minute ratings must be glazed with fire-rated glazing tape supplied by manufacturer.
- B. Glazing Compound: DAP 33 putty.

- C. Silicone Sealant: One-part neutral curing silicone, medium modulus sealant, Type S; Grade NS; Class 25 with additional movement capability of 50 percent in both extension and compression (total 100 percent); Use (Exposure) NT; Uses (Substrates) G, A, and O as applicable. Available Products:
 - 1. Dow Corning 795 - Dow Corning Corp.
 - 2. Silglaze-II 2800 - General Electric Co.
 - 3. Spectrem 2 - Tremco Inc.
- D. Setting Blocks: Neoprene, EPDM, or silicone; tested for compatibility with glazing compound; of 70 to 90 Shore A hardness.
- E. Cleaners, Primers, and Sealers: Type recommended by manufacturer of glass and gaskets.

2.9 FABRICATION OF GLAZING UNITS

- A. Fabricate glass and other glazing products in sizes required to glaze openings indicated for Project, with edge and face clearances, edge and surface conditions, and bite complying with recommendations of product manufacturer and referenced glazing standard as required to comply with system performance requirements.
- B. Clean-cut or flat grind vertical edges of butt-glazed monolithic lites in a manner that produces square edges with slight kerfs at junctions with outdoor and indoor faces.
- C. Grind smooth and polish exposed glass edges and corners.

2.10 GLAZING GASKETS

- A. Dense Compression Gaskets: Molded or extruded gaskets of material indicated below, complying with standards referenced with name of elastomer indicated below, and of profile and hardness required to maintain watertight seal:
 - 1. Neoprene, ASTM C 864.
 - 2. EPDM, ASTM C 864.
 - 3. Thermoplastic polyolefin rubber, ASTM C 1115.
 - 4. Any material indicated above.
- B. Soft Compression Gaskets: Extruded or molded, closed-cell, integral-skinned gaskets of material indicated below; complying with ASTM C 509, Type II, black; and of profile and hardness required to maintain watertight seal:
 - 1. Neoprene.
- C. Lock-Strip Gaskets: Neoprene extrusions in size and shape indicated, fabricated into frames with molded corner units and zipper lock-strips, complying with ASTM C 542, black.

2.11 GLAZING TAPES

- A. Back-Bedding Mastic Glazing Tapes: Preformed, butyl-based elastomeric tape with a solids content of 100 percent; nonstaining and nonmigrating in contact with nonporous surfaces; with or without spacer rod as recommended in writing by tape and glass manufacturers for application indicated; packaged on rolls with a release paper backing; and complying with ASTM C 1281 and AAMA 800 for products indicated below:
 - 1. AAMA 806.3 tape, for glazing applications in which tape is subject to continuous pressure.
 - 2. AAMA 807.3 tape, for glazing applications in which tape is not subject to continuous pressure.

- B. Expanded Cellular Glazing Tapes: Closed-cell, PVC foam tapes; factory coated with adhesive on both surfaces; packaged on rolls with release liner protecting adhesive; and complying with AAMA 800 for the following types:
1. Type 1, for glazing applications in which tape acts as the primary sealant.

2.12 MISCELLANEOUS GLAZING MATERIALS

- A. General: Provide products of material, size, and shape complying with referenced glazing standard, requirements of manufacturers of glass and other glazing materials for application indicated, and with a proven record of compatibility with surfaces contacted in installation.
- B. Cleaners, Primers, and Sealers: Types recommended by sealant or gasket manufacturer.
- C. Setting Blocks: Elastomeric material with a Shore, Type A durometer hardness of 85, plus or minus 5.
- D. Spacers: Elastomeric blocks or continuous extrusions with a Shore, Type A durometer hardness required by glass manufacturer to maintain glass lites in place for installation indicated.
- E. Edge Blocks: Elastomeric material of hardness needed to limit glass lateral movement (side walking).
- F. Perimeter Insulation for Fire-Resistive Glazing: Identical to product used in test assembly to obtain fire-resistance rating.

2.13 FABRICATION OF GLAZING UNITS

- A. Fabricate glazing units in sizes required to glaze openings indicated for Project, with edge and face clearances, edge and surface conditions, and bite complying with written instructions of product manufacturer and referenced glazing publications, to comply with system performance requirements.
- B. Clean-cut or flat-grind vertical edges of butt-glazed monolithic lites in a manner that produces square edges with slight kerfs at junctions with outdoor and indoor faces.
- C. Grind smooth and polish exposed glass edges and corners.

2.14 INSULATING-GLASS UNITS

- A. Insulating-Glass Units: Guardian SNX or equivalent.
1. Overall Unit Thickness and Thickness of Each Lite: 1" and ¼" mm.
 2. Indoor Lite: Clear Float Glass, Type I, Class 1, quality q3.
 - a. Kind FT (fully tempered)
 3. Outdoor Lite: ASTM C 1036, Type I, Class 1, Quality q3 (transparent glass, flat) float glass.
 - a. Product: SNX 62.
 - b. Low E Coating on 2nd surface.
 - c. Kind FT (fully tempered),
 4. Visible Light Transmittance: 62 percent
 5. U-Value: Maximum of 0.38
 6. Solar Heat Gain Coefficient: 0.27
 7. Shading Coefficient: 0.40
 8. Relative Heat Gain: 65
 9. Light to Solar Gain: 2.30
 10. Applications: See Window Elevations & Door Schedule

PART 3 - EXECUTION

3.1 EXAMINATION

- A. Examine framing, glazing channels, and stops, with Installer present, for compliance with the following:
 - 1. Manufacturing and installation tolerances, including those for size, squareness, and offsets at corners.
 - 2. Presence and functioning of weep systems.
 - 3. Minimum required face and edge clearances.
 - 4. Effective sealing between joints of glass-framing members.
- B. Proceed with installation only after unsatisfactory conditions have been corrected.

3.2 PREPARATION

- A. Clean glazing channels and other framing members receiving glass immediately before glazing. Remove coatings not firmly bonded to substrates.
- B. Examine glazing units to locate exterior and interior surfaces. Label or mark units as needed so that exterior and interior surfaces are readily identifiable. Do not use materials that will leave visible marks in the completed work.

3.3 GLAZING, GENERAL

- A. Comply with combined written instructions of manufacturers of glass, sealants, gaskets, and other glazing materials, unless more stringent requirements are indicated, including those in referenced glazing publications.
- B. Adjust glazing channel dimensions as required by Project conditions during installation to provide necessary bite on glass, minimum edge and face clearances, and adequate sealant thicknesses, with reasonable tolerances.
- C. Protect glass edges from damage during handling and installation. Remove damaged glass from Project site and legally dispose of off Project site. Damaged glass is glass with edge damage or other imperfections that, when installed, could weaken glass and impair performance and appearance.
- D. Apply primers to joint surfaces where required for adhesion of sealants, as determined by preconstruction testing.
- E. Install setting blocks in sill rabbets, sized and located to comply with referenced glazing publications, unless otherwise required by glass manufacturer. Set blocks in thin course of compatible sealant suitable for heel bead.
- F. Do not exceed edge pressures stipulated by glass manufacturers for installing glass lites.
- G. Provide spacers for glass lites where length plus width is larger than 50 inches.
 - 1. Locate spacers directly opposite each other on both inside and outside faces of glass. Install correct size and spacing to preserve required face clearances, unless gaskets and glazing tapes are used that have demonstrated ability to maintain required face clearances and to comply with system performance requirements.
 - 2. Provide 1/8-inch minimum bite of spacers on glass and use thickness equal to sealant width. With glazing tape, use thickness slightly less than final compressed thickness of tape.

- H. Provide edge blocking where indicated or needed to prevent glass lites from moving sideways in glazing channel, as recommended in writing by glass manufacturer and according to requirements in referenced glazing publications.
- I. Set glass lites in each series with uniform pattern, draw, bow, and similar characteristics.
- J. Set glass lites with proper orientation so that coatings face exterior or interior as specified.

3.4 TAPE GLAZING

- A. Position tapes on fixed stops so that, when compressed by glass, their exposed edges are flush with or protrude slightly above sightline of stops.
- B. Install tapes continuously, but not necessarily in one continuous length. Do not stretch tapes to make them fit opening.
- C. Cover vertical framing joints by applying tapes to heads and sills first and then to jambs. Cover horizontal framing joints by applying tapes to jambs and then to heads and sills.
- D. Place joints in tapes at corners of opening with adjoining lengths butted together, not lapped. Seal joints in tapes with compatible sealant approved by tape manufacturer.
- E. Do not remove release paper from tape until right before each glazing unit is installed.
- F. Apply heel bead of elastomeric sealant.
- G. Center glass lites in openings on setting blocks and press firmly against tape by inserting dense compression gaskets formed and installed to lock in place against faces of removable stops. Start gasket applications at corners and work toward centers of openings.
- H. Apply cap bead of elastomeric sealant over exposed edge of tape.

3.5 GASKET GLAZING (DRY)

- A. Cut compression gaskets to lengths recommended by gasket manufacturer to fit openings exactly, with allowance for stretch during installation.
- B. Insert soft compression gasket between glass and frame or fixed stop so it is securely in place with joints miter cut and bonded together at corners.

3.6 SEALANT GLAZING (WET)

- A. Install continuous spacers, or spacers combined with cylindrical sealant backing, between glass lites and glazing stops to maintain glass face clearances and to prevent sealant from extruding into glass channel and blocking weep systems until sealants cure. Secure spacers or spacers and backings in place and in position to control depth of installed sealant relative to edge clearance for optimum sealant performance.
- B. Force sealants into glazing channels to eliminate voids and to ensure complete wetting or bond of sealant to glass and channel surfaces.
- C. Tool exposed surfaces of sealants to provide a substantial wash away from glass.

3.7 CLEANING AND PROTECTION

- A. Protect exterior glass from damage immediately after installation by attaching crossed streamers to framing held away from glass. Do not apply markers to glass surface. Remove nonpermanent labels and clean surfaces.

- B. Protect glass from contact with contaminating substances resulting from construction operations. If, despite such protection, contaminating substances do come into contact with glass, remove substances immediately as recommended in writing by glass manufacturer.
- C. Examine glass surfaces adjacent to or below exterior concrete and other masonry surfaces at frequent intervals during construction, but not less than once a month, for buildup of dirt, scum, alkaline deposits, or stains; remove as recommended in writing by glass manufacturer.
- D. Remove and replace glass that is broken, chipped, cracked, or abraded or that is damaged from natural causes, accidents, and vandalism, during construction period.
- E. Wash glass on both exposed surfaces in each area of Project not more than four days before date scheduled for inspections that establish date of Substantial Completion. Wash glass as recommended in writing by glass manufacturer.

END OF SECTION 088000

SECTION 08 8300 - MIRRORS

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

- A. Drawings and general provisions of the Contract, including General and Supplementary Conditions and Division 01 Specification Sections, apply to this Section.

1.2 SUMMARY

- A. This Section includes the following types of silvered flat glass mirrors.
 - 1. Laminated glass mirrors qualifying as safety glazing.

1.3 DEFINITIONS

- A. Deterioration of Mirrors: Defects developed from normal use that are attributable to the manufacturing process and not to causes other than glass breakage and practices for maintaining and cleaning mirrors contrary to mirror manufacturer's written instructions. Defects include discoloration, black spots, and clouding of the silver film.

1.4 PERFORMANCE REQUIREMENTS

- A. Provide mirrors that will not fail under normal usage. Failure includes glass breakage and deterioration attributable to defective manufacture, fabrication, and installation.

1.5 SUBMITTALS

- A. Product Data: For the following:
 - 1. Mirrors. Include description of materials and process used to produce each type of silvered flat glass mirror specified that indicates sources of glass, glass coating components, edge sealer, and quality-control provisions.
 - 2. Mirror mastic.
 - 3. Mirror hardware.
- B. Shop Drawings: Include mirror elevations, edge details, mirror hardware, and attachments to other work.
- C. Samples: For each type of mirror product required, in the form indicated below:
 - 1. Mirrors, 12 inches (300 mm) square, including edge treatment on 2 adjoining edges.
 - 2. Mirror clips.
 - 3. Mirror trim, 12 inches (300 mm) long.

- D. Product Certificates: For each type of mirror and mirror mastic, signed by product manufacturer.
- E. Mirror Mastic Compatibility Test Reports: From mirror manufacturer indicating that mirror mastic was tested for compatibility and adhesion with mirror backing and substrates on which mirrors are installed.
- F. Warranty: Special warranty specified in this Section.

1.6 QUALITY ASSURANCE

- A. Installer Qualifications: An experienced installer who has completed mirror glazing similar in material, design, and extent to that indicated for this Project; whose work has resulted in mirror installations with a record of successful in-service performance; and who employs glass installers for this Project who are certified under NGA's Glazier Certification Program as Level 2 (Senior Glaziers) or Level 3 (Master Glaziers).
- B. Source Limitations for Mirrors: Obtain mirrors from one source for each type of mirror indicated.
- C. Source Limitations for Mirror Glazing Accessories: Obtain mirror glazing accessories from one source for each type of accessory indicated.
- D. Glazing Publications: Comply with the following published recommendations:
 - 1. GANA's "Glazing Manual" unless more stringent requirements are indicated. Refer to this publication for definitions of glass and glazing terms not otherwise defined in this Section or in referenced standards.
 - 2. GANA Mirror Division's "Mirrors, Handle with Extreme Care: Tips for the Professional on the Care and Handling of Mirrors."
- E. Safety Glazing Products: Provide mirrors complying with testing requirements in 16 CFR 1201 for Category II materials.
- F. Preconstruction Mirror Mastic Compatibility Test: Submit mirror mastic products to mirror manufacturer for testing to determine compatibility of mastic with mirror backing and substrates on which mirrors are installed.

1.7 DELIVERY, STORAGE, AND HANDLING

- A. Protect mirrors according to mirror manufacturer's written instructions and as needed to prevent damage to mirrors from condensation, temperature changes, direct exposure to sun, or other causes.
- B. Comply with mirror manufacturer's written instructions for shipping, storing, and handling mirrors as needed to prevent deterioration of silvering, damage to edges, and abrasion of glass surfaces and applied coatings. Store indoors, protected from moisture including condensation.

1.8 PROJECT CONDITIONS

- A. Environmental Limitations: Do not install mirrors until ambient temperature and humidity conditions are maintained at levels indicated for final occupancy.

1.9 WARRANTY

- A. Special Warranty: Manufacturer's standard form, made out to Owner and signed by mirror manufacturer agreeing to replace mirrors that deteriorate as defined in "Definitions" Article, f.o.b. the nearest shipping point to Project site, within specified warranty period indicated below:
 - 1. Warranty Period: Five years from date of Substantial Completion.

PART 2 - PRODUCTS

2.1 MANUFACTURERS

- A. Available Manufacturers: Subject to compliance with requirements, manufacturers offering mirrors that may be incorporated into the Work include, but are not limited to, the following:
 - 1. VVP America, Inc.; Binswanger Mirror Products.

2.2 SILVERED FLAT GLASS MIRROR MATERIALS

- A. Clear Glass Mirrors: ASTM C 1503, Mirror Select Quality.
 - 1. Nominal Thickness: 1/4-inch.
- B. Annealed Float Glass for Inner Lite of Laminated Mirrors: ASTM C 1036, Type I (transparent flat glass), Quality-Q3; Class 1 (clear).
- C. Product: "ScarGard 2 Surface Protected Mirrors" by VVP America, Inc.; Binswanger Mirror Products (Vitro America), or equivalent.

2.3 MISCELLANEOUS MATERIALS

- A. Setting Blocks: Elastomeric material with a Type A Shore durometer hardness of 85, plus or minus 5.
- B. Edge Sealer: Coating compatible with glass coating and approved by mirror manufacturer for use in protecting against silver deterioration at mirrored glass edges.
- C. Mirror Mastic: An adhesive setting compound, produced specifically for setting mirrors and certified by both mirror manufacturer and mastic manufacturer as compatible with glass coating and substrates on which mirrors will be installed.

2.4 MIRROR HARDWARE

- A. Top and Bottom Aluminum J-Channels: Aluminum extrusions with a return deep enough to produce a glazing channel to accommodate mirrors of thickness indicated and in lengths required to cover bottom and top edges of each mirror in a single piece.
 - 1. Bottom Trim: J-channels formed with front leg and back leg not less than 3/8 and 7/8 inch (9.5 and 22 mm) in height, respectively, and a thickness of not less than **0.05 inch (1.3 mm)**.
 - 2. Top Trim: J-channels formed with front leg and back leg not less than 5/8 and 1 inch (16 and 25 mm) in height, respectively, and a thickness of not less than **0.062 inch (1.57 mm)**.
- B. Plated Steel Hardware: Formed-steel shapes with plated finish indicated.
 - 1. Profile: As selected from manufacturer's full range of profiles.
 - 2. Finish: As selected from manufacturer's full range of finishes and colors.>
- C. Fasteners: Fabricated of same basic metal and alloy as fastened metal and matching it in finished color and texture where fasteners are exposed.
- D. Anchors and Inserts: Provide devices as required for mirror hardware installation. Provide toothed or lead-shield expansion-bolt devices for drilled-in-place anchors. Provide galvanized anchors and inserts.

2.5 FABRICATION

- A. Mirror Sizes: To suit Project conditions, cut mirrors to final sizes and shapes.
- B. Cutouts: Fabricate cutouts for holes in mirrors without marring visible surfaces. Locate and size cutouts so they fit closely around penetrations in mirrors.
- C. Mirror Edge Treatment: Flat polished edge.
 - 1. Seal edges of mirrors after edge treatment to prevent chemical or atmospheric penetration of glass coating.
 - 2. Perform edge treatment and sealing in factory immediately after cutting to final sizes.
- D. Laminated Safety Mirrors: Provide laminated mirrors fabricated to produce units complying with ASTM C 1172, Kind LM, and the following:
 - 1. Glass Lites: Outer lite of mirror glass with silver coating on second surface and inner lite of clear float glass.
 - 2. Interlayer Material: Mirror manufacturer's standard 0.030-inch- (0.76-mm-) thick, polyvinyl-butylal interlayer with a proven record of showing no tendency to delaminate from, or cause damage to, silver coating.
 - 3. Laminating Process: Laminate glass using laminator's standard heat-plus-pressure process to produce glass free from foreign substances, air or glass pockets, and other defects.

4. Seal edges of laminated units to comply with written requirements of interlayer manufacturer.

PART 3 - EXECUTION

3.1 EXAMINATION

- A. Examine substrates, over which mirrors are to be mounted, with Installer present, for compliance with installation tolerances, substrate preparation, and other conditions affecting performance.
 1. Verify compatibility with and suitability of substrates, including compatibility of mirror mastic with existing finishes or primers.
 2. Proceed with mirror installation only after unsatisfactory conditions have been corrected and surfaces are dry.

3.2 PREPARATION

- A. Comply with mastic manufacturer's written installation instructions for preparation of substrates, including coating surfaces with mastic manufacturer's special bond coating where applicable.

3.3 INSTALLATION

- A. General: Install mirrors to comply with mirror manufacturer's written instructions and with referenced GANA publications. Mount mirrors accurately in place in a manner that avoids distorting reflected images.
- B. Provide a minimum air space of 1/8 inch (3 mm) between back of mirrors and mounting surface for air circulation between back of mirrors and face of mounting surface.
- C. For wall-mounted mirrors, install mirrors with mastic and mirror hardware.
 1. Attach mirror hardware securely to mounting surfaces with mechanical fasteners installed with anchors or inserts as applicable. Install fasteners so heads do not impose point loads on backs of mirrors.
 2. For mirror hardware in the form of a continuous J-channel at bottom and continuous top trim at top, fasten J-channel directly to wall and attach top trim to continuous cleat fastened directly to wall.
 3. Where indicated, install mirror hardware in the form of J-channels that are fabricated in single lengths to fit and cover top and bottom edges of mirrors.

3.4 CLEANING AND PROTECTION

- A. Protect mirrors from breakage and contaminating substances resulting from construction operations.

- B. Do not permit edges of mirrors to be exposed to standing water.
- C. Maintain environmental conditions that will prevent mirrors from being exposed to moisture from condensation or other sources for continuous periods of time.

END OF SECTION 08 8300

SECTION 092216 - NON-STRUCTURAL METAL FRAMING

PART 1 - GENERAL

1.1 SUMMARY

- A. Section Includes:
 - 1. Non-load-bearing steel framing systems for interior gypsum board assemblies.
 - 2. Suspension systems for interior gypsum ceilings, soffits, and grid systems.

1.2 ACTION SUBMITTALS

- A. Product Data: For each type of product.

1.3 REFERENCES

- A. SSMA: Steel Stud Manufacturers Association

1.4 INFORMATIONAL SUBMITTALS

- A. Evaluation Reports: For steel studs and runners, from ICC-ES.

PART 2 - PRODUCTS

2.1 PERFORMANCE REQUIREMENTS

- A. Fire-Test-Response Characteristics: For fire-resistance-rated assemblies that incorporate non-load-bearing steel framing, provide materials and construction identical to those tested in assembly indicated, according to ASTM E 119 by an independent testing agency.
- B. STC-Rated Assemblies: For STC-rated assemblies, provide materials and construction identical to those tested in assembly indicated, according to ASTM E 90 and classified according to ASTM E 413 by an independent testing agency.
- C. Framing Members, General: Comply with ASTM C 754 for conditions indicated.
 - 1. Steel Sheet Components: Comply with ASTM C 645 or SSMA for equivalent requirements for metal unless otherwise indicated.
 - 2. Protective Coating: ASTM A 653, G40 or Coating with equivalent corrosion resistance of ASTM A 653, G40, hot-dip galvanized unless otherwise indicated.
- D. Studs and Runners: ASTM C 645. Use steel studs and runners..
 - 1. Steel Studs and Runners:
 - a. Minimum Base-Metal Thickness: 25 gauge or a 25 gauge equivalent high performance stud certified under SSMA code compliance program.
 - b. Depth: As indicated on Drawings.
- E. Slip-Type Head Joints: Where indicated, provide one of the following:
 - 1. Single Long-Leg Runner System: ASTM C 645 top runner with 2-inch- deep flanges in thickness not less than indicated for studs, installed with studs friction fit into top runner and with continuous bridging located within 12 inches of the top of studs to provide lateral bracing.
- F. Flat Strap and Backing Plate: Steel sheet for blocking and bracing in length and width indicated.
 - 1. Minimum Base-Metal Thickness: 25 gauge.

- G. Cold-Rolled Channel Bridging: Steel, 18 gauge minimum base-metal thickness, with minimum 1/2-inch- wide flanges.
 - 1. Depth: 1-1/2 inches.
 - 2. Clip Angle: Not less than 1-1/2 by 1-1/2 inches, 0.068-inch- thick, galvanized steel.
- H. Hat-Shaped, Rigid Furring Channels: ASTM C 645.
 - 1. Minimum Base-Metal Thickness: 25 gauge.
 - 2. Depth: As indicated on Drawings.

2.2 SUSPENSION SYSTEMS

- A. Tie Wire: ASTM A 641/A 641M, Class 1 zinc coating, soft temper, 0.062-inch- diameter wire, or double strand of 0.048-inch- diameter wire.
- B. Carrying Channels: Cold-rolled, commercial-steel sheet with a base-metal thickness of 18 gauge minimum and 1/2-inch- wide flanges.
 - 1. Depth: 1-1/2 inches.
- C. Grid Suspension System for Gypsum Board Ceilings: ASTM C 645, direct-hung system composed of main beams and cross-furring members that interlock.
 - 1. Products: Subject to compliance with requirements, provide one of the following:
 - a. Armstrong World Industries, Inc.; Drywall Grid Systems.
 - b. Chicago Metallic Corporation; Drywall Grid System.
 - c. USG Corporation; Drywall Suspension System.

2.3 AUXILIARY MATERIALS

- A. General: Provide auxiliary materials that comply with referenced installation standards.
 - 1. Fasteners for Metal Framing: Of type, material, size, corrosion resistance, holding power, and other properties required to fasten steel members to substrates.
- B. Isolation Strip at Exterior Walls: Provide one of the following:
 - 1. Asphalt-Saturated Organic Felt: ASTM D 226, Type I (No. 15 asphalt felt), nonperforated.
 - 2. Foam Gasket: Adhesive-backed, closed-cell vinyl foam strips that allow fastener penetration without foam displacement, 1/8 inch thick, in width to suit steel stud size.

PART 3 - EXECUTION

3.1 EXAMINATION

- A. Examine areas and substrates, with Installer present, and including welded hollow-metal frames, cast-in anchors, and structural framing, for compliance with requirements and other conditions affecting performance of the Work.
- B. Proceed with installation only after unsatisfactory conditions have been corrected.

3.2 PREPARATION

- A. Suspended Assemblies: Coordinate installation of suspension systems with installation of overhead structure to ensure that inserts and other provisions for anchorages to building structure have been installed to receive hangers at spacing required to support the Work and that hangers will develop their full strength.
 - 1. Furnish concrete inserts and other devices indicated to other trades for installation in advance of time needed for coordination and construction.

- B. Coordination with Sprayed Fire-Resistive Materials:
 - 1. Before sprayed fire-resistive materials are applied, attach offset anchor plates or ceiling runners (tracks) to surfaces indicated to receive sprayed fire-resistive materials. Where offset anchor plates are required, provide continuous plates fastened to building structure not more than 24 inches o.c.
 - 2. After sprayed fire-resistive materials are applied, remove them only to extent necessary for installation of non-load-bearing steel framing. Do not reduce thickness of fire-resistive materials below that required for fire-resistance ratings indicated. Protect adjacent fire-resistive materials from damage.

3.3 INSTALLATION, GENERAL

- A. Installation Standard: ASTM C 754.
 - 1. Gypsum Board Assemblies: Also comply with requirements in ASTM C 840 that apply to framing installation.
- B. Install supplementary framing, and blocking to support fixtures, equipment services, heavy trim, grab bars, toilet accessories, furnishings, or similar construction.
- C. Install bracing at terminations in assemblies.
- D. Do not bridge building control and expansion joints with non-load-bearing steel framing members. Frame both sides of joints independently.

3.4 INSTALLING FRAMED ASSEMBLIES

- A. Install framing system components according to spacings indicated, but not greater than spacings required by referenced installation standards for assembly types.
 - 1. Single-Layer Application: 16 inches o.c. unless otherwise indicated.
 - 2. Multilayer Application: 16 inches o.c. unless otherwise indicated.
 - 3. Tile Backing Panels: 16 inches o.c. unless otherwise indicated.
- B. Attach steel stud tracks to metal or concrete deck.
- C. Where studs are installed directly against exterior masonry walls or dissimilar metals at exterior walls, install isolation strip between studs and exterior wall.
- D. Install studs so flanges within framing system point in same direction.
- E. Install tracks (runners) at floors and overhead supports. Extend framing full height to structural supports or substrates above suspended ceilings except where partitions are indicated to terminate at suspended ceilings. Continue framing around ducts penetrating partitions above ceiling.
 - 1. Slip-Type Head Joints: Where framing extends to overhead structural supports, install to produce joints at tops of framing systems that prevent axial loading of finished assemblies.
 - 2. Door Openings: Screw vertical studs at jambs to jamb anchor clips on door frames; install runner track section (for cripple studs) at head and secure to jamb studs.
 - a. Install two studs at each jamb unless otherwise indicated.
 - b. Install cripple studs at head adjacent to each jamb stud, with a minimum 1/2-inch clearance from jamb stud to allow for installation of control joint in finished assembly.
 - c. Extend jamb studs through suspended ceilings and attach to underside of overhead structure.

3. Other Framed Openings: Frame openings other than door openings the same as required for door openings unless otherwise indicated. Install framing below sills of openings to match framing required above door heads.
 4. Fire-Resistance-Rated Partitions: Install framing to comply with fire-resistance-rated assembly indicated and support closures and to make partitions continuous from floor to underside of solid structure.
 - a. Firestop Track: Where indicated, install to maintain continuity of fire-resistance-rated assembly indicated.
 5. Curved Partitions:
 - a. Bend track to uniform curve and locate straight lengths so they are tangent to arcs.
 - b. Begin and end each arc with a stud, and space intermediate studs equally along arcs. On straight lengths of no fewer than two studs at ends of arcs, place studs 6 inches o.c.
- F. Installation Tolerance: Install each framing member so fastening surfaces vary not more than 1/8 inch from the plane formed by faces of adjacent framing.

3.5 INSTALLING SUSPENSION SYSTEMS

- A. Install suspension system components according to spacings indicated, but not greater than spacings required by referenced installation standards for assembly types.
1. Hangers: 48 inches o.c.
 2. Carrying Channels (Main Runners): 48 inches o.c.
 3. Furring Channels (Furring Members): 24 inches o.c.
- B. Isolate suspension systems from building structure where they abut or are penetrated by building structure to prevent transfer of loading imposed by structural movement.
- C. Suspend hangers from building structure as follows:
1. Install hangers plumb and free from contact with insulation or other objects within ceiling plenum that are not part of supporting structural or suspension system.
 - a. Splay hangers only where required to miss obstructions and offset resulting horizontal forces by bracing, countersplaying, or other equally effective means.
 2. Where width of ducts and other construction within ceiling plenum produces hanger spacings that interfere with locations of hangers required to support standard suspension system members, install supplemental suspension members and hangers in the form of trapezes or equivalent devices.
 - a. Size supplemental suspension members and hangers to support ceiling loads within performance limits established by referenced installation standards.
 3. Wire Hangers: Secure by looping and wire tying, either directly to structures or to inserts, eye screws, or other devices and fasteners that are secure and appropriate for substrate, and in a manner that will not cause hangers to deteriorate or otherwise fail.
 4. Do not attach hangers to permanent metal forms.
 5. Do not attach hangers to rolled-in hanger tabs of composite steel floor deck.
 6. Do not connect or suspend steel framing from ducts, pipes, or conduit.
- D. Fire-Resistance-Rated Assemblies: Wire tie furring channels to supports.
- E. Grid Suspension Systems: Attach perimeter wall track or angle where grid suspension systems meet vertical surfaces. Mechanically join main beam and cross-furring members to each other and butt-cut to fit into wall track.

- F. Installation Tolerances: Install suspension systems that are level to within 1/8 inch in 12 feet measured lengthwise on each member that will receive finishes and transversely between parallel members that will receive finishes.

END OF SECTION 092216

SECTION 092900 - GYPSUM BOARD

PART 1 - GENERAL

1.1 SUMMARY

- A. Section Includes:
 - 1. Interior gypsum board.
 - 2. Tile backing panels.
- B. Related Requirements:
 - 1. Section 092216 "Non-Structural Metal Framing" for non-structural framing and suspension systems that support gypsum board panels.
 - 2. Section 093000 "Tiling" for cementitious backer units installed as substrates for ceramic tile.

1.2 ACTION SUBMITTALS

- A. Product Data: For each type of product.
- B. Samples: For the following products:
 - 1. Trim Accessories: Full-size Sample in 12-inch- long length for each trim accessory indicated.

1.3 DELIVERY, STORAGE AND HANDLING

- A. Store materials inside under cover and keep them dry and protected against weather, condensation, direct sunlight, construction traffic, and other potential causes of damage. Stack panels flat and supported on risers on a flat platform to prevent sagging.

1.4 FIELD CONDITIONS

- A. Environmental Limitations: Comply with ASTM C 840 requirements or gypsum board manufacturer's written recommendations, whichever are more stringent.
- B. Do not install paper-faced gypsum panels until installation areas are enclosed and conditioned.
- C. Do not install panels that are wet, those that are moisture damaged, and those that are mold damaged.
 - 1. Indications that panels are wet or moisture damaged include, but are not limited to, discoloration, sagging, or irregular shape.
 - 2. Indications that panels are mold damaged include, but are not limited to, fuzzy or splotchy surface contamination and discoloration.

PART 2 - PRODUCTS

2.1 PERFORMANCE REQUIREMENTS

- A. Fire-Resistance-Rated Assemblies: For fire-resistance-rated assemblies, provide materials and construction identical to those tested in assembly indicated according to ASTM E 119 by an independent testing agency.
- B. STC-Rated Assemblies: For STC-rated assemblies, provide materials and construction identical to those tested in assembly indicated according to ASTM E 90 and classified according to ASTM E 413 by an independent testing agency.

2.2 GYPSUM BOARD, GENERAL

- A. Size: Provide maximum lengths and widths available that will minimize joints in each area and that correspond with support system indicated.

2.3 INTERIOR GYPSUM BOARD

- A. Manufacturers: Subject to compliance with requirements, provide products by one of the following:
1. Georgia-Pacific Gypsum LLC.
 2. National Gypsum Company.
 3. USG Corporation.
- B. Gypsum Board, Type X: ASTM C 1396.
1. Thickness: 5/8 inch.
 2. Long Edges: Tapered.
- C. Flexible Gypsum Board: ASTM C 1396. Manufactured to bend to fit radii and to be more flexible than standard regular-type gypsum board of same thickness.
1. Thickness: 1/4 inch.
 2. Long Edges: Tapered.
- D. Abuse-Resistant Gypsum Board: ASTM C 1629.
1. Core: As indicated on Drawings.
 2. Long Edges: Tapered.
 3. Mold Resistance: ASTM D 3273, score of 10 as rated according to ASTM D 3274.
- E. Moisture- and Mold-Resistant Gypsum Board: ASTM C 1396/C 1396M. With moisture- and mold-resistant core and paper surfaces.
1. Core: 5/8 inch, Type X.
 2. Long Edges: Tapered.
 3. Mold Resistance: ASTM D 3273, score of 10 as rated according to ASTM D 3274.

2.4 TILE BACKING PANELS

- A. Cementitious Backer Units: ANSI A118.9 and ASTM C 1288 or 1325, with manufacturer's standard edges.
1. Products: Subject to compliance with requirements, provide one of the following:
 - a. CertainTeed Corp.; FiberCement BackerBoard.
 - b. James Hardie Building Products, Inc.; Hardiebacker.
 - c. National Gypsum Company, Permabase Cement Board.
 - d. USG Corporation; DUROCK Cement Board.
 2. Thickness: 1/2 inch.
 3. Mold Resistance: ASTM D 3273, score of 10 as rated according to ASTM D 3274.

2.5 TRIM ACCESSORIES

- A. Interior Trim: ASTM C 1047.
1. Material: Galvanized or aluminum-coated steel sheet or rolled zinc.
 2. Shapes:
 - a. Cornerbead.
 - b. Bullnose bead.
 - c. LC-Bead: J-shaped; exposed long flange receives joint compound.
 - d. L-Bead: L-shaped; exposed long flange receives joint compound.
 - e. U-Bead: J-shaped; exposed short flange does not receive joint compound.

- f. Expansion (control) joint.
- g. Curved-Edge Cornerbead: With notched or flexible flanges.

2.6 JOINT TREATMENT MATERIALS

- A. General: Comply with ASTM C 475/C 475M.
- B. Joint Tape:
 - 1. Interior Gypsum Board: Paper.
 - 2. Glass-Mat Gypsum Sheathing Board: 10-by-10 glass mesh.
 - 3. Tile Backing Panels: As recommended by panel manufacturer.
- C. Joint Compound for Interior Gypsum Board: For each coat use formulation that is compatible with other compounds applied on previous or for successive coats.
 - 1. Prefilling: At open joints, rounded or beveled panel edges, and damaged surface areas, use setting-type taping compound.
 - 2. Embedding and First Coat: For embedding tape and first coat on joints, fasteners, and trim flanges, use setting-type taping compound.
 - a. Use setting-type compound for installing paper-faced metal trim accessories.
 - 3. Fill Coat: For second coat, use setting-type, sandable topping compound.
 - 4. Finish Coat: For third coat, use setting-type, sandable topping compound.

2.7 AUXILIARY MATERIALS

- A. General: Provide auxiliary materials that comply with referenced installation standards and manufacturer's written recommendations.
- B. Laminating Adhesive: Adhesive or joint compound recommended for directly adhering gypsum panels to continuous substrate.
 - 1. Laminating adhesive shall have a VOC content of 50 g/L or less when calculated according to 40 CFR 59, Subpart D (EPA Method 24).
- C. Steel Drill Screws: ASTM C 1002, unless otherwise indicated.
 - 1. Use screws complying with ASTM C 954 for fastening panels to steel members from 0.033 to 0.112 inch thick.
 - 2. For fastening cementitious backer units, use screws of type and size recommended by panel manufacturer.
- D. Sound Attenuation Blankets: ASTM C 665, Type I (blankets without membrane facing) produced by combining thermosetting resins with mineral fibers manufactured from glass, slag wool, or rock wool.
 - 1. Fire-Resistance-Rated Assemblies: Comply with mineral-fiber requirements of assembly.
- E. Acoustical Joint Sealant: Manufacturer's standard nonsag, paintable, nonstaining latex sealant complying with ASTM C 834. Product effectively reduces airborne sound transmission through perimeter joints and openings in building construction as demonstrated by testing representative assemblies according to ASTM E 90.
 - 1. Products: Subject to compliance with requirements, provide one of the following:
 - a. Pecora Corporation; AC-20 FTR.
 - b. USG Corporation; SHEETROCK Acoustical Sealant.
 - 2. Acoustical joint sealant shall have a VOC content of 250 g/L or less when calculated according to 40 CFR 59, Subpart D (EPA Method 24).

3. Acoustical joint sealant shall comply with the testing and product requirements of the California Department of Health Services' "Standard Practice for the Testing of Volatile Organic Emissions from Various Sources Using Small-Scale Environmental Chambers."
- F. Thermal Insulation: As specified in Section 072100 "Thermal Insulation."
- G. Vapor Retarder: As specified in Section 072100 "Thermal Insulation."

PART 3 - EXECUTION

3.1 EXAMINATION

- A. Examine areas and substrates including welded hollow-metal frames and framing, with Installer present, for compliance with requirements and other conditions affecting performance.
- B. Examine panels before installation. Reject panels that are wet, moisture damaged, and mold damaged.
- C. Proceed with installation only after unsatisfactory conditions have been corrected.

3.2 APPLYING AND FINISHING PANELS, GENERAL

- A. Comply with ASTM C 840.
- B. Install ceiling panels across framing to minimize the number of abutting end joints and to avoid abutting end joints in central area of each ceiling. Stagger abutting end joints of adjacent panels not less than one framing member.
- C. Install panels with face side out. Butt panels together for a light contact at edges and ends with not more than 1/16 inch of open space between panels. Do not force into place.
- D. Locate edge and end joints over supports, except in ceiling applications where intermediate supports or gypsum board back-blocking is provided behind end joints. Do not place tapered edges against cut edges or ends. Stagger vertical joints on opposite sides of partitions. Do not make joints other than control joints at corners of framed openings.
- E. Form control and expansion joints with space between edges of adjoining gypsum panels.
- F. Cover both faces of support framing with gypsum panels in concealed spaces (above ceilings, etc.), except in chases braced internally.
 1. Unless concealed application is indicated or required for sound, fire, air, or smoke ratings, coverage may be accomplished with scraps of not less than 8 sq. ft. in area.
 2. Fit gypsum panels around ducts, pipes, and conduits.
 3. Where partitions intersect structural members projecting below underside of floor/roof slabs and decks, cut gypsum panels to fit profile formed by structural members; allow 1/4- to 3/8-inch- wide joints to install sealant.
- G. Isolate perimeter of gypsum board applied to non-load-bearing partitions at structural abutments, except floors. Provide 1/4- to 1/2-inch- wide spaces at these locations and trim edges with edge trim where edges of panels are exposed. Seal joints between edges and abutting structural surfaces with acoustical sealant.
- H. Attachment to Steel Framing: Attach panels so leading edge or end of each panel is attached to open (unsupported) edges of stud flanges first.
- I. STC-Rated Assemblies: Seal construction at perimeters, behind control joints, and at openings and penetrations with a continuous bead of acoustical sealant. Install acoustical sealant at both faces of partitions at perimeters and through penetrations. Comply with ASTM C 919 and with

manufacturer's written recommendations for locating edge trim and closing off sound-flanking paths around or through assemblies, including sealing partitions above acoustical ceilings.

- J. Install sound attenuation blankets before installing gypsum panels unless blankets are readily installed after panels have been installed on one side.

3.3 APPLYING INTERIOR GYPSUM BOARD

- A. Install interior gypsum board in the following locations:
1. Type X: As indicated on Drawings.
 2. Flexible Type: As indicated on Drawings. Apply in double layer at curved assemblies.
 3. Ceiling Type: As indicated on Drawings.
 4. Abuse-Resistant Type: As indicated on Drawings.
 5. Moisture- and Mold-Resistant Type: As indicated on Drawings.
- B. Single-Layer Application:
1. On ceilings, apply gypsum panels before wall/partition board application to greatest extent possible and at right angles to framing unless otherwise indicated.
 2. On partitions/walls, apply gypsum panels vertically (parallel to framing) unless otherwise indicated or required by fire-resistance-rated assembly, and minimize end joints.
 - a. Stagger abutting end joints not less than one framing member in alternate courses of panels.
 - b. At stairwells and other high walls, install panels horizontally unless otherwise indicated or required by fire-resistance-rated assembly.
 3. Fastening Methods: Apply gypsum panels to supports with steel drill screws.
- C. Multilayer Application:
1. On ceilings, apply gypsum board indicated for base layers before applying base layers on walls/partitions; apply face layers in same sequence. Apply base layers at right angles to framing members and offset face-layer joints one framing member, 16 inches minimum, from parallel base-layer joints, unless otherwise indicated or required by fire-resistance-rated assembly.
 2. On partitions/walls, apply gypsum board indicated for base layers and face layers vertically (parallel to framing) with joints of base layers located over stud or furring member and face-layer joints offset at least one stud or furring member with base-layer joints, unless otherwise indicated or required by fire-resistance-rated assembly. Stagger joints on opposite sides of partitions.
 3. Fastening Methods: Fasten base layers and face layers separately to supports with screws.
- D. Laminating to Substrate: Where gypsum panels are indicated as directly adhered to a substrate (other than studs, joists, furring members, or base layer of gypsum board), comply with gypsum board manufacturer's written recommendations and temporarily brace or fasten gypsum panels until fastening adhesive has set.
- E. Curved Surfaces:
1. Install panels horizontally (perpendicular to supports) and unbroken, to extent possible, across curved surface plus 12-inch- long straight sections at ends of curves and tangent to them.
 2. For double-layer construction, fasten base layer to studs with screws 16 inches o.c. Center gypsum board face layer over joints in base layer, and fasten to studs with screws spaced 12 inches o.c.

3.4 APPLYING TILE BACKING PANELS

- A. Cementitious Backer Units: ANSI A108.11, at locations indicated to receive tile.
- B. Where tile backing panels abut other types of panels in same plane, shim surfaces to produce a uniform plane across panel surfaces.

3.5 INSTALLING TRIM ACCESSORIES

- A. General: For trim with back flanges intended for fasteners, attach to framing with same fasteners used for panels. Otherwise, attach trim according to manufacturer's written instructions.
- B. Control Joints: Install control joints according to ASTM C 840 and in specific locations approved by Architect for visual effect.
- C. Interior Trim: Install in the following locations:
 - 1. Cornerbead: Use at outside corners unless otherwise indicated.
 - 2. LC-Bead: Use at exposed panel edges.
 - 3. Curved-Edge Cornerbead: Use at curved openings.

3.6 FINISHING GYPSUM BOARD

- A. General: Treat gypsum board joints, interior angles, edge trim, control joints, penetrations, fastener heads, surface defects, and elsewhere as required to prepare gypsum board surfaces for decoration. Promptly remove residual joint compound from adjacent surfaces.
- B. Prefill open joints, rounded or beveled edges, and damaged surface areas.
- C. Apply joint tape over gypsum board joints, except for trim products specifically indicated as not intended to receive tape.
- D. Gypsum Board Finish Levels: Finish panels to levels indicated below and according to ASTM C 840:
 - 1. Level 1: Ceiling plenum areas, concealed areas, and where indicated.
 - 2. Level 2: Panels that are substrate for tile.
 - 3. Level 4: At panel surfaces that will be exposed to view unless otherwise indicated.
 - a. Primer and its application to surfaces are specified in Section 099123 "Interior Painting."
- E. Cementitious Backer Units: Finish according to manufacturer's written instructions.

3.7 PROTECTION

- A. Protect adjacent surfaces from drywall compound and promptly remove from floors and other non-drywall surfaces. Repair surfaces stained, marred, or otherwise damaged during drywall application.
- B. Protect installed products from damage from weather, condensation, direct sunlight, construction, and other causes during remainder of the construction period.
- C. Remove and replace panels that are wet, moisture damaged, and mold damaged.
 - 1. Indications that panels are wet or moisture damaged include, but are not limited to, discoloration, sagging, or irregular shape.
 - 2. Indications that panels are mold damaged include, but are not limited to, fuzzy or splotchy surface contamination and discoloration.

END OF SECTION 092900

SECTION 093000 - TILING

PART 1 - GENERAL

1.1 SUMMARY

- A. Section Includes:
 - 1. Ceramic tile.
 - 2. Stone thresholds.
 - 3. Waterproof membrane.
- B. Related Sections:
 - 1. Section 079200 "Joint Sealants" for sealing of expansion, contraction, control, and isolation joints in tile surfaces.
 - 2. Section 092900 "Gypsum Board" for cementitious backer units.

1.2 REFERENCE STANDARDS

1.3 A. General: Definitions in the ANSI A108/A118/A136 – American National Standard Specifications for the installation of Ceramic Tile (Compendium); 2019.

- A. A.1 ANSI A108 Series: ANSI A108.01, ANSI A108.02, ANSI A108.1A, ANSI A108.1B, ANSI A108.1C, ANSI A108.4, ANSI A108.5, ANSI A108.6, ANSI A108.8, ANSI A108.9, ANSI A108.10, ANSI A108.11, ANSI A108.12, ANSI A108.13, ANSI A108.14, ANSI A108.15, ANSI A108.16, and ANSI A108.17
- B. B. ANSI A137.1 – American National Standard Specifications for Ceramic Tile.
- C. series of tile installation standards and in ANSI A137.1 apply to Work of this Section unless otherwise specified.
- D. Current TCNA (HB) – Handbook for Ceramic, Glass and Stone Tile Installation
- E. Retain definition(s) remaining after this Section has been edited. Coordinate with tile sizes used in "Tile Products" Article.
- F. Module Size: Actual tile size plus joint width indicated.
- G. Face Size: Actual tile size, excluding spacer lugs.

1.4 PERFORMANCE REQUIREMENTS

- A. Dynamic Coefficient of Friction (DCOF): For tile installed on walkway surfaces, provide products with the following values as determined by testing identical products per ASTM C 1028:
 - 1. Level Surfaces: Minimum Wet: ≥ 0.42

1.5 ACTION SUBMITTALS

- A. Product Data: For each type of product indicated.
- B. Samples for Initial Selection: For each type and color of tile and grout indicated, including custom blends, in scheduled sample size
 - 1. Include Samples of accessories involving color selection.

1.6 INFORMATIONAL SUBMITTALS

- A. Qualification Data: For qualified Installer.

- B. Product Certificates: For each type of product, signed by product manufacturer.
- C. Material Test Reports: For each tile-setting and -grouting product.

1.7 MAINTENANCE MATERIAL SUBMITTALS

- A. Furnish extra materials that match and are from same production runs as products installed and that are packaged with protective covering for storage and identified with labels describing contents.
 - 1. Tile and Trim Units: Furnish quantity of full-size units equal to 3 percent of amount installed for each type, composition, color, pattern, and size indicated.
 - 2. Grout: Furnish quantity of grout equal to 3 percent of amount installed for each type, composition, and color indicated.

1.8 QUALITY ASSURANCE

- A. Maintain one copy of ANSI A108/A118/A136 and current TCNA (HB) on site.
- B. Manufacturer Qualifications: Company specializing in manufacturing the types of products specified in this section, with minimum five years of documented experience.
- C. Installer Qualifications:
 - 1. Company specializing in performing tile installation, with minimum of five years of documented experience.
 - a. Accredited Five-Star member of the National Tile Contractors Association (NTCA) or Trowel of Excellence member of the Tile Contractor's Association of America (TCAA)
- D. Source Limitations for Tile: Obtain tile from one source or producer.
 - 1. Obtain tile of each type and color or finish from same production run and of consistent quality in appearance and physical properties for each contiguous area.
- E. Source Limitations for Setting and Grouting Materials: Obtain ingredients of a uniform quality for each mortar, adhesive, and grout component from one manufacturer and each aggregate from one source or producer.
- F. Source Limitations for Other Products: Obtain each of the following products specified in this Section from a single manufacturer for each product:
 - 1. Marble thresholds.
 - 2. Waterproof membrane.
 - 3. Crack isolation membrane.
 - 4. Joint sealants.
 - 5. Cementitious backer units.
 - 6. Metal edge strips.
 - 7. Review requirements in ANSI A108.01 for substrates.
- G.

1.9 DELIVERY, STORAGE, AND HANDLING

- A. Deliver and store packaged materials in original containers with seals unbroken and labels intact until time of use. Comply with requirements in ANSI A137.1 for labeling tile packages.
- B. Store tile and cementitious materials on elevated platforms, under cover, and in a dry location.

- C. Store aggregates where grading and other required characteristics can be maintained, and contamination can be avoided.
- D. Store liquid materials in unopened containers and protected from freezing.
- E. Handle tile that has temporary protective coating on exposed surfaces to prevent coated surfaces from contacting backs or edges of other units. If coating does contact bonding surfaces of tile, remove coating from bonding surfaces before setting tile.
- F. Protect adhesives and grouts from freezing or overheating in accordance with manufacturer's instructions.

1.10 PROJECT CONDITIONS

- A. Environmental Limitations: Do not install tile until construction in spaces is complete and ambient temperature and humidity conditions are maintained at the levels indicated in referenced standards and manufacturer's written instructions.

PART 2 - PRODUCTS

2.1 PRODUCTS, GENERAL

- A. ANSI Ceramic Tile Standard: Provide tile that complies with ANSI A137.1 for types, compositions, and other characteristics indicated.
 - 1. Provide tile complying with Standard grade requirements unless otherwise indicated.

2.2 INSTALLATION, GENERAL

- B. **Comply with ANSI Standards for Tile Installation Materials:** Provide materials complying with ANSI A108.02, ANSI standards referenced in other Part 2 articles, ANSI standards referenced by current TCNA installation methods specified in tile installation schedules, and other requirements specified.
- C. Install tile, thresholds, stair treads, and grout in accordance with applicable requirements of ANSI A108.1a through ANSI A108.19, manufacturer's instructions and current TCNA (HB).
- D. Factory Blending: For tile exhibiting color variations within ranges, blend tile in factory and package so tile units taken from one package show same range in colors as those taken from other packages and match approved Samples.
- E. Mounting: For factory-mounted tile, provide back- or edge-mounted tile assemblies as standard with manufacturer unless otherwise indicated.
 - 1. Where tile is indicated for installation in wet areas, do not use back- or edge-mounted tile assemblies unless tile manufacturer specifies in writing that this type of mounting is suitable for installation indicated and has a record of successful in-service performance.
- F. Control and expansion joints per current TCNA EJ171 methods.

2.2 TILE PRODUCTS

- A. Colors and Patterns: Refer to I000 Interior Finish Schedule.
- B. Tile Type: Factory-mounted unglazed porcelain mosaic floor tile.
 - 1. Products: Provide the basis of design product as shown on Drawing I000 or the following equivalent products matching the basis of design products, characteristics, and color.:
 - a. American Olean; Division of Dal-Tile International Inc.

- b. Daltile
 2. Surface: Slip-resistant, with abrasive admixture.
 3. Grout Color: As selected by Architect from manufacturer's full range.
 4. Trim Units: Coordinated with sizes and coursing of adjoining flat tile where applicable and matching characteristics of adjoining flat tile. Units in subparagraph below are available from some manufacturers. Before retaining, verify availability with manufacturers selected.
- C. Tile Type: Glazed Ceramic Wall Tile.
 1. Products: Provide the basis of design product as shown on Drawing I000: or the following equivalent products matching the basis of design products, characteristics, and color.:
 - a. American Olean; Division of Dal-Tile International Inc.
 - b. Crossville, Inc.
 - c. Anatolia
 - d. Daltile
 2. Module Size: As scheduled
 3. Thickness: As scheduled
 4. Face: Plain with cushion edges.
 5. Finish: as scheduled
 6. Grout Color: As selected by Architect from manufacturer's full range.
 7. Trim Units: Coordinated with sizes and coursing of adjoining flat tile where applicable and matching characteristics of adjoining flat tile. Provide shapes as follows, selected from manufacturer's standard shapes:
 - a. Base for Thin-Set Mortar Installations: Flat Top Cove, module size: as scheduled.
 - b. Wainscot Cap for Thin-Set Mortar Installations: Surface bullnose, module size 3 by 6 inches.
 - c. External Corners for Thin-Set Mortar Installations: Surface bullnose, same size as adjoining flat tile.
 - d. Internal Corners: Field-buttet square corners. For coved base and cap use angle pieces designed to fit with stretcher shapes.
- D. Tile Type: Porcelain wall tile.
 1. Products: Provide the basis of design product as shown on Drawing I000: or the following equivalent products matching the basis of design products, characteristics, and color.:
 - a. Anatolia
 - b. Mosa
 - c. Florida Tile
 - d. Daltile
 2. Composition: Porcelain.
 3. Module Size: As scheduled
 4. Thickness: As scheduled
 5. Face: Plain with cushion edges.
 6. Grout Color: As selected by Architect from manufacturer's full range.
 7. Trim Units: Coordinated with sizes and coursing of adjoining flat tile where applicable and matching characteristics of adjoining flat tile. Units in subparagraph below are available from some manufacturers. Before retaining, verify availability with manufacturers selected. Refer to I000 for basis of design: profile, finish. Size to be determined based on tile thickness or as scheduled.

2.3 THRESHOLDS

- A. General: Fabricate to sizes and profiles indicated or required to provide transition between adjacent floor finishes.
 - 1. Bevel edges at 1:2 slope, with lower edge of bevel aligned with or up to 1/16 inch above adjacent floor surface. Finish bevel to match top surface of threshold. Limit height of threshold to 1/2 inch or less above adjacent floor surface.
- B. Marble Thresholds: ASTM C 503, with a minimum abrasion resistance of [10] [12] per ASTM C 1353 or ASTM C 241 and with honed finish.
 - 1. Description: Uniform, fine- to medium-grained white stone with gray veining.

2.4 WATERPROOF MEMBRANE

- A. General: Manufacturer's standard product, selected from the following, that complies with ANSI A118.10 and is recommended by the manufacturer for the application indicated. Include reinforcement and accessories recommended by manufacturer.
- B. Fabric-Reinforced, Fluid-Applied Membrane: System consisting of elastomeric polymer and continuous fabric reinforcement.
 - 1. Products: Subject to compliance with requirements, provide one of the following:
 - a. **Custom Building Products**, RedGard Waterproofing and Crack Prevention Membrane
 - b. Laticrete International, Inc.; Laticrete 9235 Waterproof Membrane.

2.5 SETTING MATERIALS

- A. Latex-Portland Cement Mortar (Thin Set): ANSI A118.4.
 - 1. Manufacturers: Subject to compliance with requirements, provide products by one of the following:
 - a. **Custom Building Products.**
 - b. Laticrete International, Inc.
 - c. TEC; a subsidiary of H. B. Fuller Company.
 - 2. Provide prepackaged, dry-mortar mix containing dry, redispersible, vinyl acetate or acrylic additive to which only water must be added at Project site.
 - 3. For wall applications, provide mortar that complies with requirements for non-sag mortar in addition to the other requirements in ANSI A118.4.

2.6 GROUT MATERIALS

- A. Water-Cleanable Epoxy Grout: ANSI A118.3.
 - 1. Products: Subject to compliance with requirements, provide one of the following products:
 - a. **Custom Building Products.**
 - b. Laticrete International, Inc.
 - c. TEC; a subsidiary of H. B. Fuller Company.
 - 2. Provide product capable of withstanding continuous and intermittent exposure to temperatures of up to 140 deg F and 212 deg F, respectively, and certified by manufacturer for intended use.

2.7 BONDING PRIMER

- A. Multi-Surface bonding primer;

1. Products: Subject to compliance with requirements, provide one of the following products:
 - a. MBP by Custom Building Products.
 - b. Kilz 3 - Premium
2. Provide product capable of withstanding continuous and intermittent exposure to temperatures between 50-90 degrees F.
3. For wall applications to dry and clean surfaces, refer to manufacturer's requirements.

2.8 MISCELLANEOUS MATERIALS

- A. Trowelable Underlayments and Patching Compounds: Latex-modified, portland cement-based formulation provided or approved by manufacturer of tile-setting materials for installations indicated.
- B. Tile Cleaner: A neutral cleaner capable of removing soil and residue without harming tile and grout surfaces, specifically approved for materials and installations indicated by tile and grout manufacturers.
- C. Transition and Edge Trim: Refer to drawing I250 for suggested manufacturer, style and color for each condition.

2.9 MIXING MORTARS AND GROUT

- A. Mix mortars and grouts to comply with referenced standards and mortar and grout manufacturers' written instructions.
- B. Add materials, water, and additives in accurate proportions.
- C. Obtain and use type of mixing equipment, mixer speeds, mixing containers, mixing time, and other procedures to produce mortars and grouts of uniform quality with optimum performance characteristics for installations indicated.

PART 3 - EXECUTION

3.1 EXAMINATION

- A. Examine substrates, areas, and conditions where tile will be installed, with Installer present, for compliance with requirements for installation tolerances and other conditions affecting performance of installed tile.
 1. Verify that substrates for setting tile are firm, dry, clean, free of coatings that are incompatible with tile-setting materials including curing compounds and other substances that contain soap, wax, oil, or silicone; and comply with flatness tolerances required by ANSI A108.01 for installations indicated.
 2. Verify that concrete substrates for tile floors installed with thin-set mortar comply with surface finish requirements in ANSI A108.01 for installations indicated.
 - a. Verify that surfaces that received a steel trowel finish have been mechanically scarified.
 - b. Verify that protrusions, bumps, and ridges have been removed by sanding or grinding.
 3. Verify that installation of grounds, anchors, recessed frames, electrical and mechanical units of work, and similar items located in or behind tile has been completed.

4. Verify that joints and cracks in tile substrates are coordinated with tile joint locations; if not coordinated, adjust joint locations in consultation with Architect.
- B. Proceed with installation only after unsatisfactory conditions have been corrected.

3.2 PREPARATION

- A. Fill holes, and depressions in concrete substrates for tile floors installed with thin-set mortar with trowelable leveling and patching compound specifically recommended by tile-setting material manufacturer.
- B. For cracks, in concrete substrates for tile floors apply crack suppression membrane installed with specified reinforcement materials and adhesive compounds specifically recommended by tile-setting material manufacturer **and per ANSI A118.12.**
- C. Prepare substrates to receive fluid applied waterproofing.
- D. Blending: For tile exhibiting color variations, verify that tile has been factory blended and packaged so tile units taken from one package show same range of colors as those taken from other packages and match approved Samples. If not factory blended, either return to manufacturer or blend tiles at Project site before installing.

3.3 TILE INSTALLATION

- A. Comply with TCNA's current "Handbook for Ceramic Tile Installation" for TCNA installation methods specified in tile installation schedules. Comply with parts of the ANSI A108 Series "Specifications for Installation of Ceramic Tile" that are referenced in TCNA installation methods, specified in tile installation schedules, and apply to types of setting and grouting materials used.
 1. For the following installations, follow procedures in the ANSI A108 Series of tile installation standards for providing 95 percent mortar coverage:
 - a. Tile floors in wet areas.
 - b. Tile floors composed of rib-backed tiles.
- B. Extend tile work into recesses and under or behind equipment and fixtures to form complete covering without interruptions unless otherwise indicated. Terminate work neatly at obstructions, edges, and corners without disrupting pattern or joint alignments.
- C. Accurately form intersections and returns. Perform cutting and drilling of tile without marring visible surfaces. Carefully grind cut edges of tile abutting trim, finish, or built-in items for straight aligned joints. Fit tile closely to electrical outlets, piping, fixtures, and other penetrations so plates, collars, or covers overlap tile.
- D. Provide manufacturer's standard trim shapes where necessary to eliminate exposed tile edges.
- E. Jointing Pattern: Lay tile in grid pattern unless otherwise indicated. Lay out tile work and center tile fields in both directions in each space or on each wall area. Lay out tile work to minimize the use of pieces that are less than half of a tile. Provide uniform joint widths unless otherwise indicated.
 1. For tile mounted in sheets, make joints between tile sheets same width as joints within tile sheets so joints between sheets are not apparent in finished work.
 2. Where adjoining tiles on floor, base, walls, or trim are specified or indicated to be same size, align joints.

3. Where tiles are specified or indicated to be whole integer multiples of adjoining tiles on floor, base, walls, or trim, align joints unless otherwise indicated.
- F. Joint Widths: Unless otherwise indicated, install tile with the following joint widths:
 1. Ceramic Mosaic Tile: 1/8 inch.
 2. Glazed Wall Tile: 1/16 inch.
- G. Lay out tile wainscots to dimensions indicated or to next full tile beyond dimensions indicated.
- H. Expansion Joints: Provide expansion joints and other sealant-filled joints, including control, contraction, and isolation joints, where indicated, per current TCNA EJ171 methods. Form joints during installation of setting materials, mortar beds, and tile. Do not saw-cut joints after installing tiles
 1. Where joints occur in concrete substrates, locate joints in tile surfaces directly above them.
- I. Stone Thresholds: Install stone thresholds in same type of setting bed as adjacent floor unless otherwise indicated.
 1. Do not extend waterproofing under thresholds set in latex-portland cement mortar. Fill joints between such thresholds and adjoining tile set on waterproofing with elastomeric sealant.

3.4 WATERPROOFING INSTALLATION

- A. Install waterproofing to comply with **ANSI A118.10 and ANSI 118.12 for crack isolation membrane**, per manufacturer's written instructions to produce waterproof membrane of uniform thickness and bonded securely to substrate.
- B. Do not install tile or setting materials over waterproofing until waterproofing has cured and been tested to determine that it is watertight.

3.5 CLEANING AND PROTECTING

- A. Cleaning: On completion of placement and grouting, clean all ceramic tile surfaces so they are free of foreign matter.
 1. Remove epoxy grout residue from tile as soon as possible.
 2. Clean grout smears and haze from tile according to tile and grout manufacturer's written instructions but no sooner than 10 days after installation. Use only cleaners recommended by tile and grout manufacturers and only after determining that cleaners are safe to use by testing on samples of tile and other surfaces to be cleaned. Protect metal surfaces and plumbing fixtures from effects of cleaning. Flush surfaces with clean water before and after cleaning.
- B. Protect installed tile work with kraft paper or other heavy covering during construction period to prevent staining, damage, and wear. If recommended by tile manufacturer, apply coat of neutral protective cleaner to completed tile walls and floors.
- C. Prohibit foot and wheel traffic from tiled floors for at least seven days after grouting is completed.
- D. Before final inspection, remove protective coverings and rinse neutral protective cleaner from tile surfaces.

END OF SECTION 093000

SECTION 095113 - ACOUSTICAL PANEL CEILINGS

PART 1 - GENERAL

1.1 SUMMARY

- A. This Section includes acoustical panels and exposed suspension systems for ceilings.

1.2 DEFINITIONS

- A. AC: Articulation Class.
- B. CAC: Ceiling Attenuation Class.
- C. LR: Light Reflectance coefficient.
- D. NRC: Noise Reduction Coefficient.

1.3 SUBMITTALS

- A. Product Data: For each type of product indicated.
- B. Samples for Initial Selection: For components with factory-applied color finishes.
- C. Maintenance Data: For finishes to include in maintenance manuals.

1.4 QUALITY ASSURANCE

- A. Source Limitations:
 - 1. Acoustical Ceiling Panel: Obtain each type through one source from a single manufacturer.
 - 2. Suspension System: Obtain each type through one source from a single manufacturer.
- B. Source Limitations: Obtain each type of acoustical ceiling panel and supporting suspension system through one source from a single manufacturer.

1.5 DELIVERY, STORAGE, AND HANDLING

- A. Deliver acoustical panels, suspension system components, and accessories to Project site in original, unopened packages and store them in a fully enclosed, conditioned space where they will be protected against damage from moisture, humidity, temperature extremes, direct sunlight, surface contamination, and other causes.
- B. Before installing acoustical panels, permit them to reach room temperature and a stabilized moisture content.
- C. Handle acoustical panels carefully to avoid chipping edges or damaging units in any way.

1.6 PROJECT CONDITIONS

- A. Environmental Limitations: Do not install acoustical panel ceilings until spaces are enclosed and weatherproof, wet work in spaces is complete and dry, work above ceilings is complete, and ambient temperature and humidity conditions are maintained at the levels indicated for Project when occupied for its intended use.

1.7 COORDINATION

- A. Coordinate layout and installation of acoustical panels and suspension system with other construction that penetrates ceilings or is supported by them, including light fixtures, HVAC equipment, fire-suppression system, and partition assemblies.

1.8 EXTRA MATERIALS

- A. Furnish extra materials described below that match products installed and that are packaged with protective covering for storage and identified with labels describing contents.
 - 1. Acoustical Ceiling Panels: Full-size panels equal to 5 percent of quantity installed.

PART 2 - PRODUCTS

2.1 ACOUSTICAL PANELS, GENERAL

- A. Acoustical Panel Standard: Provide manufacturer's standard panels of configuration indicated that comply with ASTM E 1264 classifications as designated by types, patterns, acoustical ratings, and light reflectances, unless otherwise indicated.
 - 1. Mounting Method for Measuring NRC: Type E-400; plenum mounting in which face of test specimen is 15-3/4 inches away from test surface per ASTM E 795.
- B. Acoustical Panel Colors and Patterns: Match appearance characteristics indicated for each product type.
 - 1. Where appearance characteristics of acoustical panels are indicated by referencing pattern designations in ASTM E 1264 and not manufacturers' proprietary product designations, provide products selected by Architect from each manufacturer's full range that comply with requirements indicated for type, pattern, color, light reflectance, acoustical performance, edge detail, and size.
- C. Broad Spectrum Antimicrobial Fungicide and Bactericide Treatment: Provide acoustical panels treated with manufacturer's standard antimicrobial formulation that inhibits fungus, mold, mildew, and gram-positive and gram-negative bacteria and showing no mold, mildew, or bacterial growth when tested according to ASTM D 3273 and evaluated according to ASTM D 3274 or ASTM G 21.
- D. Antimicrobial Fungicide Treatment: Provide acoustical panels with face and back surfaces coated with antimicrobial treatment consisting of manufacturer's standard formulation with fungicide added to inhibit growth of mold and mildew and showing no mold or mildew growth when tested according to ASTM D 3273 and evaluated according to ASTM D 3274 or ASTM G 21.

2.2 ACOUSTICAL PANELS FOR ACOUSTICAL PANEL CEILING (ACT)

- A. Basis of Design Products: Subject to compliance with requirements, available products that may be incorporated into the Work include, but are not limited to the products indicated on the "I" drawings

2.3 SYSTEMS, GENERAL

- A. Metal Suspension System Standard: Provide manufacturer's standard direct-hung metal suspension systems of types, structural classifications, and finishes indicated that comply with applicable requirements in ASTM C 635.

- B. Finishes and Colors, General: Comply with NAAMM's "Metal Finishes Manual for Architectural and Metal Products" for recommendations for applying and designating finishes. Provide manufacturer's standard factory-applied finish for type of system indicated.
 - 1. High-Humidity Finish: Comply with ASTM C 635 requirements for "Coating Classification for Severe Environment Performance" where high-humidity finishes are indicated.
- C. Attachment Devices: Size for five times the design load indicated in ASTM C 635, Table 1, "Direct Hung," unless otherwise indicated. Comply with seismic design requirements.
 - 1. Anchors in Concrete: Anchors of type and material indicated below, with holes or loops for attaching hangers of type indicated and with capability to sustain, without failure, a load equal to five times that imposed by ceiling construction, as determined by testing per ASTM E 488 or ASTM E 1512 as applicable, conducted by a qualified testing and inspecting agency.
 - a. Corrosion Protection: Carbon-steel components zinc plated to comply with ASTM B 633, Class Fe/Zn 5 (0.005 mm) for Class SC 1 service condition.
- D. Wire Hangers, Braces, and Ties: Provide wires complying with the following requirements:
 - 1. Zinc-Coated, Carbon-Steel Wire: ASTM A 641/A 641M, Class 1 zinc coating, soft temper.

2.4 METAL SUSPENSION SYSTEM FOR ACOUSTICAL PANEL CEILING

- A. Products: Subject to compliance with requirements, provide one of the following:
 - 1. Armstrong World Industries, Inc.; Prelude.
- B. Wide-Face, Capped, Double-Web, Steel Suspension System: Main and cross runners roll formed from cold-rolled steel sheet, prepainted, electrolytically zinc coated, or hot-dip galvanized according to ASTM A 653/A 653M, not less than G30 coating designation, with prefinished 15/16-inch wide metal caps on flanges.
 - 1. Structural Classification: Heavy-duty system.
 - 2. Face Design: Flat, flush.

2.5 METAL EDGE MOLDINGS AND TRIM

- A. Products: Subject to compliance with requirements, provide one of the following:
 - 1. Armstrong World Industries, Inc.;
- B. Roll-Formed, Sheet-Metal Edge Moldings and Trim: Type and profile indicated or, if not indicated, manufacturer's standard moldings for edges and penetrations that comply with seismic design requirements; formed from sheet metal of same material, finish, and color as that used for exposed flanges of suspension system runners.
 - 1. Provide manufacturer's standard edge moldings that fit acoustical panel edge details and suspension systems indicated and that match width and configuration of exposed runners, unless otherwise indicated.
 - 2. For circular penetrations of ceiling, provide edge moldings fabricated to diameter required to fit penetration exactly.

2.6 ACOUSTICAL SEALANT

- A. Products: Subject to compliance with requirements, provide one of the following:
 - 1. Acoustical Sealant for Exposed and Concealed Joints:
 - a. Pecora Corporation; AC-20 FTR Acoustical and Insulation Sealant.
 - b. USG Corporation; SHEETROCK Acoustical Sealant.

- B. Acoustical Sealant for Exposed and Concealed Joints: Manufacturer's standard nonsag, paintable, nonstaining latex sealant, with a VOC content of 250 g/L or less when calculated according to 40 CFR 59, Subpart D (EPA Method 24), complying with ASTM C 834 and effective in reducing airborne sound transmission through perimeter joints and openings in building construction as demonstrated by testing representative assemblies according to ASTM E 90.

PART 3 - EXECUTION

3.1 EXAMINATION

- A. Examine substrates, areas, and conditions, including structural framing to which acoustical panel ceilings attach or abut, with Installer present, for compliance with requirements specified in this and other Sections that affect ceiling installation and anchorage and with requirements for installation tolerances and other conditions affecting performance of acoustical panel ceilings.
1. Proceed with installation only after unsatisfactory conditions have been corrected.

3.2 PREPARATION

- A. Measure each ceiling area and establish layout of acoustical panels to balance border widths at opposite edges of each ceiling. Avoid using less-than-half-width panels at borders, and comply with layout shown on reflected ceiling plans.

3.3 INSTALLATION

- A. General: Install acoustical panel ceilings to comply with ASTM C 636, per manufacturer's written instructions and CISCA's "Ceiling Systems Handbook."
- B. Suspend ceiling hangers from building's structural members and as follows:
1. Install hangers plumb and free from contact with insulation or other objects within ceiling plenum that are not part of supporting structure or of ceiling suspension system.
 2. Splay hangers only where required to miss obstructions; offset resulting horizontal forces by bracing, countersplaying, or other equally effective means.
 3. Where width of ducts and other construction within ceiling plenum produces hanger spacings that interfere with location of hangers at spacings required to support standard suspension system members, install supplemental suspension members and hangers in form of trapezes or equivalent devices.
 4. Secure wire hangers to ceiling suspension members and to supports above with a minimum of three tight turns. Connect hangers directly either to structures or to inserts, eye screws, or other devices that are secure and appropriate for substrate and that will not deteriorate or otherwise fail due to age, corrosion, or elevated temperatures.
 5. Do not support ceilings directly from floor deck. Fasten hangers to cast-in-place hanger inserts, postinstalled mechanical or adhesive anchors, or power-actuated fasteners that extend through forms into concrete.
 6. When steel framing does not permit installation of hanger wires at spacing required, install carrying channels or other supplemental support for attachment of hanger wires.
 7. Do not attach hangers to steel deck tabs.
 8. Do not attach hangers to steel roof deck. Attach hangers to structural members.
 9. Space hangers not more than 48 inches o.c. along each member supported directly from hangers, unless otherwise indicated; provide hangers not more than 8 inches from ends of each member.
 10. Size supplemental suspension members and hangers to support ceiling loads within performance limits established by referenced standards and publications.

- C. Secure bracing wires to ceiling suspension members and to supports with a minimum of four tight turns. Suspend bracing from building's structural members as required for hangers, without attaching to permanent metal forms, steel deck, or steel deck tabs. Fasten bracing wires into concrete with cast-in-place or postinstalled anchors.
- D. Install edge moldings and trim of type indicated at perimeter of acoustical ceiling area and where necessary to conceal edges of acoustical panels.
 - 1. Apply acoustical sealant in a continuous ribbon concealed on back of vertical legs of moldings before they are installed.
 - 2. Screw attach moldings to substrate at intervals not more than 16 inches o.c. and not more than 3 inches from ends, leveling with ceiling suspension system to a tolerance of 1/8 inch in 12 feet. Miter corners accurately and connect securely.
 - 3. Do not use exposed fasteners, including pop rivets, on moldings and trim.
- E. Install suspension system runners so they are square and securely interlocked with one another. Remove and replace dented, bent, or kinked members.
- F. Install acoustical panels with undamaged edges and fit accurately into suspension system runners and edge moldings. Scribe and cut panels at borders and penetrations to provide a neat, precise fit.
 - 1. Arrange directionally patterned acoustical panels as follows:
 - a. As indicated on reflected ceiling plans.
 - 2. For square-edged panels, install panels with edges fully hidden from view by flanges of suspension system runners and moldings.
 - 3. For reveal-edged panels on suspension system runners, install panels with bottom of reveal in firm contact with top surface of runner flanges.
 - 4. For reveal-edged panels on suspension system members with box-shaped flanges, install panels with reveal surfaces in firm contact with suspension system surfaces and panel faces flush with bottom face of runners.
 - 5. Paint cut edges of panel remaining exposed after installation; match color of exposed panel surfaces using coating recommended in writing for this purpose by acoustical panel manufacturer.

3.4 CLEANING

- A. Clean exposed surfaces of acoustical panel ceilings, including trim, edge moldings, and suspension system members. Comply with manufacturer's written instructions for cleaning and touchup of minor finish damage. Remove and replace ceiling components that cannot be successfully cleaned and repaired to permanently eliminate evidence of damage.

END OF SECTION 095113

SECTION 09 6513 - RESILIENT WALL BASE AND ACCESSORIES

PART 1 - GENERAL

1.1 SUMMARY

- A. This Section includes the following:
 - 1. Resilient wall base.
 - 2. Resilient flooring accessories.

1.2 SUBMITTALS

- A. General: Submit the following in accordance with Conditions of Contract and Division 1 Specification Sections.
- B. Product data for each type of product specified.
- C. Samples for initial selection purposes of manufacturer's standard and premium sample sets in form of pieces cut from each type of product specified showing full range of colors and patterns available.
- D. Product certificates, in lieu of laboratory test reports when permitted by Architect, signed by manufacturer certifying that each product complies with requirements.

1.3 QUALITY ASSURANCE

- A. Single-Source Responsibility for Products: Obtain each type and color of product specified from a single source with resources to provide products of consistent quality in appearance and physical properties without delaying progress of the Work.
- B. Fire Performance Characteristics: Provide products with the following fire performance characteristics as determined by testing products per ASTM test method indicated below by UL or another testing and inspecting agency acceptable to authorities having jurisdiction.
 - 1. Critical Radiant Flux: 0.45 watts per sq cm or more per ASTM E 648.
 - 2. Smoke Density: Less than 450 per ASTM E 662.

1.4 DELIVERY, STORAGE, AND HANDLING

- A. Deliver products to Project site in original manufacturer's unopened cartons and containers, each bearing names of product and manufacturer, Project identification, and shipping and handling instructions.
- B. Store products in dry spaces protected from the weather with ambient temperatures maintained between 50 deg F and 90 deg F.
- C. Move products into spaces where they will be installed at least 48 hours in advance of installation.

1.5 PROJECT CONDITIONS

- A. Maintain a minimum temperature of 70 deg F in spaces to receive products specified in this Section for at least 48 hours prior to installation, during installation, and for not less than 48 hours after installation. After this period, maintain a temperature of not less than 55 deg F or more than 95 deg F (35 deg C).

- B. Do not install products until they are at the same temperature as that of the space where they are to be installed.
- C. Close spaces to traffic during installation of products specified in this Section.

1.6 SEQUENCING AND SCHEDULING

- A. Sequence installing products specified in this Section with other construction to minimize possibility of damage and soiling during remainder of construction period.

PART 2 - PRODUCTS

2.1 MANUFACTURERS

- A. Products: Subject to compliance with requirements, provide the following:
 - 1. Manufacturers of Resilient Wall Base:
 - a. Roppe.
 - b. Johnsonite
 - c. Tarkett

- B. Colors: As selected from manufacturer's full range.

2.2 INSTALLATION ACCESSORIES

- A. Concrete Slab Primer: Non-staining type as recommended by flooring manufacturer.
- B. Trowelable Underlayments and Patching Compounds: Latex-modified, portland-cement-based formulation provided or approved by flooring manufacturer for applications indicated.
- C. Adhesives: Water-resistant type recommended by manufacturer to suit resilient flooring product and substrate conditions indicated.

PART 3 - EXECUTION

3.1 EXAMINATION

- A. Examine areas where installation of products specified in this Section will occur, with Installer present, to verify that substrates and conditions are satisfactory for installation and comply with manufacturer's requirements and those specified in this Section. Do not proceed with installation until unsatisfactory conditions have been corrected.

3.2 PREPARATION

- A. General: Comply with manufacturer's installation specifications for preparing substrates indicated to receive products indicated.
- B. Use trowelable leveling and patching compounds per manufacturer's directions to fill cracks, holes, and depressions in substrates.

- C. Remove coatings, including curing compounds, and other substances that are incompatible with flooring adhesives and that contain soap, wax, oil, or silicone, by using a terrazzo or concrete grinder, a drum sander, or a polishing machine equipped with a heavy-duty wire brush.
- D. Broom or vacuum clean substrates to be covered immediately before installing products specified in this Section. Following cleaning, examine substrates for moisture, alkaline salts, carbonation, or dust.
- E. Apply concrete slab primer, if recommended by flooring manufacturer, prior to applying adhesive. Apply according to manufacturer's directions.

3.3 INSTALLATION

- A. General: Install products specified in this Section using methods indicated according to manufacturer's installation directions.
- B. Apply resilient wall base to walls, columns, pilasters, casework, and other permanent fixtures in rooms and areas where base is required. Install wall base in lengths as long as practicable. Tightly adhere wall base to substrate throughout length of each piece, with base in continuous contact with horizontal and vertical substrates.
 - 1. On masonry surfaces or other similar irregular substrates, fill voids along top edge of resilient wall base with manufacturer's recommended adhesive filler material.
 - 2. Install inside and exterior corners before installing straight pieces.
- C. Place resilient accessories so they are butted to adjacent materials of type indicated and bond to substrates with adhesive. Install reducer strips at edges of flooring that otherwise would be exposed.

3.4 CLEANING AND PROTECTION

- A. Perform the following operations immediately after completing installation:
 - 1. Remove visible adhesive and other surface blemishes using cleaner recommended by manufacturers of resilient product involved.
 - 2. Sweep or vacuum horizontal surfaces thoroughly.
 - 3. Do not wash resilient products until after time period recommended by manufacturer.
 - 4. Damp-mop resilient products to remove black marks and soil.
- B. Protect resilient products against marks, marks, indentations, and other damage from construction operations and placement of equipment and fixtures during remainder of construction period. Use protection methods indicated or recommended by manufacturer of resilient product involved.
 - 1. Apply protective floor polish to resilient products that are free from soil, visible adhesive, and surface blemishes if directed by the manufacturer.
 - a. Use commercially available product as recommended and accepted by the resilient product manufacturer.
 - b. Coordinate selection of floor polish with Owner's maintenance service and resilient product manufacturer's written recommendations.
- C. Clean products specified in this Section not more than 4 days prior to dates scheduled for inspections intended to establish date of Substantial Completion in each area of Project. Clean products using method recommended by manufacturer.
 - 1. Reapply polish after cleaning.

END OF SECTION 096513

SECTION 09 6566 - RESILIENT ATHLETIC FLOORING

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

- A. Drawings and general provisions of the Contract, including General and Supplementary Conditions and Division 01 Specification Sections, apply to this Section.

1.2 SUMMARY

- A. Section Includes:
1. Interlocking, rubber floor tile.
 2. Interlocking, suspended, polymer floor tile.
 3. Interlocking, open-grid, vinyl floor tile.
 4. Rubber mats.
 5. Rubber floor tile.
 6. Rubber-strip floor tile.
 7. Rubber sheet flooring.
- B. Related Sections:
1. Division 09 Section "Wood Athletic Flooring" for resilient wood flooring.
 2. Division 09 Section "Resilient Base and Accessories" for wall base and accessories installed with flooring.
 3. Division 09 Section "Fluid-Applied Athletic Flooring" for liquid polyurethane flooring applied directly to substrates or pads.

1.3 SUBMITTALS

- A. Product Data: For each type of product indicated.
- B. Shop Drawings: Show installation details and locations of the following:
1. Border tiles.
 2. Floor patterns.
 3. Layout, colors, widths, and dimensions of game lines and markers.
 4. Locations of floor inserts for athletic equipment installed through flooring.
- C. Samples for Initial Selection: For each type of flooring indicated.
1. Game-Line and Marker Paint: Include charts showing available colors and glosses.
- D. Samples for Verification: For each type, color, and pattern of flooring indicated, 6-inch- square Samples of same thickness and material indicated for the Work.
1. Seam Samples: For each vinyl sheet flooring color and pattern required; with seam running lengthwise and in center of 6-by-9-inch Sample applied to a rigid backing and prepared by Installer for this Project.
- E. Maintenance Data: For flooring to include in maintenance manuals.

1.4 QUALITY ASSURANCE

- A. Rubber Flooring Installer Qualifications: An experienced Installer who has completed rubber flooring installations using methods indicated for this Project and similar in material, design, and extent to that indicated for this Project; who is acceptable to manufacturer; and whose work has resulted in installations with a record of successful in-service performance.

1.5 DELIVERY, STORAGE, AND HANDLING

- A. Deliver materials in original packages and containers, with seals unbroken, bearing manufacturer's labels indicating brand name and directions for storing.
- B. Store materials to prevent deterioration. Store tiles on flat surfaces and rolls upright.

1.6 FIELD CONDITIONS

- A. Adhesively Applied Products:
 - 1. Maintain temperatures during installation within range recommended in writing by manufacturer, but not less than 70 deg F or more than 95 deg F, in spaces to receive flooring 48 hours before installation, during installation, and 48 hours after installation unless longer period is recommended in writing by manufacturer.
 - 2. After post installation period, maintain temperatures within range recommended in writing by manufacturer, but not less than 55 deg F or more than 95 deg F.
 - 3. Close spaces to traffic during flooring installation.
 - 4. Close spaces to traffic for 48 hours after flooring installation unless manufacturer recommends longer period in writing.
- B. Install flooring after other finishing operations, including painting, have been completed.

1.7 COORDINATION

- A. Coordinate layout and installation of flooring with floor inserts for gymnasium equipment.

1.8 EXTRA MATERIALS

- A. Furnish extra materials, before installation begins, that match products installed and that are packaged with protective covering for storage and identified with labels describing contents.
 - 1. Floor Tile: Furnish no fewer than 1 box for each 50 boxes or fraction thereof, of each type, color, pattern, and size of floor tile installed.

PART 2 - PRODUCTS

2.1 INTERLOCKING, RUBBER FLOOR TILE

- A. Description: Athletic flooring consisting of modular rubber tiles with precision cut, interlocking edges, for free-lay installation.
- B. Basis-of-Design Product: Subject to compliance with requirements, provide the product indicated **on I000** Interior Finish Schedule or a comparable product by one of the following:
 - 1. Action Floor Systems, LLC.
 - 2. Amarco Products.
 - 3. American Floor Products Company, Inc.
 - 4. E CORE International.
 - 5. Flexco.
 - 6. Horner Flooring Company, Inc.
 - 7. Johnsonite; a Tarkett company.
 - 8. Mondo America Inc.
 - 9. Musson Rubber Co.
 - 10. Pawling Corporation; Architectural Products Division.

- C. Comparable Products: Comply with the requirements of Section 01 1600 “Product Requirements” and with the following characteristics of the Basis-of-Design product:
 - 1. Material.
 - 2. Tile Interlock.
 - 3. Traffic-Surface Texture.
 - a. Provide reversible tiles (with traffic-surface texture on both sides).
 - 4. Size.
 - 5. Thickness.
 - 6. Weight.
 - 7. Color and Pattern.
- D. Border: Interlocking, beveled-edge tiles, of same material as floor tile; with bevels that transition from thickness of floor tile to surface below it; with straight outside edges; and for use where flooring corners and edges do not abut vertical surfaces.
 - 1. Border Color and Pattern: As selected by Architect from manufacturer's full range to contrast with floor tile.

2.2 RUBBER FLOOR TILE

- A. Description: Athletic flooring consisting of modular rubber tiles with smooth edges for adhered application.
- B. Basis-of-Design Product: Subject to compliance with requirements, provide the product indicated **I000 Interior Finish Schedule** or a comparable product by one of the following:
 - 1. Aacer Flooring, LLC.
 - 2. Action Floor Systems, LLC.
 - 3. Amarco Products.
 - 4. American Floor Products Company, Inc.
 - 5. E CORE International.
 - 6. Flexco.
 - 7. Horner Flooring Company, Inc.
 - 8. Johnsonite; a Tarkett company.
 - 9. Mondo America Inc.
 - 10. Musson Rubber Co.
 - 11. nora systems, Inc.
 - 12. Robbins Sports Surfaces.
 - 13. Roppe Corporation.
 - 14. Sport Court; Subsidiary of Connor Sport Court International.
 - 15. Surface America Incorporated.
 - 16. Tuflex Rubber Flooring; a division of Tuflex Rubber Products, Inc.
- C. Comparable Products: Comply with the requirements of Section 01 1600 “Product Requirements” and with the following characteristics of the Basis-of-Design product:
 - 1. Material.
 - 2. Traffic-Surface Texture.
 - 3. Thickness.
 - 4. Weight.
 - 5. Color and Pattern.
- D. Border: Interlocking, beveled-edge tiles, of same material as floor tile; with bevels that transition from thickness of floor tile to surface below it; with straight outside edges; and for use where flooring corners and edges do not abut vertical surfaces.

1. Border Color and Pattern: As selected by Architect from manufacturer's full range to contrast with floor tile.

2.3 ACCESSORIES

- A. Trowelable Leveling and Patching Compound: Latex-modified, hydraulic-cement-based formulation approved by flooring manufacturer.
- B. Concrete Floor Degreaser: Nonpetroleum degreaser and cleaner, "Citrus Degreaser and Cleaner" by Sonneborn Division of BASF.
- C. Adhesives: Water-resistant type recommended in writing by manufacturer for substrate and conditions indicated.
 1. Use adhesives that have a VOC content of 50 g/L or less when calculated according to 40 CFR 59, Subpart D (EPA Method 24).
- D. Game-Line and Marker Paint: Complete system including primer, if any, compatible with flooring and recommended in writing by flooring and paint manufacturers for use indicated.
 1. VOC content: Provide products with VOC content not more than 150 g/L when calculated according to 40 CFR 59, Subpart D (EPA Method 24).

PART 3 - EXECUTION

3.1 EXAMINATION

- A. Examine substrates, with Installer present, for compliance with requirements for installation tolerances, moisture content, and other conditions affecting performance of the Work.
 1. Verify that finishes of substrates comply with tolerances and other requirements specified in other Sections and that substrates are free of cracks, ridges, depressions, scale, and foreign deposits that might interfere with adhesion of resilient products.
- B. Proceed with installation only after unsatisfactory conditions have been corrected.

3.2 PREPARATION

- A. Prepare substrates according to manufacturer's written recommendations to ensure adhesion of flooring.
- B. Concrete Substrates: Prepare according to ASTM F 710.
- C. Concrete Substrates: Prepare according to ASTM F 710.
 1. Verify that substrates are dry and free of curing compounds, sealers, and hardeners.
 2. Remove substrate coatings and other substances that are incompatible with adhesives and that contain soap, wax, or silicone, using mechanical methods recommended by manufacturer. Do not use solvents.
 3. Remove oils using concrete floor degreaser or mechanical methods recommended by manufacturer.
 - a. Apply degreaser full strength at approximately 200 sq.ft./gal. Allow 5 to 10 minutes for penetration. Scrub if necessary.
 - b. Rinse with clean water to remove all traces of greased and oil.
 - c. Apply a second application for unusually deep-seated grease and oil stains.
 4. Alkalinity and Adhesion Testing: Perform tests recommended by manufacturer. Proceed with installation only after substrates pass testing.
 5. Moisture Testing: Perform tests recommended by manufacturer. Proceed with installation only after substrates pass testing.

6. Alkalinity Testing: Perform pH testing according to ASTM F 710. Proceed with installation only if pH readings are not less than 7.0 and not greater than 8.5.
- D. Use trowelable leveling and patching compound to fill cracks, holes, and depressions in substrates.
- E. Move flooring and installation materials into spaces where they will be installed at least 48 hours in advance of installation unless manufacturer recommends a longer period in writing.
 1. Do not install flooring until they are same temperature as space where they are to be installed.
- F. Sweep and vacuum clean substrates to be covered by flooring immediately before installation. After cleaning, examine substrates for moisture, alkaline salts, carbonation, and dust.
- G. Proceed with installation only after unsatisfactory conditions have been corrected.

3.3 FLOORING INSTALLATION, GENERAL

- A. Comply with manufacturer's written installation instructions.
- B. Scribe, cut, and fit flooring to butt neatly and tightly to vertical surfaces, equipment anchors, floor outlets, and other interruptions of floor surface.
- C. Extend flooring into toe spaces, door reveals, closets, and similar openings unless otherwise indicated.
- D. Maintain reference markers, holes, and openings that are in place or marked for future cutting by repeating subfloor markings on flooring. Use nonpermanent, nonstaining marking device.

3.4 FLOOR TILE INSTALLATION

- A. Lay out tiles from center marks established with principal walls, discounting minor offsets, so tiles at opposite edges of room are of equal width. Adjust as necessary to avoid using cut widths that equal less than one-half tile at perimeter.
 1. Lay tiles square with room axis, in pattern indicated
- B. Discard broken, cracked, chipped, or deformed tiles.
- C. Match tiles for color and pattern by selecting tiles from cartons in same sequence as manufactured and packaged if so numbered.
 1. Lay tiles quarter-turned pattern, in pattern of colors and sizes indicated.
- D. Adhered Flooring: Adhere products to substrates using a full spread of adhesive applied to substrate to comply with adhesive and flooring manufacturers' written instructions, including those for trowel notching, adhesive mixing, and adhesive open and working times.
 1. Provide completed installation without open cracks, voids, raising and puckering at joints, telegraphing of adhesive spreader marks, and other surface imperfections.
- E. Free-Lay Flooring: Place flooring at locations indicated with all units securely interconnected and fully seated on substrate to form a smooth, level surface.

3.5 FIELD-APPLIED FINISHES

- A. Apply finish according to manufacturer's written instructions to produce a sealed surface that is ready for use.
- B. Do not cover flooring after finishing until finish reaches full cure.

3.6 CLEANING AND PROTECTING

- A. Perform the following operations immediately after completing flooring installation:
 - 1. Remove adhesive and other blemishes from flooring surfaces.
 - 2. Sweep and vacuum flooring thoroughly.
 - 3. Damp-mop flooring to remove marks and soil after time period recommended in writing by manufacturer.
- B. Protect flooring from mars, marks, indentations, and other damage from construction operations and placement of equipment and fixtures during remainder of construction period. Use protection methods recommended in writing by manufacturer.
 - 1. Do not move heavy and sharp objects directly over flooring. Protect flooring with plywood or hardboard panels to prevent damage from storing or moving objects over flooring.

END OF SECTION 09 6566

SECTION 09 6620 - RESINOUS MATRIX TERRAZZO FLOORING

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

- A. Drawings and general provisions of the Contract, including General and Supplementary Conditions and Division 01 Specification Sections, apply to this Section.

1.2 SUMMARY

- A. Section Includes:
 - 1. Thin-set epoxy-resin terrazzo flooring and base.

1.3 SUBMITTALS

- A. Product Data: For each type of product indicated.
- B. Shop Drawings: Include terrazzo installation requirements. Include plans, elevations, sections, component details, and attachments to other work. Show layout of the following:
 - 1. Divider strips.
 - 2. Control-joint strips.
 - 3. Accessory strips.
 - 4. Terrazzo patterns.
- C. Samples for Verification: For each type, material, color, and pattern of terrazzo and accessory required showing the full range of color, texture, and pattern variations expected. Label each terrazzo sample to identify manufacturer's matrix color, types, sizes, and proportions. Prepare samples of same thickness and from same material to be used for the Work in size indicated below:
 - 1. **Terrazzo: 6-inch- (150-mm-) square Samples.**
 - 2. **Accessories: 6-inch- (150-mm-) long Samples of each exposed strip item required.**
- D. **Installer Certificates: Signed by manufacturers** certifying that installers comply with requirements.
- E. Qualification Data: For qualified Installer.
- F. Material Certificates: For each type of terrazzo material or product, from manufacturer.
- G. Maintenance Data: For terrazzo to include in maintenance manuals.

1.4 QUALITY ASSURANCE

- A. Installer Qualifications: A qualified installer who is acceptable to terrazzo manufacturer to install manufacturer's products.
 - 1. Engage an installer who is certified in writing by terrazzo manufacturer as qualified to install manufacturer's products.
- B. Source Limitations: Obtain primary terrazzo materials from one source from a single manufacturer. Provide secondary materials including patching and fill material, joint sealant, and repair materials of type and from source recommended by manufacturer of primary materials.
- C. Source Limitations for Aggregates: Obtain each color, grade, type, and variety of granular materials from one source with resources to provide materials of consistent quality in appearance and physical properties.
- D. NTMA Standards: Comply with NTMA's "Terrazzo Specifications and Design Guide" and with written recommendations for terrazzo type indicated unless more stringent requirements are specified.

1.5 DELIVERY, STORAGE, AND HANDLING

- A. Deliver materials to Project site in supplier's original wrappings and containers, labeled with source's or manufacturer's name, material or product brand name, and lot number if any.
- B. Store materials in their original, undamaged packages and containers, inside a well-ventilated area protected from weather, moisture, soiling, extreme temperatures, and humidity.

1.6 PROJECT CONDITIONS

- A. Environmental Limitations: Comply with manufacturer's written instructions for substrate temperature, ambient temperature, moisture, ventilation, and other conditions affecting terrazzo installation.
- B. Provide permanent lighting or, if permanent lighting is not in place, simulate permanent lighting conditions during terrazzo installation.
- C. Close spaces to traffic during terrazzo application and for not less than 24 hours after application unless manufacturer recommends a longer period.
- D. Control and collect dust produced by grinding operations. Protect adjacent construction from detrimental effects of grinding operations.
 - 1. Provide dustproof partitions and temporary enclosures to limit dust migration and to isolate areas from noise.

PART 2 - PRODUCTS

2.1 EPOXY-RESIN TERRAZZO

- A. Products: Subject to compliance with requirements, available products that may be incorporated into the Work include, but are not limited to, the following:
1. General Polymers Corporation; Terrazzo 1100.
- B. Materials:
1. Flexible Reinforcing Membrane: Manufacturer's resinous membrane for substrate crack preparation and reflective crack reduction.
 - a. Reinforcement: Fiberglass scrim.
 2. Primer: Manufacturer's product recommended for substrate and use indicated.
 3. Epoxy-Resin Matrix: Manufacturer's standard recommended for use indicated and in color required for mix indicated.
 - a. Physical Properties without Marble Chips or Aggregates:
 - 1) Hardness: 60 to 85 per ASTM D 2240, Shore D.
 - 2) Minimum Tensile Strength: 3000 psi (20.7 MPa) per ASTM D 638 for a 2-inch (51-mm) specimen made using a "C" die per ASTM D 412.
 - 3) Minimum Compressive Strength: 10,000 psi (6.9 MPa) per ASTM D 695, Specimen B cylinder.
 - 4) Chemical Resistance: No deleterious effects by contaminants listed below after seven-day immersion at room temperature per ASTM D 1308.
 - a) Distilled water.
 - b) Mineral water.
 - c) Isopropanol.
 - d) Ethanol.
 - e) 0.025 percent detergent solution.
 - f) 1.0 percent soap solution.
 - g) 10 percent sodium hydroxide.
 - h) 10 percent hydrochloric acid.
 - i) 30 percent sulfuric acid.
 - j) 5 percent acetic acid.
 - b. Physical Properties with Marble Chips or Aggregates: For resin blended with Georgia white marble, ground, grouted, and cured per requirements in NTMA's "Terrazzo Specifications and Design Guide," comply with the following:
 - 1) Flammability: Self-extinguishing, maximum extent of burning 0.25 inch (6.35 mm) per ASTM D 635.
 - 2) Thermal Coefficient of Linear Expansion: 0.0025 inch/inch per deg F (0.0025 mm/mm per 0.5556 deg C) for temperature range of minus 12 to plus 140 deg F (minus 24 to plus 60 deg C) per ASTM D 696.

4. Marble Chips and Aggregates: Complying with NTMA gradation standards for mix indicated and containing no deleterious or foreign matter.
 - a. Abrasion and Impact Resistance: Less than 40 percent loss per ASTM C 131.
 - b. 24-Hour Absorption Rate: Less than 0.75 percent.
 - c. Dust Content: Less than 1.0 percent by weight.
5. Finishing Grout: Resin based.
- C. Terrazzo: Comply with NTMA's "Terrazzo Specifications and Design Guide" and manufacturer's written instructions for matrix and marble-chip and aggregate proportions and mixing.
 1. Custom Mix Color and Pattern: Match existing.

2.2 STRIP MATERIALS

- A. Thin-Set Divider Strips: L-type angle or T-type, 1/4 inch (6.4 mm) deep.
 1. Material: White-zinc alloy, in color to match existing.
 2. Top Width: Match existing.
- B. Heavy-Top Divider Strips: L-type angle in depth required for topping thickness.
 1. Bottom-Section Material: Matching top-section material.
 2. Top-Section Material: White-zinc alloy, in color to match existing.
 3. Top-Section Width: Match existing.
- C. Control-Joint Strips: Separate, double L-type angles, positioned back to back, that match material, thickness, and color of divider strips and in depth required for topping thickness indicated.
- D. Accessory Strips: Match divider strip width, material, and color unless otherwise indicated. Use the following types of accessory strips as required to provide a complete installation:
 1. Base-bead strips for exposed top edge of terrazzo base.
 2. Edge-bead strips for exposed edges of terrazzo.

2.3 MISCELLANEOUS ACCESSORIES

- A. Strip Adhesive: Epoxy-resin adhesive recommended by adhesive manufacturer for this use and acceptable to terrazzo manufacturer.
- B. Anchoring Devices:
 1. Strips: Provide mechanical anchoring devices for strip materials as required for secure attachment to substrate.
- C. Patching and Fill Material: Terrazzo manufacturer's resinous product approved and recommended by manufacturer for application indicated.

- D. Joint Compound: Terrazzo manufacturer's resinous product approved and recommended by manufacturer for application indicated.
- E. Cleaner: Chemically neutral cleaner with pH factor between 7 and 10 that is biodegradable, phosphate free, and recommended by sealer manufacturer for use on terrazzo type indicated.
- F. Sealer: Slip- and stain-resistant penetrating-type sealer that is chemically neutral with pH factor between 7 and 10; does not affect color or physical properties of terrazzo; is recommended by sealer manufacturer; and complies with NTMA's "Terrazzo Specifications and Design Guide" for terrazzo type indicated.

PART 3 - EXECUTION

3.1 EXAMINATION

- A. Examine substrates and areas, with Installer present, for compliance with requirements for installation tolerances and other conditions affecting performance.
- B. Proceed with installation only after unsatisfactory conditions, including levelness tolerances, have been corrected.

3.2 PREPARATION

- A. Clean substrates of substances, including oil, grease, and curing compounds, that might impair terrazzo bond. Provide clean, dry, and neutral substrate for terrazzo application.
- B. Concrete Slabs:
 - 1. Provide sound concrete surfaces free of laitance, glaze, efflorescence, curing compounds, form-release agents, dust, dirt, grease, oil, and other contaminants incompatible with terrazzo.
 - a. Shot-blast surfaces with an apparatus that abrades the concrete surface, contains the dispensed shot within the apparatus, and recirculates the shot by vacuum pickup.
 - b. Repair damaged and deteriorated concrete according to terrazzo manufacturer's written recommendations.
 - c. Use patching and fill material to fill holes and depressions in substrates according to terrazzo manufacturer's written instructions.
 - 2. Verify that concrete substrates are visibly dry and free of moisture.
 - 3. Moisture Testing:
 - a. Test for moisture content by method recommended in writing by terrazzo manufacturer. Proceed with installation only after substrates pass testing.
- C. Protect other work from dust generated by grinding operations. Control dust to prevent air pollution and comply with environmental protection regulations.

1. Erect and maintain temporary enclosures and other suitable methods to limit dust migration and to ensure adequate ambient temperatures and ventilation conditions during installation.

D. Installation of terrazzo indicates acceptance of surfaces and conditions.

3.3 EPOXY-RESIN TERRAZZO INSTALLATION

A. General:

1. Comply with NTMA's written recommendations for terrazzo and accessory installation.
2. Place, rough grind, grout, cure grout, fine grind, and finish terrazzo according to manufacturer's written instructions and NTMA's "Terrazzo Specifications and Design Guide."
3. Installation Tolerance: Limit variation in terrazzo surface from level to 1/4 inch in 10 feet (6 mm in 3 m); noncumulative.
4. Ensure that matrix components and fluids from grinding operations do not stain terrazzo by reacting with divider and control-joint strips.
5. Delay fine grinding until heavy trade work is complete and construction traffic through area is restricted.

B. Thickness: 3/8 inch (9.5 mm) nominal.

C. Flexible Reinforcing Membrane:

1. Prepare and prefill substrate cracks with membrane material.
2. Install membrane to produce full substrate coverage in areas to receive terrazzo.
3. Reinforce membrane with fiberglass scrim.
4. Prepare membrane according to manufacturer's written instructions before applying substrate primer.

D. Primer: Apply to terrazzo substrates according to manufacturer's written instructions.

E. Strip Materials:

1. Divider and Control-Joint Strips:

- a. Locate divider strips per manufacturer's written instructions.
- b. Install control-joint strips back to back directly above concrete-slab control joints.
- c. Install control-joint strips with 1/4-inch (6.4-mm) gap between strips, and install sealant in gap.
- d. Install strips in adhesive setting bed without voids below strips, or mechanically anchor strips as required to attach strips to substrate, as recommended by strip manufacturer.

F. Fine Grinding: Grind with stones 120 grit or finer until all grout is removed from surface. Repeat rough grinding, grout coat, and fine grinding if large voids exist after initial fine grinding. Produce surface with a minimum of 70 percent aggregate exposure.

- G. Repair: Remove and replace terrazzo areas that evidence lack of bond with substrate. Cut out terrazzo areas in panels defined by strips and replace to match adjacent terrazzo, or repair panels according to NTMA's written recommendations, as approved by Architect.

3.4 CLEANING AND PROTECTION

A. Cleaning:

- 1. Remove grinding dust from installation and adjacent areas.
- 2. Wash surfaces with cleaner according to NTMA's written recommendations and manufacturer's written instructions; rinse surfaces with water and allow to dry thoroughly.

B. Sealing:

- 1. Seal surfaces according to NTMA's written recommendations.
- 2. Apply sealer according to sealer manufacturer's written instructions.

- C. Protection: Provide final protection and maintain conditions, in a manner acceptable to Installer, that ensure that terrazzo is without damage or deterioration at time of Substantial Completion.

END OF SECTION 09 6620

SECTION 096723 - RESINOUS FLOORING

PART 1 - GENERAL

1.1 SUMMARY

- A. Section Includes:
 - 1. Decorative resinous flooring systems with integral cove base.
 - 2. Transition Strips
 - 3. Divider Strips

1.2 ACTION SUBMITTALS

- A. Product Data: For each type of product indicated. Include manufacturer's technical data, surface preparation, storage and handling requirements, application instructions, and recommendations for each resinous flooring component required.
- B. Samples for Verification: For each resinous flooring system required, 6 inches square, applied to a rigid backing by Installer for this Project.
- C. Product Schedule: For resinous flooring. Use same designations indicated on Drawings.

1.3 INFORMATIONAL SUBMITTALS

- A. Installer Certificates: Signed by manufacturer certifying that installers comply with specified requirements. Minimum 10 years of experience installing 3/16" Colored Quartz decorative troweled mortar systems.. References to be provided by the Flooring installer.
- B. Material Certificates: For each resinous flooring component, from manufacturer.
- C. Manufacturer's Qualifications: Obtain 3/16" Colored Quartz Decorative Troweled Mortar System materials from a single manufacturer with a minimum of 10 years verifiable experience providing materials of the type specified in this section.
- D. Material Test Reports: For each resinous flooring system, by a qualified testing agency.
- E. Material Warranty: The contractor and the manufacturer shall furnish a standard guarantee of the 3/16" Colored Quartz Decorative Troweled Mortar System for a period of five years after installation. The labor and material guarantee shall include loss of bond and wear-through to the concrete substrate from normal use.

1.4 CLOSEOUT SUBMITTALS

- A. Maintenance Data: For resinous flooring to include in maintenance manuals. Manual shall include an Area summary with finish schedule. Area detail designating where each product/color/finish was used. Manual shall include safety data sheets, care and cleaning instructions, touch-up procedures, and color samples of each color and finish used.

1.5 QUALITY ASSURANCE

- A. Installer Qualifications: Manufacturer's authorized representative who is trained and approved for installation of flooring systems required for this Project.
 - 1. Engage an installer who has **minimum of 10 years experience** and is certified in writing by resinous flooring manufacturer as qualified to apply resinous flooring systems indicated.

- B. Source Limitations: Obtain primary resinous flooring materials, including primers, resins, hardening agents, grouting coats, and topcoats, from single source from single manufacturer. Provide secondary materials, including patching and fill material, joint sealant, and repair materials, of type and from source recommended by manufacturer of primary materials.
- C. Mockups: Apply mockups to verify selections made under sample submittals and to demonstrate aesthetic effects and set quality standards for materials and execution.
 - 1. Apply full-thickness mockups on area selected by Architect and indicated in the drawings, including metal trim strips to effectively document color separation and design.
 - 2. Approved mockups may become part of the completed Work if undisturbed at time of Substantial Completion.
- D. Preinstallation Conference: Conduct conference at Project site.

1.6 DELIVERY, STORAGE, AND HANDLING

- A. Deliver materials in original packages and containers, with seals unbroken, bearing manufacturer's labels indicating brand name and directions for storage and mixing with other components.

1.7 PROJECT CONDITIONS

- A. Environmental Limitations: Comply with resinous flooring manufacturer's written instructions for substrate temperature, ambient temperature, moisture, ventilation, and other conditions affecting resinous flooring application.
- B. The contractor shall visit the jobsite prior to the installation of the 3/16" Colored Quartz Decorative Troweled Mortar System to evaluate substrate condition, including substrate moisture transmission, quantity and severity of cracking, and the extent of repairs needed. Substrate imperfections should be repaired only after mechanical preparation of the substrate. Surface preparation reveals most imperfections requiring repair. Concrete substrates shall be tested to verify that the moisture vapor transmission of the substrate does not exceed the 3/16" Colored Quartz Decorative Troweled Mortar System manufacturers' recommendations. Cost associated with repair, leveling and remediation of the substrate are the responsibility of the provider of the substrate.
- C. The contractor should exercise care during surface preparation and system installation to protect surrounding substrates and surfaces, as well as in-place equipment. The contractor shall prepare the substrate to remove laitance and open the surface. This shall be achieved by light brush grit blasting. Surface profile achieved shall be similar to medium grit sandpaper and free from bond-inhibiting contaminants. Costs incurred that are associated with damage from negligence or inadequate protection shall be the sole responsibility of the contractor.
- D. The minimum slab temperature must be conditioned to 60 degrees F before commencing installation, during installation, and for at least 72 hours after installation is complete. The substrate temperature must be at least 5 degrees F above the dew point during installation.
- E. Close spaces to traffic during resinous flooring application and for not less than 24 hours after application unless manufacturer recommends a longer period.

PART 2 - PRODUCTS

2.1 DECORATIVE RESINOUS FLOORING

- A. Manufacturer: **Basis of Design EF-1: Dex-o-tex:**

1. 3/16" Colored Quartz Decorative Troweled Mortar System consists of 3579 Standard Primer / Binder as primer, 3561 Epoxy Resin Glaze as the binder resin, 5900C (Coarse) ESTES Ceramic Granules, 3745 Self-Leveling Epoxy Grout as the grout and 4409 WB Polyurethane Semi-gloss as seal coat A-200
 2. Quartz: Full line of available colors manufactured by Torignol
 3. Physical properties:
 - a. Hardness @ 24 hours, Shore D ASTM D2240: 85/65
 - b. Compressive Strength, ASTM C 579: 11,000 psi
 - c. Tensile Strength ASTM C 307 and ASTM D 638: 2,500 psi and 6,000 psi
 - d. Abrasion Resistance ASTM D 4060, 1000 cycles: 100mgs lost
 - e. Flammability: Self-extinguishing over concrete
- B. Primer: Manufacturers recommended primer for substrate conditions
- 2.2 METAL TRANSITIONS AND TRIM**
- A. Transition Strips, Basis of Design: Schluter Systems, refer to I000 drawing for finish and installation need.
1. Sized to meet the transition requirements for ADA compliance and flooring surfaces.
- B. Divider Strip: Basis of Design: Klein and Co. Terrazzo, L-Angle
1. Height to match epoxy and setting-bed thickness, 3/16" High
 2. Finish: Zinc (Z)

PART 3 - EXECUTION

3.1 PREPARATION

- A. General: Prepare and clean substrates according to resinous flooring manufacturer's written instructions for substrate indicated. Provide clean, dry substrate for resinous flooring application.
- B. Concrete Substrates: Provide sound concrete surfaces free of laitance, glaze, efflorescence, curing compounds, form-release agents, dust, dirt, grease, oil, and other contaminants incompatible with resinous flooring.
1. Roughen concrete substrates as follows:
 - a. Shot-blast surfaces with an apparatus that abrades the concrete surface, contains the dispensed shot within the apparatus, and recirculates the shot by vacuum pickup.
 - b. Comply with ASTM C 811 requirements unless manufacturer's written instructions are more stringent.
 2. Repair damaged and deteriorated concrete with flexible fiberglass scrim or according to resinous flooring manufacturer's written instructions.
 3. Repair and treat cracks and control joints according to resinous flooring manufacturer's written instructions. Additional treatment is considered excessive and must be bid on a per linear foot basis.
 4. Verify that concrete substrates are dry and moisture-vapor emissions are within acceptable levels according to manufacturer's written instructions.
 - a. Perform anhydrous calcium chloride test, ASTM F 1869. Proceed with application of resinous flooring only after substrates have maximum moisture-vapor-emission rate of 3 lb of water/1000 sq. ft. of slab area in 24 hours.
 5. Alkalinity and Adhesion Testing: Verify that concrete substrates have pH within acceptable range. Perform tests recommended by manufacturer. Proceed with application only after substrates pass testing.

6. Patching and Filling: Use patching and fill material to fill holes and depressions in substrates according to manufacturer's written instructions.
 - a. Control Joint Treatment: Treat control joints and other nonmoving substrate cracks to prevent cracks from reflecting through resinous flooring according to manufacturer's written instructions.
 7. Resinous Materials: Mix components and prepare materials according to resinous flooring manufacturer's written instructions.
 8. Flash patch up to installed metal trim as indicated at door way.
- C. Resinous Materials: Mix components and prepare materials according to resinous flooring manufacturer's written instructions.

3.2 APPLICATION

- A. General: Apply components of resinous flooring system according to manufacturer's written instructions to produce a uniform, monolithic wearing surface of thickness indicated.
1. Coordinate application of components to provide optimum adhesion of resinous flooring system to substrate, and optimum intercoat adhesion.
 2. Cure resinous flooring components according to manufacturer's written instructions. Prevent contamination during application and curing processes.
 3. At substrate expansion and isolation joints, comply with resinous flooring manufacturer's written instructions.
 4. Strictly adhere to mixing and installation methods, recoat windows, cure times and environmental restrictions.
 5. System is to be installed directly over non-moving control joints and cracks which have been treated with EPO-FLEX epoxy, and the 3/16" Colored Quartz Decorative Troweled Mortar System will terminate at the edge of isolation and expansion joints as designated by the Architect, Engineer or Design Professional
 6. All expansion joints must be honored through the flooring system.
- B. Apply 3579 Standard Primer / Binder over prepared substrate at manufacturer's recommended spreading rate.
- C. Apply reinforcing membrane to substrate cracks.
- D. Integral Cove Base: Apply cove base mix to wall surfaces before applying flooring. Apply according to manufacturer's written instructions and details, including those for taping, mixing, priming, troweling, sanding, and top coating of cove base. Round internal and external corners.
1. Integral Cove Base, as indicated on the drawings. Decorative quartz to be mixed into cove base prior to installation. Cove base to be finished with metal trim cap and silicone caulk bead
- E. Apply 3561Epoxy Resin Glaze 5900C (Coarse) Estes Ceramic Granules body coats in thickness indicated for flooring system. Hand or power trowel and grout to fill voids. When cured, remove trowel marks and roughness using method recommended by manufacturer. Texture, color, and finish to be seamless.
- F. Apply two-coats 3745 Self-Leveling Epoxy Grout in thickness indicated for flooring system. Refer to manufacturer's directions and recommended method.
- G. Apply WBU Polyurethane Flat as seal coat in number indicated for flooring system and at spreading rates recommended in writing by manufacturer.

3.3 CURING AND CLEANING

- A. Cure the 3/16" Colored Quartz Decorative Troweled Mortar System materials in compliance with manufacturer's directions, taking care to prevent contamination during stages of the installation and prior to completion of the curing process.

3.4 PROTECTION

- A. Protect resinous flooring from damage and wear during the remainder of construction period. Use protective methods and materials, including temporary covering, recommended in writing by resinous flooring manufacturer.

END OF SECTION 096723

SECTION 096813 - TILE CARPETING

PART 1 - GENERAL

1.1 SUMMARY

- A. Section includes modular, carpet tile and carpet tile used as walk of mats
- B. Related Requirements:
 - 1. Section 024119 "Selective Demolition" for removing existing floor coverings.
 - 2. Section 096513 "Resilient Base and Accessories" Section 096519 "Resilient Tile Flooring" for resilient wall base and accessories installed with carpet tile.

1.2 ACTION SUBMITTALS

- A. Product Data: For each type of product.
 - 1. Include manufacturer's written data on physical characteristics, durability, and fade resistance.
 - 2. Include installation recommendations for each type of substrate.
 - 3.
- B. Samples: For each of the following products and for each color and texture required. Label each Sample with manufacturer's name, material description, color, pattern, and designation indicated on Drawings and in schedules.
 - 1. Carpet Tile: Full-size Sample.
 - 2. Exposed Edge, Transition, and Other Accessory Stripping: 6-inch-long Samples.
- C. Product Schedule: For carpet tile. Use same designations indicated on Drawings.

1.3 INFORMATIONAL SUBMITTALS

- A. Qualification Data: For Installer.
- B. Product Test Reports: For carpet tile, for tests performed by a qualified testing agency.
- C. Sample Warranty: For special warranty.

1.4 CLOSEOUT SUBMITTALS

- A. Maintenance Data: For carpet tiles to include in maintenance manuals. Include the following:
 - 1. Methods for maintaining carpet tile, including cleaning and stain-removal products and procedures and manufacturer's recommended maintenance schedule.
 - 2. Precautions for cleaning materials and methods that could be detrimental to carpet tile.

1.5 MAINTENANCE MATERIAL SUBMITTALS

- A. Furnish extra materials, from the same product run, that match products installed and that are packaged with protective covering for storage and identified with labels describing contents.
 - 1. Carpet Tile: Full-size units equal to 5 percent of amount installed for each type indicated, but not less than 10 sq. yds.

1.6 QUALITY ASSURANCE

- A. Fire-Test-Response Ratings: Where indicated, provide carpet tile identical to those of assemblies tested for fire response according to NFPA 253 by a qualified testing agency.
 - 1. Critical Radiant Flux Classification: Not less than 0.45 W/sq. cm according to NFPA 253.
- B. Mockups: Build mockups to verify selections made under Sample submittals and to demonstrate aesthetic effects and set quality standards for fabrication and installation.
 - 1. Build mockups at locations and in sizes shown on Drawings.
 - 2. Subject to compliance with requirements, approved mockups may become part of the completed Work if undisturbed at time of Substantial Completion.

1.7 DELIVERY, STORAGE, AND HANDLING

- A. Comply with CRI 104.

1.8 FIELD CONDITIONS

- A. Comply with CRI 104 for temperature, humidity, and ventilation limitations.
- B. Environmental Limitations: Do not deliver or install carpet tiles until spaces are enclosed and weathertight, wet work in spaces is complete and dry, and ambient temperature and humidity conditions are maintained at occupancy levels during the remainder of the construction period.
- C. Do not install carpet tiles over concrete slabs until slabs have cured and are sufficiently dry to bond with adhesive and concrete slabs have pH range recommended by carpet tile manufacturer.
- D. Where demountable partitions or other items are indicated for installation on top of carpet tiles, install carpet tiles before installing these items.

1.9 WARRANTY

- A. Special Warranty for Carpet Tiles: Manufacturer agrees to repair or replace components of carpet tile installation that fail in materials or workmanship within specified warranty period.
 - 1. Warranty does not include deterioration or failure of carpet tile due to unusual traffic, failure of substrate, vandalism, or abuse.
 - 2. Failures include, but are not limited to, more than 10 percent edge raveling, snags, runs, dimensional stability, excess static discharge, loss of tuft bind strength, loss of face fiber, and delamination.
 - 3. Warranty Period: 15 years from date of Substantial Completion.

PART 2 - PRODUCTS

2.1 CARPET TILE (WOM-1 and 2)

- A. Products: Refer to Color and Finish Schedule on Drawing I000 for Manufacturer, Product, and Finish.
- B. Basis-of-Design Product: Subject to compliance with requirements, provide the product indicated on Drawing I000 or a comparable product by one of the following:
 - 1. Interface
 - 2. Tandus/Johnsonite
 - 3. Patcraft

- C. Comparable Products: Comply with the requirements of Section 01 1600 "Product Requirements" and with the following characteristics of the Basis-of-Design product.
- D. Fiber Content: Solution Dyed Textile Composite

2.2 INSTALLATION ACCESSORIES

- A. Trowelable Leveling and Patching Compounds: Latex-modified, hydraulic-cement-based formulation provided or recommended by carpet tile manufacturer.
- B. Adhesives: Water-resistant, mildew-resistant, non-staining, pressure-sensitive type to suit products and subfloor conditions indicated, that complies with flammability requirements for installed carpet tile and is recommended by carpet tile manufacturer for releasable installation.
 - 1. Adhesives shall have a VOC content of 50 g/L or less when calculated according to 40 CFR 59, Subpart D (EPA Method 24).
- C. Metal Edge/Transition Strips: Extruded aluminum with mill finish of profile and width shown, of height required to protect exposed edge of carpet, and of maximum lengths to minimize running joints.

PART 3 - EXECUTION

3.1 EXAMINATION

- A. Examine substrates, areas, and conditions, with Installer present, for compliance with requirements for maximum moisture content, alkalinity range, installation tolerances, and other conditions affecting carpet tile performance. Examine carpet tile for type, color, pattern, and potential defects.
- B. Concrete Subfloors: Verify that concrete slabs comply with ASTM F 710 and the following:
 - 1. Slab substrates are dry and free of foreign materials that may interfere with adhesive bond. Determine adhesion and dryness characteristics by performing bond and moisture tests recommended by carpet tile manufacturer.
 - 2. Subfloors are free of cracks, ridges, depressions, scale, and foreign deposits.
- C. Proceed with installation only after unsatisfactory conditions have been corrected.

3.2 PREPARATION

- A. General: Comply with CRI 104, Section 6.2, "Site Conditions; Floor Preparation," and with carpet tile manufacturer's written installation instructions for preparing substrates indicated to receive carpet tile installation.
- B. Remove coatings, including curing compounds, and other substances that are incompatible with adhesives and that contain soap, wax, oil, or silicone, without using solvents. Use mechanical methods recommended in writing by carpet tile manufacturer.
- C. Floor Preparation Sequence
 - 1. Fill cracks, holes, and depressions in substrates with trowelable leveling and patching compound; remove bumps and ridges. Fill or level cracks, holes and depressions 1/8 inch wide or wider and protrusions more than 1/32 inch unless more stringent requirements are required by manufacturer's written instructions.

2. Flash Patch and Skim Coat the entire floor surface. Lightly sand ridges and bumps using a commercial grade floor sander to produce uniform and smooth substrate.
- D. Broom and vacuum clean substrates to be covered immediately before installing carpet tile.

3.3 INSTALLATION

- A. General: Comply with CRI 104, Section 14, "Carpet Modules," and with carpet tile manufacturer's written installation instructions.
- B. Installation Method: As recommended in writing by carpet tile manufacturer.
- C. Maintain dye lot integrity. Do not mix dye lots in same area.
- D. Cut and fit carpet tile to butt tightly to vertical surfaces, permanent fixtures, and built-in furniture including cabinets, pipes, outlets, edgings, thresholds, and nosings. Bind or seal cut edges as recommended by carpet tile manufacturer.
- E. Extend carpet tile into toe spaces, door reveals, closets, open-bottomed obstructions, removable flanges, alcoves, and similar openings.
- F. Maintain reference markers, holes, and openings that are in place or marked for future cutting by repeating on finish flooring as marked on subfloor. Use nonpermanent, non-staining marking device.
- G. Install pattern as indicated on drawings and in schedule.

3.4 CLEANING AND PROTECTION

- A. Perform the following operations immediately after installing carpet tile:
1. Remove excess adhesive, seam sealer, and other surface blemishes using cleaner recommended by carpet tile manufacturer.
 2. Remove yarns that protrude from carpet tile surface.
 3. Vacuum carpet tile using commercial machine with face-beater element.
- B. Protect installed carpet tile to comply with CRI 104, Section 16, "Protecting Indoor Installations."
- C. Protect carpet tile against damage from construction operations and placement of equipment and fixtures during the remainder of construction period. Use protection methods indicated or recommended in writing by carpet tile manufacturer.

END OF SECTION 096813

SECTION 097200 - DIGITAL WALL FILM

PART 1 - GENERAL

1.1 SUMMARY

- A. Section Includes:
1. Digital Printed Graphic Film.

1.2 SUBMITTALS

- A. Product Data: For each type of product indicated. Include data on physical characteristics, durability, fade resistance, and flame-resistance characteristics.
- B. Samples for Verification: Full width by 36-inch- long section of wall covering.
1. Sample from same print run or dye lot to be used for the Work, with specified treatments or paint applied. Show complete pattern repeat. Mark top and face of fabric.
 2. Sample from same flitch to be used for the Work, with specified finish applied.
- C. Product Schedule: For wall coverings.
- D. Product Test Reports: Based on evaluation of comprehensive tests performed by a qualified testing agency, for wall covering.
- E. Maintenance Data: For wall coverings to include in maintenance manuals.

1.3 QUALITY ASSURANCE

- A. Fire-Test-Response Characteristics: As determined by testing identical wall coverings applied with identical adhesives to substrates according to test method indicated below by a qualified testing agency. Identify products with appropriate markings of applicable testing agency.
1. Surface-Burning Characteristics: As follows, per ASTM E 84:
 - a. Flame-Spread Index: 25 or less.
 - b. Smoke-Developed Index: 450 or less.
 2. Fire-Growth Contribution: Textile wall coverings complying with acceptance criteria of UBC Standard 8-2.
 3. Fire-Growth Contribution: Textile wall coverings tested according to NFPA 286 and complying with test protocol and criteria in the 2003 IBC.
- B. Mockups: Build mockups to verify selections made under sample submittals and to demonstrate aesthetic effects and set quality standards for fabrication and installation.
1. Build mockups for each type of wall covering on each substrate required. Comply with requirements in ASTM F 1141.
 2. Approved mockups may become part of the completed Work if undisturbed at time of Substantial Completion.

1.4 PROJECT CONDITIONS

- A. Environmental Limitations: Do not deliver or install wall coverings until spaces are enclosed and weathertight, wet work in spaces is complete and dry, work above ceilings is complete, and temporary HVAC system is operating and maintaining ambient temperature and humidity conditions at occupancy levels during the remainder of the construction period.
1. Wood-Veneer Wall Coverings: Condition spaces for not less than 48 hours before installation.

- B. Lighting: Do not install wall covering until a permanent level of lighting is provided on the surfaces to receive wall covering.
- C. Ventilation: Provide continuous ventilation during installation and for not less than the time recommended by wall-covering manufacturer for full drying or curing.

PART 2 - PRODUCTS

2.1 VINYL GRAPHIC DIGITAL FILM

- A. Basis-of-Design Product: Subject to compliance with requirements, provide the product indicated on drawing I000.

2.2 ACCESSORIES

- A. Adhesive: Adhesive, for use with specific film and substrate application as recommended in writing by the manufacturer.

PART 3 - EXECUTION

3.1 EXAMINATION

- A. Examine substrates and conditions, with Installer present, for compliance with requirements for levelness, wall plumbness, maximum moisture content, and other conditions affecting performance of the Work.
- B. Proceed with installation only after unsatisfactory conditions have been corrected.

3.2 PREPARATION

- A. Comply with manufacturer's written instructions for surface preparation.
- B. Clean substrates of substances that could impair bond of wall covering, including dirt, oil, grease, mold, mildew, and incompatible primers.
- C. Prepare substrates to achieve a smooth, dry, clean, structurally sound surface free of flaking, unsound coatings, cracks, and defects.
 - 1. Moisture Content: Maximum of 5 percent on new plaster, concrete, and concrete masonry units when tested with an electronic moisture meter.
 - 2. Plaster: Allow new plaster to cure. Neutralize areas of high alkalinity. Prime with primer as recommended in writing by primer/sealer manufacturer and wall-covering manufacturer.
 - 3. Gypsum Board: Prime with primer as recommended in writing by primer/sealer manufacturer and wall-covering manufacturer.
 - 4. Painted Surfaces: Treat areas susceptible to pigment bleeding.
- D. Check painted surfaces for pigment bleeding. Sand gloss, semigloss, and eggshell finish with fine sandpaper.
- E. Remove hardware and hardware accessories, electrical plates and covers, light fixture trims, and similar items.

3.3 INSTALLATION

- A. General: Comply with manufacturers' written installation instructions applicable to products and applications indicated except where more stringent requirements apply.

- B. Fully bond film to substrate. Remove air bubbles, wrinkles, blisters, and other defects.
- C. Trim edges and seams for color uniformity, pattern match, and tight closure. Butt seams without any overlay or spacing between strips.

3.4 CLEANING

- A. Remove excess adhesive at finished seams, perimeter edges, and adjacent surfaces.
- B. Use cleaning methods recommended in writing by wall-covering manufacturer.
- C. Replace strips that cannot be cleaned.
- D. Reinstall hardware and hardware accessories, electrical plates and covers, light fixture trims, and similar items.

END OF SECTION 097200

SECTION 099123 - INTERIOR PAINTING

PART 1 - GENERAL

1.1 SUMMARY

- A. This Section includes surface preparation and the application of paint systems on the following interior substrates:
1. Concrete masonry units (CMU).
 2. Steel.
 3. Galvanized metal.
 4. Wood.
 5. Gypsum board.
 6. Plaster.
 7. Concrete (stained)
- B. Related Sections include the following:
1. Division 05 Sections for shop priming of metal substrates with primers specified in this Section.
 2. Division 06 Sections for shop priming carpentry with primers specified in this Section.
 3. Division 08 Sections for factory priming doors with primers specified in this Section.
 4. See "I" Drawings for selection of basis-of-design paint manufacturers and colors.
 5. Division 09 Section "High-Performance Coatings" for epoxy paint.

1.2 SUBMITTALS

- A. Product Data: For each type of product indicated.
- B. Samples for Initial Selection: For each type of topcoat product indicated.
- C. Product List: For each product indicated, include the following:
1. Cross-reference to paint system and locations of application areas. Use same designations indicated on Drawings and in schedules.
 2. Printout of current "MPI Approved Products List" for each product category specified in Part 2, with the proposed product highlighted.

1.3 QUALITY ASSURANCE

- A. MPI Standards:
1. Products: Complying with MPI standards indicated and listed in "MPI Approved Products List."
 2. Preparation and Workmanship: Comply with requirements in "MPI Architectural Painting Specification Manual" for products and paint systems indicated and with requirements as specified.
 3. Preparation of Existing Surfaces: Comply with requirements "MPI Maintenance Repainting Manual" for products and paint systems indicated and with requirements as specified.

1.4 DELIVERY, STORAGE, AND HANDLING

- A. Store materials not in use in tightly covered containers in well-ventilated areas with ambient temperatures continuously maintained at not less than 45 deg F.
1. Maintain containers in clean condition, free of foreign materials and residue.
 2. Remove rags and waste from storage areas daily.

1.5 PROJECT CONDITIONS

- A. Apply paints only when temperature of surfaces to be painted and ambient air temperatures are between 50 and 95 deg F.
- B. Do not apply paints when relative humidity exceeds 85 percent; at temperatures less than 5 deg F above the dew point; or to damp or wet surfaces.

1.6 EXTRA MATERIALS

- A. Furnish extra materials described below that are from same production run (batch mix) as materials applied and that are packaged for storage and identified with labels describing contents.
 - 1. Quantity: Furnish an additional 5 percent, but not less than 1 gal. of each material and color applied.

PART 2 - PRODUCTS

2.1 MANUFACTURERS

- A. Basis-of-Design Product: Subject to compliance with requirements, provide the follow product
 - 1. Sherwin Williams
 - 2. Benjamin Moore & Co.
 - 3. Glidden Paints

2.2 PAINT, GENERAL

- A. Material Compatibility:
 - 1. Provide materials for use within each paint system that are compatible with one another and substrates indicated, under conditions of service and application as demonstrated by manufacturer, based on testing and field experience.
 - 2. For each coat in a paint system, provide products recommended in writing by manufacturers of topcoat for use in paint system and on substrate indicated.
- B. Colors: As indicated on the I Drawings.

2.3 PATCHING MATERIALS

- A. Wood Patching Compound: 2-part polyester or epoxy-resin wood compound with a 10- to 15-minute cure at 70 deg F, in knife grade formulation and recommended by manufacturer for type of wood repair indicated. Compound shall be produced for filling damaged wood materials that have deteriorated due to weathering and exposure. Filler shall be capable of filling deep holes and capable of spreading to featheredge.
- B. Metal Patching Compound: 2-part polyester-resin metal patching compound with a 10- to 15-minute cure at 70 deg F, in knife grade formulation and recommended by manufacturer for type of metal repair indicated. Compound shall be produced for filling metal that has deteriorated due to corrosion. Filler shall be capable of filling deep holes and capable of spreading to featheredge.
- C. Interior Plaster Patching Compound: Provide spackle and plaster patching compounds and repair materials specifically manufactured for surface preparation and sanding prior to repainting.

2.4 CLEANING MATERIALS

- A. Detergent Cleaning Solution: Mix 2 cups of tetrasodium polyphosphate, 1/2 cup of laundry detergent, 5 quarts of 5 percent sodium hypochlorite bleach, and 15 quarts of warm water for each 5 gal. of solution required.

- B. Job-Mixed Mold, Mildew, and Algae Remover: Mix 2 cups of tetrasodium polyphosphate, 5 quarts of 5 percent sodium hypochlorite bleach, and 15 quarts of hot water for every 5 gal. of solution required.

2.5 BLOCK FILLERS

- A. Interior/Exterior Latex Block Filler: MPI #4.

2.6 PRIMERS/SEALERS

- A. Interior Latex Primer/Sealer: MPI #50.

2.7 METAL PRIMERS

- A. Rust-Inhibitive Primer (Water Based): MPI #107.
- B. Waterborne Galvanized-Metal Primer: MPI #134.

2.8 LATEX PAINTS

- A. Institutional Low-Odor/VOC Latex (Eggshell): MPI #145
- B. Institutional Low-Odor/VOC Latex (Semigloss): MPI #147

2.9 CONCRETE STAIN

- A. Manufacturer: Increte systems
- B. Product: Stain-Crete
 1. Description: Deep penetrating acid based stain to cured concrete
 2. Sealer: Manufacturers Clear Seal

PART 3 - EXECUTION

3.1 EXAMINATION

- A. Examine substrates and conditions, with Applicator present, for compliance with requirements for maximum moisture content and other conditions affecting performance of work.
- B. Maximum Moisture Content of Substrates: When measured with an electronic moisture meter as follows:
 1. Concrete: 12 percent.
 2. Masonry (Clay and CMU): 12 percent.
 3. Wood: 15 percent.
 4. Gypsum Board: 12 percent.
 5. Plaster: 12 percent.
- C. Verify suitability of substrates, including surface conditions and compatibility with existing finishes and primers.
- D. Begin coating application only after unsatisfactory conditions have been corrected and surfaces are dry.
 1. Beginning coating application constitutes Contractor's acceptance of substrates and conditions.

3.2 PREPARATION

- A. Comply with manufacturer's written instructions and recommendations in "MPI Architectural Painting Specification Manual" applicable to substrates indicated.

- B. Remove plates, machined surfaces, and similar items already in place that are not to be painted. If removal is impractical or impossible because of size or weight of item, provide surface-applied protection before surface preparation and painting.
 - 1. After completing painting operations, use workers skilled in the trades involved to reinstall items that were removed. Remove surface-applied protection if any.
 - 2. Do not paint over labels of independent testing agencies or equipment name, identification, performance rating, or nomenclature plates.
- C. Surface Preparation Methods: Wash surfaces by hand cleaning using clean rags, sponges, water, and detergent, or other method as follows:
 - 1. Hand-Tool Cleaning: Use wet sanding and wet scraping methods. Hand tools include scrapers, wire brushes, sandpaper, steel wool, nonmetallic pads, and dusters.
 - 2. Solvent Cleaning: Remove oil, grease, smoke, tar, and asphalt from painted or unpainted surfaces with solvents. Use clean solvent and clean rags for the final wash to remove all foreign materials.
 - 3. Power Tool Cleaning: Power tool equipment shall be used with vacuum filter attachments.
- D. General: Clean substrates of substances that could impair bond of paints, including dirt, oil, grease, and incompatible paints and encapsulants.
 - 1. Clean existing surfaces to remove loose dirt and dust.
 - 2. Remove surface films that will prevent proper adhesion.
 - 3. Treat existing gloss sheen paint finishes with de-glosser to dull the surface.
 - 4. Remove loose, blistered, or otherwise defective paint; smooth edges with sandpaper.
 - 5. Clean corroded iron or steel surfaces to bright metal.
 - 6. Spackle and sand gypsum and plaster surfaces.
 - 7. Prime bare surfaces.
 - 8. If existing surfaces cannot be prepared to an acceptable condition for proper finishing by using specified surface-preparation methods, notify Architect in writing.
- E. Existing Sound Painted Substrates: Clean tightly-adhered paint film, with no evidence of cracking, checking, blistering, or lack of adhesion as follows:
 - 1. Wash areas to be repainted; use mild detergent solution, and rinse with clean water until all detergent has been removed.
 - 2. Remove dirt, mildew and chalking from the surface without damaging the substrates or adjacent areas.
 - 3. At existing smooth metal surfaces that have been previously painted, use deglosser before applying paint.
 - 4. Allow washed areas to dry before painting.
- F. Existing Deteriorated Painted Substrates: Clean cracked or loose paint film showing moderate cracking, checking, blistering, erosion, and loss of adhesion as follows:
 - 1. Treat areas as specified for sound existing paint above.
 - 2. After washing, carefully examine surface for cracking, blistering, peeling, or flaking paint.
 - 3. Remove cracked, blistered, and nonadhering paint.
 - 4. Scrape and sand edges smooth so that edges will not telegraph through new paint finish.
 - 5. Wipe surface clean to remove remaining dust.
- G. Pre-Painted Plaster Substrates: Wash all areas to be painted with a mild detergent solution; rinse with clean water until all detergent has been removed.
 - 1. Rout out surface cracks to remove loose, unsound plaster material; fill with patching compound and wet sand. Spot-prime with specified primer.
 - 2. Allow washed areas to dry thoroughly before painting.

- H. Concrete Masonry Substrates: Remove efflorescence and chalk. Do not paint surfaces if moisture content or alkalinity of surfaces to be painted exceeds that permitted in manufacturer's written instructions.
- I. Steel Substrates: Remove rust and loose mill scale. Clean using methods recommended in writing by paint manufacturer.
 - 1. Existing Steel: Fill holes from rust removal with metal filler. Allow to dry thoroughly and sand smooth.
- J. Galvanized-Metal Substrates: Remove grease and oil residue from galvanized sheet metal fabricated from coil stock by mechanical methods to produce clean, lightly etched surfaces that promote adhesion of subsequently applied paints.
- K. Wood Substrates:
 - 1. Scrape and clean knots, and apply coat of knot sealer before applying primer.
 - 2. Sand surfaces that will be exposed to view, and dust off.
 - 3. Prime edges, ends, faces, undersides, and backsides of wood.
 - 4. After priming, fill holes and imperfections in the finish surfaces with putty or plastic wood filler. Sand smooth when dried.
 - 5. Existing Wood: Fill gouges and cracks with wood filler. Allow to dry and sand smooth. Apply primer, and lightly sand prior to finishing.
- L. Gypsum Board Substrates: Do not begin paint application until finishing compound is dry and sanded smooth.
- M. Plaster Substrates: Do not begin paint application until plaster is fully cured and dry.
- N. Concrete floor substrate.
 - 1. Allow new concrete to fully cure. New concrete to be cured with water and a moisture retaining cover. Do not use curing compounds on surfaces to receive concrete stain.
 - 2. Do not stain surfaces if moisture content of surfaces to be stained exceeds that permitted in manufacturer's written instructions.
 - 3. Apply stain in accordance with Manufacturers printed instructions.
 - 4. Provide mechanical ventilation during the application and drying process
 - 5. Apply 2 coats to achieve require results.
 - 6. Apply manufacturers recommended clear sealer upon completion.

3.3 APPLICATION

- A. Apply paints according to manufacturer's written instructions.
 - 1. Use applicators and techniques suited for paint and substrate indicated.
 - 2. Paint surfaces behind movable equipment and furniture same as similar exposed surfaces. Before final installation, paint surfaces behind permanently fixed equipment or furniture with prime coat only.
 - 3. Paint front and backsides of access panels, removable or hinged covers, and similar hinged items to match exposed surfaces.
- B. If undercoats or other conditions show through topcoat, apply additional coats until cured film has a uniform paint finish, color, and appearance.
- C. Apply paints to produce surface films without cloudiness, spotting, holidays, laps, brush marks, roller tracking, runs, sags, ropiness, or other surface imperfections. Cut in sharp lines and color breaks.
- D. Painting Mechanical and Electrical Work: Paint items exposed in equipment rooms and occupied spaces including, but not limited to, the following:
 - 1. Mechanical Work:

- a. Uninsulated metal piping.
- b. Uninsulated plastic piping.
- c. Pipe hangers and supports.
- d. Tanks that do not have factory-applied final finishes.
- e. Visible portions of internal surfaces of metal ducts, without liner, behind air inlets and outlets.
- f. Duct, equipment, and pipe insulation having cotton or canvas insulation covering or other paintable jacket material.
- g. Mechanical equipment that is indicated to have a factory-primed finish for field painting.
- 2. Electrical Work:
 - a. Switchgear.
 - b. Panelboards.
 - c. Electrical equipment that is indicated to have a factory-primed finish for field painting.

3.4 CLEANING AND PROTECTION

- A. At end of each workday, remove rubbish, empty cans, rags, and other discarded materials from Project site.
- B. After completing paint application, clean spattered surfaces. Remove spattered paints by washing, scraping, or other methods. Do not scratch or damage adjacent finished surfaces.
- C. Protect work of other trades against damage from paint application. Correct damage to work of other trades by cleaning, repairing, replacing, and refinishing, as approved by Architect, and leave in an undamaged condition.
- D. At completion of construction activities of other trades, touch up and restore damaged or defaced painted surfaces.

3.5 INTERIOR PAINTING SCHEDULE

- A. CMU Substrates:
 - 1. Institutional Low-Odor/VOC Latex System: MPI INT 4.2E.
 - a. Prime Coat: Interior/exterior latex block filler.
 - b. Intermediate Coat: Institutional low-odor/VOC interior latex matching topcoat.
 - c. Topcoat: Institutional low-odor/VOC interior latex (eggshell).
- B. Steel Substrates:
 - 1. Institutional Low-Odor/VOC Latex System: MPI INT 5.1S.
 - a. Prime Coat: Rust-inhibitive primer (water based).
 - b. Intermediate Coat: Institutional low-odor/VOC interior latex matching topcoat.
 - c. Topcoat: Institutional low-odor/VOC interior latex (semigloss).
- C. Galvanized-Metal Substrates:
 - 1. Institutional Low-Odor/VOC Latex System: MPI INT 5.3N.
 - a. Prime Coat: Waterborne galvanized-metal primer.
 - b. Intermediate Coat: Institutional low-odor/VOC interior latex matching topcoat.
 - c. Topcoat: Institutional low-odor/VOC interior latex (semigloss).
- D. Dressed Lumber Substrates: Including architectural woodwork and doors.
 - 1. Institutional Low-Odor/VOC Latex System: MPI INT 6.3V.
 - a. Prime Coat: Interior latex-based wood primer.
 - b. Intermediate Coat: Institutional low-odor/VOC interior latex matching topcoat.
 - c. Topcoat: Institutional low-odor/VOC interior latex (semigloss).

E. Gypsum Board Substrates:

1. Institutional Low-Odor/VOC Latex System: MPI INT 9.2M.
 - a. Prime Coat: Interior latex primer/sealer.
 - b. Intermediate Coat: Institutional low-odor/VOC interior latex matching topcoat.
 - c. Topcoat: Institutional low-odor/VOC interior latex (eggshell).

END OF SECTION 099123

SECTION 099600 - HIGH-PERFORMANCE COATINGS

PART 1 - GENERAL

1.1 SUMMARY

- A. Section includes:
 - 1. Epoxy Paint
- B. Section includes surface preparation and application of high-performance coating systems on the following interior substrates:
 - 1. Concrete masonry units (CMU).
 - 2. Gypsum board.
- C. Related Requirements:
 - 1. Section 099123 "Interior Painting" for special-use coatings and general field painting.

1.2 DEFINITIONS

- A. Gloss Level 3: 10 to 25 units at 60 degrees and 10 to 35 units at 85 degrees, according to ASTM D 523, an eggshell finish.
- B. Gloss Level 5: 35 to 70 units at 60 degrees, according to ASTM D 523, a semi-gloss finish.
- C. Gloss Level 6: 70 to 85 units at 60 degrees, according to ASTM D 523, a gloss finish.
- D. Gloss Level 7: More than 85 units at 60 degrees, according to ASTM D 523, a high-gloss finish.

1.3 ACTION SUBMITTALS

- A. Product Data: For each type of product. Include preparation requirements and application instructions.
- B. Samples for Initial Selection: For each type and color of topcoat product, in manufacturer's standard sample size.
- C. Samples for Verification: For each type of paint system and in each color and gloss of topcoat.
 - 1. Submit Samples on rigid backing.
 - 2. Step coats on Samples to show each coat required for system.
 - 3. Label each coat of each Sample.
 - 4. Label each Sample for location and application area.

1.4 CLOSEOUT SUBMITTALS

- A. Coating Maintenance Manual: Provide coating maintenance manual including area summary with finish schedule, area detail designating location where each product/color/finish was used, product data pages, material safety data sheets, care and cleaning instructions, touch-up procedures, and color samples of each color and finish used.

1.5 MAINTENANCE MATERIAL SUBMITTALS

- A. Furnish extra materials that match products installed and that are packaged with protective covering for storage and identified with labels describing contents.
 - 1. Paint: **5** percent, but not less than **1 gal.** of each material and color applied.

1.6 DELIVERY, STORAGE, AND HANDLING

- A. Delivery and Handling: Deliver products to Project site in an undamaged condition in manufacturer's original sealed containers, complete with labels and instructions for handling, storing, unpacking, protecting, and installing. Packaging shall bear the manufacturer's label with the following information:
 - 1. Product name and type (description).
 - 2. Batch date.
 - 3. Color number.
 - 4. VOC content.
 - 5. Environmental handling requirements.
 - 6. Surface preparation requirements.
 - 7. Application instructions.
- B. Store materials not in use in tightly covered containers in well-ventilated areas with ambient temperatures continuously maintained at not less than 45 deg F.
 - 1. Maintain containers in clean condition, free of foreign materials and residue.
 - 2. Remove rags and waste from storage areas daily.

1.7 FIELD CONDITIONS

- A. Apply paints only when temperature of surfaces to be painted and ambient air temperatures are between 50 and 95 deg F.
- B. Do not apply paints when relative humidity exceeds 85 percent; at temperatures less than 5 deg F above the dew point; or to damp or wet surfaces.
- C. Lead Paint: It is not expected that lead paint will be encountered in the Work.
 - 1. If suspected lead paint is encountered, do not disturb; immediately notify Architect and Owner.

PART 2 - PRODUCTS

2.1 MANUFACTURERS

- A. Epoxy Paint - Basis-of-Design Product: Subject to compliance with requirements, provide products indicated on drawing I250 or comparable product from one of the following:
 - 1. Benjamin Moore & Co.
 - 2. PPG Architectural Finishes, Inc.
 - 3. Valspar
- B. Erasable Marker Board Paint - Basis-of-Design Product: Subject to compliance with requirements, provide products indicated on drawing I250 or comparable product from one of the following:
 - 1. Sherwin Williams.
 - 2. IdeaPaint U.S.
 - 3. Koroseal, Inc
- C. Source Limitations: Obtain paint materials from single source from single listed manufacturer.
 - 1. Manufacturer's designations listed on a separate color schedule are for color reference only and do not indicate prior approval.

2.2 HIGH-PERFORMANCE COATINGS, EPOXY PAINT (EPT-#)

- A. MPI Standards: Provide products that comply with MPI standards indicated and are listed in "MPI Approved Products List."

B. Material Compatibility:

1. Provide materials for use within each coating system that are compatible with one another and substrates indicated, under conditions of service and application as demonstrated by manufacturer, based on testing and field experience.
2. For each coat in a coating system, provide products recommended in writing by manufacturers of topcoat for use in coating system and on substrate indicated.
3. Provide products of same manufacturer for each coat in a coating system.

2.3 SOURCE QUALITY CONTROL

A. Testing of Coating Materials: Owner reserves the right to invoke the following procedure:

1. Owner will engage the services of a qualified testing agency to sample coating materials. Contractor will be notified in advance and may be present when samples are taken. If coating materials have already been delivered to Project site, samples may be taken at Project site. Samples will be identified, sealed, and certified by testing agency.
2. Testing agency will perform tests for compliance with product requirements.
3. Owner may direct Contractor to stop applying paints if test results show materials being used do not comply with product requirements. Contractor shall remove noncomplying coating materials from Project site, pay for testing, and recoat surfaces coated with rejected materials. Contractor will be required to remove rejected materials from previously coated surfaces if, on recoating with complying materials, the two coatings are incompatible.

PART 3 - EXECUTION

3.1 EXAMINATION

A. Examine substrates and conditions, with Applicator present, for compliance with requirements for maximum moisture content and other conditions affecting performance of the Work. Verify suitability of substrates, including surface conditions and compatibility with existing finishes and primers. Where acceptability of substrate conditions is in question, apply samples and perform in-situ testing to verify compatibility, adhesion, and film integrity of new paint application.

1. Report, in writing, conditions that may affect application, appearance, or performance of paint.

B. Substrate Conditions:

1. Maximum Moisture Content of Substrates: When measured with an electronic moisture meter as follows:
 - a. Concrete: 12 percent
 - b. Masonry (Clay and CMU): 12 percent.
 - c. Wood: 15 percent
 - d. Gypsum Board: 12 percent.
 - e. Plaster: 12 percent
2. Gypsum Board Substrates: Verify that finishing compound is sanded smooth.
3. Plaster Substrates: Verify that plaster is fully cured.

C. Proceed with coating application only after unsatisfactory conditions have been corrected; application of coating indicates acceptance of surfaces and conditions.

1. Application of coating indicates acceptance of surfaces and conditions.

3.2 PREPARATION

A. Comply with manufacturer's written instructions and recommendations in "MPI Manual" applicable to substrates indicated.

- B. Remove hardware, covers, plates, and similar items already in place that are removable and are not to be painted. If removal is impractical or impossible because of size or weight of item, provide surface-applied protection before surface preparation and painting.
 - 1. After completing painting operations, use workers skilled in the trades involved to reinstall items that were removed. Remove surface-applied protection if any.
- C. Clean substrates of substances that could impair bond of paints, including dust, dirt, oil, grease, and incompatible paints and encapsulants.
 - 1. Remove incompatible primers and reprime substrate with compatible primers or apply tie coat as required to produce paint systems indicated.
- D. Masonry Substrates: Remove efflorescence and chalk. Do not paint surfaces if moisture content or alkalinity of surfaces or mortar joints exceed that permitted in manufacturer's written instructions.

3.3 APPLICATION

- A. Apply paints according to manufacturer's written instructions and to recommendations in "MPI Manual."
 - 1. Use applicators and techniques suited for paint and substrate indicated.
 - 2. Paint surfaces behind movable equipment and furniture same as similar exposed surfaces. Before final installation, paint surfaces behind permanently fixed equipment or furniture with prime coat only.
 - 3. Paint front and backsides of access panels, removable or hinged covers, and similar hinged items to match exposed surfaces.
 - 4. Do not paint over labels of independent testing agencies or equipment name, identification, performance rating, or nomenclature plates.
 - 5. Primers specified in painting schedules may be omitted on items that are factory primed or factory finished if acceptable to topcoat manufacturers.
- B. Tint each undercoat a lighter shade to facilitate identification of each coat if multiple coats of same material are to be applied. Tint undercoats to match color of topcoat, but provide sufficient difference in shade of undercoats to distinguish each separate coat.
- C. If undercoats or other conditions show through topcoat, apply additional coats until cured film has a uniform paint finish, color, and appearance.
- D. Apply paints to produce surface films without cloudiness, spotting, holidays, laps, brush marks, roller tracking, runs, sags, ropiness, or other surface imperfections. Cut in sharp lines and color breaks.
- E. Painting Fire Suppression, Plumbing, HVAC, Electrical, Communication, and Electronic Safety and Security Work (applies to Epoxy Paint only):
 - 1. Paint the following work where exposed in occupied spaces:
 - a. Equipment, including panelboards.
 - b. Uninsulated metal piping.
 - c. Uninsulated plastic piping.
 - d. Pipe hangers and supports.
 - e. Metal conduit.
 - f. Plastic conduit.
 - g. Duct, equipment, and pipe insulation having cotton or canvas insulation covering or other paintable jacket material.
 - h. Other items as directed by Architect.

2. Paint portions of internal surfaces of metal ducts, without liner, behind air inlets and outlets that are visible from occupied spaces.

3.4 FIELD QUALITY CONTROL

- A. Dry Film Thickness Testing: Owner may engage the services of a qualified testing and inspecting agency to inspect and test paint for dry film thickness.
 1. Contractor shall touch up and restore painted surfaces damaged by testing.
 2. If test results show that dry film thickness of applied paint does not comply with paint manufacturer's written recommendations, Contractor shall pay for testing and apply additional coats as needed to provide dry film thickness that complies with paint manufacturer's written recommendations.

3.5 CLEANING AND PROTECTION

- A. At end of each workday, remove rubbish, empty cans, rags, and other discarded materials from Project site.
- B. After completing paint application, clean spattered surfaces. Remove spattered paints by washing, scraping, or other methods. Do not scratch or damage adjacent finished surfaces.
- C. Protect work of other trades against damage from paint application. Correct damage to work of other trades by cleaning, repairing, replacing, and refinishing, as approved by Architect, and leave in an undamaged condition.
- D. At completion of construction activities of other trades, touch up and restore damaged or defaced painted surfaces.

3.6 INTERIOR HIGH-PERFORMANCE COATING SCHEDULE

- A. CMU Substrates:
 1. Pre-Catalyzed Waterbased Epoxy System:
 - a. Block Filler: Block filler, latex, interior/exterior, MPI #4: S-W PrepRite Interior/Exterior Block Filler, B25 Series, at 8 mils dry, per coat.
 - b. Topcoat: Epoxy-modified latex, interior, eggshell, (Gloss Level 3), MPI #139/MPI #151: S-W Pro Industrial Pre-Catalyzed Waterbased Epoxy Eggshell, K45 Series, at 1.5 mils dry, per coat.
- B. Gypsum Board Substrates:
 1. Erasable Marker Board System:
 - a. If repainting before applying: Sand the existing wall to remove any high points or imperfections, and fill any holes or scratches. Apply primer and paint so the wall is as smooth as possible with very little stipple and no lap marks or roller lines. Allow to fully dry (4+ hours depending on conditions) before applying Topcoat.
 - b. Stir mixture while pouring Part B into Part A. Mix thoroughly for 3 to 3-1/2 minutes. As Parts A and B are incorporated, mixture will begin to thicken slightly. Be sure to incorporate any unmixed paint on the inner sides of the can into the middle. Allow mixture to "sweat-in" for 5 minutes.

- c. Once Parts A and B are mixed, system must be used within 1 hour. Do not combine multiple kits. Do not reseal cans once opened; contents will expand.
- d. Pour system into a clean metal tray and apply with a lint-free 1/4" nap roller. Cut in only as far as you are able to paint before the mixture begins to dry. Roll vertically, maintaining a wet edge. Lay off in one direction, from top to bottom. Work in manageable 3–4 ft. sections. Inspect the application from multiple angles to ensure uniform coverage and no pinholes.
- e. Let cure for minimum of 4 days before use.

END OF SECTION 099600

SECTION 099723 - CONCRETE COATINGS

PART 1 - GENERAL

1.1 SUMMARY

- A. Section includes surface preparation and application of concrete coating systems on the following substrates:
 - 1. Interior concrete floors

1.2 ACTION SUBMITTALS

- A. Product Data: For each type of product.

1.3 INFORMATIONAL SUBMITTALS

- A. Material Certificates: For each cementitious coating, from manufacturer.
- B. Product Test Reports: Based on evaluation of comprehensive tests performed by manufacturer and witnessed by a qualified testing agency or performed by a qualified testing agency, for each product formulation.

1.4 QUALITY ASSURANCE

- A. Mockups: Apply mockups of coating system indicated and each color and finish selected to verify preliminary selections made under Sample submittals and to demonstrate aesthetic effects and set quality standards for materials and execution.
 - 1. Architect will select one room to represent surfaces and conditions for application of coating.

1.5 DELIVERY, STORAGE, AND HANDLING

- A. Deliver materials to Project site in manufacturer's original, new, unopened packages and containers bearing manufacturer's name and label, and the following information:
 - 1. Product name or title of material.
 - 2. Manufacturer's stock number and date of manufacture.
 - 3. Contents by volume, for pigment and vehicle constituents.
 - 4. Application instructions.
 - 5. Color name and number.
 - 6. Handling instructions and precautions.
- B. Store materials not in use in tightly covered containers in a well-ventilated area at a minimum ambient temperature of 45 deg F. Maintain containers used in storage of coatings in a clean condition, free of foreign materials and residue.

1.6 FIELD CONDITIONS

- A. Apply coatings only when temperature of surfaces to be painted and ambient air temperatures are between 50 and 95 deg F.
- B. Do not apply coatings when relative humidity exceeds 85 percent; at temperatures less than 5 deg F above the dew point; or to damp or wet surfaces.

PART 2 - PRODUCTS

2.1 MANUFACTURERS

- A. Products: Subject to compliance with requirements, provide products as indicated on drawing I-000

2.2 CONCRETE TOPCOAT

- A. A low maintenance reflective hard surface product
- B. Other Materials: Provide crack fillers, block fillers, and related materials that are compatible with cementitious finish-coat materials and substrates indicated, under conditions of service and application as demonstrated by manufacturer, based on testing and field experience.

2.3 CONCRETE SEALER

- A. A penetrating, colorless surface treatment producing a protective coating

PART 3 - EXECUTION

3.1 EXAMINATION

- A. Examine substrates and conditions, with Applicator present, for compliance with requirements and other conditions affecting performance of the Work.
- B. Verify suitability of substrates, including surface conditions and compatibility.
- C. Begin coating application only after unsatisfactory conditions have been corrected and surfaces are dry.
 - 1. Beginning coating application constitutes Contractor's acceptance of substrates and conditions.

3.2 PREPARATION

- A. Comply with manufacturer's written instructions for mixing and preparing materials and as applicable to substrates indicated.
- B. Clean substrates of substances that could impair bond of coatings, including vinyl tile floor mastic, dirt, oil, grease, incompatible coatings, and loose substrate materials.
- C. Crack Repair: Fill cracks according to manufacturer's written instructions before coating surfaces.

3.3 APPLICATION

- A. Apply coatings according to manufacturer's written instructions. Use applicators and techniques suited for coating and substrate indicated.
- B. Apply coating to achieve material thickness as recommended in writing by manufacturer, but not less than the following:

3.4 FIELD QUALITY CONTROL

- A. Testing of Coating Materials: Owner reserves the right to invoke the following procedure at any time and as often as Owner deems necessary during the period when coating operations are being conducted:

3.5 CLEANING AND PROTECTION

- A. At end of each workday, remove rubbish, empty cans, rags, and other discarded materials from Project site.
- B. After completing coating application, clean spattered surfaces. Remove spattered coatings by washing, scraping, or other methods. Do not scratch or damage adjacent finished surfaces.
- C. Protect work of other trades against damage from coating application. Correct damage to work of other trades by cleaning, repairing, replacing, and refinishing, as approved by Architect, and leave in an undamaged condition.
- D. At completion of construction activities of other trades, touch up and restore damaged or defaced coated surfaces.

END OF SECTION 099726

SECTION 10 2113 - TOILET & SHOWER COMPARTMENTS

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

- A. Drawings and general provisions of the Contract, including General and Supplementary Conditions and Division 01 Specification Sections, apply to this Section.

1.2 SUMMARY

- A. Section Includes:
 - 1. Solid-polymer compartments configured as shown on Drawings.
- B. Related Sections:
 - 1. Section 055000 "Metal Fabrications" for supports that attach **ceiling-hung compartments** to overhead structural system.
 - 2. Section 102800 "Toilet, Bath, and Laundry Accessories" for toilet tissue dispensers, grab bars, and similar accessories.

1.3 ACTION SUBMITTALS

- A. Product Data: For each type of product indicated. Include construction details, material descriptions, dimensions of individual components and profiles, and finishes.
- B. Shop Drawings: Include plans, elevations, sections, details, and attachments to other work.
 - 1. Show locations of cutouts for compartment-mounted toilet accessories.
 - 2. Show overhead support or bracing locations.
- C. Samples for Initial Selection: For each type of unit indicated. Include Samples of hardware and accessories involving material and color selection.
- D. Samples for Verification: For the following products, in manufacturer's standard sizes unless otherwise indicated:
 - 1. Each type of material, color, and finish required for units, prepared on 6-inch- (152-mm-) square Samples of same thickness and material indicated for Work.
 - 2. Each type of hardware and accessory.

1.4 INFORMATIONAL SUBMITTALS

- A. Product Certificates: For each type of compartment, from manufacturer.

1.5 CLOSEOUT SUBMITTALS

- A. Maintenance Data: For compartments to include in maintenance manuals.

1.6 QUALITY ASSURANCE

- A. Surface-Burning Characteristics: As determined by testing identical products according to ASTM E 84, or another standard acceptable to authorities having jurisdiction, by a qualified testing agency. Identify products with appropriate markings of applicable testing agency.
 - 1. Flame-Spread Index: **75** or less.
 - 2. Smoke-Developed Index: 450 or less.
- B. Regulatory Requirements: Comply with applicable provisions in **the U.S. Architectural & Transportation Barriers Compliance Board's "Americans with Disabilities Act (ADA) and Architectural Barriers Act (ABA) Accessibility Guidelines for Buildings and Facilities" and ICC/ANSI A117.1** for toilet compartments designated as accessible.

1.7 PROJECT CONDITIONS

- A. Field Measurements: Verify actual locations of toilet fixtures, walls, columns, ceilings, and other construction contiguous with toilet and shower compartments by field measurements before fabrication.

PART 2 - PRODUCTS

2.1 MATERIALS

- A. Aluminum Extrusions: ASTM B 221 (ASTM B 221M).

2.2 SOLID-POLYMER UNITS

- A. Manufacturers: Subject to compliance with requirements, **available manufacturers offering products that may be incorporated into the Work include, but are not limited to, the following:**
 - 1. Bradley Corporation; Mills Partitions.
 - 2. Comtec Industries/Capitol Partitions.
 - 3. Hadrian, Inc.
 - 4. Santana Products, Inc.
- B. Toilet-Enclosure Style: Overhead braced.
- C. Urinal-Screen Style: Wall hung.
- D. Shower Enclosures: Ceiling-hung.

- E. Door, Panel, **Screen**, and Pilaster Construction: Solid, **high-density polyethylene (HDPE) or polypropylene (PP)** panel material, not less than 1 inch (25 mm) thick, seamless, with eased edges, and with homogenous color and pattern throughout thickness of material.
 - 1. Integral Hinges: Configure doors and pilasters to receive integral hinges.
 - 2. Heat-Sink Strip: Manufacturer's standard continuous, **stainless-steel** strip fastened to exposed bottom edges of solid-polymer components to prevent burning.
 - 3. Color and Pattern: **Two colors and patterns** in each room **as selected by Architect from manufacturer's full range**.
- F. Pilaster **Shoes and Sleeves (Caps)**: Manufacturer's standard design; **stainless steel**.
- G. Brackets (Fittings):
 - 1. Full-Height (Continuous) Type: Manufacturer's standard design; **stainless steel**.
- H. Overhead Cross Bracing for Ceiling-Hung Units: As recommended by manufacturer and fabricated from solid polymer.

2.3 ACCESSORIES

- A. Hardware and Accessories: Manufacturer's standard design, heavy-duty operating hardware and accessories.
 - 1. Material: **Stainless steel**.
 - 2. Hinges: Manufacturer's standard **integral hinge for solid-polymer doors**.
 - 3. Latch and Keeper: Manufacturer's standard **surface-mounted** latch unit designed for emergency access and with combination rubber-faced door strike and keeper. Provide units that comply with regulatory requirements for accessibility at compartments designated as accessible.
 - 4. Coat Hook: Manufacturer's standard combination hook and rubber-tipped bumper, sized to prevent in-swinging door from hitting compartment-mounted accessories.
 - 5. Door Bumper: Manufacturer's standard rubber-tipped bumper at out-swinging doors.
 - 6. Door Pull: Manufacturer's standard unit at out-swinging doors that complies with regulatory requirements for accessibility. Provide units on both sides of doors at compartments designated as accessible.
- B. Overhead Bracing: Manufacturer's standard continuous, extruded-aluminum head rail with antigrip profile and in manufacturer's standard finish.
- C. Anchorages and Fasteners: Manufacturer's standard exposed fasteners of stainless steel or chrome-plated steel or brass, finished to match the items they are securing, with theft-resistant-type heads. Provide sex-type bolts for through-bolt applications. For concealed anchors, use stainless steel, hot-dip galvanized steel, or other rust-resistant, protective-coated steel.

2.4 FABRICATION

- A. Overhead-Braced Units: Provide manufacturer's standard corrosion-resistant supports, leveling mechanism, and anchors at pilasters to suit floor conditions. Provide shoes at pilasters to conceal supports and leveling mechanism.

- B. Ceiling-Hung Units: Provide manufacturer's standard corrosion-resistant anchoring assemblies with leveling adjustment nuts at pilasters for connection to structural support above finished ceiling. Provide assemblies that support pilasters from structure without transmitting load to finished ceiling. Provide sleeves (caps) at tops of pilasters to conceal anchorage.
- C. Door Size and Swings: Unless otherwise indicated, provide 24-inch- (610-mm-) wide, in-swinging doors for standard toilet compartments and 36-inch- (914-mm-) wide, out-swinging doors with a minimum 32-inch- (813-mm-) wide, clear opening for compartments designated as accessible.

PART 3 - EXECUTION

3.1 INSTALLATION

- A. General: Comply with manufacturer's written installation instructions. Install units rigid, straight, level, and plumb. Secure units in position with manufacturer's recommended anchoring devices.
 - 1. Maximum Clearances:
 - a. Pilasters and Panels: 1/2 inch (13 mm).
 - b. Panels and Walls: 1 inch (25 mm).
- B. Overhead-Braced Units: Secure pilasters to floor and level, plumb, and tighten. Set pilasters with anchors penetrating not less than 1-3/4 inches (44 mm) into structural floor unless otherwise indicated in manufacturer's written instructions. Secure continuous head rail to each pilaster with no fewer than two fasteners. Hang doors to align tops of doors with tops of panels, and adjust so tops of doors are parallel with overhead brace when doors are in closed position.
- C. Ceiling-Hung Units: Secure pilasters to supporting structure and level, plumb, and tighten. Hang doors and adjust so bottoms of doors are level with bottoms of pilasters when doors are in closed position.
- D. Urinal Screens: Attach with anchoring devices to suit supporting structure. Set units level and plumb, rigid, and secured to resist lateral impact.

3.2 ADJUSTING

- A. Hardware Adjustment: Adjust and lubricate hardware according to hardware manufacturer's written instructions for proper operation. Set hinges on in-swinging doors to hold doors open approximately 30 degrees from closed position when unlatched. Set hinges on out-swinging doors to return doors to fully closed position.

END OF SECTION 10 2113

SECTION 102800 – TOILET, BATH, AND LAUNDRY ACCESSORIES

PART 1 - GENERAL

1.1 SUMMARY

- A. Section Includes:
1. Public-use washroom accessories.

1.2 SUBMITTALS

- A. Product Data: For each type of product indicated. Include the following:
1. Construction details and dimensions.
 2. Anchoring and mounting requirements, including requirements for cutouts in other work and substrate preparation.
 3. Material and finish descriptions.
 4. Features that will be included for Project.
 5. Manufacturer's warranty.
- B. Product Schedule: Indicating types, quantities, sizes, and installation locations by room of each accessory required.
- C. Maintenance Data: For toilet and bath accessories to include in maintenance manuals.
- D. Warranty: Sample of special warranty.

1.3 QUALITY ASSURANCE

- A. Source Limitations: For products listed together in the same Part 2 articles, obtain products from single source from single manufacturer.

1.4 COORDINATION

- A. Coordinate accessory locations with other work to prevent interference with clearances required for access by people with disabilities, and for proper installation, adjustment, operation, cleaning, and servicing of accessories.
- B. Deliver inserts and anchoring devices set into concrete or masonry as required to prevent delaying the Work.

1.5 WARRANTY

- A. Special Mirror Warranty: Manufacturer's standard form in which manufacturer agrees to replace mirrors that develop visible silver spoilage defects and that fail in materials or workmanship within specified warranty period.
1. Warranty Period: 15 years from date of Substantial Completion.

PART 2 - PRODUCTS

2.1 MATERIALS

- A. Stainless Steel: ASTM A 666, Type 304, 0.031-inch minimum nominal thickness unless otherwise indicated.
- B. Brass: ASTM B 19, flat products; ASTM B 16, rods, shapes, forgings, and flat products with finished edges; or ASTM B 30, castings.

- C. Steel Sheet: ASTM A 1008, Designation CS (cold rolled, commercial steel), 0.036-inch minimum nominal thickness.
- D. Galvanized-Steel Sheet: ASTM A 653, with G60 hot-dip zinc coating.
- E. Galvanized-Steel Mounting Devices: ASTM A 153, hot-dip galvanized after fabrication.
- F. Fasteners: Screws, bolts, and other devices of same material as accessory unit and tamper-and-theft resistant where exposed, and of galvanized steel where concealed.
- G. Chrome Plating: ASTM B 456, Service Condition Number SC 2 (moderate service).
- H. Mirrors: ASTM C 1503, Mirror Glazing Quality, clear-glass mirrors, nominal 6.0 mm thick.
- I. ABS Plastic: Acrylonitrile-butadiene-styrene resin formulation.

2.2 PUBLIC-USE WASHROOM ACCESSORIES

- A. Basis-of-Design Product: Subject to compliance with requirements, provide product indicated or comparable product by one of the following:
 - 1. A & J Washroom Accessories, Inc.
 - 2. American Specialties, Inc.
 - 3. Bobrick Washroom Equipment, Inc.
 - 4. Bradley Corporation.
 - 5. GAMCO Specialty Accessories; a division of Bobrick Washroom Equipment, Inc.
- B. Grab bar and concealed mounting plates shall be constructed of type-304 stainless steel with satin finish. Grab bar shall have wall thickness of 18 gauge and outside diameter of 1.5". Distance from inside of grab bar to finished wall shall be 1.5". Flanges shall be 11 gauge drawn stainless steel and each shall have four stainless steel set screws. Grab bar shall have 90 degree return to flange. Ends of grab bar shall pass through flanges and be heliarc welded to form one structural unit. Provide as indicated on drawings. Product: Bobrick B-6806 Series.
- C. Surface-mounted door bumper shall be constructed of type 304 stainless steel with bright polished finish. Unit shall be equipped with neoprene bumper. Provide at each compartment door. Product: Bobrick B-687.
- D. Sanitary-Napkin Disposal Unit: Bobrick No. B-254.
- E. Towel Bar: Bobrick B-530, center-line of bar to be 36" above the floor.
- F. Shower Curtain: See Interior Schedule
- G. Shower Curtain Hooks: Bobrick 204-1.
- H. Toilet Paper Dispenser: Bobrick B-2888 Series.
- I. Paper Towel Dispenser and Waste Receptacle: Bobrick B-38034.
- J. Soap Dispenser: Supplied by Owner, installed by Contractor.
- K. Soap Dish (in shower areas): Bobrick B-4390.
- L. Towel/Clothes Hook: Bobrick B-983.
- M. Folding Shower Seat: Bobrick B-5181. Top of seat shall be 18" above floor.
- N. Mirror Unit:
 - 1. Basis-of-Design Product: Bobrick No. B-290.
 - 2. Frame: Stainless-steel angle, 0.05 inch thick.
 - a. Corners: Welded and ground smooth.

3. Hangers: Produce rigid, tamper- and theft-resistant installation, using method indicated below.
 - a. One-piece, galvanized steel, wall-hanger device with spring-action locking mechanism to hold mirror unit in position with no exposed screws or bolts.
 - b. Wall bracket of galvanized steel, equipped with concealed locking devices requiring a special tool to remove.
4. Size: 24 by 36 inches, unless noted otherwise.

2.3 WARM-AIR DRYERS

- A. Manufacturers: Subject to compliance with requirements, provide products by one of the following:
 1. World Dryer Corporation.
- B. Warm-Air Dryer Retain "Basis-of-Design Product" Subparagraph below if applicable. Coordinate with specification method retained above.
 1. Basis-of-Design Product: World Dryer Smart Dri
 2. Mounting: Surface mounted.
 3. Operation: Electronic-sensor activated with timed power cut-off switch.
 4. Cover Material and Finish: Steel, with white enamel finish.
- C. Electrical Requirements: 115 V, 10 A, 1200 W.
- D. Locations: Restroom/Storage Building Toilet Rooms.

2.4 FABRICATION

- A. General: Fabricate units with tight seams and joints, and exposed edges rolled. Hang doors and access panels with full-length, continuous hinges. Equip units for concealed anchorage and with corrosion-resistant backing plates.
- B. Keys: Provide universal keys for internal access to accessories for servicing and resupplying. Provide minimum of six keys to Owner's representative.

PART 3 - EXECUTION

3.1 INSTALLATION

- A. Install accessories according to manufacturers' written instructions, using fasteners appropriate to substrate indicated and recommended by unit manufacturer. Install units level, plumb, and firmly anchored in locations and at heights indicated.
- B. Grab Bars: Install to withstand a downward load of at least 250 lbf, when tested according to ASTM F 446.

3.2 ADJUSTING AND CLEANING

- A. Adjust accessories for unencumbered, smooth operation. Replace damaged or defective items.
- B. Remove temporary labels and protective coatings.
- C. Clean and polish exposed surfaces according to manufacturer's written recommendations.

END OF SECTION 102800

SECTION 10 4416 - FIRE EXTINGUISHERS

1.1 RELATED DOCUMENTS

- A. Drawings and general provisions of the Contract, including General and Supplementary Conditions and Division 01 Specification Sections, apply to this Section.

1.2 SUMMARY

- A. Section includes portable, hand-carried fire extinguishers and mounting brackets for fire extinguishers.

1.3 SUBMITTALS

- A. Product Data: For each type of product indicated. Include rating and classification, material descriptions, dimensions of individual components and profiles, and finishes for fire extinguisher and mounting brackets.
- B. Product Schedule: For fire extinguishers. Coordinate final fire extinguisher schedule with fire protection cabinet schedule to ensure proper fit and function.
- C. Operation and Maintenance Data: For fire extinguishers to include in maintenance manuals.
- D. Warranty: Sample of special warranty.

1.4 QUALITY ASSURANCE

- A. NFPA Compliance: Fabricate and label fire extinguishers to comply with NFPA 10, "Portable Fire Extinguishers."

1.5 WARRANTY

- A. Special Warranty: Manufacturer's standard form in which manufacturer agrees to repair or replace fire extinguishers that fail in materials or workmanship within specified warranty period.
 - 1. Failures include, but are not limited to, the following:
 - a. Failure of hydrostatic test according to NFPA 10.
 - b. Faulty operation of valves or release levers.
 - 2. Warranty Period: Six years from date of Substantial Completion.

PART 2 - PRODUCTS

2.1 PORTABLE, HAND-CARRIED FIRE EXTINGUISHERS

- A. Fire Extinguishers: Type, size, and capacity for each mounting bracket indicated.
 - 1. Manufacturers: Subject to compliance with requirements, provide products by one of the following:
 - a. J. L. Industries, Inc.; a division of Activar Construction Products Group.
 - b. Kidde Residential and Commercial Division; Subsidiary of Kidde plc.
 - c. Larsen's Manufacturing Company.
 - d. Potter Roemer LLC.
 - 2. Valves: Manufacturer's standard.
 - 3. Handles and Levers: Manufacturer's standard.

- 4. Instruction Labels: Include pictorial marking system complying with NFPA 10, Appendix B.
- B. Multipurpose Dry-Chemical Type in Steel Container: UL-rated 4-A:60-B:C, 10-lb nominal capacity, with monoammonium phosphate-based dry chemical in enameled-steel container.

2.2 MOUNTING BRACKETS

- A. Mounting Brackets: Manufacturer's standard galvanized steel, designed to secure fire extinguisher to wall or structure, of sizes required for types and capacities of fire extinguishers indicated, with plated finish.

PART 3 - EXECUTION

3.1 EXAMINATION

- A. Examine fire extinguishers for proper charging and tagging.
 - 1. Remove and replace damaged, defective, or undercharged fire extinguishers.
- B. Proceed with installation only after unsatisfactory conditions have been corrected.

3.2 INSTALLATION

- A. General: Install fire extinguishers and mounting brackets in locations indicated and in compliance with requirements of authorities having jurisdiction.
 - 1. Mounting Brackets: 54 inches above finished floor to top of fire extinguisher.
- B. Mounting Brackets: Fasten mounting brackets to surfaces, square and plumb, at locations indicated.

END OF SECTION 10 4416

SECTION 10 5113 - METAL LOCKERS

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

- A. Drawings and general provisions of the Contract, including General and Supplementary Conditions and Division 01 Specification Sections, apply to this Section.

1.2 SUMMARY

- A. Section Includes:
 - 1. Welded athletic lockers.
 - 2. Locker benches.
 - 3. Note that lockers and benches (unless noted otherwise) are to be provided (i.e., supplied and installed) by the Owner. Padlocks are to be provided by Owner as well.

1.3 PREINSTALLATION MEETINGS

- A. Preinstallation Conference: Conduct conference at **Project site**.

1.4 ACTION SUBMITTALS

- A. Product Data: For each type of metal locker.
 - 1. Include construction details, material descriptions, dimensions of individual components and profiles, and finishes for each type of metal locker **and bench**.
- B. Shop Drawings: For metal lockers.
 - 1. Include plans, elevations, sections, details, and attachments to other work.
 - 2. Show locker trim and accessories.
 - 3. Include locker identification system and numbering sequence.
- C. Samples: For each color specified, in manufacturer's standard size.
- D. Samples for Initial Selection: Manufacturer's color charts showing the full range of colors available.
- E. Samples for Verification: For the following products, in manufacturer's standard size:
 - 1. Lockers and equipment.
 - 2. Locker benches.
- F. Product Schedule: For lockers.

1.5 INFORMATIONAL SUBMITTALS

- A. Qualification Data: For Installer.
- B. Sample Warranty: For special warranty.

1.6 CLOSEOUT SUBMITTALS

- A. Maintenance Data: For adjusting, repairing, and replacing locker doors and latching mechanisms to include in maintenance manuals.

1.7 MAINTENANCE MATERIAL SUBMITTALS

- A. Furnish extra materials that match products installed and that are packaged with protective covering for storage and identified with labels describing contents.
 - 1. Full-size units of the following metal locker hardware items equal to **10** percent of amount installed for each type and finish installed, but no fewer than **five** units:
 - a. Locks.
 - b. Identification plates.
 - c. Hooks.

1.8 DELIVERY, STORAGE, AND HANDLING

- A. Do not deliver metal lockers until spaces to receive them are clean, dry, and ready for their installation.
- B. Deliver **master and control keys** to Owner by registered mail or overnight package service.

1.9 FIELD CONDITIONS

- A. Field Measurements: Verify actual dimensions of recessed openings by field measurements before fabrication.

1.10 COORDINATION

- A. Coordinate sizes and locations of bases for metal lockers.
- B. Coordinate sizes and locations of framing, blocking, furring, reinforcements, and other related units of work specified in other Sections to ensure that metal lockers can be supported and installed as indicated.

1.11 WARRANTY

- A. Special Warranty: Manufacturer agrees to repair or replace components of metal lockers that fail in materials or workmanship, excluding finish, within specified warranty period.
 - 1. Failures include, but are not limited to, the following:
 - a. Structural failures.
 - b. Faulty operation of latches and other door hardware.
 - 2. Damage from deliberate destruction and vandalism is excluded.
 - 3. Warranty Period for Welded Metal Lockers: **Lifetime** from date of Substantial Completion.

PART 2 - PRODUCTS

2.1 MANUFACTURERS

- A. Source Limitations: Obtain metal lockers, locker benches, and accessories from single source from single locker manufacturer.
 - 1. Obtain locks from single lock manufacturer.

2.2 PERFORMANCE REQUIREMENTS

- A. Accessibility Requirements: For lockers indicated to be accessible, comply with applicable provisions in **the U.S. Architectural & Transportation Barriers Compliance Board's ADA-ABA Accessibility Guidelines and ICC A117.1**.
 - 1. Provide not less than 1 shelf located no higher than 54 inches above the floor for side reach.
 - 2. Provide 1 shelf located at bottom of locker no lower than 9 inches above the floor for side reach.
 - 3. See plans for locations of ADA lockers.

2.3 WELDED ATHLETIC LOCKERS

- A. Basis-of-Design Product: Subject to compliance with requirements, provide **products manufactured by List Industries, Inc. (lockers to be "Marquis Champion")**, or comparable product.
- B. Perforated Doors: One piece; fabricated from 0.075-inch (1.90-mm) nominal-thickness steel sheet with manufacturer's standard diamond perforations; formed into channel shape with double bend at **vertical edges and with right-angle single bend at horizontal edges and latch point (bottom) and right-angle single bend at remaining edges for box lockers**.
 - 1. Reinforcement: Manufacturer's standard reinforcing angles, channels, or stiffeners for doors more than 15 inches (381 mm) wide; welded to inner face of doors.

- C. Body: Assembled by welding body components together. Fabricate from unperforated steel sheet with thicknesses as follows:
 - 1. Tops and Bottoms: 0.060-inch (1.52-mm) nominal thickness, with single bend at edges.
 - 2. Backs: 0.048-inch (1.21-mm) nominal thickness.
 - 3. Shelves: 0.060-inch (1.52-mm) nominal thickness, with double bend at front and single bend at sides and back.
- D. Unperforated Sides: Fabricated from **0.060-inch (1.52-mm)** nominal-thickness steel sheet.
- E. Frames: Channel formed; fabricated from 0.060-inch (1.52-mm) nominal-thickness steel sheet or 0.097-inch (2.45-mm) nominal-thickness steel angles; lapped and factory welded at corners; with top and bottom main frames factory welded into vertical main frames. Form continuous, integral, full-height door strikes on vertical main frames.
- F. Hinges: Welded to door and attached to door frame with no fewer than two factory-installed rivets per hinge that are completely concealed and tamper resistant when door is closed; fabricated to swing 180 degrees.
 - 1. Knuckle Hinges: Steel, full loop, five or seven knuckles, tight pin; minimum 2 inches (51 mm) high. Provide no fewer than three hinges for each door more than 42 inches (1067 mm) high.
- G. Recessed Door Handle and Latch: Stainless-steel cup with integral door pull, recessed so locking device does not protrude beyond door face; pry and vandal resistant.
 - 1. Single-Point Latching: Nonmoving latch hook **with steel padlock loop that projects through recessed cup and is finished to match metal locker body.**
 - a. Latch Hook: Equip each door with one latch hook, fabricated from 0.120-inch (3.04-mm) nominal-thickness steel sheet; welded midway up full-height door strike; with resilient silencer.
- H. Door Handle and Latch for Box Lockers: Stainless-steel strike plate with integral pull; with steel padlock loop that projects through metal locker door.
- I. Locks:
 - 1. At non-ADA Lockers: **Combination padlocks.**
 - 2. **ADA Lockers:**
 - a. Provide hardware, including lock, that does not require tight grasping, pinching or twisting of the wrist, and that operates with a force of not more than 5lbf.
 - b. Provide manufacturer's standard push button or paddle key that does not require turning key to open locker.
- J. Identification Plates: Manufacturer's standard, etched, embossed, or stamped **aluminum** plates, with numbers and letters at least 3/8 inch (9 mm) high.
- K. Hooks: Manufacturer's standard ball-pointed type, steel
- L. Continuous Sloping Tops: Fabricated from 0.048-inch (1.21-mm) nominal-thickness steel sheet, with a pitch of approximately 20 degrees.

1. Closures: **Vertical**-end type.
- M. Filler Panels: Fabricated from 0.048-inch (1.21-mm) nominal-thickness steel sheet.
- N. Boxed End Panels: Fabricated from 0.060-inch (1.52-mm) nominal-thickness steel sheet.
- O. Materials:
 1. Cold-Rolled Steel Sheet: ASTM A 1008/A 1008M, Commercial Steel (CS), Type B, suitable for exposed applications.
- P. Finish: Baked enamel or powder coat.
 1. Color(s): **As selected by Architect from manufacturer's full range.** It is anticipated that two colors will be used.

2.4 LOCKS

- A. Basis-of-Design Product: Subject to compliance with requirements, **provide products by Master Lock Company, LLC** or comparable product by one of the following:
 1. American Locker Company; A Division of Master Lock Company, LLC.
 2. Zephyr Lock LLC.
- B. Combination Padlocks: **Key-controlled, three-number dialing combination locks; capable of five combination changes.**

2.5 LOCKER BENCHES

- A. Provide bench units with overall assembly height of **17-1/2 inches (445 mm), unless noted otherwise.**
- B. Bench Tops: Manufacturer's standard one-piece units, with rounded corners and edges.
 1. Size: Minimum 9-1/2 inches wide by 1-1/4 inches thick (241 mm wide by 32 mm thick), **except provide minimum 20-inch- (508-mm-) wide tops where accessible benches are indicated.**
 2. Laminated clear hardwood with one coat of clear sealer on all surfaces and one coat of clear lacquer on top and sides.
- C. Fixed Pedestals: Manufacturer's standard supports, with predrilled fastener holes for attaching bench top and anchoring to floor, complete with fasteners and anchors, and as follows:
 1. Tubular Steel: 1-1/4-inch- (32-mm-) diameter steel tubing, with 0.1265-inch- (3.2-mm-) thick steel flanges welded at top and base; with **zinc-plated** finish, painted; anchored with exposed fasteners.

2.6 FABRICATION

- A. Fabricate metal lockers square, rigid, without warp, and with metal faces flat and free of dents or distortion. Make exposed metal edges safe to touch and free of sharp edges and burrs.
 - 1. Form body panels, doors, shelves, and accessories from one-piece steel sheet unless otherwise indicated.
 - 2. Provide fasteners, filler plates, supports, clips, and closures as required for complete installation.
- B. Fabricate each metal locker with an individual door and frame; individual top, bottom, and back; and common intermediate uprights separating compartments. Factory weld frame members of each metal locker together to form a rigid, one-piece assembly.
- C. Equipment: Provide each locker with an identification plate and the following equipment:
 - 1. Single-Tier Units: Shelf, one double-prong ceiling hook, and two single-prong wall hooks.
 - 2. Double-Tier Units: One double-prong ceiling hook and two single-prong wall hooks.
 - 3. Triple-Tier Units: One double-prong ceiling hook.
- D. Welded Construction: Factory preassemble metal lockers by welding all joints, seams, and connections; with no bolts, nuts, screws, or rivets used in assembly of main locker groups. Factory weld main locker groups into one-piece structures. Grind exposed welds flush.
- E. Accessible Lockers: Fabricate as follows:
 - 1. Locate bottom shelf no lower than 15 inches (381 mm) above the floor.
 - 2. Where hooks, coat rods, or additional shelves are provided, locate no higher than 48 inches (1219 mm) above the floor.
- F. Continuous Sloping Tops: Fabricated in lengths as long as practical, without visible fasteners at splice locations; finished to match lockers.
 - 1. Sloping-top corner fillers, mitered.
- G. Filler Panels: Fabricated in an unequal leg angle shape; finished to match lockers. Provide slip-joint filler angle formed to receive filler panel.
- H. Boxed End Panels: Fabricated with 1-inch- (25-mm-) wide edge dimension, and designed for concealing fasteners and holes at exposed ends of nonrecessed metal lockers; finished to match lockers.
 - 1. Provide one-piece panels for double-row (back-to-back) locker ends.

2.7 ACCESSORIES

- A. Fasteners: Zinc- or nickel-plated steel, slotless-type, exposed bolt heads; with self-locking nuts or lock washers for nuts on moving parts.
- B. Anchors: Material, type, and size required for secure anchorage to each substrate.

1. Provide nonferrous-metal or hot-dip galvanized anchors and inserts.
2. Provide toothed-steel or lead expansion sleeves for drilled-in-place anchors.

PART 3 - EXECUTION

3.1 EXAMINATION

- A. Examine walls, floors, and support bases, with Installer present, for compliance with requirements for installation tolerances and other conditions affecting performance of the Work.
- B. Prepare written report, endorsed by Installer, listing conditions detrimental to performance of the Work.
- C. Proceed with installation only after unsatisfactory conditions have been corrected.

3.2 INSTALLATION

- A. General: Install lockers level, plumb, and true; shim as required, using concealed shims.
 1. Anchor locker runs at ends and at intervals recommended by manufacturer, but not more than 36 inches (910 mm) o.c. Using concealed fasteners, install anchors through backup reinforcing plates, channels, or blocking as required to prevent metal distortion.
 2. Anchor single rows of metal lockers to walls near top **of lockers and to floor**.
 3. Anchor back-to-back metal lockers to floor.
- B. Welded Lockers: Connect groups together with standard fasteners, with no exposed fasteners on face frames.
- C. Equipment:
 1. Attach hooks with at least two fasteners.
 2. Attach door locks on doors using security-type fasteners.
 3. Identification Plates: Identify metal lockers with identification indicated on Drawings.
 - a. Attach plates to each locker door, near top, centered, with at least two aluminum rivets.
 - b. Attach plates to upper shelf of each open-front metal locker, centered, with a least two aluminum rivets.
- D. Trim: Fit exposed connections of trim, fillers, and closures accurately together to form tight, hairline joints, with concealed fasteners and splice plates.
 1. Attach recess trim to recessed metal lockers with concealed clips.
 2. Attach filler panels with concealed fasteners. Locate filler panels where indicated on Drawings.
 3. Attach sloping-top units to metal lockers, with closures at exposed ends.
 4. Attach boxed end panels using concealed fasteners to conceal exposed ends of nonrecessed metal lockers.

- E. Fixed Locker Benches: Provide no fewer than two pedestals for each bench, uniformly spaced not more than 72 inches (1830 mm) apart. Securely fasten tops of pedestals to undersides of bench tops, and anchor bases to floor.
- F. Freestanding Locker Benches: Place benches in locations indicated on Drawings.

3.3 ADJUSTING

- A. Clean, lubricate, and adjust hardware. Adjust doors and latches to operate easily without binding.

3.4 PROTECTION

- A. Protect metal lockers from damage, abuse, dust, dirt, stain, or paint. Do not permit use during construction.
- B. Touch up marred finishes, or replace metal lockers that cannot be restored to factory-finished appearance. Use only materials and procedures recommended or furnished by locker manufacturer.

END OF SECTION 10 5113

SECTION 122413 - ROLLER WINDOW SHADES

PART 1 - GENERAL

1.1 SUMMARY

- A. Section Includes:
 - 1. Manually operated roller shades with single rollers.
- B. Related Sections include the following:
 - 1. Division 06 Section "Miscellaneous Rough Carpentry" for wood blocking and grounds for mounting roller shades and accessories.

1.2 SUBMITTALS

- A. Product Data: For each type of product indicated. Include styles, material descriptions, construction details, dimensions of individual components and profiles, features, finishes, and operating instructions.
- B. Samples for Initial Selection: For each colored component of each type of shade indicated.
 - 1. Include similar Samples of accessories involving color selection.
- C. Window Treatment Schedule: For roller shades. Use same designations indicated on Drawings.
- D. Product Certificates: For each type of roller shade, signed by product manufacturer.
- E. Qualification Data: For Installer.
- F. Maintenance Data: For roller shades to include in maintenance manuals. Include the following:
 - 1. Methods for maintaining roller shades and finishes.
 - 2. Precautions about cleaning materials and methods that could be detrimental to fabrics, finishes, and performance.
 - 3. Operating hardware.

1.3 QUALITY ASSURANCE

- A. Source Limitations: Obtain roller shades through one source from a single manufacturer.
- B. Fire-Test-Response Characteristics: Provide roller shade band materials with the fire-test-response characteristics indicated, as determined by testing identical products per test method indicated below by UL or another testing and inspecting agency acceptable to authorities having jurisdiction:
 - 1. Flame-Resistance Ratings: Passes NFPA 701.

1.4 DELIVERY, STORAGE, AND HANDLING

- A. Deliver shades in factory packages, marked with manufacturer and product name, and location of installation using same designations indicated on Drawings and in a window treatment schedule.

1.5 PROJECT CONDITIONS

- A. Environmental Limitations: Do not install roller shades until construction and wet and dirty finish work in spaces, including painting, is complete and ambient temperature and humidity conditions are maintained at the levels indicated for Project when occupied for its intended use.
- B. Field Measurements: Where roller shades are indicated to fit to other construction, verify dimensions of other construction by field measurements before fabrication and indicate measurements on Shop Drawings. Allow clearances for operable glazed units' operation hardware throughout the entire operating range. Notify Architect of discrepancies. Coordinate fabrication schedule with construction progress to avoid delaying the Work.

PART 2 - PRODUCTS

2.1 MANUAL ROLLER SHADES

- A. Basis-of-Design Product: Subject to compliance with requirements, provide “Clutch Roller Shade” by Draper Inc. or a comparable product by one of the following:
 - 1. Draper Inc.
 - 2. Mermet
- B. Shade Band Material: As Indicated on the Finishes Schedule on Drawing I000.
- C. Chain-and-Clutch Operating Mechanisms: With continuous-loop bead chain and clutch that stops shade movement when bead chain is released; permanently adjusted and lubricated.
 - 1. Bead Chains: Nickel-plated metal or Stainless steel.
 - a. Loop Length: Full length of roller shade.
 - b. Limit Stops: Provide upper and lower ball stops.
 - c. Chain-Retainer Type: Chain tensioner, jamb mounted.
- D. Rollers: Corrosion-resistant steel or extruded-aluminum tubes of diameters and wall thicknesses required to accommodate operating mechanisms and weights and widths of shadebands indicated without deflection. Provide with permanently lubricated drive-end assemblies and idle-end assemblies designed to facilitate removal of shadebands for service.
 - 1. Shadeband-to-Roller Attachment: Manufacturer's standard method.
- E. Mounting Hardware: Brackets or endcaps, corrosion resistant and compatible with roller assembly, operating mechanism, installation accessories, and mounting location and conditions indicated.
- F. Installation Accessories:
 - 1. Exposed Headbox: Rectangular, extruded-aluminum enclosure including front fascia, top and back covers, endcaps, and removable bottom closure for between the jamb mounting.
 - a. Height: Manufacturer's standard height required to enclose roller and shadeband assembly when shade is fully open, but not less than 4 inches.
 - 2. Endcap Covers: To cover exposed endcaps at folding doors.

2.2 ROLLER SHADE FABRICATION

- A. Product Description: Roller shade consisting of a roller, a means of supporting the roller, a flexible sheet or band of material carried by the roller, a means of attaching the material to the roller, a bottom bar, and an operating mechanism that lifts and lowers the shade.
- B. Concealed Components: Noncorrodible or corrosion-resistant-coated materials.
 - 1. Lifting Mechanism: With permanently lubricated moving parts.
- C. Unit Sizes: Obtain units fabricated in sizes to fill window and other openings as follows, measured at 74 deg F:
 - 1. Shade Units Installed Outside Jambs: Width and length as indicated, with terminations between shades of end-to-end installations at centerlines of mullion or other defined vertical separations between openings.
- D. Installation Brackets: Designed for easy removal and reinstallation of shade, for supporting roller, and operating hardware and for hardware position and shade mounting method indicated.
- E. Installation Fasteners: No fewer than two fasteners per bracket, fabricated from metal noncorrosive to shade hardware and adjoining construction; type designed for securing to supporting substrate; and supporting shades and accessories under conditions of normal use.

PART 3 - EXECUTION

3.1 EXAMINATION

- A. Examine substrates, areas, and conditions, with Installer present, for compliance with requirements for installation tolerances, operational clearances, and other conditions affecting performance.
 - 1. Proceed with installation only after unsatisfactory conditions have been corrected.

3.2 ROLLER SHADE INSTALLATION

- A. Install roller shades level, plumb, and aligned with adjacent units according to manufacturer's written instructions and located so shade band is not closer than 2 inches to interior face of glass. Allow clearances for window operation hardware.

3.3 ADJUSTING

- A. Adjust and balance roller shades to operate smoothly, easily, safely, and free from binding or malfunction throughout entire operational range.

3.4 CLEANING AND PROTECTION

- A. Clean roller shade surfaces after installation, according to manufacturer's written instructions.
- B. Provide final protection and maintain conditions, in a manner acceptable to manufacturer and Installer that ensure that roller shades are without damage or deterioration at time of Substantial Completion.
- C. Replace damaged roller shades that cannot be repaired, in a manner approved by Architect, before time of Substantial Completion.

END OF SECTION 122413

SECTION 123661.16 - SOLID SURFACING COUNTERTOPS

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

- A. Drawings and general provisions of the Contract, including General and Supplementary Conditions and Division 01 Specification Sections, apply to this Section.

1.2 SUMMARY

- A. Section Includes:
 - 1. Solid surface material countertops.
 - 2. Solid surface material backsplashes.
 - 3. Solid surface material end splashes.
 - 4. Solid surface material apron fronts.
 - 5. Solid surface material window sills.

1.3 ACTION SUBMITTALS

- A. Product Data: For countertop materials.
- B. Shop Drawings: For countertops. Show materials, finishes, edge and backsplash profiles, methods of joining, and cutouts for plumbing fixtures.
 - 1. Show locations and details of joints.
 - 2. Show direction of directional pattern, if any.
- C. Samples for Initial Selection: For each type, color and finish of material exposed to view, in manufacturer's standard sample size.

1.4 INFORMATIONAL SUBMITTALS

- A. Qualification Data: For fabricator.

1.5 CLOSEOUT SUBMITTALS

- A. Maintenance Data: For solid surface material countertops to include in maintenance manuals. Include Product Data for care products used or recommended by Installer and names, addresses, and telephone numbers of local sources for products.

1.6 QUALITY ASSURANCE

- A. Fabricator Qualifications: Shop that employs skilled workers who custom-fabricate countertops similar to that required for this Project, and whose products have a record of successful in-service performance.
- B. Installer Qualifications: Fabricator of countertops.
- C. Performance/Design Criteria:

- C. Plywood: Exterior softwood plywood complying with DOC PS 1, Grade C-C Plugged, touch sanded.

2.2 COUNTERTOP FABRICATION

- A. Fabricate countertops according to solid surface material manufacturer's written instructions and to the AWI/AWMAC/WT's "Architectural Woodwork Standards."
 - 1. Grade: Custom.
- B. Configuration:
 - 1. Front: Straight, slightly eased at top.
 - 2. End Splash: Matching backsplash.
- C. Countertops: **1/2-inch** thick, solid surface material with front edge built up with same material.
- D. Backsplashes: **1/2-inch** thick, solid surface material.
- E. Fabricate tops with shop-applied edges and backsplashes unless otherwise indicated. Comply with solid surface material manufacturer's written instructions for adhesives, sealers, fabrication, and finishing.
 - 1. Fabricate with loose backsplashes for field assembly.
 - 2. Install integral sink bowls in countertops in the shop.
- F. Joints: Fabricate countertops without joints.
- G. Cutouts and Holes:
 - 1. Undercounter Plumbing Fixtures: Make cutouts for fixtures using template or pattern furnished by fixture manufacturer. Form cutouts to smooth, even curves.
 - a. Provide 3/4-inch full bullnose edges projecting 3/8 inch into fixture opening.
 - 2. Counter-Mounted Plumbing Fixtures: Prepare countertops in shop for field cutting openings for counter-mounted fixtures. Mark tops for cutouts and drill holes at corners of cutout locations. Make corner holes of largest radius practical.
 - 3. Fittings: Drill countertops in shop for plumbing fittings, undercounter soap dispensers, and similar items.

2.3 INSTALLATION MATERIALS

- A. Adhesive: Product recommended by solid surface material manufacturer.
- B. Sealant for Countertops: Comply with applicable requirements in Section 079200 "Joint Sealants."

PART 3 - EXECUTION

3.1 EXAMINATION

- A. Examine substrates to receive solid surface material countertops and conditions under which countertops will be installed, with Installer present, for compliance with requirements for installation tolerances and other conditions affecting performance of countertops.
- B. Proceed with installation only after unsatisfactory conditions have been corrected.

3.2 INSTALLATION

- A. Install countertops level to a tolerance of 1/8 inch in 8 feet, 1/4 inch maximum. Do not exceed 1/64-inch difference between planes of adjacent units.
- B. Fasten countertops by screwing through corner blocks of base units into underside of countertop. Predrill holes for screws as recommended by manufacturer. Align adjacent surfaces and, using adhesive in color to match countertop, form seams to comply with manufacturer's written instructions. Carefully dress joints smooth, remove surface scratches, and clean entire surface.
- C. Fasten subtops to cabinets by screwing through subtops into cornerblocks of base cabinets. Shim as needed to align subtops in a level plane.
- D. Secure countertops to subtops with adhesive according to solid surface material manufacturer's written instructions. Align adjacent surfaces and, using adhesive in color to match countertop, form seams to comply with manufacturer's written instructions. Carefully dress joints smooth, remove surface scratches, and clean entire surface.
- E. Bond joints with adhesive and draw tight as countertops are set. Mask areas of countertops adjacent to joints to prevent adhesive smears.
 - 1. Consider retaining one of two subparagraphs below, or both. Metal splines may be an unnecessary expense at typical joints but may be advantageous if using narrow strips of solid surface material between joints to form large openings for kitchen sinks, cooktops, and so forth.
 - 2. Install metal splines in kerfs in countertop edges at joints. Fill kerfs with adhesive before inserting splines and remove excess immediately after adjoining units are drawn into position.
 - 3. Clamp units to temporary bracing, supports, or each other to ensure that countertops are properly aligned, and joints are of specified width.
- F. Install backsplashes and end splashes by adhering to wall and countertops with adhesive. Mask areas of countertops and splashes adjacent to joints to prevent adhesive smears.
- G. Install aprons to backing and countertops with adhesive. Mask areas of countertops and splashes adjacent to joints to prevent adhesive smears. Fasten by screwing through backing. Predrill holes for screws as recommended by manufacturer.
- H. Complete cutouts not finished in shop. Mask areas of countertops adjacent to cutouts to prevent damage while cutting. Make cutouts to accurately fit items to be installed, and at right angles to finished surfaces unless beveling is required for clearance. Ease edges slightly to prevent snipping.
- I. Seal edges of cutouts in particleboard subtops by saturating with varnish.
- J. Apply sealant to gaps at walls; comply with Section 079200 "Joint Sealants."

END OF SECTION 123661.16

SECTION 220517 - SLEEVES AND SLEEVE SEALS FOR PLUMBING PIPING

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

- A. Drawings and general provisions of the Contract, including General and Supplementary Conditions and Division 01 Specification Sections, apply to this Section.

1.2 SUMMARY

- A. Section Includes:
1. Sleeves.
 2. Stack-sleeve fittings.
 3. Sleeve-seal systems.
 4. Sleeve-seal fittings.
 5. Grout.

1.3 ACTION SUBMITTALS

- A. Product Data: For each type of product indicated.

PART 2 - PRODUCTS

2.1 SLEEVES

- A. Cast-Iron Wall Pipes: Cast or fabricated of cast or ductile iron and equivalent to ductile-iron pressure pipe, with plain ends and integral waterstop unless otherwise indicated.
- B. Galvanized-Steel Wall Pipes: ASTM A 53/A 53M, Schedule 40, with plain ends and welded steel collar; zinc coated.
- C. Galvanized-Steel-Pipe Sleeves: ASTM A 53/A 53M, Type E, Grade B, Schedule 40, zinc coated, with plain ends.
- D. PVC-Pipe Sleeves: ASTM D 1785, Schedule 40.

2.2 STACK-SLEEVE FITTINGS

- A. Manufacturers: Subject to compliance with requirements, available manufacturers offering products that may be incorporated into the Work include, but are not limited to, the following:
1. Smith, Jay R. Mfg. Co.
 2. Zurn Specification Drainage Operation; Zurn Plumbing Products Group.
- B. Description: Manufactured, cast-iron sleeve with integral clamping flange. Include clamping ring, bolts, and nuts for membrane flashing.
1. Underdeck Clamp: Clamping ring with setscrews.

2.3 SLEEVE-SEAL FITTINGS

- A. Manufacturers: Subject to compliance with requirements, available manufacturers offering products that may be incorporated into the Work include, but are not limited to, the following:
1. Presealed Systems.

- B. Description: Manufactured plastic, sleeve-type, waterstop assembly made for imbedding in concrete slab or wall. Unit has plastic or rubber waterstop collar with center opening to match piping OD.

2.4 GROUT

- A. Standard: ASTM C 1107/C 1107M, Grade B, post-hardening and volume-adjusting, dry, hydraulic-cement grout.
- B. Characteristics: Nonshrink; recommended for interior and exterior applications.
- C. Design Mix: 5000-psi, 28-day compressive strength.
- D. Packaging: Premixed and factory packaged.

PART 3 - EXECUTION

3.1 SLEEVE INSTALLATION

- A. Install sleeves for piping passing through penetrations in floors, partitions, roofs, and walls.
- B. For sleeves that will have sleeve-seal system installed, select sleeves of size large enough to provide 1-inch annular clear space between piping and concrete slabs and walls.
1. Sleeves are not required for core-drilled holes.
- C. Install sleeves in concrete floors, concrete roof slabs, and concrete walls as new slabs and walls are constructed.
1. Permanent sleeves are not required for holes in slabs formed by molded-PE or -PP sleeves.
 2. Cut sleeves to length for mounting flush with both surfaces.
 - a. Exception: Extend sleeves installed in floors of mechanical equipment areas or other wet areas 2 inches above finished floor level.
 3. Using grout, seal the space outside of sleeves in slabs and walls without sleeve-seal system.
- D. Install sleeves for pipes passing through interior partitions.
1. Cut sleeves to length for mounting flush with both surfaces.
 2. Install sleeves that are large enough to provide 1/4-inch annular clear space between sleeve and pipe or pipe insulation.
 3. Seal annular space between sleeve and piping or piping insulation; use joint sealants appropriate for size, depth, and location of joint. Comply with requirements for sealants specified in Section 079200 "Joint Sealants."
- E. Fire-Barrier Penetrations: Maintain indicated fire rating of walls, partitions, ceilings, and floors at pipe penetrations. Seal pipe penetrations with firestop materials. Comply with requirements for firestopping specified in Section 078413 "Penetration Firestopping."

3.2 STACK-SLEEVE-FITTING INSTALLATION

- A. Install stack-sleeve fittings in new slabs as slabs are constructed.
1. Install fittings that are large enough to provide 1/4-inch annular clear space between sleeve and pipe or pipe insulation.
 2. Secure flashing between clamping flanges for pipes penetrating floors with membrane waterproofing. Comply with requirements for flashing specified in Section 076200 "Sheet Metal Flashing and Trim."

3. Install section of cast-iron soil pipe to extend sleeve to 2 inches above finished floor level.
 4. Extend cast-iron sleeve fittings below floor slab as required to secure clamping ring if ring is specified.
 5. Using grout, seal the space around outside of stack-sleeve fittings.
- B. Fire-Barrier Penetrations: Maintain indicated fire rating of floors at pipe penetrations. Seal pipe penetrations with firestop materials. Comply with requirements for firestopping specified in Section 078413 "Penetration Firestopping."

3.3 SLEEVE-SEAL-FITTING INSTALLATION

- A. Install sleeve-seal fittings in new walls and slabs as they are constructed.
- B. Assemble fitting components of length to be flush with both surfaces of concrete slabs and walls. Position waterstop flange to be centered in concrete slab or wall.
- C. Secure nailing flanges to concrete forms.
- D. Using grout, seal the space around outside of sleeve-seal fittings.

3.4 SLEEVE AND SLEEVE-SEAL SCHEDULE

- A. Use sleeves and sleeve seals for the following piping-penetration applications:
1. Exterior Concrete Walls above Grade:
 - a. Piping Smaller Than NPS 6: Galvanized-steel-pipe sleeves.
 2. Exterior Concrete Walls below Grade:
 - a. Piping Smaller Than NPS 6: Sleeve-seal fittings.
 - 1) Select sleeve size to allow for 1-inch annular clear space between piping and sleeve for installing sleeve-seal system.
 - b. Piping NPS 6 and Larger: Galvanized-steel-pipe sleeves with sleeve-seal system.
 - 1) Select sleeve size to allow for 1-inch annular clear space between piping and sleeve for installing sleeve-seal system.
 3. Concrete Slabs-on-Grade:
 - a. Piping Smaller Than NPS 6: Sleeve-seal fittings.
 - 1) Select sleeve size to allow for 1-inch annular clear space between piping and sleeve for installing sleeve-seal system.
 - b. Piping NPS 6 and Larger: Galvanized-steel-pipe sleeves.
 - 1) Select sleeve size to allow for 1-inch annular clear space between piping and sleeve for installing sleeve-seal system.
 4. Concrete Slabs above Grade:
 - a. Piping Smaller Than NPS 6: Galvanized-steel-pipe sleeves or PVC-pipe sleeves.
 - b. Piping NPS 6 and Larger: Galvanized-steel-pipe sleeves or PVC-pipe sleeves.
 5. Interior Partitions:
 - a. Piping Smaller Than NPS 6: Galvanized-steel-pipe sleeves or PVC-pipe sleeves.
 - b. Piping NPS 6 and Larger: Galvanized-steel-sheet sleeves.

END OF SECTION 220517

THIS PAGE LEFT INTENTIONALLY BLANK

SECTION 220518 - ESCUTCHEONS FOR PLUMBING PIPING

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

- A. Drawings and general provisions of the Contract, including General and Supplementary Conditions and Division 01 Specification Sections, apply to this Section.

1.2 SUMMARY

- A. Section Includes:
 - 1. Escutcheons.
 - 2. Floor plates.

1.3 ACTION SUBMITTALS

- A. Product Data: For each type of product indicated.

PART 2 - PRODUCTS

2.1 ESCUTCHEONS

- A. One-Piece, Cast-Brass Type: With polished, chrome-plated finish and setscrew fastener.
- B. One-Piece, Deep-Pattern Type: Deep-drawn, box-shaped brass with chrome-plated finish and spring-clip fasteners.
- C. One-Piece, Stamped-Steel Type: With chrome-plated finish and spring-clip fasteners.
- D. Split-Casting Brass Type: With polished, chrome-plated finish and with concealed hinge and setscrew.

2.2 FLOOR PLATES

- A. One-Piece Floor Plates: Cast-iron flange with holes for fasteners.
- B. Split-Casting Floor Plates: Cast brass with concealed hinge.

PART 3 - EXECUTION

3.1 INSTALLATION

- A. Install escutcheons for piping penetrations of walls, ceilings, and finished floors.
- B. Install escutcheons with ID to closely fit around pipe, tube, and insulation of insulated piping and with OD that completely covers opening.
 - 1. Escutcheons for New Piping:
 - a. Piping with Fitting or Sleeve Protruding from Wall: One-piece, deep-pattern type.
 - b. Chrome-Plated Piping: One-piece, cast-brass type with polished, chrome-plated finish.
 - c. Insulated Piping: One-piece, stamped-steel type.
 - d. Bare Piping at Wall and Floor Penetrations in Finished Spaces: One-piece, cast-brass type with polished, chrome-plated finish.

- e. Bare Piping at Ceiling Penetrations in Finished Spaces: One-piece, cast-brass type with polished, chrome-plated finish.
 - f. Bare Piping in Unfinished Service Spaces: One-piece, cast-brass type with polished, chrome-plated finish.
 - g. Bare Piping in Equipment Rooms: One-piece, cast-brass type with polished, chrome-plated finish.
 - 2. Escutcheons for Existing Piping:
 - a. Chrome-Plated Piping: Split-casting brass type with polished, chrome-plated finish.
 - b. Insulated Piping: Split-plate, stamped-steel type with concealed or exposed-rivet hinge.
 - c. Bare Piping at Wall and Floor Penetrations in Finished Spaces: Split-casting brass type with polished, chrome-plated finish.
 - d. Bare Piping at Ceiling Penetrations in Finished Spaces: Split-casting brass type with polished, chrome-plated finish.
 - e. Bare Piping in Unfinished Service Spaces: Split-casting brass type with polished, chrome-plated finish.
 - f. Bare Piping in Equipment Rooms: Split-casting brass type with polished, chrome-plated finish.
 - C. Install floor plates for piping penetrations of equipment-room floors.
 - D. Install floor plates with ID to closely fit around pipe, tube, and insulation of piping and with OD that completely covers opening.
 - 1. New Piping: One-piece, floor-plate type.
 - 2. Existing Piping: Split-casting, floor-plate type.
- 3.2 FIELD QUALITY CONTROL**
- A. Replace broken and damaged escutcheons and floor plates using new materials.

END OF SECTION 220518

SECTION 220523 - GENERAL-DUTY VALVES FOR PLUMBING PIPING

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

- A. Drawings and general provisions of the Contract, including General and Supplementary Conditions and Division 01 Specification Sections, apply to this Section.

1.2 SUMMARY

- A. Section Includes:
 - 1. Bronze ball valves.
 - 2. Iron, single-flange butterfly valves.
 - 3. Iron, grooved-end butterfly valves.
 - 4. Bronze swing check valves.
 - 5. Iron gate valves.
 - 6. Lubricated plug valves.

1.3 DEFINITIONS

- A. CWP: Cold working pressure.
- B. EPDM: Ethylene propylene copolymer rubber.
- C. NBR: Acrylonitrile-butadiene, Buna-N, or nitrile rubber.
- D. NRS: Nonrising stem.
- E. OS&Y: Outside screw and yoke.
- F. RS: Rising stem.
- G. SWP: Steam working pressure.

1.4 ACTION SUBMITTALS

- A. Product Data: For each type of valve indicated.

1.5 QUALITY ASSURANCE

- A. Source Limitations for Valves: Obtain each type of valve from single source from single manufacturer.
- B. ASME Compliance:
 - 1. ASME B16.10 and ASME B16.34 for ferrous valve dimensions and design criteria.
 - 2. ASME B31.1 for power piping valves.
 - 3. ASME B31.9 for building services piping valves.
- C. NSF Compliance: NSF 61 and NSF 372 for valve materials for potable-water service.

1.6 DELIVERY, STORAGE, AND HANDLING

- A. Prepare valves for shipping as follows:
 - 1. Protect internal parts against rust and corrosion.
 - 2. Protect threads, flange faces, grooves, and weld ends.
 - 3. Set angle, gate, and globe valves closed to prevent rattling.

4. Set ball and plug valves open to minimize exposure of functional surfaces.
 5. Set butterfly valves closed or slightly open.
 6. Block check valves in either closed or open position.
- B. Use the following precautions during storage:
1. Maintain valve end protection.
 2. Store valves indoors and maintain at higher than ambient dew point temperature. If outdoor storage is necessary, store valves off the ground in watertight enclosures.

PART 2 - PRODUCTS

2.1 GENERAL REQUIREMENTS FOR VALVES

- A. Refer to valve schedule articles for applications of valves.
- B. Per new Federal Lead Free Law, any product designed for dispensing potable water meet both the NSF 61 and NSF 372 test standards via third-party testing and certification.
- C. Valve Pressure and Temperature Ratings: Not less than indicated and as required for system pressures and temperatures.
- D. Valve Sizes: Same as upstream piping unless otherwise indicated.
- E. Valve Actuator Types:
1. Gear Actuator: For quarter-turn valves NPS 8 and larger.
 2. Handwheel: For valves other than quarter-turn types.
 3. Handlever: For quarter-turn valves NPS 6 and smaller.
 4. Wrench: For plug valves with square heads. Furnish Owner with 1 wrench for every 5 plug valves, for each size square plug-valve head.
- F. Valves in Insulated Piping: With 2-inch stem extensions and the following features:
1. Gate Valves: With rising stem.
 2. Ball Valves: With extended operating handle of non-thermal-conductive material, and protective sleeve that allows operation of valve without breaking the vapor seal or disturbing insulation.
 3. Butterfly Valves: With extended neck.
- G. Valve-End Connections:
1. Flanged: With flanges according to ASME B16.1 for iron valves.
 2. Grooved: With grooves according to AWWA C606.
 3. Solder Joint: With sockets according to ASME B16.18.
 4. Threaded: With threads according to ASME B1.20.1.
- H. Valve Bypass and Drain Connections: MSS SP-45.

2.2 BRONZE BALL VALVES

- A. Two-Piece, Full-Port, Bronze Ball Valves with Bronze Trim:
1. Manufacturers: Subject to compliance with requirements, available manufacturers offering products that may be incorporated into the Work include, but are not limited to, the following:
 - a. American Valve, Inc.
 - b. Conbraco Industries, Inc.; Apollo Valves.
 - c. Crane Co.; Crane Valve Group; Crane Valves.
 - d. Hammond Valve.
 - e. Lance Valves; a division of Advanced Thermal Systems, Inc.

- f. Milwaukee Valve Company.
 - g. NIBCO INC.
 - h. Red-White Valve Corporation.
 - i. Watts Regulator Co.; a division of Watts Water Technologies, Inc.
- 2. Description:
 - a. Standard: MSS SP-110.
 - b. SWP Rating: 150 psig.
 - c. CWP Rating: 600 psig.
 - d. Body Design: Two piece.
 - e. Body Material: Bronze.
 - f. Ends: Threaded.
 - g. Seats: PTFE or TFE.
 - h. Stem: Bronze.
 - i. Ball: Chrome-plated brass.
 - j. Port: Full.

2.3 BRONZE SWING CHECK VALVES

- A. Class 125, Bronze Swing Check Valves with Bronze Disc:
 - 1. Manufacturers: Subject to compliance with requirements, available manufacturers offering products that may be incorporated into the Work include, but are not limited to, the following:
 - a. American Valve, Inc.
 - b. Crane Co.; Crane Valve Group; Crane Valves.
 - c. Crane Co.; Crane Valve Group; Jenkins Valves.
 - d. Crane Co.; Crane Valve Group; Stockham Division.
 - e. Hammond Valve.
 - f. Kitz Corporation.
 - g. Milwaukee Valve Company.
 - h. NIBCO INC.
 - i. Red-White Valve Corporation.
 - j. Watts Regulator Co.; a division of Watts Water Technologies, Inc.
 - 2. Description:
 - a. Standard: MSS SP-80, Type 3.
 - b. CWP Rating: 200 psig.
 - c. Body Design: Horizontal flow.
 - d. Body Material: ASTM B 62, bronze.
 - e. Ends: Threaded.
 - f. Disc: Bronze.

2.4 IRON GATE VALVES

- A. Class 125, OS&Y, Iron Gate Valves:
 - 1. Manufacturers: Subject to compliance with requirements, available manufacturers offering products that may be incorporated into the Work include, but are not limited to, the following:
 - a. Crane Co.; Crane Valve Group; Crane Valves.
 - b. Crane Co.; Crane Valve Group; Jenkins Valves.
 - c. Crane Co.; Crane Valve Group; Stockham Division.
 - d. Hammond Valve.
 - e. Kitz Corporation.
 - f. Milwaukee Valve Company.

- g. NIBCO INC.
- h. Powell Valves.
- i. Red-White Valve Corporation.
- j. Watts Regulator Co.; a division of Watts Water Technologies, Inc.
- 2. Description:
 - a. Standard: MSS SP-70, Type I.
 - b. CWP Rating: 200 psig.
 - c. Body Material: ASTM A 126, gray iron with bolted bonnet.
 - d. Ends: Flanged.
 - e. Trim: Bronze.
 - f. Disc: Solid wedge.
 - g. Packing and Gasket: Asbestos free.

2.5 LUBRICATED PLUG VALVES

- A. Class 125, Regular-Gland, Lubricated Plug Valves with Threaded Ends:
 - 1. Manufacturers: Subject to compliance with requirements, available manufacturers offering products that may be incorporated into the Work include, but are not limited to, the following:
 - a. Nordstrom Valves, Inc.
 - 2. Description:
 - a. Standard: MSS SP-78, Type II.
 - b. CWP Rating: 200 psig.
 - c. Body Material: ASTM A 48/A 48M or ASTM A 126, cast iron with lubrication-sealing system.
 - d. Pattern: Regular or short.
 - e. Plug: Cast iron or bronze with sealant groove.
- B. Class 125, Lubricated Plug Valves with Flanged Ends:
 - 1. Manufacturers: Subject to compliance with requirements, available manufacturers offering products that may be incorporated into the Work include, but are not limited to, the following:
 - a. Nordstrom Valves, Inc.
 - 2. Description:
 - a. Standard: MSS SP-78, Type II.
 - b. CWP Rating: 200 psig.
 - c. Body Material: ASTM A 48/A 48M or ASTM A 126, cast iron with lubrication-sealing system.
 - d. Pattern: Regular or short.
 - e. Plug: Cast iron or bronze with sealant groove.

PART 3 - EXECUTION

3.1 EXAMINATION

- A. Examine valve interior for cleanliness, freedom from foreign matter, and corrosion. Remove special packing materials, such as blocks, used to prevent disc movement during shipping and handling.
- B. Operate valves in positions from fully open to fully closed. Examine guides and seats made accessible by such operations.
- C. Examine threads on valve and mating pipe for form and cleanliness.

- D. Examine mating flange faces for conditions that might cause leakage. Check bolting for proper size, length, and material. Verify that gasket is of proper size, that its material composition is suitable for service, and that it is free from defects and damage.
- E. Do not attempt to repair defective valves; replace with new valves.

3.2 VALVE INSTALLATION

- A. Install valves with unions or flanges at each piece of equipment arranged to allow service, maintenance, and equipment removal without system shutdown.
- B. Locate valves for easy access and provide separate support where necessary.
- C. Install valves in horizontal piping with stem at or above center of pipe.
- D. Install valves in position to allow full stem movement.
- E. Install check valves for proper direction of flow and as follows:
 - 1. Swing Check Valves: In horizontal position with hinge pin level.

3.3 ADJUSTING

- A. Adjust or replace valve packing after piping systems have been tested and put into service but before final adjusting and balancing. Replace valves if persistent leaking occurs.

3.4 GENERAL REQUIREMENTS FOR VALVE APPLICATIONS

- A. If valve applications are not indicated, use the following:
 - 1. Shutoff Service: Ball, butterfly valves.
 - 2. Butterfly Valve Dead-End Service: Single-flange (lug) type.
 - 3. Throttling Service: ball, or butterfly valves.
 - 4. Pump-Discharge Check Valves:
 - a. NPS 2 and Smaller: Bronze swing check valves with bronze disc.
 - b. NPS 2-1/2 and Larger for Domestic Water: Iron swing check valves with lever and weight or with spring or iron, center-guided, resilient-seat check valves.
 - c. NPS 2-1/2 and Larger for Sanitary Waste and Storm Drainage: Iron swing check valves with lever and weight or spring.
- B. If valves with specified SWP classes or CWP ratings are not available, the same types of valves with higher SWP classes or CWP ratings may be substituted.
- C. Select valves, except wafer types, with the following end connections:
 - 1. For Copper Tubing, NPS 2 and Smaller: Threaded ends except where solder-joint valve-end option is indicated in valve schedules below.
 - 2. For Copper Tubing, NPS 2-1/2 to NPS 4: Flanged ends except where threaded valve-end option is indicated in valve schedules below.
 - 3. For Copper Tubing, NPS 5 and Larger: Flanged ends.
 - 4. For Grooved-End Copper Tubing: Valve ends may be grooved.

3.5 DOMESTIC, HOT- AND COLD-WATER VALVE SCHEDULE

- A. Pipe NPS 2 and Smaller:
 - 1. Bronze Valves: May be provided with solder-joint ends instead of threaded ends.
 - 2. Ball Valves: Two piece, full port, bronze with bronze trim.
 - 3. Bronze Swing Check Valves: Class 125, bronze disc.
- B. Pipe NPS 2-1/2 and Larger:

1. Iron Valves, NPS 2-1/2 to NPS 4: May be provided with threaded ends instead of flanged ends.
2. Iron Ball Valves: Class 150.
3. Iron, Single-Flange Butterfly Valves: 200 CWP, EPDM seat, aluminum-bronze disc.
4. Iron, Grooved-End Butterfly Valves: 175 CWP.
5. Iron Swing Check Valves: Class 125, nonmetallic-to-metal seats.
6. Iron Gate Valves: Class 125, OS&Y.

3.6 SANITARY-WASTE AND STORM-DRAINAGE VALVE SCHEDULE

A. Pipe NPS 2 and Smaller:

1. Bronze Swing Check Valves: Class 125, bronze disc.

B. Pipe NPS 2-1/2 and Larger:

1. Iron Swing Check Valves: Class 125, nonmetallic-to-metal seats.

END OF SECTION 220523

SECTION 220529 - HANGERS AND SUPPORTS FOR PLUMBING PIPING AND EQUIPMENT

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

- A. Drawings and general provisions of the Contract, including General and Supplementary Conditions and Division 01 Specification Sections, apply to this Section.

1.2 SUMMARY

- A. Section Includes:
 - 1. Metal pipe hangers and supports.
 - 2. Trapeze pipe hangers.
 - 3. Thermal-hanger shield inserts.
 - 4. Fastener systems.
 - 5. Pipe stands.
 - 6. Equipment supports.
- B. Related Sections:
 - 1. Section 055000 "Metal Fabrications" for structural-steel shapes and plates for trapeze hangers for pipe and equipment supports.
 - 2. Section 220516 "Expansion Fittings and Loops for Plumbing Piping" for pipe guides and anchors.
 - 3. Section 220548 "Vibration and Seismic Controls for Plumbing Piping and Equipment" for vibration isolation devices.

1.3 DEFINITIONS

- A. MSS: Manufacturers Standardization Society of The Valve and Fittings Industry Inc.

1.4 PERFORMANCE REQUIREMENTS

- A. Delegated Design: Design trapeze pipe hangers and equipment supports, including comprehensive engineering analysis by a qualified professional engineer, using performance requirements and design criteria indicated.
- B. Structural Performance: Hangers and supports for plumbing piping and equipment shall withstand the effects of gravity loads and stresses within limits and under conditions indicated according to ASCE/SEI 7.
 - 1. Design supports for multiple pipes, including pipe stands, capable of supporting combined weight of supported systems, system contents, and test water.
 - 2. Design equipment supports capable of supporting combined operating weight of supported equipment and connected systems and components.

1.5 ACTION SUBMITTALS

- A. Product Data: For each type of product indicated.
- B. Shop Drawings: Show fabrication and installation details and include calculations for the following; include Product Data for components:
 - 1. Trapeze pipe hangers.
 - 2. Metal framing systems.
 - 3. Pipe stands.
 - 4. Equipment supports.

- C. Delegated-Design Submittal: For trapeze hangers indicated to comply with performance requirements and design criteria, including analysis data signed and sealed by the qualified professional engineer responsible for their preparation.
1. Detail fabrication and assembly of trapeze hangers.
 2. Design Calculations: Calculate requirements for designing trapeze hangers.

1.6 INFORMATIONAL SUBMITTALS

- A. Welding certificates.

1.7 QUALITY ASSURANCE

- A. Structural Steel Welding Qualifications: Qualify procedures and personnel according to AWS D1.1/D1.1M, "Structural Welding Code - Steel."
- B. Pipe Welding Qualifications: Qualify procedures and operators according to ASME Boiler and Pressure Vessel Code.

PART 2 - PRODUCTS

2.1 METAL PIPE HANGERS AND SUPPORTS

- A. Carbon-Steel Pipe Hangers and Supports:
1. Description: MSS SP-58, Types 1 through 58, factory-fabricated components.
 2. Galvanized Metallic Coatings: Pregalvanized or hot dipped.
 3. Nonmetallic Coatings: Plastic coating, jacket, or liner.
 4. Padded Hangers: Hanger with fiberglass or other pipe insulation pad or cushion to support bearing surface of piping.
 5. Hanger Rods: Continuous-thread rod, nuts, and washer made of carbon steel.
- B. Copper Pipe Hangers:
1. Description: MSS SP-58, Types 1 through 58, copper-coated-steel, factory-fabricated components.
 2. Hanger Rods: Continuous-thread rod, nuts, and washer made of copper-coated steel.

2.2 TRAPEZE PIPE HANGERS

- A. Description: MSS SP-69, Type 59, shop- or field-fabricated pipe-support assembly made from structural carbon-steel shapes with MSS SP-58 carbon-steel hanger rods, nuts, saddles, and U-bolts.

2.3 THERMAL-HANGER SHIELD INSERTS

- A. Manufacturers: Subject to compliance with requirements, available manufacturers offering products that may be incorporated into the Work include, but are not limited to, the following:
1. Carpenter & Paterson, Inc.
 2. Clement Support Services.
 3. ERICO International Corporation.
 4. National Pipe Hanger Corporation.
 5. PHS Industries, Inc.
 6. Pipe Shields, Inc.; a subsidiary of Piping Technology & Products, Inc.
 7. Piping Technology & Products, Inc.
 8. Rilco Manufacturing Co., Inc.
 9. Value Engineered Products, Inc.

- B. Insulation-Insert Material for Cold Piping: ASTM C 552, Type II cellular glass with 100-psig minimum compressive strength and vapor barrier.
- C. Insulation-Insert Material for Hot Piping: ASTM C 552, Type II cellular glass with 100-psig minimum compressive strength.
- D. For Trapeze or Clamped Systems: Insert and shield shall cover entire circumference of pipe.
- E. For Clevis or Band Hangers: Insert and shield shall cover lower 180 degrees of pipe.
- F. Insert Length: Extend 2 inches beyond sheet metal shield for piping operating below ambient air temperature.

2.4 FASTENER SYSTEMS

- A. Powder-Actuated Fasteners: Threaded-steel stud, for use in hardened portland cement concrete with pull-out, tension, and shear capacities appropriate for supported loads and building materials where used.
- B. Mechanical-Expansion Anchors: Insert-wedge-type, zinc-coated steel anchors, for use in hardened portland cement concrete; with pull-out, tension, and shear capacities appropriate for supported loads and building materials where used.

2.5 PIPE STANDS

- A. General Requirements for Pipe Stands: Shop- or field-fabricated assemblies made of manufactured corrosion-resistant components to support roof-mounted piping.
- B. Compact Pipe Stand: One-piece plastic unit with integral-rod roller, pipe clamps, or V-shaped cradle to support pipe, for roof installation without membrane penetration.
- C. Low-Type, Single-Pipe Stand: One-piece plastic base unit with plastic roller, for roof installation without membrane penetration.
- D. High-Type, Single-Pipe Stand:
 - 1. Description: Assembly of base, vertical and horizontal members, and pipe support, for roof installation without membrane penetration.
 - 2. Base: Plastic.
 - 3. Vertical Members: Two or more cadmium-plated-steel or stainless-steel, continuous-thread rods.
 - 4. Horizontal Member: Cadmium-plated-steel or stainless-steel rod with plastic or stainless-steel, roller-type pipe support.
- E. High-Type, Multiple-Pipe Stand:
 - 1. Description: Assembly of bases, vertical and horizontal members, and pipe supports, for roof installation without membrane penetration.
 - 2. Bases: One or more; plastic.
 - 3. Vertical Members: Two or more protective-coated-steel channels.
 - 4. Horizontal Member: Protective-coated-steel channel.
 - 5. Pipe Supports: Galvanized-steel, clevis-type pipe hangers.

2.6 EQUIPMENT SUPPORTS

- A. Description: Welded, shop- or field-fabricated equipment support made from structural carbon-steel shapes.

2.7 MISCELLANEOUS MATERIALS

- A. Structural Steel: ASTM A 36/A 36M, carbon-steel plates, shapes, and bars; black and galvanized.
- B. Grout: ASTM C 1107, factory-mixed and -packaged, dry, hydraulic-cement, nonshrink and nonmetallic grout; suitable for interior and exterior applications.
 - 1. Properties: Nonstaining, noncorrosive, and nongaseous.
 - 2. Design Mix: 5000-psi, 28-day compressive strength.

PART 3 - EXECUTION**3.1 HANGER AND SUPPORT INSTALLATION**

- A. Metal Pipe-Hanger Installation: Comply with MSS SP-69 and MSS SP-89. Install hangers, supports, clamps, and attachments as required to properly support piping from the building structure.
- B. Metal Trapeze Pipe-Hanger Installation: Comply with MSS SP-69 and MSS SP-89. Arrange for grouping of parallel runs of horizontal piping, and support together on field-fabricated trapeze pipe hangers.
 - 1. Pipes of Various Sizes: Support together and space trapezes for smallest pipe size or install intermediate supports for smaller diameter pipes as specified for individual pipe hangers.
 - 2. Field fabricate from ASTM A 36/A 36M, carbon-steel shapes selected for loads being supported. Weld steel according to AWS D1.1/D1.1M.
- C. Thermal-Hanger Shield Installation: Install in pipe hanger or shield for insulated piping.
- D. Fastener System Installation:
 - 1. Install powder-actuated fasteners for use in lightweight concrete or concrete slabs less than 4 inches thick in concrete after concrete is placed and completely cured. Use operators that are licensed by powder-actuated tool manufacturer. Install fasteners according to powder-actuated tool manufacturer's operating manual.
 - 2. Install mechanical-expansion anchors in concrete after concrete is placed and completely cured. Install fasteners according to manufacturer's written instructions.
- E. Pipe Stand Installation:
 - 1. Pipe Stand Types except Curb-Mounted Type: Assemble components and mount on smooth roof surface. Do not penetrate roof membrane.
 - 2. Curb-Mounted-Type Pipe Stands: Assemble components or fabricate pipe stand and mount on permanent, stationary roof curb. See Section 077200 "Roof Accessories" for curbs.
- F. Install hangers and supports complete with necessary attachments, inserts, bolts, rods, nuts, washers, and other accessories.
- G. Equipment Support Installation: Fabricate from welded-structural-steel shapes.
- H. Install hangers and supports to allow controlled thermal movement of piping systems, to permit freedom of movement between pipe anchors, and to facilitate action of expansion joints, expansion loops, expansion bends, and similar units.
- I. Install lateral bracing with pipe hangers and supports to prevent swaying.
- J. Install building attachments within concrete slabs or attach to structural steel. Install additional attachments at concentrated loads, including valves, flanges, and strainers, NPS 2-1/2 and larger

and at changes in direction of piping. Install concrete inserts before concrete is placed; fasten inserts to forms and install reinforcing bars through openings at top of inserts.

- K. Load Distribution: Install hangers and supports so that piping live and dead loads and stresses from movement will not be transmitted to connected equipment.
- L. Pipe Slopes: Install hangers and supports to provide indicated pipe slopes and to not exceed maximum pipe deflections allowed by ASME B31.9 for building services piping.
- M. Insulated Piping:
 - 1. Attach clamps and spacers to piping.
 - a. Piping Operating above Ambient Air Temperature: Clamp may project through insulation.
 - b. Piping Operating below Ambient Air Temperature: Use thermal-hanger shield insert with clamp sized to match OD of insert.
 - c. Do not exceed pipe stress limits allowed by ASME B31.9 for building services piping.
 - 2. Install MSS SP-58, Type 39, protection saddles if insulation without vapor barrier is indicated. Fill interior voids with insulation that matches adjoining insulation.
 - a. Option: Thermal-hanger shield inserts may be used. Include steel weight-distribution plate for pipe NPS 4 and larger if pipe is installed on rollers.
 - 3. Install MSS SP-58, Type 40, protective shields on cold piping with vapor barrier. Shields shall span an arc of 180 degrees.
 - a. Option: Thermal-hanger shield inserts may be used. Include steel weight-distribution plate for pipe NPS 4 and larger if pipe is installed on rollers.
 - 4. Shield Dimensions for Pipe: Not less than the following:
 - a. NPS 1/4 to NPS 3-1/2: 12 inches long and 0.048 inch thick.
 - b. NPS 4: 12 inches long and 0.06 inch thick.
 - c. NPS 5 and NPS 6: 18 inches long and 0.06 inch thick.
 - d. NPS 8 to NPS 14: 24 inches long and 0.075 inch thick.
 - e. NPS 16 to NPS 24: 24 inches long and 0.105 inch thick.
 - 5. Pipes NPS 8 and Larger: Include wood or reinforced calcium-silicate-insulation inserts of length at least as long as protective shield.
 - 6. Thermal-Hanger Shields: Install with insulation same thickness as piping insulation.

3.2 EQUIPMENT SUPPORTS

- A. Fabricate structural-steel stands to suspend equipment from structure overhead or to support equipment above floor.
- B. Grouting: Place grout under supports for equipment and make bearing surface smooth.
- C. Provide lateral bracing, to prevent swaying, for equipment supports.

3.3 METAL FABRICATIONS

- A. Cut, drill, and fit miscellaneous metal fabrications for trapeze pipe hangers and equipment supports.
- B. Fit exposed connections together to form hairline joints. Field weld connections that cannot be shop welded because of shipping size limitations.
- C. Field Welding: Comply with AWS D1.1/D1.1M procedures for shielded, metal arc welding; appearance and quality of welds; and methods used in correcting welding work; and with the following:

1. Use materials and methods that minimize distortion and develop strength and corrosion resistance of base metals.
2. Obtain fusion without undercut or overlap.
3. Remove welding flux immediately.
4. Finish welds at exposed connections so no roughness shows after finishing and so contours of welded surfaces match adjacent contours.

3.4 ADJUSTING

- A. Hanger Adjustments: Adjust hangers to distribute loads equally on attachments and to achieve indicated slope of pipe.
- B. Trim excess length of continuous-thread hanger and support rods to 1-1/2 inches.

3.5 PAINTING

- A. Touchup: Clean field welds and abraded areas of shop paint. Paint exposed areas immediately after erecting hangers and supports. Use same materials as used for shop painting. Comply with SSPC-PA 1 requirements for touching up field-painted surfaces.
 1. Apply paint by brush or spray to provide a minimum dry film thickness of 2.0 mils.
- B. Touchup: Cleaning and touchup painting of field welds, bolted connections, and abraded areas of shop paint on miscellaneous metal are specified in Section 09
- C. Galvanized Surfaces: Clean welds, bolted connections, and abraded areas and apply galvanizing-repair paint to comply with ASTM A 780.

3.6 HANGER AND SUPPORT SCHEDULE

- A. Specific hanger and support requirements are in Sections specifying piping systems and equipment.
- B. Comply with MSS SP-69 for pipe-hanger selections and applications that are not specified in piping system Sections.
- C. Use hangers and supports with galvanized metallic coatings for piping and equipment that will not have field-applied finish.
- D. Use nonmetallic coatings on attachments for electrolytic protection where attachments are in direct contact with copper tubing.
- E. Use carbon-steel pipe hangers and supports, metal trapeze pipe hangers and metal framing systems and attachments for general service applications.
- F. Use copper-plated pipe hangers and copper attachments for copper piping and tubing.
- G. Use thermal-hanger shield inserts for insulated piping and tubing.
- H. Horizontal-Piping Hangers and Supports: Unless otherwise indicated and except as specified in piping system Sections, install the following types:
 1. Adjustable, Steel Clevis Hangers (MSS Type 1): For suspension of noninsulated or insulated, stationary pipes NPS 1/2 to NPS 30.
 2. Steel Pipe Clamps (MSS Type 4): For suspension of cold and hot pipes NPS 1/2 to NPS 24 if little or no insulation is required.
 3. Clips (MSS Type 26): For support of insulated pipes not subject to expansion or contraction.
 4. Single-Pipe Rolls (MSS Type 41): For suspension of pipes NPS 1 to NPS 30, from two rods if longitudinal movement caused by expansion and contraction might occur.

- I. Vertical-Piping Clamps: Unless otherwise indicated and except as specified in piping system Sections, install the following types:
 - 1. Extension Pipe or Riser Clamps (MSS Type 8): For support of pipe risers NPS 3/4 to NPS 24.
 - 2. Carbon- or Alloy-Steel Riser Clamps (MSS Type 42): For support of pipe risers NPS 3/4 to NPS 24 if longer ends are required for riser clamps.
- J. Hanger-Rod Attachments: Unless otherwise indicated and except as specified in piping system Sections, install the following types:
 - 1. Steel Turnbuckles (MSS Type 13): For adjustment up to 6 inches for heavy loads.
 - 2. Steel Clevises (MSS Type 14): For 120 to 450 deg F piping installations.
 - 3. Steel Weldless Eye Nuts (MSS Type 17): For 120 to 450 deg F piping installations.
- K. Building Attachments: Unless otherwise indicated and except as specified in piping system Sections, install the following types:
 - 1. Steel or Malleable Concrete Inserts (MSS Type 18): For upper attachment to suspend pipe hangers from concrete ceiling.
 - 2. Top-Beam C-Clamps (MSS Type 19): For use under roof installations with bar-joint construction, to attach to top flange of structural shape.
 - 3. Side-Beam or Channel Clamps (MSS Type 20): For attaching to bottom flange of beams, channels, or angles.
 - 4. Side-Beam Clamps (MSS Type 27): For bottom of steel I-beams.
 - 5. Steel-Beam Clamps with Eye Nuts (MSS Type 28): For attaching to bottom of steel I-beams for heavy loads.
 - 6. Horizontal Travelers (MSS Type 58): For supporting piping systems subject to linear horizontal movement where headroom is limited.
- L. Saddles and Shields: Unless otherwise indicated and except as specified in piping system Sections, install the following types:
 - 1. Steel-Pipe-Covering Protection Saddles (MSS Type 39): To fill interior voids with insulation that matches adjoining insulation.
 - 2. Protection Shields (MSS Type 40): Of length recommended in writing by manufacturer to prevent crushing insulation.
 - 3. Thermal-Hanger Shield Inserts: For supporting insulated pipe.
- M. Comply with MSS SP-69 for trapeze pipe-hanger selections and applications that are not specified in piping system Sections.
- N. Use powder-actuated fasteners instead of building attachments where required in concrete construction.
- O. Use pipe positioning systems in pipe spaces behind plumbing fixtures to support supply and waste piping for plumbing fixtures.

END OF SECTION 220529

THIS PAGE LEFT BLANK INTENTIONALLY

SECTION 220553 - IDENTIFICATION FOR PLUMBING PIPING AND EQUIPMENT

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

- A. Drawings and general provisions of the Contract, including General and Supplementary Conditions and Division 01 Specification Sections, apply to this Section.

1.2 SUMMARY

- A. Section Includes:
 - 1. Equipment labels.
 - 2. Warning signs and labels.
 - 3. Pipe labels.
 - 4. Stencils.
 - 5. Valve tags.
 - 6. Warning tags.

1.3 ACTION SUBMITTALS

- A. Product Data: For each type of product indicated.
- B. Samples: For color, letter style, and graphic representation required for each identification material and device.
- C. Equipment Label Schedule: Include a listing of all equipment to be labeled with the proposed content for each label.
- D. Valve numbering scheme.
- E. Valve Schedules: For each piping system to include in maintenance manuals.

1.4 COORDINATION

- A. Coordinate installation of identifying devices with completion of covering and painting of surfaces where devices are to be applied.
- B. Coordinate installation of identifying devices with locations of access panels and doors.
- C. Install identifying devices before installing acoustical ceilings and similar concealment.

PART 2 - PRODUCTS

2.1 EQUIPMENT LABELS

- A. Metal Labels for Equipment:
 - 1. Material and Thickness: Brass, 0.032-inch, Aluminum, 0.032-inch or anodized aluminum, 0.032-inch minimum thickness, and having predrilled or stamped holes for attachment hardware.
 - 2. Minimum Label Size: Length and width vary for required label content, but not less than 2-1/2 by 3/4 inch.
 - 3. Minimum Letter Size: 1/4 inch for name of units if viewing distance is less than 24 inches, 1/2 inch for viewing distances up to 72 inches, and proportionately larger lettering for greater viewing distances. Include secondary lettering two-thirds to three-fourths the size of principal lettering.

4. Fasteners: Stainless-steel rivets or self-tapping screws.
5. Adhesive: Contact-type permanent adhesive, compatible with label and with substrate.
- B. Label Content: Include equipment's Drawing designation or unique equipment number, Drawing numbers where equipment is indicated (plans, details, and schedules), plus the Specification Section number and title where equipment is specified.
- C. Equipment Label Schedule: For each item of equipment to be labeled, on 8-1/2-by-11-inch bond paper. Tabulate equipment identification number and identify Drawing numbers where equipment is indicated (plans, details, and schedules), plus the Specification Section number and title where equipment is specified. Equipment schedule shall be included in operation and maintenance data.

2.2 WARNING SIGNS AND LABELS

- A. Material and Thickness: Multilayer, multicolor, plastic labels for mechanical engraving, 1/16 inch thick, and having predrilled holes for attachment hardware.
- B. Letter Color: Black.
- C. Background Color: Yellow.
- D. Maximum Temperature: Able to withstand temperatures up to 160 deg F.
- E. Minimum Label Size: Length and width vary for required label content, but not less than 2-1/2 by 3/4 inch.
- F. Minimum Letter Size: 1/4 inch for name of units if viewing distance is less than 24 inches, 1/2 inch for viewing distances up to 72 inches, and proportionately larger lettering for greater viewing distances. Include secondary lettering two-thirds to three-fourths the size of principal lettering.
- G. Fasteners: Stainless-steel rivets or self-tapping screws.
- H. Adhesive: Contact-type permanent adhesive, compatible with label and with substrate.
- I. Label Content: Include caution and warning information, plus emergency notification instructions.

2.3 PIPE LABELS

- A. General Requirements for Manufactured Pipe Labels: Preprinted, color-coded, with lettering indicating service, and showing flow direction.
- B. Pretensioned Pipe Labels: Precoiled, semirigid plastic formed to partially cover circumference of pipe and to attach to pipe without fasteners or adhesive.
- C. Self-Adhesive Pipe Labels: Printed plastic with contact-type, permanent-adhesive backing.
- D. Pipe Label Contents: Include identification of piping service using same designations or abbreviations as used on Drawings, pipe size, and an arrow indicating flow direction.
 1. Flow-Direction Arrows: Integral with piping system service lettering to accommodate both directions, or as separate unit on each pipe label to indicate flow direction.
 2. Lettering Size: At least 1-1/2 inches high.

2.4 STENCILS

- A. Stencils: Prepared with letter sizes according to ASME A13.1 for piping; and minimum letter height of 3/4 inch for access panel and door labels, equipment labels, and similar operational instructions.
1. Stencil Material: Fiberboard or metal.
 2. Stencil Paint: Exterior, gloss, acrylic enamel black unless otherwise indicated. Paint may be in pressurized spray-can form.
 3. Identification Paint: Exterior, acrylic enamel in colors according to ASME A13.1 unless otherwise indicated.

2.5 VALVE TAGS

- A. Valve Tags: Stamped or engraved with 1/4-inch letters for piping system abbreviation and 1/2-inch numbers.
1. Tag Material: Brass, 0.032-inch Stainless steel, 0.025-inch Aluminum, 0.032-inch or anodized aluminum, 0.032-inch minimum thickness, and having predrilled or stamped holes for attachment hardware.
 2. Fasteners: Brass beaded chain.
- B. Valve Schedules: For each piping system, on 8-1/2-by-11-inch bond paper. Tabulate valve number, piping system, system abbreviation (as shown on valve tag), location of valve (room or space), normal-operating position (open, closed, or modulating), and variations for identification. Mark valves for emergency shutoff and similar special uses.
1. Valve-tag schedule shall be included in operation and maintenance data.

2.6 WARNING TAGS

- A. Warning Tags: Preprinted or partially preprinted, accident-prevention tags, of plasticized card stock with matte finish suitable for writing.
1. Size: 3 by 5-1/4 inches minimum.
 2. Fasteners: Brass grommet and wire.
 3. Nomenclature: Large-size primary caption such as "DANGER," "CAUTION," or "DO NOT OPERATE."
 4. Color: Yellow background with black lettering.

PART 3 - EXECUTION

3.1 PREPARATION

- A. Clean piping and equipment surfaces of substances that could impair bond of identification devices, including dirt, oil, grease, release agents, and incompatible primers, paints, and encapsulants.

3.2 EQUIPMENT LABEL INSTALLATION

- A. Install or permanently fasten labels on each major item of mechanical equipment.
- B. Locate equipment labels where accessible and visible.

3.3 PIPE LABEL INSTALLATION

- A. Piping Color-Coding: Painting of piping is specified in Section 09.

- B. Stenciled Pipe Label Option: Stenciled labels may be provided instead of manufactured pipe labels, at Installer's option. Install stenciled pipe labels, complying with ASME A13.1, on each piping system.
 - 1. Identification Paint: Use for contrasting background.
 - 2. Stencil Paint: Use for pipe marking.
- C. Locate pipe labels where piping is exposed or above accessible ceilings in finished spaces; machine rooms; accessible maintenance spaces such as shafts, tunnels, and plenums; and exterior exposed locations as follows:
 - 1. Near each valve and control device.
 - 2. Near each branch connection, excluding short takeoffs for fixtures and terminal units. Where flow pattern is not obvious, mark each pipe at branch.
 - 3. Near penetrations through walls, floors, ceilings, and inaccessible enclosures.
 - 4. At access doors, manholes, and similar access points that permit view of concealed piping.
 - 5. Near major equipment items and other points of origination and termination.
 - 6. Spaced at maximum intervals of 50 feet along each run. Reduce intervals to 25 feet in areas of congested piping and equipment.
 - 7. On piping above removable acoustical ceilings. Omit intermediately spaced labels.
- D. Pipe Label Color Schedule:
 - 1. Domestic Water Piping:
 - a. Background Color: Yellow.
 - b. Letter Color: Black.
 - 2. Sanitary Waste and Storm Drainage Piping:
 - a. Background Color: Yellow.
 - b. Letter Color: Black.

3.4 VALVE-TAG INSTALLATION

- A. Install tags on valves and control devices in piping systems, except check valves; valves within factory-fabricated equipment units; shutoff valves; faucets; convenience and lawn-watering hose connections; and similar roughing-in connections of end-use fixtures and units. List tagged valves in a valve schedule.
- B. Valve-Tag Application Schedule: Tag valves according to size, shape, and color scheme and with captions similar to those indicated in the following subparagraphs:
 - 1. Valve-Tag Size and Shape:
 - a. Cold Water: 1-1/2 inches, round.
 - b. Hot Water: 1-1/2 inches, round.
 - 2. Valve-Tag Color:
 - a. Cold Water: Natural.
 - b. Hot Water: Natural.
 - 3. Letter Color:
 - a. Cold Water: Black.
 - b. Hot Water: Black.

3.5 WARNING-TAG INSTALLATION

- A. Write required message on, and attach warning tags to, equipment and other items where required.

END OF SECTION 220553

SECTION 220719 - PLUMBING PIPING INSULATION

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

- A. Drawings and general provisions of the Contract, including General and Supplementary Conditions and Division 01 Specification Sections, apply to this Section.

1.2 SUMMARY

- A. Section includes insulating the following plumbing piping services:
 - 1. Domestic cold-water piping.
 - 2. Domestic hot-water piping.
 - 3. Domestic recirculating hot-water piping.
 - 4. Roof drains and rainwater leaders.
 - 5. Supplies and drains for handicap-accessible lavatories and sinks.

1.3 ACTION SUBMITTALS

- A. Product Data: For each type of product indicated. Include thermal conductivity, water-vapor permeance thickness, and jackets (both factory- and field-applied, if any).
- B. Shop Drawings: Include plans, elevations, sections, details, and attachments to other work.
 - 1. Detail application of protective shields, saddles, and inserts at hangers for each type of insulation and hanger.
 - 2. Detail insulation application at elbows, fittings, flanges, valves, and specialties for each type of insulation.
 - 3. Detail application of field-applied jackets.

1.4 INFORMATIONAL SUBMITTALS

- A. Qualification Data: For qualified Installer.
- B. Material Test Reports: From a qualified testing agency acceptable to authorities having jurisdiction indicating, interpreting, and certifying test results for compliance of insulation materials, sealers, attachments, cements, and jackets, with requirements indicated. Include dates of tests and test methods employed.
- C. Field quality-control reports.

1.5 QUALITY ASSURANCE

- A. Surface-Burning Characteristics: For insulation and related materials, as determined by testing identical products according to ASTM E 84 by a testing agency acceptable to authorities having jurisdiction. Factory label insulation and jacket materials and adhesive, mastic, tapes, and cement material containers, with appropriate markings of applicable testing agency.
 - 1. Insulation Installed Indoors: Flame-spread index of 25 or less, and smoke-developed index of 50 or less.
 - 2. Insulation Installed Outdoors: Flame-spread index of 75 or less, and smoke-developed index of 150 or less.
- B. Comply with the following applicable standards and other requirements specified for miscellaneous components:
 - 1. Supply and Drain Protective Shielding Guards: ICC A117.1.

1.6 DELIVERY, STORAGE, AND HANDLING

- A. Packaging: Insulation material containers shall be marked by manufacturer with appropriate ASTM standard designation, type and grade, and maximum use temperature.

1.7 COORDINATION

- A. Coordinate sizes and locations of supports, hangers, and insulation shields specified in Section 220529 "Hangers and Supports for Plumbing Piping and Equipment."
- B. Coordinate clearance requirements with piping Installer for piping insulation application. Before preparing piping Shop Drawings, establish and maintain clearance requirements for installation of insulation and field-applied jackets and finishes and for space required for maintenance.
- C. Coordinate installation and testing of heat tracing.

1.8 SCHEDULING

- A. Schedule insulation application after pressure testing systems and, where required, after installing and testing heat tracing. Insulation application may begin on segments that have satisfactory test results.
- B. Complete installation and concealment of plastic materials as rapidly as possible in each area of construction.

PART 2 - PRODUCTS

2.1 INSULATION MATERIALS

- A. Comply with requirements in "Piping Insulation Schedule, General," "Indoor Piping Insulation Schedule," "Outdoor, Aboveground Piping Insulation Schedule," and "Outdoor, Underground Piping Insulation Schedule" articles for where insulating materials shall be applied.
- B. Products shall not contain asbestos, lead, mercury, or mercury compounds.
- C. Products that come in contact with stainless steel shall have a leachable chloride content of less than 50 ppm when tested according to ASTM C 871.
- D. Insulation materials for use on austenitic stainless steel shall be qualified as acceptable according to ASTM C 795.
- E. Foam insulation materials shall not use CFC or HCFC blowing agents in the manufacturing process.
- F. Flexible Elastomeric Insulation: Closed-cell, sponge- or expanded-rubber materials. Comply with ASTM C 534, Type I for tubular materials.
 - 1. Products: Subject to compliance with requirements, available products that may be incorporated into the Work include, but are not limited to, the following:
 - a. Aeroflex USA, Inc.; Aerocel.
 - b. Armacell LLC; AP Armaflex.
 - c. K-Flex USA; Insul-Lock, Insul-Tube, and K-FLEX LS.
- G. Mineral-Fiber, Preformed Pipe Insulation:
 - 1. Products: Subject to compliance with requirements, available products that may be incorporated into the Work include, but are not limited to, the following:
 - a. Fibrex Insulations Inc.; Coreplus 1200.
 - b. Johns Manville; Micro-Lok.

- c. Knauf Insulation; 1000-Degree Pipe Insulation.
- d. Manson Insulation Inc.; Alley-K.
- e. Owens Corning; Fiberglas Pipe Insulation.
2. Type I, 850 Deg F Materials: Mineral or glass fibers bonded with a thermosetting resin. Comply with ASTM C 547, Type I, Grade A, with factory-applied ASJ. Factory-applied jacket requirements are specified in "Factory-Applied Jackets" Article.

2.2 INSULATING CEMENTS

- A. Mineral-Fiber Insulating Cement: Comply with ASTM C 195.
 1. Products: Subject to compliance with requirements, available products that may be incorporated into the Work include, but are not limited to, the following:
 - a. Ramco Insulation, Inc.; Super-Stik.

2.3 ADHESIVES

- A. Materials shall be compatible with insulation materials, jackets, and substrates and for bonding insulation to itself and to surfaces to be insulated, unless otherwise indicated.
- B. Flexible Elastomeric Adhesive: Comply with MIL-A-24179A, Type II, Class I.
 1. Products: Subject to compliance with requirements, available products that may be incorporated into the Work include, but are not limited to, the following:
 - a. Aeroflex USA, Inc.; Aero seal.
 - b. Armacell LLC; Armaflex 520 Adhesive.
 - c. Foster Brand, Specialty Construction Brands, Inc., a business of H. B. Fuller Company; 85-75.
 - d. K-Flex USA; R-373 Contact Adhesive.
 2. For indoor applications, adhesive shall have a VOC content of 50 g/L or less when calculated according to 40 CFR 59, Subpart D (EPA Method 24).
 3. Adhesive shall comply with the testing and product requirements of the California Department of Health Services' "Standard Practice for the Testing of Volatile Organic Emissions from Various Sources Using Small-Scale Environmental Chambers."
- C. Mineral-Fiber Adhesive: Comply with MIL-A-3316C, Class 2, Grade A.
 1. Products: Subject to compliance with requirements, available products that may be incorporated into the Work include, but are not limited to, the following:
 - a. Childers Brand, Specialty Construction Brands, Inc., a business of H. B. Fuller Company; CP-127.
 - b. Eagle Bridges - Marathon Industries; 225.
 - c. Foster Brand, Specialty Construction Brands, Inc., a business of H. B. Fuller Company; 85-60/85-70.
 - d. Mon-Eco Industries, Inc.; 22-25.
 2. For indoor applications, adhesive shall have a VOC content of 80 g/L or less when calculated according to 40 CFR 59, Subpart D (EPA Method 24).
 3. Adhesive shall comply with the testing and product requirements of the California Department of Health Services' "Standard Practice for the Testing of Volatile Organic Emissions from Various Sources Using Small-Scale Environmental Chambers."
- D. PVC Jacket Adhesive: Compatible with PVC jacket.
 1. Products: Subject to compliance with requirements, available products that may be incorporated into the Work include, but are not limited to, the following:
 - a. Dow Corning Corporation; 739, Dow Silicone.
 - b. Johns Manville; Zeston Perma-Weld, CEEL-TITE Solvent Welding Adhesive.

- c. P.I.C. Plastics, Inc.; Welding Adhesive.
 - d. Speedline Corporation; Polyco VP Adhesive.
2. For indoor applications, adhesive shall have a VOC content of 50 g/L or less when calculated according to 40 CFR 59, Subpart D (EPA Method 24).
3. Adhesive shall comply with the testing and product requirements of the California Department of Health Services' "Standard Practice for the Testing of Volatile Organic Emissions from Various Sources Using Small-Scale Environmental Chambers."

2.4 SEALANTS

A. Joint Sealants:

1. Joint Sealants for Cellular-Glass Products: Subject to compliance with requirements, available products that may be incorporated into the Work include, but are not limited to, the following:
 - a. Childers Brand, Specialty Construction Brands, Inc., a business of H. B. Fuller Company; CP-76.
 - b. Eagle Bridges - Marathon Industries; 405.
 - c. Foster Brand, Specialty Construction Brands, Inc., a business of H. B. Fuller Company; 30-45.
 - d. Mon-Eco Industries, Inc.; 44-05.
 - e. Pittsburgh Corning Corporation; Pittseal 444.
2. Materials shall be compatible with insulation materials, jackets, and substrates.
3. Permanently flexible, elastomeric sealant.
4. Service Temperature Range: Minus 100 to plus 300 deg F.
5. Color: White or gray.
6. For indoor applications, sealants shall have a VOC content of 420 g/L or less when calculated according to 40 CFR 59, Subpart D (EPA Method 24).
7. Sealants shall comply with the testing and product requirements of the California Department of Health Services' "Standard Practice for the Testing of Volatile Organic Emissions from Various Sources Using Small-Scale Environmental Chambers."

2.5 FACTORY-APPLIED JACKETS

- A. Insulation system schedules indicate factory-applied jackets on various applications. When factory-applied jackets are indicated, comply with the following:
1. ASJ: White, kraft-paper, fiberglass-reinforced scrim with aluminum-foil backing; complying with ASTM C 1136, Type I.

2.6 FIELD-APPLIED JACKETS

- A. Field-applied jackets shall comply with ASTM C 921, Type I, unless otherwise indicated.
- B. PVC Jacket: High-impact-resistant, UV-resistant PVC complying with ASTM D 1784, Class 16354-C; thickness as scheduled; roll stock ready for shop or field cutting and forming. Thickness is indicated in field-applied jacket schedules.
1. Products: Subject to compliance with requirements, available products that may be incorporated into the Work include, but are not limited to, the following:
 - a. Johns Manville; Zeston.
 - b. P.I.C. Plastics, Inc.; FG Series.
 - c. Proto Corporation; LoSmoke.
 - d. Speedline Corporation; SmokeSafe.
 2. Adhesive: As recommended by jacket material manufacturer.
 3. Color: White.

4. Factory-fabricated fitting covers to match jacket if available; otherwise, field fabricate.
 - a. Shapes: 45- and 90-degree, short- and long-radius elbows, tees, valves, flanges, unions, reducers, end caps, soil-pipe hubs, traps, mechanical joints, and P-trap and supply covers for lavatories.

2.7 PROTECTIVE SHIELDING GUARDS

- A. Protective Shielding Pipe Covers at ADA Lavatories :
 1. Manufacturers: Subject to compliance with requirements, available manufacturers offering products that may be incorporated into the Work include, but are not limited to, the following:
 - a. Engineered Brass Company.
 - b. Insul-Tect Products Co.; a subsidiary of MVG Molded Products.
 - c. McGuire Manufacturing.
 - d. Plumberex.
 - e. Truebro; a brand of IPS Corporation.
 - f. Zurn Industries, LLC; Tubular Brass Plumbing Products Operation.
 2. Description: Manufactured plastic wraps for covering plumbing fixture hot- and cold-water supplies and trap and drain piping. Comply with Americans with Disabilities Act (ADA) requirements.

PART 3 - EXECUTION

3.1 EXAMINATION

- A. Examine substrates and conditions for compliance with requirements for installation tolerances and other conditions affecting performance of insulation application.
 1. Verify that systems to be insulated have been tested and are free of defects.
 2. Verify that surfaces to be insulated are clean and dry.
- B. Proceed with installation only after unsatisfactory conditions have been corrected.

3.2 PREPARATION

- A. Surface Preparation: Clean and dry surfaces to receive insulation. Remove materials that will adversely affect insulation application.

3.3 GENERAL INSTALLATION REQUIREMENTS

- A. Install insulation materials, accessories, and finishes with smooth, straight, and even surfaces; free of voids throughout the length of piping including fittings, valves, and specialties.
- B. Install accessories compatible with insulation materials and suitable for the service. Install accessories that do not corrode, soften, or otherwise attack insulation or jacket in either wet or dry state.
- C. Install insulation with longitudinal seams at top and bottom of horizontal runs.
- D. Install multiple layers of insulation with longitudinal and end seams staggered.
- E. Do not weld brackets, clips, or other attachment devices to piping, fittings, and specialties.
- F. Keep insulation materials dry during application and finishing.
- G. Install insulation with tight longitudinal seams and end joints. Bond seams and joints with adhesive recommended by insulation material manufacturer.

- H. Install insulation with least number of joints practical.
- I. Where vapor barrier is indicated, seal joints, seams, and penetrations in insulation at hangers, supports, anchors, and other projections with vapor-barrier mastic.
 - 1. Install insulation continuously through hangers and around anchor attachments.
 - 2. For insulation application where vapor barriers are indicated, extend insulation on anchor legs from point of attachment to supported item to point of attachment to structure. Taper and seal ends at attachment to structure with vapor-barrier mastic.
 - 3. Install insert materials and install insulation to tightly join the insert. Seal insulation to insulation inserts with adhesive or sealing compound recommended by insulation material manufacturer.
 - 4. Cover inserts with jacket material matching adjacent pipe insulation. Install shields over jacket, arranged to protect jacket from tear or puncture by hanger, support, and shield.
- J. Apply adhesives, mastics, and sealants at manufacturer's recommended coverage rate and wet and dry film thicknesses.
- K. Install insulation with factory-applied jackets as follows:
 - 1. Draw jacket tight and smooth.
 - 2. Cover circumferential joints with 3-inch- wide strips, of same material as insulation jacket. Secure strips with adhesive and outward clinching staples along both edges of strip, spaced 4 inches o.c.
 - 3. Overlap jacket longitudinal seams at least 1-1/2 inches. Install insulation with longitudinal seams at bottom of pipe. Clean and dry surface to receive self-sealing lap. Staple laps with outward clinching staples along edge at 2 inches o.c.
 - a. For below-ambient services, apply vapor-barrier mastic over staples.
 - 4. Cover joints and seams with tape, according to insulation material manufacturer's written instructions, to maintain vapor seal.
 - 5. Where vapor barriers are indicated, apply vapor-barrier mastic on seams and joints and at ends adjacent to pipe flanges and fittings.
- L. Cut insulation in a manner to avoid compressing insulation more than 75 percent of its nominal thickness.
- M. Finish installation with systems at operating conditions. Repair joint separations and cracking due to thermal movement.
- N. Repair damaged insulation facings by applying same facing material over damaged areas. Extend patches at least 4 inches beyond damaged areas. Adhere, staple, and seal patches similar to butt joints.
- O. For above-ambient services, do not install insulation to the following:
 - 1. Vibration-control devices.
 - 2. Testing agency labels and stamps.
 - 3. Nameplates and data plates.
 - 4. Cleanouts.

3.4 PENETRATIONS

- A. Insulation Installation at Roof Penetrations: Install insulation continuously through roof penetrations.
 - 1. Seal penetrations with flashing sealant.
 - 2. For applications requiring only indoor insulation, terminate insulation above roof surface and seal with joint sealant. For applications requiring indoor and outdoor insulation,

- install insulation for outdoor applications tightly joined to indoor insulation ends. Seal joint with joint sealant.
- 3. Extend jacket of outdoor insulation outside roof flashing at least 2 inches below top of roof flashing.
- 4. Seal jacket to roof flashing with flashing sealant.
- B. Insulation Installation at Underground Exterior Wall Penetrations: Terminate insulation flush with sleeve seal. Seal terminations with flashing sealant.
- C. Insulation Installation at Interior Wall and Partition Penetrations (That Are Not Fire Rated): Install insulation continuously through walls and partitions.
- D. Insulation Installation at Fire-Rated Wall and Partition Penetrations: Install insulation continuously through penetrations of fire-rated walls and partitions.
 - 1. Comply with requirements in Section 078413 "Penetration Firestopping" for firestopping and fire-resistive joint sealers.
- E. Insulation Installation at Floor Penetrations:
 - 1. Pipe: Install insulation continuously through floor penetrations.
 - 2. Seal penetrations through fire-rated assemblies. Comply with requirements in Section 078413 "Penetration Firestopping."

3.5 GENERAL PIPE INSULATION INSTALLATION

- A. Requirements in this article generally apply to all insulation materials except where more specific requirements are specified in various pipe insulation material installation articles.
- B. Insulation Installation on Fittings, Valves, Strainers, Flanges, and Unions:
 - 1. Install insulation over fittings, valves, strainers, flanges, unions, and other specialties with continuous thermal and vapor-retarder integrity unless otherwise indicated.
 - 2. Insulate pipe elbows using preformed fitting insulation or mitered fittings made from same material and density as adjacent pipe insulation. Each piece shall be butted tightly against adjoining piece and bonded with adhesive. Fill joints, seams, voids, and irregular surfaces with insulating cement finished to a smooth, hard, and uniform contour that is uniform with adjoining pipe insulation.
 - 3. Insulate tee fittings with preformed fitting insulation or sectional pipe insulation of same material and thickness as used for adjacent pipe. Cut sectional pipe insulation to fit. Butt each section closely to the next and hold in place with tie wire. Bond pieces with adhesive.
 - 4. Insulate valves using preformed fitting insulation or sectional pipe insulation of same material, density, and thickness as used for adjacent pipe. Overlap adjoining pipe insulation by not less than two times the thickness of pipe insulation, or one pipe diameter, whichever is thicker. For valves, insulate up to and including the bonnets, valve stuffing-box studs, bolts, and nuts. Fill joints, seams, and irregular surfaces with insulating cement.
 - 5. Insulate flanges and unions using a section of oversized preformed pipe insulation. Overlap adjoining pipe insulation by not less than two times the thickness of pipe insulation, or one pipe diameter, whichever is thicker.
 - 6. Cover segmented insulated surfaces with a layer of finishing cement and coat with a mastic. Install vapor-barrier mastic for below-ambient services and a breather mastic for above-ambient services. Reinforce the mastic with fabric-reinforcing mesh. Trowel the mastic to a smooth and well-shaped contour.
 - 7. For services not specified to receive a field-applied jacket except for flexible elastomeric and polyolefin, install fitted PVC cover over elbows, tees, strainers, valves, flanges, and

- unions. Terminate ends with PVC end caps. Tape PVC covers to adjoining insulation facing using PVC tape.
8. Stencil or label the outside insulation jacket of each union with the word "union." Match size and color of pipe labels.
- C. Insulate instrument connections for thermometers, pressure gages, pressure temperature taps, test connections, flow meters, sensors, switches, and transmitters on insulated pipes. Shape insulation at these connections by tapering it to and around the connection with insulating cement and finish with finishing cement, mastic, and flashing sealant.

3.6 INSTALLATION OF FLEXIBLE ELASTOMERIC INSULATION

- A. Seal longitudinal seams and end joints with manufacturer's recommended adhesive to eliminate openings in insulation that allow passage of air to surface being insulated.
- B. Insulation Installation on Pipe Flanges:
1. Install pipe insulation to outer diameter of pipe flange.
 2. Make width of insulation section same as overall width of flange and bolts, plus twice the thickness of pipe insulation.
 3. Fill voids between inner circumference of flange insulation and outer circumference of adjacent straight pipe segments with cut sections of sheet insulation of same thickness as pipe insulation.
 4. Secure insulation to flanges and seal seams with manufacturer's recommended adhesive to eliminate openings in insulation that allow passage of air to surface being insulated.
- C. Insulation Installation on Pipe Fittings and Elbows:
1. Install mitered sections of pipe insulation.
 2. Secure insulation materials and seal seams with manufacturer's recommended adhesive to eliminate openings in insulation that allow passage of air to surface being insulated.
- D. Insulation Installation on Valves and Pipe Specialties:
1. Install preformed valve covers manufactured of same material as pipe insulation when available.
 2. When preformed valve covers are not available, install cut sections of pipe and sheet insulation to valve body. Arrange insulation to permit access to packing and to allow valve operation without disturbing insulation.
 3. Install insulation to flanges as specified for flange insulation application.
 4. Secure insulation to valves and specialties and seal seams with manufacturer's recommended adhesive to eliminate openings in insulation that allow passage of air to surface being insulated.

3.7 INSTALLATION OF MINERAL-FIBER INSULATION

- A. Insulation Installation on Straight Pipes and Tubes:
1. Secure each layer of preformed pipe insulation to pipe with wire or bands and tighten bands without deforming insulation materials.
 2. Where vapor barriers are indicated, seal longitudinal seams, end joints, and protrusions with vapor-barrier mastic and joint sealant.
 3. For insulation with factory-applied jackets on above-ambient surfaces, secure laps with outward clinched staples at 6 inches o.c.
 4. For insulation with factory-applied jackets on below-ambient surfaces, do not staple longitudinal tabs. Instead, secure tabs with additional adhesive as recommended by insulation material manufacturer and seal with vapor-barrier mastic and flashing sealant.

- B. Insulation Installation on Pipe Flanges:
 - 1. Install preformed pipe insulation to outer diameter of pipe flange.
 - 2. Make width of insulation section same as overall width of flange and bolts, plus twice the thickness of pipe insulation.
 - 3. Fill voids between inner circumference of flange insulation and outer circumference of adjacent straight pipe segments with mineral-fiber blanket insulation.
 - 4. Install jacket material with manufacturer's recommended adhesive, overlap seams at least 1 inch, and seal joints with flashing sealant.
- C. Insulation Installation on Pipe Fittings and Elbows:
 - 1. Install preformed sections of same material as straight segments of pipe insulation when available.
 - 2. When preformed insulation elbows and fittings are not available, install mitered sections of pipe insulation, to a thickness equal to adjoining pipe insulation. Secure insulation materials with wire or bands.
- D. Insulation Installation on Valves and Pipe Specialties:
 - 1. Install preformed sections of same material as straight segments of pipe insulation when available.
 - 2. When preformed sections are not available, install mitered sections of pipe insulation to valve body.
 - 3. Arrange insulation to permit access to packing and to allow valve operation without disturbing insulation.
 - 4. Install insulation to flanges as specified for flange insulation application.

3.8 FIELD-APPLIED JACKET INSTALLATION

- A. Where PVC jackets are indicated, install with 1-inch overlap at longitudinal seams and end joints. Seal with manufacturer's recommended adhesive.
 - 1. Apply two continuous beads of adhesive to seams and joints, one bead under lap and the finish bead along seam and joint edge.

3.9 FIELD QUALITY CONTROL

- A. Testing Agency: Engage a qualified testing agency to perform tests and inspections.
- B. Perform tests and inspections.
- C. Tests and Inspections:
 - 1. Inspect pipe, fittings, strainers, and valves, randomly selected by Architect, by removing field-applied jacket and insulation in layers in reverse order of their installation. Extent of inspection shall be limited to three locations of straight pipe, three locations of threaded fittings, locations of threaded valves, and locations of flanged valves for each pipe service defined in the "Piping Insulation Schedule, General" Article.
- D. All insulation applications will be considered defective Work if sample inspection reveals noncompliance with requirements.

3.10 PIPING INSULATION SCHEDULE, GENERAL

- A. Acceptable preformed pipe and tubular insulation materials and thicknesses are identified for each piping system and pipe size range. If more than one material is listed for a piping system, selection from materials listed is Contractor's option.
- B. Items Not Insulated: Unless otherwise indicated, do not install insulation on the following:

1. Drainage piping located in crawl spaces.
2. Underground piping.
3. Chrome-plated pipes and fittings unless there is a potential for personnel injury.

3.11 INDOOR PIPING INSULATION SCHEDULE

- A. Domestic Cold Water:
 1. NPS 1 and Smaller: Insulation shall be one of the following:
 - a. Flexible Elastomeric: 1 inch Insert dimension thick.
 - b. Mineral-Fiber, Preformed Pipe Insulation, Type I: 1/2 inch thick.
 2. NPS 1-1/4 and Larger: Insulation shall be one of the following:
 - a. Flexible Elastomeric: 1 inch thick.
 - b. Mineral-Fiber, Preformed Pipe Insulation, Type I: 1 inch thick.
- B. Domestic Hot and Recirculated Hot Water (105-140 F):
 1. NPS 1-1/4 and Smaller: Insulation shall be one of the following:
 - a. Flexible Elastomeric: 1 inch thick.
 - b. Mineral-Fiber, Preformed Pipe Insulation, Type I: 1-1/2 inch thick.
 2. NPS 1-1/2 and Larger: Insulation shall be one of the following:
 - a. Flexible Elastomeric: 1 inch thick.
 - b. Mineral-Fiber, Preformed Pipe Insulation, Type I: 1-1/2 inch thick.
- C. Stormwater and Overflow:
 1. All Pipe Sizes: Insulation shall be one of the following:
 - a. Flexible Elastomeric: 1 inch thick.
 - b. Mineral-Fiber, Preformed Pipe Insulation, Type I: 1 inch thick.
- D. Roof Drain and Overflow Drain Bodies:
 1. All Pipe Sizes: Insulation shall be one of the following:
 - a. Flexible Elastomeric: 1 inch thick.
 - b. Mineral-Fiber, Preformed Pipe Insulation, Type I: 1 inch thick.
- E. Exposed Sanitary Drains, Domestic Water, Domestic Hot Water, and Stops for Plumbing Fixtures for People with Disabilities:
 1. All Pipe Sizes: Insulation shall be the following:
 - a. Mineral-Fiber, Preformed Pipe Insulation, Type I: 1/2 inch thick.
- F. Sanitary Waste Piping Where Heat Tracing Is Installed:
 1. All Pipe Sizes: Insulation shall be the following:
 - a. Cellular Glass: 2 inches thick.

3.12 INDOOR, FIELD-APPLIED JACKET SCHEDULE

- A. Install jacket over insulation material. For insulation with factory-applied jacket, install the field-applied jacket over the factory-applied jacket.
- B. If more than one material is listed, selection from materials listed is Contractor's option.
- C. Piping, Concealed:
 1. None.
- D. Piping, Exposed:
 1. PVC: 20 mils thick.

END OF SECTION 220719

SECTION 221116 - DOMESTIC WATER PIPING

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

- A. Drawings and general provisions of the Contract, including General and Supplementary Conditions and Division 01 Specification Sections, apply to this Section.

1.2 SUMMARY

- A. Section Includes:
 - 1. Under-building-slab and aboveground domestic water pipes, tubes, and fittings inside buildings.
 - 2. Encasement for piping.

1.3 ACTION SUBMITTALS

- A. Product Data: For transition fittings and dielectric fittings.

1.4 INFORMATIONAL SUBMITTALS

- A. System purging and disinfecting activities report.
- B. Field quality-control reports.

1.5 QUALITY ASSURANCE

- A. Regulatory Requirements:
 - 1. Comply with requirements of utility company supplying water. Include tapping of water mains and backflow prevention.
 - 2. Comply with standards of authorities having jurisdiction for potable-water-service piping, including materials, installation, testing, and disinfection.
- B. Piping materials shall bear label, stamp, or other markings of specified testing agency.
- C. Per new Federal Lead Free Law, any product designed for dispensing potable water meet both the NSF 61 and NSF 372 test standards via third-party testing and certification.

1.6 FIELD CONDITIONS

- A. Interruption of Existing Water Service: Do not interrupt water service to facilities occupied by Owner or others unless permitted under the following conditions and then only after arranging to provide temporary water service according to requirements indicated:
 - 1. Notify Architect, Construction Manager and Owner no fewer than two days in advance of proposed interruption of water service.
 - 2. Do not interrupt water service without Owner's written permission.

PART 2 - PRODUCTS

2.1 PIPING MATERIALS

- A. Comply with requirements in "Piping Schedule" Article for applications of pipe, tube, fitting materials, and joining methods for specific services, service locations, and pipe sizes.

- B. Potable-water piping and components shall comply with NSF 14 and NSF 61. Plastic piping components shall be marked with "NSF-pw."

2.2 COPPER TUBE AND FITTINGS

- A. Hard Copper Tube: ASTM B 88, Type L water tube, drawn temper.
- B. Soft Copper Tube: ASTM B 88, Type L water tube, annealed temper.
- C. Cast-Copper, Solder-Joint Fittings: ASME B16.18, pressure fittings.
- D. Wrought-Copper, Solder-Joint Fittings: ASME B16.22, wrought-copper pressure fittings.
- E. Bronze Flanges: ASME B16.24, Class 150, with solder-joint ends.
- F. Copper Unions:
 - 1. MSS SP-123.
 - 2. Cast-copper-alloy, hexagonal-stock body.
 - 3. Ball-and-socket, metal-to-metal seating surfaces.
 - 4. Solder-joint or threaded ends.

2.3 DUCTILE-IRON PIPE AND FITTINGS

- A. Mechanical-Joint, Ductile-Iron Pipe:
 - 1. AWWA C151/A21.51, with mechanical-joint bell and plain spigot end unless grooved or flanged ends are indicated.
 - 2. Glands, Gaskets, and Bolts: AWWA C111/A21.11, ductile- or gray-iron glands, rubber gaskets, and steel bolts.
- B. Standard-Pattern, Mechanical-Joint Fittings:
 - 1. AWWA C110/A21.10, ductile or gray iron.
 - 2. Glands, Gaskets, and Bolts: AWWA C111/A21.11, ductile- or gray-iron glands, rubber gaskets, and steel bolts.
- C. Standard-Pattern, Push-on-Joint Fittings:
 - 1. AWWA C110/A21.10, ductile or gray iron.
 - 2. Gaskets: AWWA C111/A21.11, rubber.
- D. Plain-End, Ductile-Iron Pipe: AWWA C151/A21.51.

2.4 PIPING JOINING MATERIALS

- A. Pipe-Flange Gasket Materials:
 - 1. AWWA C110/A21.10, rubber, flat face, 1/8 inch thick or ASME B16.21, nonmetallic and asbestos free unless otherwise indicated.
 - 2. Full-face or ring type unless otherwise indicated.
- B. Metal, Pipe-Flange Bolts and Nuts: ASME B18.2.1, carbon steel unless otherwise indicated.
- C. Solder Filler Metals: ASTM B 32, lead-free alloys.
- D. Flux: ASTM B 813, water flushable.

2.5 TRANSITION FITTINGS

- A. General Requirements:
 - 1. Same size as pipes to be joined.
 - 2. Pressure rating at least equal to pipes to be joined.
 - 3. End connections compatible with pipes to be joined.

- B. Fitting-Type Transition Couplings: Manufactured piping coupling or specified piping system fitting.
- C. Sleeve-Type Transition Coupling: AWWA C219.
 - 1. Manufacturers: Subject to compliance with requirements, available manufacturers offering products that may be incorporated into the Work include, but are not limited to, the following:
 - a. Cascade Waterworks Manufacturing.
 - b. Dresser, Inc.; Piping Specialties Products.
 - c. Ford Meter Box Company, Inc. (The).
 - d. JCM Industries.
 - e. Romac Industries, Inc.
 - f. Smith-Blair, Inc.; a Sensus company.
 - g. Viking Johnson.

2.6 DIELECTRIC FITTINGS

- A. General Requirements: Assembly of copper alloy and ferrous materials with separating nonconductive insulating material. Include end connections compatible with pipes to be joined.
- B. Dielectric Unions:
 - 1. Manufacturers: Subject to compliance with requirements, available manufacturers offering products that may be incorporated into the Work include, but are not limited to, the following:
 - a. Capitol Manufacturing Company; member of the Phoenix Forge Group.
 - b. Central Plastics Company.
 - c. Hart Industries International, Inc.
 - d. Jomar International.
 - e. Matco-Norca.
 - f. McDonald, A. Y. Mfg. Co.
 - g. Watts; a division of Watts Water Technologies, Inc.
 - h. Wilkins; a Zurn company.
 - 2. Standard: ASSE 1079.
 - 3. Pressure Rating: 150 psig minimum at 180 deg F.
 - 4. End Connections: Solder-joint copper alloy and threaded ferrous.
- C. Dielectric Flanges:
 - 1. Manufacturers: Subject to compliance with requirements, available manufacturers offering products that may be incorporated into the Work include, but are not limited to, the following:
 - a. Capitol Manufacturing Company; member of the Phoenix Forge Group.
 - b. Central Plastics Company.
 - c. Matco-Norca.
 - d. Watts; a division of Watts Water Technologies, Inc.
 - e. Wilkins; a Zurn company.
 - 2. Standard: ASSE 1079.
 - 3. Factory-fabricated, bolted, companion-flange assembly.
 - 4. Pressure Rating: 150 psig minimum at 180 deg F.
 - 5. End Connections: Solder-joint copper alloy and threaded ferrous; threaded solder-joint copper alloy and threaded ferrous.
- D. Dielectric-Flange Insulating Kits:

1. Manufacturers: Subject to compliance with requirements, available manufacturers offering products that may be incorporated into the Work include, but are not limited to, the following:
 - a. Advance Products & Systems, Inc.
 - b. Calpico, Inc.
 - c. Central Plastics Company.
 - d. Pipeline Seal and Insulator, Inc.
 2. Nonconducting materials for field assembly of companion flanges.
 3. Pressure Rating: 150 psig.
 4. Gasket: Neoprene or phenolic.
 5. Bolt Sleeves: Phenolic or polyethylene.
 6. Washers: Phenolic with steel backing washers.
- E. Dielectric Nipples:
1. Manufacturers: Subject to compliance with requirements, available manufacturers offering products that may be incorporated into the Work include, but are not limited to, the following:
 - a. Elster Perfection Corporation.
 - b. Grinnell Mechanical Products; Tyco Fire Products LP.
 - c. Matco-Norca.
 - d. Precision Plumbing Products, Inc.
 - e. Victaulic Company.
 2. Standard: IAPMO PS 66.
 3. Electroplated steel nipple complying with ASTM F 1545.
 4. Pressure Rating and Temperature: 300 psig at 225 deg F.
 5. End Connections: Male threaded or grooved.
 6. Lining: Inert and noncorrosive, propylene.

PART 3 - EXECUTION

3.1 EARTHWORK

- A. Comply with requirements in Section 312000 "Earth Moving" for excavating, trenching, and backfilling.

3.2 PIPING INSTALLATION

- A. Drawing plans, schematics, and diagrams indicate general location and arrangement of domestic water piping. Indicated locations and arrangements are used to size pipe and calculate friction loss, expansion, and other design considerations. Install piping as indicated unless deviations to layout are approved on coordination drawings.
- B. Install copper tubing under building slab according to CDA's "Copper Tube Handbook."
- C. Install ductile-iron piping under building slab with restrained joints according to AWWA C600 and AWWA M41.
- D. Install underground ductile-iron pipe in PE encasement according to ASTM A 674 or AWWA C105/A21.5.
- E. Install shutoff valve, hose-end drain valve, strainer, pressure gage, and test tee with valve inside the building at each domestic water-service entrance. Comply with requirements for pressure gages in Section 220519 "Meters and Gages for Plumbing Piping" and with requirements for drain valves and strainers in Section 221119 "Domestic Water Piping Specialties."

- F. Install shutoff valve immediately upstream of each dielectric fitting.
- G. Install water-pressure-reducing valves downstream from shutoff valves. Comply with requirements for pressure-reducing valves in Section 221119 "Domestic Water Piping Specialties."
- H. Install domestic water piping level without pitch and plumb.
- I. Rough-in domestic water piping for water-meter installation according to utility company's requirements.
- J. Install seismic restraints on piping. Comply with requirements for seismic-restraint devices in Division 22 "Vibration and Seismic Controls for Plumbing Piping and Equipment."
- K. Install piping concealed from view and protected from physical contact by building occupants unless otherwise indicated and except in equipment rooms and service areas.
- L. Install piping indicated to be exposed and piping in equipment rooms and service areas at right angles or parallel to building walls. Diagonal runs are prohibited unless specifically indicated otherwise.
- M. Install piping above accessible ceilings to allow sufficient space for ceiling panel removal, and coordinate with other services occupying that space.
- N. Install piping to permit valve servicing.
- O. Install nipples, unions, special fittings, and valves with pressure ratings the same as or higher than the system pressure rating used in applications below unless otherwise indicated.
- P. Install piping free of sags and bends.
- Q. Install fittings for changes in direction and branch connections.
- R. Install unions in copper tubing at final connection to each piece of equipment, machine, and specialty.
- S. Install pressure gages on suction and discharge piping for each plumbing pump and packaged booster pump. Comply with requirements for pressure gages in Division 22 "Meters and Gages for Plumbing Piping."
- T. Install thermostats in hot-water circulation piping near water heater.
- U. Install thermometers on inlet and outlet piping from each water heater. Comply with requirements for thermometers in Section 220519 "Meters and Gages for Plumbing Piping."
- V. Install sleeves for piping penetrations of walls, ceilings, and floors. Comply with requirements for sleeves specified in Section 220517 "Sleeves and Sleeve Seals for Plumbing Piping."
- W. Install sleeve seals for piping penetrations of concrete walls and slabs. Comply with requirements for sleeve seals specified in Section 220517 "Sleeves and Sleeve Seals for Plumbing Piping."
- X. Install escutcheons for piping penetrations of walls, ceilings, and floors. Comply with requirements for escutcheons specified in Section 220518 "Escutcheons for Plumbing Piping."

3.3 JOINT CONSTRUCTION

- A. Ream ends of pipes and tubes and remove burrs. Bevel plain ends of steel pipe.
- B. Remove scale, slag, dirt, and debris from inside and outside of pipes, tubes, and fittings before assembly.

- C. Threaded Joints: Thread pipe with tapered pipe threads according to ASME B1.20.1. Cut threads full and clean using sharp dies. Ream threaded pipe ends to remove burrs and restore full ID. Join pipe fittings and valves as follows:
 - 1. Apply appropriate tape or thread compound to external pipe threads.
 - 2. Damaged Threads: Do not use pipe or pipe fittings with threads that are corroded or damaged.
- D. Soldered Joints for Copper Tubing: Apply ASTM B 813, water-flushable flux to end of tube. Join copper tube and fittings according to ASTM B 828 or CDA's "Copper Tube Handbook."
- E. Joint Construction for Grooved-End, Ductile-Iron Piping: Make joints according to AWWA C606. Cut round-bottom grooves in ends of pipe at gasket-seat dimension required for specified (flexible or rigid) joint. Lubricate and install gasket over ends of pipes or pipe and fitting. Install coupling housing sections over gasket with keys seated in piping grooves. Install and tighten housing bolts.
- F. Flanged Joints: Select appropriate asbestos-free, nonmetallic gasket material in size, type, and thickness suitable for domestic water service. Join flanges with gasket and bolts according to ASME B31.9.
- G. Joints for Dissimilar-Material Piping: Make joints using adapters compatible with materials of both piping systems.

3.4 TRANSITION FITTING INSTALLATION

- A. Install transition couplings at joints of dissimilar piping.
- B. Transition Fittings in Underground Domestic Water Piping:
 - 1. Fittings for NPS 1-1/2 and Smaller: Fitting-type coupling.
 - 2. Fittings for NPS 2 and Larger: Sleeve-type coupling.

3.5 DIELECTRIC FITTING INSTALLATION

- A. Install dielectric fittings in piping at connections of dissimilar metal piping and tubing.
- B. Dielectric Fittings for NPS 2 and Smaller: Use dielectric couplings or nipples.
- C. Dielectric Fittings for NPS 2-1/2 to NPS 4: Use dielectric flange kits.
- D. Dielectric Fittings for NPS 5 and Larger: Use dielectric flange kits.

3.6 HANGER AND SUPPORT INSTALLATION

- A. Comply with requirements for seismic-restraint devices in Section 220548 "Vibration and Seismic Controls for Plumbing Piping and Equipment."
- B. Comply with requirements for pipe hanger, support products, and installation in Section 220529 "Hangers and Supports for Plumbing Piping and Equipment."
 - 1. Vertical Piping: MSS Type 8 or 42, clamps.
 - 2. Individual, Straight, Horizontal Piping Runs:
 - a. 100 Feet and Less: MSS Type 1, adjustable, steel clevis hangers.
 - b. Longer Than 100 Feet: MSS Type 43, adjustable roller hangers.
 - c. Longer Than 100 Feet if Indicated: MSS Type 49, spring cushion rolls.
 - 3. Multiple, Straight, Horizontal Piping Runs 100 Feet or Longer: MSS Type 44, pipe rolls. Support pipe rolls on trapeze.
 - 4. Base of Vertical Piping: MSS Type 52, spring hangers.
- C. Support vertical piping and tubing at base and at each floor.

- D. Rod diameter may be reduced one size for double-rod hangers, to a minimum of 3/8 inch.
- E. Install hangers for copper tubing with the following maximum horizontal spacing and minimum rod diameters:
 - 1. NPS 3/4 and Smaller: 60 inches with 3/8-inch rod.
 - 2. NPS 1 and NPS 1-1/4: 72 inches with 3/8-inch rod.
 - 3. NPS 1-1/2 and NPS 2: 96 inches with 3/8-inch rod.
 - 4. NPS 2-1/2: 108 inches with 1/2-inch rod.
 - 5. NPS 3 to NPS 5: 10 feet with 1/2-inch rod.
 - 6. NPS 6: 10 feet with 5/8-inch rod.
- F. Install supports for vertical copper tubing every 10 feet.
- G. Support piping and tubing not listed in this article according to MSS SP-69 and manufacturer's written instructions.

3.7 CONNECTIONS

- A. Drawings indicate general arrangement of piping, fittings, and specialties.
- B. When installing piping adjacent to equipment and machines, allow space for service and maintenance.
- C. Connect domestic water piping to exterior water-service piping. Use transition fitting to join dissimilar piping materials.
- D. Connect domestic water piping to water-service piping with shutoff valve; extend and connect to the following:
 - 1. Water Heaters: Cold-water inlet and hot-water outlet piping in sizes indicated, but not smaller than sizes of water heater connections.
 - 2. Plumbing Fixtures: Cold- and hot-water-supply piping in sizes indicated, but not smaller than that required by plumbing code.
 - 3. Equipment: Cold- and hot-water-supply piping as indicated, but not smaller than equipment connections. Provide shutoff valve and union for each connection. Use flanges instead of unions for NPS 2-1/2 and larger.

3.8 IDENTIFICATION

- A. Identify system components. Comply with requirements for identification materials and installation in Section 220553 "Identification for Plumbing Piping and Equipment."
- B. Label pressure piping with system operating pressure.

3.9 FIELD QUALITY CONTROL

- A. Perform the following tests and inspections:
 - 1. Piping Inspections:
 - a. Do not enclose, cover, or put piping into operation until it has been inspected and approved by authorities having jurisdiction.
 - b. During installation, notify authorities having jurisdiction at least one day before inspection must be made. Perform tests specified below in presence of authorities having jurisdiction:
 - 1) Roughing-in Inspection: Arrange for inspection of piping before concealing or closing in after roughing in and before setting fixtures.

- 2) Final Inspection: Arrange for authorities having jurisdiction to observe tests specified in "Piping Tests" Subparagraph below and to ensure compliance with requirements.
 - c. Reinspection: If authorities having jurisdiction find that piping will not pass tests or inspections, make required corrections and arrange for reinspection.
 - d. Reports: Prepare inspection reports and have them signed by authorities having jurisdiction.
 2. Piping Tests:
 - a. Fill domestic water piping. Check components to determine that they are not air bound and that piping is full of water.
 - b. Test for leaks and defects in new piping and parts of existing piping that have been altered, extended, or repaired. If testing is performed in segments, submit a separate report for each test, complete with diagram of portion of piping tested.
 - c. Leave new, altered, extended, or replaced domestic water piping uncovered and unconcealed until it has been tested and approved. Expose work that was covered or concealed before it was tested.
 - d. Cap and subject piping to static water pressure of 50 psig above operating pressure, without exceeding pressure rating of piping system materials. Isolate test source and allow it to stand for two hours. Leaks and loss in test pressure constitute defects that must be repaired.
 - e. Repair leaks and defects with new materials, and retest piping or portion thereof until satisfactory results are obtained.
 - f. Prepare reports for tests and for corrective action required.
- B. Domestic water piping will be considered defective if it does not pass tests and inspections.
- C. Reports: Prepare inspection and test reports and have them signed by authorities having jurisdiction. Submit all reports to Architect.

3.10 ADJUSTING

- A. Perform the following adjustments before operation:
 1. Close drain valves, hydrants, and hose bibbs.
 2. Open shutoff valves to fully open position.
 3. Open throttling valves to proper setting.
 4. Adjust balancing valves in hot-water-circulation return piping to provide adequate flow.
 - a. Manually adjust ball-type balancing valves in hot-water-circulation return piping to provide hot-water flow in each branch.
 - b. Adjust calibrated balancing valves to flows indicated.
 5. Remove plugs used during testing of piping and for temporary sealing of piping during installation.
 6. Remove and clean strainer screens. Close drain valves and replace drain plugs.
 7. Remove filter cartridges from housings and verify that cartridges are as specified for application where used and are clean and ready for use.
 8. Check plumbing specialties and verify proper settings, adjustments, and operation.

3.11 CLEANING

- A. Clean and disinfect potable domestic water piping as follows:
 1. Purge new piping and parts of existing piping that have been altered, extended, or repaired before using.

2. Use purging and disinfecting procedures prescribed by authorities having jurisdiction; if methods are not prescribed, use procedures described in either AWWA C651 or AWWA C652 or follow procedures described below:
 - a. Flush piping system with clean, potable water until dirty water does not appear at outlets.
 - b. Fill and isolate system according to either of the following:
 - 1) Fill system or part thereof with water/chlorine solution with at least 50 ppm of chlorine. Isolate with valves and allow to stand for 24 hours. OR
 - 2) Fill system or part thereof with water/chlorine solution with at least 200 ppm of chlorine. Isolate and allow to stand for three hours.
 - c. Flush system with clean, potable water until no chlorine is in water coming from system after the standing time.
 - d. Repeat procedures if biological examination shows contamination.
 - e. Submit water samples in sterile bottles to NYS Department of Health approved lab with results sent to the architect/engineer of record..
- B. Prepare and submit reports of purging and disinfecting activities. Include copies of water-sample approvals from **NYS Department of Health approved lab**.
- C. Clean interior of domestic water piping system. Remove dirt and debris as work progresses.

3.12 PIPING SCHEDULE

- A. Transition and special fittings with pressure ratings at least equal to piping rating may be used in applications below unless otherwise indicated.
- B. Flanges and unions may be used for aboveground piping joints unless otherwise indicated.
- C. Fitting Option: Extruded-tee connections and brazed joints may be used on aboveground copper tubing.
- D. Under-building-slab (and above ground stub up to backflow prevention device), combined domestic water, building-service, and fire-service-main piping, NPS 6 to NPS 12, shall be the following:
 1. Mechanical-joint, ductile-iron pipe; standard-pattern, mechanical-joint fittings; and mechanical joints.
 2. Push-on-joint, ductile-iron pipe; standard-pattern, push-on-joint fittings; and gasketed joints.
- E. Under-building-slab, domestic water piping, NPS 2 and smaller, shall be the following:
 1. Soft copper tube, ASTM B 88, Type L; wrought-copper, solder-joint fittings; and brazed joints.
- F. Aboveground domestic water piping, NPS 2 and smaller, shall be the following:
 1. Hard copper tube, ASTM B 88, Type L; cast- or wrought-copper, solder-joint fittings; and soldered joints.
- G. Aboveground domestic water piping, NPS 2-1/2 to NPS 6, shall be the following:
 1. Hard copper tube, ASTM B 88, Type L; cast- or wrought-copper, solder-joint fittings; and soldered joints.
- H. Aboveground combined domestic water-service and fire-service-main piping (up to backflow prevention device), NPS 6 to NPS 12, shall be one of the following:
 1. Plain-end, ductile-iron pipe; grooved-joint, ductile-iron-pipe appurtenances; and grooved joints.

2. Fire Protection service shall not transition to Steel pipe until downstream of the backflow prevention device.

3.13 VALVE SCHEDULE

- A. Drawings indicate valve types to be used. Where specific valve types are not indicated, the following requirements apply:
 1. Shutoff Duty: Use ball or gate valves for piping NPS 2 and smaller. Use butterfly, ball, or gate valves with flanged ends for piping NPS 2-1/2 and larger.
 2. Throttling Duty: Use ball or globe valves for piping NPS 2 and smaller. Use butterfly or ball valves with flanged ends for piping NPS 2-1/2 and larger.
 3. Hot-Water Circulation Piping, Balancing Duty: Calibrated balancing valves.
 4. Drain Duty: Hose-end drain valves.
- B. Use check valves to maintain correct direction of domestic water flow to and from equipment.
- C. Iron grooved-end valves may be used with grooved-end piping.

END OF SECTION 221116

SECTION 221316 - SANITARY WASTE AND VENT PIPING

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

- A. Drawings and general provisions of the Contract, including General and Supplementary Conditions and Division 01 Specification Sections, apply to this Section.

1.2 SUMMARY

- A. Section Includes:
 - 1. Pipe, tube, and fittings.
 - 2. Specialty pipe fittings.
 - 3. Encasement for underground metal piping.

1.3 PERFORMANCE REQUIREMENTS

- A. Components and installation shall be capable of withstanding the following minimum working pressure unless otherwise indicated:
 - 1. Soil, Waste, and Vent Piping: 10-foot head of water.
 - 2. Waste, Force-Main Piping: 100 psig.
- B. Seismic Performance: Soil, waste, and vent piping and support and installation shall withstand the effects of earthquake motions determined according to ASCE/SEI 7.

1.4 ACTION SUBMITTALS

- A. Product Data: For each type of product indicated.

1.5 INFORMATIONAL SUBMITTALS

- A. Seismic Qualification Certificates: For waste and vent piping, accessories, and components, from manufacturer.
 - 1. Basis for Certification: Indicate whether withstand certification is based on actual test of assembled components or on calculation.
 - 2. Detailed description of piping anchorage devices on which the certification is based and their installation requirements.
- B. Field quality-control reports.

1.6 QUALITY ASSURANCE

- A. Piping materials shall bear label, stamp, or other markings of specified testing agency, as well as collective trademark of the Cast Iron Soil Pipe Institute (CISPI) and be listed by NSF International.

1.7 PROJECT CONDITIONS

- A. Interruption of Existing Sanitary Waste Service: Do not interrupt service to facilities occupied by Owner or others unless permitted under the following conditions and then only after arranging to provide temporary service according to requirements indicated:
 - 1. Notify Architect, Construction Manager, and Owner no fewer than two days in advance of proposed interruption of sanitary waste service.

2. Do not proceed with interruption of sanitary waste service without Owner's written permission.

PART 2 - PRODUCTS

2.1 PIPING MATERIALS

- A. Comply with requirements in "Piping Schedule" Article for applications of pipe, tube, fitting materials, and joining methods for specific services, service locations, and pipe sizes.

2.2 HUB-AND-SPIGOT, CAST-IRON SOIL PIPE AND FITTINGS

- A. Pipe and Fittings: ASTM A 74, Service class(es).
- B. Gaskets: ASTM C 564, rubber.
- C. Calking Materials: ASTM B 29, pure lead and oakum or hemp fiber.

2.3 HUBLESS, CAST-IRON SOIL PIPE AND FITTINGS

- A. Pipe and Fittings: ASTM A 888 or CISPI 301.
- B. Sovent Stack Fittings: ASME B16.45 or ASSE 1043, hubless, cast-iron aerator and deaerator drainage fittings.
- C. CISPI, Hubless-Piping Couplings:
 1. Manufacturers: Subject to compliance with requirements, available manufacturers offering products that may be incorporated into the Work include, but are not limited to, the following:
 - a. ANACO-Husky.
 - b. Fernco Inc.
 - c. Mission Rubber Company; a division of MCP Industries, Inc.
 - d. Tyler Pipe.
 2. Standards: ASTM C 1277 and CISPI 310.
 3. Description: Stainless-steel corrugated shield with stainless-steel bands and tightening devices; and ASTM C 564, rubber sleeve with integral, center pipe stop.
- D. Heavy-Duty, Hubless-Piping Couplings:
 1. Manufacturers: Subject to compliance with requirements, available manufacturers offering products that may be incorporated into the Work include, but are not limited to, the following:
 - a. ANACO-Husky.
 - b. Clamp-All Corp.
 - c. Mission Rubber Company; a division of MCP Industries, Inc.
 - d. Tyler Pipe.
 2. Standards: ASTM C 1277 and ASTM C 1540.
 3. Description: Stainless-steel shield with stainless-steel bands and tightening devices; and ASTM C 564, rubber sleeve with integral, center pipe stop.

2.4 COPPER TUBE AND FITTINGS

- A. Copper DWV Tube: ASTM B 306, drainage tube, drawn temper.
- B. Copper Drainage Fittings: ASME B16.23, cast copper or ASME B16.29, wrought copper, solder-joint fittings.

- C. Hard Copper Tube: ASTM B 88, Type L water tube, drawn temper.
- D. Copper Pressure Fittings:
 - 1. Copper Fittings: ASME B16.18, cast-copper-alloy or ASME B16.22, wrought-copper, solder-joint fittings. Furnish wrought-copper fittings if indicated.
 - 2. Copper Unions: MSS SP-123, copper-alloy, hexagonal-stock body with ball-and-socket, metal-to-metal seating surfaces, and solder-joint or threaded ends.
- E. Copper Flanges: ASME B16.24, Class 150, cast copper with solder-joint end.
 - 1. Flange Gasket Materials: ASME B16.21, full-face, flat, nonmetallic, asbestos-free, 1/8-inch maximum thickness unless thickness or specific material is indicated.
 - 2. Flange Bolts and Nuts: ASME B18.2.1, carbon steel unless otherwise indicated.
- F. Solder: ASTM B 32, lead free with ASTM B 813, water-flushable flux.

2.5 SPECIALTY PIPE FITTINGS

- A. Transition Couplings:
 - 1. General Requirements: Fitting or device for joining piping with small differences in OD's or of different materials. Include end connections same size as and compatible with pipes to be joined.
 - 2. Fitting-Type Transition Couplings: Manufactured piping coupling or specified piping system fitting.
 - 3. Shielded, Nonpressure Transition Couplings:
 - a. Manufacturers: Subject to compliance with requirements, available manufacturers offering products that may be incorporated into the Work include, but are not limited to, the following:
 - 1) Mission Rubber Company; a division of MCP Industries, Inc.
 - b. Standard: ASTM C 1460.
 - c. Description: Elastomeric or rubber sleeve with full-length, corrosion-resistant outer shield and corrosion-resistant-metal tension band and tightening mechanism on each end.
 - 4. Pressure Transition Couplings:
 - a. Manufacturers: Subject to compliance with requirements, available manufacturers offering products that may be incorporated into the Work include, but are not limited to, the following:
 - 1) Dresser, Inc.
 - 2) EBAA Iron, Inc.
 - 3) JCM Industries, Inc.
 - 4) Romac Industries, Inc.
 - 5) Smith-Blair, Inc.; a Sensus company.
 - 6) The Ford Meter Box Company, Inc.
 - 7) Viking Johnson.
 - b. Standard: AWWA C219.
 - c. Description: Metal, sleeve-type same size as, with pressure rating at least equal to, and ends compatible with, pipes to be joined.
 - d. Center-Sleeve Material: Stainless steel.
 - e. Gasket Material: Natural or synthetic rubber.
 - f. Metal Component Finish: Corrosion-resistant coating or material.
- B. Dielectric Fittings:

1. General Requirements: Assembly of copper alloy and ferrous materials with separating nonconductive insulating material. Include end connections compatible with pipes to be joined.
2. Dielectric Unions:
 - a. Manufacturers: Subject to compliance with requirements, available manufacturers offering products that may be incorporated into the Work include, but are not limited to, the following:
 - 1) Capitol Manufacturing Company.
 - 2) Hart Industries International, Inc.
 - 3) Jomar International Ltd.
 - 4) Matco-Norca, Inc.
 - 5) Watts Regulator Co.; a division of Watts Water Technologies, Inc.
 - 6) Wilkins; a Zurn company.
 - b. Description:
 - 1) Standard: ASSE 1079.
 - 2) Pressure Rating: 125 psig minimum at 180 deg F.
 - 3) End Connections: Solder-joint copper alloy and threaded ferrous.
3. Dielectric Flanges:
 - a. Manufacturers: Subject to compliance with requirements, available manufacturers offering products that may be incorporated into the Work include, but are not limited to, the following:
 - 1) Capitol Manufacturing Company.
 - 2) Matco-Norca, Inc.
 - 3) Watts Regulator Co.; a division of Watts Water Technologies, Inc.
 - 4) Wilkins; a Zurn company.
 - b. Description:
 - 1) Standard: ASSE 1079.
 - 2) Factory-fabricated, bolted, companion-flange assembly.
 - 3) Pressure Rating: 125 psig minimum at 180 deg F.
 - 4) End Connections: Solder-joint copper alloy and threaded ferrous; threaded solder-joint copper alloy and threaded ferrous.
4. Dielectric-Flange Insulating Kits:
 - a. Manufacturers: Subject to compliance with requirements, available manufacturers offering products that may be incorporated into the Work include, but are not limited to, the following:
 - 1) Advance Products & Systems, Inc.
 - 2) Calpico, Inc.
 - 3) Pipeline Seal and Insulator, Inc.
 - b. Description:
 - 1) Nonconducting materials for field assembly of companion flanges.
 - 2) Pressure Rating: 150 psig.
 - 3) Gasket: Neoprene or phenolic.
 - 4) Bolt Sleeves: Phenolic or polyethylene.
 - 5) Washers: Phenolic with steel backing washers.
5. Dielectric Nipples:
 - a. Manufacturers: Subject to compliance with requirements, available manufacturers offering products that may be incorporated into the Work include, but are not limited to, the following:
 - 1) Elster Perfection.
 - 2) Grinnell Mechanical Products.
 - 3) Matco-Norca, Inc.

- 4) Precision Plumbing Products, Inc.
- 5) Victaulic Company.
- b. Description:
 - 1) Standard: IAPMO PS 66
 - 2) Electroplated steel nipple.
 - 3) Pressure Rating: 300 psig at 225 deg F.
 - 4) End Connections: Male threaded or grooved.
 - 5) Lining: Inert and noncorrosive, propylene.

PART 3 - EXECUTION

3.1 EARTH MOVING

- A. Comply with requirements for excavating, trenching, and backfilling specified in Section 312000 "Earth Moving."

3.2 PIPING INSTALLATION

- A. Drawing plans, schematics, and diagrams indicate general location and arrangement of piping systems. Indicated locations and arrangements were used to size pipe and calculate friction loss, expansion, pump sizing, and other design considerations. Install piping as indicated unless deviations to layout are approved on coordination drawings.
- B. Install piping in concealed locations unless otherwise indicated and except in equipment rooms and service areas.
- C. Install piping indicated to be exposed and piping in equipment rooms and service areas at right angles or parallel to building walls. Diagonal runs are prohibited unless specifically indicated otherwise.
- D. Install piping above accessible ceilings to allow sufficient space for ceiling panel removal.
- E. Install piping to permit valve servicing.
- F. Install piping at indicated slopes.
- G. Install piping free of sags and bends.
- H. Install fittings for changes in direction and branch connections.
- I. Install piping to allow application of insulation.
- J. Install seismic restraints on piping. Comply with requirements for seismic-restraint devices specified in Section 220548 "Vibration and Seismic Controls for Plumbing Piping and Equipment."
- K. Vent termination through roof shall be min. 18" above roof.
- L. Make changes in direction for soil and waste drainage and vent piping using appropriate branches, bends, and long-sweep bends. Sanitary tees and short-sweep 1/4 bends may be used on vertical stacks if change in direction of flow is from horizontal to vertical. Use long-turn, double Y-branch and 1/8-bend fittings if two fixtures are installed back to back or side by side with common drain pipe. Straight tees, elbows, and crosses may be used on vent lines. Do not change direction of flow more than 90 degrees. Use proper size of standard increasers and reducers if pipes of different sizes are connected. Reducing size of drainage piping in direction of flow is prohibited.

- M. Lay buried building drainage piping beginning at low point of each system. Install true to grades and alignment indicated, with unbroken continuity of invert. Place hub ends of piping upstream. Install required gaskets according to manufacturer's written instructions for use of lubricants, cements, and other installation requirements. Maintain swab in piping and pull past each joint as completed.
- N. Install soil and waste drainage and vent piping at the following minimum slopes unless otherwise indicated:
 - 1. Building Sanitary Drain: 2 percent downward in direction of flow for piping NPS 3 and smaller; 1 percent downward in direction of flow for piping NPS 4 and larger.
 - 2. Horizontal Sanitary Drainage Piping: 2 percent downward in direction of flow.
 - 3. Vent Piping: 1 percent down toward vertical fixture vent or toward vent stack.
- O. Install cast-iron soil piping according to CISPI's "Cast Iron Soil Pipe and Fittings Handbook," Chapter IV, "Installation of Cast Iron Soil Pipe and Fittings."
 - 1. Install encasement on underground piping according to ASTM A 674 or AWWA C105/A 21.5.
- P. Install aboveground copper tubing according to CDA's "Copper Tube Handbook."
- Q. Install engineered soil and waste drainage and vent piping systems as follows:
 - 1. Combination Waste and Vent: Comply with standards of authorities having jurisdiction.
- R. Install copper, force-main tubing according to CDA's "Copper Tube Handbook."
- S. Install force mains at elevations indicated.
- T. Plumbing Specialties:
 - 1. Install cleanouts at grade and extend to where building sanitary drains connect to building sanitary sewers in sanitary drainage gravity-flow piping. Install cleanout fitting with closure plug inside the building in sanitary drainage force-main piping. Comply with requirements for cleanouts specified in Section 221319 "Sanitary Waste Piping Specialties."
 - 2. Install drains in sanitary drainage gravity-flow piping. Comply with requirements for drains specified in Section 221319 "Sanitary Waste Piping Specialties."
- U. Do not enclose, cover, or put piping into operation until it is inspected and approved by authorities having jurisdiction.
- V. Install sleeves for piping penetrations of walls, ceilings, and floors. Comply with requirements for sleeves specified in Section 220517 "Sleeves and Sleeve Seals for Plumbing Piping."
- W. Install sleeve seals for piping penetrations of concrete walls and slabs. Comply with requirements for sleeve seals specified in Section 220517 "Sleeves and Sleeve Seals for Plumbing Piping."
- X. Install escutcheons for piping penetrations of walls, ceilings, and floors. Comply with requirements for escutcheons specified in Section 220518 "Escutcheons for Plumbing Piping."

3.3 JOINT CONSTRUCTION

- A. Join hub-and-spigot, cast-iron soil piping with gasket joints according to CISPI's "Cast Iron Soil Pipe and Fittings Handbook" for compression joints.
- B. Join hub-and-spigot, cast-iron soil piping with calked joints according to CISPI's "Cast Iron Soil Pipe and Fittings Handbook" for lead-and-oakum calked joints.

- C. Join hubless, cast-iron soil piping according to CISPI 310 and CISPI's "Cast Iron Soil Pipe and Fittings Handbook" for hubless-piping coupling joints.
- D. Join copper tube and fittings with soldered joints according to ASTM B 828. Use ASTM B 813, water-flushable, lead-free flux and ASTM B 32, lead-free-alloy solder.

3.4 SPECIALTY PIPE FITTING INSTALLATION

- A. Transition Couplings:
 - 1. Install transition couplings at joints of piping with small differences in OD's.
 - 2. In Drainage Piping: Shielded, nonpressure transition couplings.
 - 3. In Aboveground Force Main Piping: Fitting-type transition couplings.
 - 4. In Underground Force Main Piping:
 - a. NPS 1-1/2 and Smaller: Fitting-type transition couplings.
 - b. NPS 2 and Larger: Pressure transition couplings.
- B. Dielectric Fittings:
 - 1. Install dielectric fittings in piping at connections of dissimilar metal piping and tubing.
 - 2. Dielectric Fittings for NPS 2 and Smaller: Use dielectric nipples or unions.
 - 3. Dielectric Fittings for NPS 2-1/2 to NPS 4: Use dielectric flange kits.
 - 4. Dielectric Fittings for NPS 5 and Larger: Use dielectric flange kits.

3.5 VALVE INSTALLATION

- A. General valve installation requirements are specified in Section 220523 "General-Duty Valves for Plumbing Piping."
- B. Shutoff Valves:
 - 1. Install shutoff valve on each sewage pump discharge.
 - 2. Install gate or full-port ball valve for piping NPS 2 and smaller.
 - 3. Install gate valve for piping NPS 2-1/2 and larger.
- C. Check Valves: Install swing check valve, between pump and shutoff valve, on each sewage pump discharge.

3.6 HANGER AND SUPPORT INSTALLATION

- A. Comply with requirements for seismic-restraint devices specified in Section 220548 "Vibration and Seismic Controls for Plumbing Piping and Equipment."
- B. Comply with requirements for pipe hanger and support devices and installation specified in Section 220529 "Hangers and Supports for Plumbing Piping and Equipment."
 - 1. Install carbon-steel pipe hangers for horizontal piping in noncorrosive environments.
 - 2. Install carbon-steel pipe support clamps for vertical piping in noncorrosive environments.
 - 3. Vertical Piping: MSS Type 8 or Type 42, clamps.
 - 4. Install individual, straight, horizontal piping runs:
 - a. 100 Feet and Less: MSS Type 1, adjustable, steel clevis hangers.
 - b. Longer Than 100 Feet: MSS Type 43, adjustable roller hangers.
 - c. Longer Than 100 Feet if Indicated: MSS Type 49, spring cushion rolls.
 - 5. Multiple, Straight, Horizontal Piping Runs 100 Feet or Longer: MSS Type 44, pipe rolls. Support pipe rolls on trapeze.
 - 6. Base of Vertical Piping: MSS Type 52, spring hangers.
- C. Support horizontal piping and tubing within 12 inches of each fitting and coupling.
- D. Support vertical piping and tubing at base and at each floor.

- E. Rod diameter may be reduced one size for double-rod hangers, with 3/8-inch minimum rods.
- F. Install hangers for cast-iron soil piping with the following maximum horizontal spacing and minimum rod diameters:
 - 1. NPS 1-1/2 and NPS 2: 60 inches with 3/8-inch rod.
 - 2. NPS 3: 60 inches with 1/2-inch rod.
 - 3. NPS 4 and NPS 5: 60 inches with 5/8-inch rod.
 - 4. NPS 6 and NPS 8: 60 inches with 3/4-inch rod.
 - 5. NPS 10 and NPS 12: 60 inches with 7/8-inch rod.
 - 6. Spacing for 10-foot lengths may be increased to 10 feet. Spacing for fittings is limited to 60 inches.
- G. Install supports for vertical cast-iron soil piping every 15 feet.
- H. Install hangers for copper tubing with the following maximum horizontal spacing and minimum rod diameters:
 - 1. NPS 1-1/4: 72 inches with 3/8-inch rod.
 - 2. NPS 1-1/2 and NPS 2: 96 inches with 3/8-inch rod.
 - 3. NPS 2-1/2: 108 inches with 1/2-inch rod.
 - 4. NPS 3 and NPS 5: 10 feet with 1/2-inch rod.
 - 5. NPS 6: 10 feet with 5/8-inch rod.
 - 6. NPS 8: 10 feet with 3/4-inch rod.
- I. Install supports for vertical copper tubing every 10 feet.
- J. Support piping and tubing not listed above according to MSS SP-69 and manufacturer's written instructions.

3.7 CONNECTIONS

- A. Drawings indicate general arrangement of piping, fittings, and specialties.
- B. Connect soil and waste piping to exterior sanitary sewerage piping. Use transition fitting to join dissimilar piping materials.
- C. Connect drainage and vent piping to the following:
 - 1. Plumbing Fixtures: Connect drainage piping in sizes indicated, but not smaller than required by plumbing code.
 - 2. Plumbing Fixtures and Equipment: Connect atmospheric vent piping in sizes indicated, but not smaller than required by authorities having jurisdiction.
 - 3. Plumbing Specialties: Connect drainage and vent piping in sizes indicated, but not smaller than required by plumbing code.
 - 4. Install test tees (wall cleanouts) in conductors near floor and floor cleanouts with cover flush with floor.
 - 5. Comply with requirements for cleanouts and drains specified in Section 221319 "Sanitary Waste Piping Specialties."
 - 6. Equipment: Connect drainage piping as indicated. Provide shutoff valve if indicated and union for each connection. Use flanges instead of unions for connections NPS 2-1/2 and larger.
- D. Connect force-main piping to the following:
 - 1. Sewage Pump: To sewage pump discharge.
- E. Where installing piping adjacent to equipment, allow space for service and maintenance of equipment.

- F. Make connections according to the following unless otherwise indicated:
1. Install unions, in piping NPS 2 and smaller, adjacent to each valve and at final connection to each piece of equipment.
 2. Install flanges, in piping NPS 2-1/2 and larger, adjacent to flanged valves and at final connection to each piece of equipment.

3.8 IDENTIFICATION

- A. Identify exposed sanitary waste and vent piping. Comply with requirements for identification specified in Section 220553 "Identification for Plumbing Piping and Equipment."

3.9 FIELD QUALITY CONTROL

- A. During installation, notify authorities having jurisdiction at least 24 hours before inspection must be made. Perform tests specified below in presence of authorities having jurisdiction.
1. Roughing-in Inspection: Arrange for inspection of piping before concealing or closing-in after roughing-in and before setting fixtures.
 2. Final Inspection: Arrange for final inspection by authorities having jurisdiction to observe tests specified below and to ensure compliance with requirements.
- B. Reinspection: If authorities having jurisdiction find that piping will not pass test or inspection, make required corrections and arrange for reinspection.
- C. Test sanitary drainage and vent piping according to procedures of authorities having jurisdiction or, in absence of published procedures, as follows:
1. Test for leaks and defects in new piping and parts of existing piping that have been altered, extended, or repaired. If testing is performed in segments, submit separate report for each test, complete with diagram of portion of piping tested.
 2. Leave uncovered and unconcealed new, altered, extended, or replaced drainage and vent piping until it has been tested and approved. Expose work that was covered or concealed before it was tested.
 3. Roughing-in Plumbing Test Procedure: Test drainage and vent piping except outside leaders on completion of roughing-in. Close openings in piping system and fill with water to point of overflow, but not less than 10-foot head of water. From 15 minutes before inspection starts to completion of inspection, water level must not drop. Inspect joints for leaks.
 4. Finished Plumbing Test Procedure: After plumbing fixtures have been set and traps filled with water, test connections and prove they are gastight and watertight. Plug vent-stack openings on roof and building drains where they leave building. Introduce air into piping system equal to pressure of 1-inch wg. Use U-tube or manometer inserted in trap of water closet to measure this pressure. Air pressure must remain constant without introducing additional air throughout period of inspection. Inspect plumbing fixture connections for gas and water leaks.
 5. Repair leaks and defects with new materials and retest piping, or portion thereof, until satisfactory results are obtained.
 6. Prepare reports for tests and required corrective action.
- D. Test force-main piping according to procedures of authorities having jurisdiction or, in absence of published procedures, as follows:
1. Leave uncovered and unconcealed new, altered, extended, or replaced force-main piping until it has been tested and approved. Expose work that was covered or concealed before it was tested.

2. Cap and subject piping to static-water pressure of 50 psig above operating pressure, without exceeding pressure rating of piping system materials. Isolate test source and allow to stand for four hours. Leaks and loss in test pressure constitute defects that must be repaired.
 3. Repair leaks and defects with new materials and retest piping, or portion thereof, until satisfactory results are obtained.
 4. Prepare reports for tests and required corrective action.
- E. Reports: Prepare inspection and test reports and have them signed by authorities having jurisdiction. Submit all reports to Architect.

3.10 CLEANING AND PROTECTION

- A. Clean interior of piping. Remove dirt and debris as work progresses.
- B. Protect drains during remainder of construction period to avoid clogging with dirt and debris and to prevent damage from traffic and construction work.
- C. Place plugs in ends of uncompleted piping at end of day and when work stops.

3.11 PIPING SCHEDULE

- A. Flanges and unions may be used on aboveground pressure piping unless otherwise indicated.
- B. Aboveground, soil and waste piping NPS 4 and smaller shall be the following:
 1. Service class, cast-iron soil pipe and fittings; gaskets; and gasketed joints.
 2. Hubless, cast-iron soil pipe and fittings; heavy-duty hubless-piping couplings; and coupled joints.
 3. Copper DWV tube, copper drainage fittings, and soldered joints.
 4. Dissimilar Pipe-Material Couplings: Shielded, nonpressure transition couplings.
- C. Aboveground, soil and waste piping NPS 5 and larger shall be the following:
 1. Service class, cast-iron soil pipe and fittings; gaskets; and gasketed joints.
 2. Hubless, cast-iron soil pipe and fittings; heavy-duty hubless-piping couplings; and coupled joints.
 3. Dissimilar Pipe-Material Couplings: Shielded, nonpressure transition couplings.
- D. Aboveground, vent piping NPS 4 and smaller shall be the following:
 1. Service class, cast-iron soil pipe and fittings; gaskets; and gasketed joints.
 2. Hubless, cast-iron soil pipe and fittings; CISPI hubless-piping couplings; and coupled joints.
 3. Copper DWV tube, copper drainage fittings, and soldered joints.
 4. Dissimilar Pipe-Material Couplings: Shielded, nonpressure transition couplings.
- E. Underground, soil, waste, and vent piping NPS 4 and smaller shall be the following:
 1. Service class, cast-iron soil piping; gaskets; and gasketed joints.
 2. Hubless, cast-iron soil pipe and fittings; heavy-duty hubless-piping couplings; and coupled joints.
 3. Dissimilar Pipe-Material Couplings: Shielded, nonpressure transition couplings.
- F. Aboveground sanitary-sewage force mains NPS 1-1/2 and NPS 2 shall be the following:
 1. Hard copper tube, Type L; copper pressure fittings; and soldered joints.
 2. Galvanized-steel pipe, pressure fittings, and threaded joints.

END OF SECTION 221316

SECTION 224213 - COMMERCIAL WATER CLOSETS & URINALS

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

- A. Drawings and general provisions of the Contract, including General and Supplementary Conditions and Division 01 Specification Sections, apply to this Section.

1.2 SUMMARY

- A. Section Includes:
1. Water closets.
 2. Urinals.
 3. Flushometer valves.
 4. Toilet seats.

1.3 ACTION SUBMITTALS

- A. Product Data: For each type of product.
1. Include construction details, material descriptions, dimensions of individual components and profiles, and finishes for water closets.
 2. Include rated capacities, operating characteristics, electrical characteristics, and furnished specialties and accessories.

1.4 CLOSEOUT SUBMITTALS

- A. Operation and Maintenance Data: For flushometer valves to include in operation and maintenance manuals.

PART 2 - PRODUCTS

2.1 FLOOR-MOUNTED, BOTTOM-OUTLET WATER CLOSETS

- A. Water Closets WC-1: Standard height, Floor mounted, bottom outlet, top spud.
1. Manufacturers: Subject to compliance with requirements, available manufacturers offering products that may be incorporated into the Work include, but are not limited to, the following:
 - a. American Standard America. Equal to Madera 3451.001
 - b. Gerber Plumbing Fixtures LLC.
 - c. Kohler Co.
 - d. Mansfield Plumbing Products LLC.
 - e. TOTO USA, INC.
 - f. Zurn Industries, LLC; Commercial Brass and Fixtures.
 2. Bowl:
 - a. Standards: ASME A112.19.2/CSA B45.1 and ASME A112.19.5.
 - b. Material: Vitreous china.
 - c. Type: Siphon jet.
 - d. Style: Flushometer valve.
 - e. Height: Standard.
 - f. Rim Contour: Elongated.
 - g. Water Consumption: Range 1.1- 1.6 gal. per flush.
 - h. Spud Size and Location: NPS 1-1/2; top.

- i. Color: White.
 3. Bowl-to-Drain Connecting Fitting: ASTM A 1045 or ASME A112.4.3.
 4. Flushometer Valve: FV-1.
 5. Toilet Seat: Open front - required.
- B. Water Closets WC-2: Accessible height Floor mounted, bottom outlet, top spud.
 1. Manufacturers: Subject to compliance with requirements, available manufacturers offering products that may be incorporated into the Work include, but are not limited to, the following:
 - a. American Standard America. Equal to Madera Right Height 3461.001
 - b. Gerber Plumbing Fixtures LLC.
 - c. Kohler Co.
 - d. Mansfield Plumbing Products LLC.
 - e. TOTO USA, INC.
 - f. Zurn Industries, LLC; Commercial Brass and Fixtures.
 2. Bowl:
 - a. Standards: ASME A112.19.2/CSA B45.1 and ASME A112.19.5.
 - b. Material: Vitreous china.
 - c. Type: Siphon jet.
 - d. Style: Flushometer valve.
 - e. Height: Accessible/"Right height".
 - f. Rim Contour: Elongated.
 - g. Water Consumption: Range 1.1- 1.6 gal. per flush.
 - h. Spud Size and Location: NPS 1-1/2; top.
 - i. Color: White.
 3. Bowl-to-Drain Connecting Fitting: ASTM A 1045 or ASME A112.4.3.
 4. Flushometer Valve: FV-1.
 5. Toilet Seat: Open front - required.

2.2 WALL-HUNG URINALS

- A. Urinals UR-1: Wall hung, back outlet, washout, accessible.
 1. Manufacturers: Subject to compliance with requirements, available manufacturers offering products that may be incorporated into the Work include, but are not limited to, the following:
 - a. American Standard America. Equal to WashBrook 6501.010
 - b. Gerber Plumbing Fixtures LLC.
 - c. Kohler Co.
 - d. Mansfield Plumbing Products LLC.
 - e. TOTO USA, INC.
 - f. Zurn Industries, LLC; Commercial Brass and Fixtures.
 2. Fixture:
 - a. Standards: ASME A112.19.2/CSA B45.1 and ASME A112.19.5.
 - b. Material: Vitreous china.
 - c. Type: Washout with extended shields.
 - d. Strainer or Trapway: Manufacturer's standard strainer with integral trap.
 - e. Water Consumption: Water saving 0.5 gpf.
 - f. Spud Size and Location: NPS 3/4, top.
 - g. Outlet Size and Location: NPS 2, back.
 - h. Color: White.
 3. Flushometer Valve: FV-2.
 4. Waste Fitting:

- a. Standard: ASME A112.18.2/CSA B125.2 for coupling.
- b. Size: NPS 2.
- 5. Support: ASME A112.6.1M, Type I, urinal carrier with fixture support plates and coupling with seal and fixture bolts and hardware matching fixture. Include rectangular, steel uprights.

2.3 FLUSHOMETER VALVES

A. Lever-Handle, Diaphragm Flushometer Valves FV-1:

- 1. Manufacturers: Subject to compliance with requirements, available manufacturers offering products that may be incorporated into the Work include, but are not limited to, the following:
 - a. Sloan Valve Company. Equal to 111-1.28
 - b. Zurn Industries, LLC; Commercial Brass and Fixtures.
- 2. Standard: ASSE 1037.
- 3. Minimum Pressure Rating: 125 psig.
- 4. Features: Include integral check stop and backflow-prevention device.
- 5. Material: Brass body with corrosion-resistant components.
- 6. Exposed Flushometer-Valve Finish: Chrome plated.
- 7. Panel Finish: Chrome plated or stainless steel.
- 8. Style: Exposed.
- 9. Consumption: 1.28 gal. per flush.
- 10. Minimum Inlet: NPS 1.
- 11. Minimum Outlet: NPS 1-1/4.

B. Lever-Handle, Diaphragm Flushometer Valves FV-2:

- 1. Manufacturers: Subject to compliance with requirements, available manufacturers offering products that may be incorporated into the Work include, but are not limited to, the following:
 - a. Sloan Valve Company. Equal to 186
 - b. Coyne & Delany Co.
 - c. Gerber Plumbing Fixtures LLC.
 - d. Zurn Industries, LLC; Commercial Brass and Fixtures.
- 2. Standard: ASSE 1037.
- 3. Minimum Pressure Rating: 125 psig.
- 4. Features: Include integral check stop and backflow-prevention device.
- 5. Material: Brass body with corrosion-resistant components.
- 6. Exposed Flushometer-Valve Finish: Chrome plated.
- 7. Panel Finish: Chrome plated or stainless steel.
- 8. Style: Exposed.
- 9. Consumption: 0.5 gal. per flush.
- 10. Minimum Inlet: NPS 3/4.
- 11. Minimum Outlet: NPS 3/4.

C.

2.4 TOILET SEATS

A. Toilet Seats:

- 1. Manufacturers: Subject to compliance with requirements, available manufacturers offering products that may be incorporated into the Work include, but are not limited to, the following:
 - a. American Standard America.

- b. Bemis Manufacturing Company.
- c. Church Seats.
- d. Olsonite Seat Co.
- e. TOTO USA, INC.
- f. Zurn Industries, LLC; Commercial Brass and Fixtures.
- 2. Standard: IAPMO/ANSI Z124.5.
- 3. Material: Plastic.
- 4. Type: Commercial (Heavy duty).
- 5. Shape: Elongated rim, open front.
- 6. Hinge: Self-sustaining.
- 7. Hinge Material: Noncorroding metal.
- 8. Seat Cover: Not required.
- 9. Color: White.

PART 3 - EXECUTION

3.1 EXAMINATION

- A. Examine roughing-in of water supply and sanitary drainage and vent piping systems to verify actual locations of piping connections before water-closet installation.
- B. Examine walls and floors for suitable conditions where water closets will be installed.
- C. Proceed with installation only after unsatisfactory conditions have been corrected.

3.2 INSTALLATION

- A. Water-Closet Installation:
 - 1. Install level and plumb according to roughing-in drawings.
 - 2. Install floor-mounted water closets on bowl-to-drain connecting fitting attachments to piping or building substrate.
 - 3. Install accessible, wall-mounted water closets at mounting height for handicapped/elderly, according to ICC/ANSI A117.1.
- B. Urinal Installation:
 - 1. Install urinals level and plumb according to roughing-in drawings.
 - 2. Install wall-hung, back-outlet urinals onto waste fitting seals and attached to supports.
 - 3. Install accessible, wall-mounted urinals at mounting height for the handicapped/elderly, according to ICC/ANSI A117.1.
- C. Support Installation:
 - 1. Install supports, affixed to building substrate, for floor-mounted, back-outlet water closets.
 - 2. Use carrier supports with waste-fitting assembly and seal.
 - 3. Install floor-mounted, back-outlet water closets attached to building floor substrate, onto waste-fitting seals; and attach to support.
- D. Flushometer-Valve Installation:
 - 1. Install flushometer-valve, water-supply fitting on each supply to each water closet.
 - 2. Attach supply piping to supports or substrate within pipe spaces behind fixtures.
 - 3. Install lever-handle flushometer valves for accessible water closets with handle mounted on open side of water closet.
 - 4. Install actuators in locations that are easy for people with disabilities to reach.

- E. Install toilet seats on water closets.
- F. Wall Flange and Escutcheon Installation:
 - 1. Install wall flanges or escutcheons at piping wall penetrations in exposed, finished locations and within cabinets and millwork.
 - 2. Install deep-pattern escutcheons if required to conceal protruding fittings.
 - 3. Comply with escutcheon requirements specified in Section 220518 "Escutcheons for Plumbing Piping."
- G. Joint Sealing:
 - 1. Seal joints between water closets and walls and floors using sanitary-type, one-part, mildew-resistant silicone sealant.
 - 2. Match sealant color to water-closet color.
 - 3. Comply with sealant requirements specified in Section 079200 "Joint Sealants."

3.3 CONNECTIONS

- A. Connect water closets with water supplies and soil, waste, and vent piping. Use size fittings required to match water closets.
- B. Comply with water piping requirements specified in Section 221116 "Domestic Water Piping."
- C. Comply with soil and waste piping requirements specified in Section 221316 "Sanitary Waste and Vent Piping."
- D. Where installing piping adjacent to water closets, allow space for service and maintenance.

3.4 ADJUSTING

- A. Operate and adjust water closets and controls. Replace damaged and malfunctioning water closets, fittings, and controls.
- B. Adjust water pressure at flushometer valves to produce proper flow.

3.5 CLEANING AND PROTECTION

- A. Clean water closets and fittings with manufacturers' recommended cleaning methods and materials.
- B. Install protective covering for installed water closets and fittings.
- C. Do not allow use of water closets for temporary facilities unless approved in writing by Owner.

END OF SECTION 224213

THIS PAGE LEFT INTENTIONALLY BLANK

SECTION 224213.16 - COMMERCIAL URINALS

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

- A. Drawings and general provisions of the Contract, including General and Supplementary Conditions and Division 01 Specification Sections, apply to this Section.

1.2 SUMMARY

- A. Section Includes:
1. Urinals.
 2. Flushometer valves.

1.3 ACTION SUBMITTALS

- A. Product Data: For each type of product.
1. Include construction details, material descriptions, dimensions of individual components and profiles, and finishes for urinals.
 2. Include rated capacities, operating characteristics, electrical characteristics, and furnished specialties and accessories.
- B. Shop Drawings: Include diagrams for power, signal, and control wiring.

1.4 CLOSEOUT SUBMITTALS

- A. Operation and Maintenance Data: For flushometer valves to include in operation and maintenance manuals.

PART 2 - PRODUCTS

2.1 WALL-HUNG URINALS

- A. Urinals UR-1: Wall hung, back outlet, washout, accessible.
1. Manufacturers: Subject to compliance with requirements, available manufacturers offering products that may be incorporated into the Work include, but are not limited to, the following:
 - a. American Standard America. Equal to WashBrook 6501.010
 - b. Gerber Plumbing Fixtures LLC.
 - c. Kohler Co.
 - d. Mansfield Plumbing Products LLC.
 - e. TOTO USA, INC.
 - f. Zurn Industries, LLC; Commercial Brass and Fixtures.
 2. Fixture:
 - a. Standards: ASME A112.19.2/CSA B45.1 and ASME A112.19.5.
 - b. Material: Vitreous china.
 - c. Type: Washout with extended shields.
 - d. Strainer or Trapway: Manufacturer's standard strainer with integral trap.
 - e. Water Consumption: Water saving 0.5 gpf.
 - f. Spud Size and Location: NPS 3/4, top.
 - g. Outlet Size and Location: NPS 2, back.
 - h. Color: White.

3. Flushometer Valve: FV-2.
4. Waste Fitting:
 - a. Standard: ASME A112.18.2/CSA B125.2 for coupling.
 - b. Size: NPS 2.
5. Support: ASME A112.6.1M, Type I, urinal carrier with fixture support plates and coupling with seal and fixture bolts and hardware matching fixture. Include rectangular, steel uprights.

2.2 URINAL FLUSHOMETER VALVES

- A. Lever-Handle, Diaphragm Flushometer Valves FV-2:
 1. Manufacturers: Subject to compliance with requirements, available manufacturers offering products that may be incorporated into the Work include, but are not limited to, the following:
 - a. Sloan Valve Company. Equal to 186
 - b. Coyne & Delany Co.
 - c. Gerber Plumbing Fixtures LLC.
 - d. Zurn Industries, LLC; Commercial Brass and Fixtures.
 2. Standard: ASSE 1037.
 3. Minimum Pressure Rating: 125 psig.
 4. Features: Include integral check stop and backflow-prevention device.
 5. Material: Brass body with corrosion-resistant components.
 6. Exposed Flushometer-Valve Finish: Chrome plated.
 7. Panel Finish: Chrome plated or stainless steel.
 8. Style: Exposed.
 9. Consumption: 0.5 gal. per flush.
 10. Minimum Inlet: NPS 3/4.
 11. Minimum Outlet: NPS 3/4.

PART 3 - EXECUTION

3.1 EXAMINATION

- A. Examine roughing-in of water supply and sanitary drainage and vent piping systems to verify actual locations of piping connections before urinal installation.
- B. Examine walls and floors for suitable conditions where urinals will be installed.
- C. Proceed with installation only after unsatisfactory conditions have been corrected.

3.2 INSTALLATION

- A. Urinal Installation:
 1. Install urinals level and plumb according to roughing-in drawings.
 2. Install wall-hung, back-outlet urinals onto waste fitting seals and attached to supports.
 3. Install accessible, wall-mounted urinals at mounting height for the handicapped/elderly, according to ICC/ANSI A117.1.
- B. Support Installation:
 1. Use chair-type carrier supports with rectangular steel uprights for accessible urinals.
- C. Flushometer-Valve Installation:
 1. Install flushometer-valve water-supply fitting on each supply to each urinal.
 2. Attach supply piping to supports or substrate within pipe spaces behind fixtures.

3. Install lever-handle flushometer valves for accessible urinals with handle mounted on open side of compartment.
- D. Wall Flange and Escutcheon Installation:
 1. Install wall flanges or escutcheons at piping wall penetrations in exposed, finished locations.
 2. Install deep-pattern escutcheons if required to conceal protruding fittings.
 3. Comply with escutcheon requirements specified in Section 220518 "Escutcheons for Plumbing Piping."
- E. Joint Sealing:
 1. Seal joints between urinals and walls and floors using sanitary-type, one-part, mildew-resistant silicone sealant.
 2. Match sealant color to urinal color.
 3. Comply with sealant requirements specified in Section 079200 "Joint Sealants."

3.3 CONNECTIONS

- A. Connect urinals with water supplies and soil, waste, and vent piping. Use size fittings required to match urinals.
- B. Comply with water piping requirements specified in Section 221116 "Domestic Water Piping."
- C. Comply with soil and waste piping requirements specified in Section 221316 "Sanitary Waste and Vent Piping."
- D. Where installing piping adjacent to urinals, allow space for service and maintenance.

3.4 ADJUSTING

- A. Operate and adjust urinals and controls. Replace damaged and malfunctioning urinals, fittings, and controls.
- B. Adjust water pressure at flushometer valves to produce proper flow.

3.5 CLEANING AND PROTECTION

- A. Clean urinals and fittings with manufacturers' recommended cleaning methods and materials.
- B. Install protective covering for installed urinals and fittings.
- C. Do not allow use of urinals for temporary facilities unless approved in writing by Owner.

END OF SECTION 224213.16

THIS PAGE LEFT INTENTIONALLY BLANK

SECTION 224216.14 - COMMERCIAL LAVATORIES

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

- A. Drawings and general provisions of the Contract, including General and Supplementary Conditions and Division 01 Specification Sections, apply to this Section.

1.2 SUMMARY

- A. Section Includes:
 - 1. Lavatories.
 - 2. Faucets.

1.3 ACTION SUBMITTALS

- A. Product Data: For each type of product.
 - 1. Include construction details, material descriptions, dimensions of individual components and profiles, and finishes for lavatories.
 - 2. Include rated capacities, operating characteristics, electrical characteristics, and furnished specialties and accessories.

1.4 CLOSEOUT SUBMITTALS

- A. Operation and Maintenance Data: For lavatories and faucets to include in operation and maintenance manuals.

PART 2 - PRODUCTS

2.1 GENERAL REQUIREMENTS FOR LAVATORIES

- A. Potable-water piping and components shall comply with NSF 61.
- B. Per new Federal Lead Free Law, any product designed for dispensing potable water meet both the NSF 61 and NSF 372 test standards via third-party testing and certification.

2.2 VITREOUS-CHINA, WALL-MOUNTED LAVATORIES

- A. Lavatory LAV-1: Accessible height, Vitreous china, wall mounted, with back – for toilet rooms
 - 1. Manufacturers: Subject to compliance with requirements, available manufacturers offering products that may be incorporated into the Work include, but are not limited to, the following:
 - a. American Standard America. Equal to Lucerne 0355.012
 - b. Gerber Plumbing Fixtures LLC.
 - c. Kohler Co.
 - d. Mansfield Plumbing Products LLC.
 - e. Zurn Industries, LLC; Commercial Brass and Fixtures.
 - 2. Fixture:
 - a. Standard: ASME A112.19.2/CSA B45.1.
 - b. Type: For wall hanging.
 - c. Nominal Size: Rectangle, 20 by 18 inches.
 - d. Faucet-Hole Punching: Three holes.
 - e. Faucet-Hole Location: Top.

- f. Color: White.
 - g. Mounting Material: Chair carrier.
 - 3. Faucet: LF-1.
 - 4. Support: ASME A112.6.1M, Type II, concealed-arm lavatory carrier with escutcheons.
 - 5. Protective Insulation Shielding Guards, Per ADA requirements: Required
- B. Lavatory LAV-2: Accessible height, Vitreous china, wall mounted, with back for Hospital/medical area hand wash.
 - 1. Manufacturers: Subject to compliance with requirements, available manufacturers offering products that may be incorporated into the Work include, but are not limited to, the following:
 - a. American Standard America. Equal to Lucerne 0355.012
 - b. Gerber Plumbing Fixtures LLC.
 - c. Kohler Co.
 - d. Mansfield Plumbing Products LLC.
 - e. Zurn Industries, LLC; Commercial Brass and Fixtures.
 - 2. Fixture:
 - a. Standard: ASME A112.19.2/CSA B45.1.
 - b. Type: For wall hanging.
 - c. Nominal Size: Rectangle, 20 by 18 inches.
 - d. Faucet-Hole Punching: Three holes.
 - e. Faucet-Hole Location: Top.
 - f. Color: White.
 - g. Mounting Material: Chair carrier.
 - 3. Faucet: LF-2.
 - 4. Support: ASME A112.6.1M, Type II, concealed-arm lavatory carrier with escutcheons.
 - 5. Protective Insulation Shielding Guards, Per ADA requirements: Required

2.3 SOLID-BRASS, MANUALLY OPERATED FAUCETS

- A. NSF Standard: Comply with NSF/ANSI 61, "Drinking Water System Components - Health Effects," for faucet materials that will be in contact with potable water.
- B. Per new Federal Lead Free Law, any product designed for dispensing potable water meet both the NSF 61 and NSF 372 test standards via third-party testing and certification.
- C. Lavatory Faucets LF-1 (for LAV-1): Manual-type, single-control mixing, commercial, solid-brass valve.
 - 1. Manufacturers: Subject to compliance with requirements, available manufacturers offering products that may be incorporated into the Work include, but are not limited to, the following:
 - a. Chicago Faucets. Equal to 420-CP
 - b. American Standard America.
 - c. Speakman Company.
 - d. T & S Brass and Bronze Works, Inc.
 - e. Zurn Industries, LLC; Commercial Brass and Fixtures.
 - 2. Standard: ASME A112.18.1/CSA B125.1.
 - 3. General: Include hot- and cold-water indicators; coordinate faucet inlets with supplies and fixture hole punchings; coordinate outlet with spout and fixture receptor.
 - 4. Body Type: Two holes.
 - 5. Body Material: Commercial, solid brass.
 - 6. Finish: Polished chrome plate.
 - 7. Maximum Flow Rate: 1.5 gpm non-aerating laminar flow outlet

8. Mounting Type: Deck, exposed.
 9. Valve Handle(s): Single lever.
 10. Spout: Rigid type.
 11. Spout Outlet: Laminar flow.
 12. Operation: Manual.
- D. Lavatory Faucets LF-2 (for LAV-2-Health Care Facilities): Manual-type, two-handle mixing, commercial, solid-brass valve, no aerator.
1. Manufacturers: Subject to compliance with requirements, available manufacturers offering products that may be incorporated into the Work include, but are not limited to, the following:
 - a. Chicago Faucets. Equal to 895-317GN2FCAB
 - b. American Standard America.
 - c. Speakman Company.
 - d. T & S Brass and Bronze Works, Inc.
 - e. Zurn Industries, LLC; Commercial Brass and Fixtures.
 2. Standard: ASME A112.18.1/CSA B125.1.
 3. General: Include hot- and cold-water indicators; coordinate faucet inlets with supplies and fixture hole punchings; coordinate outlet with spout and fixture receptor.
 4. Body Type: Centerset.
 5. Body Material: Commercial, solid brass.
 6. Finish: Polished chrome plate.
 7. Maximum Flow Rate: 0.5 gpm, Chicago 50-046KJKNF Laminar Flow Control Device in base of faucet (not at spout)
 8. Mounting Type: Deck, exposed.
 9. Valve Handle(s): Wrist blade, 4 inches.
 10. Spout: Rigid/Swing, gooseneck type.
 11. Spout Outlet: Plain end (no aerator)
 12. Operation: Manual.

2.4 LAMINAR-FLOW, FAUCET-SPOUT OUTLETS

- A. NSF Standard: Comply with NSF/ANSI 61, "Drinking Water System Components - Health Effects," for faucet-spout-outlet materials that will be in contact with potable water.
- B. Per new Federal Lead Free Law, any product designed for dispensing potable water meet both the NSF 61 and NSF 372 test standards via third-party testing and certification.
- C. Manufacturers: Subject to compliance with requirements, available manufacturers offering products that may be incorporated into the Work include, but are not limited to, the following:
1. AM Conservation Group, Inc.
 2. Chronomite Laboratories, Inc.; a division of Acorn Engineering Company.
 3. NEOPERL, Inc.
- D. Description: Chrome-plated-brass, faucet-spout outlet that produces non-aerating, laminar stream. Include external or internal thread that mates with faucet outlet for attachment to faucets where indicated and flow-rate range that includes flow of faucet.

2.5 SUPPLY FITTINGS

- A. NSF Standard: Comply with NSF/ANSI 61, "Drinking Water System Components - Health Effects," for supply-fitting materials that will be in contact with potable water.

- B. Per new Federal Lead Free Law, any product designed for dispensing potable water meet both the NSF 61 and NSF 372 test standards via third-party testing and certification.
- C. Standard: ASME A112.18.1/CSA B125.1.
- D. Supply Piping: Chrome-plated-brass pipe or chrome-plated copper tube matching water-supply piping size. Include chrome-plated-brass or stainless-steel wall flange.
- E. Supply Stops: Chrome-plated-brass, one-quarter-turn, ball-type or compression valve with inlet connection matching supply piping.
- F. Operation: Loose key.
- G. Risers:
 - 1. NPS 1/2.
 - 2. Chrome-plated, rigid-copper-pipe and brass straight or offset tailpieces or ASME A112.18.6, braided- or corrugated-stainless-steel, flexible hose riser.

2.6 WASTE FITTINGS

- A. Standard: ASME A112.18.2/CSA B125.2.
- B. Drain: Grid type with NPS 1-1/4 offset and straight tailpiece.
- C. Trap:
 - 1. Size: NPS 1-1/2 by NPS 1-1/4.
 - 2. Material: Chrome-plated, two-piece, cast-brass trap and swivel elbow with 0.032-inch-thick brass tube to wall; and chrome-plated, brass or steel wall flange.

PART 3 - EXECUTION

3.1 EXAMINATION

- A. Examine roughing-in of water supply and sanitary drainage and vent piping systems to verify actual locations of piping connections before lavatory installation.
- B. Examine counters and walls for suitable conditions where lavatories will be installed.
- C. Proceed with installation only after unsatisfactory conditions have been corrected.

3.2 INSTALLATION

- A. Install lavatories level and plumb according to roughing-in drawings.
- B. Install supports, affixed to building substrate, for wall-mounted lavatories.
- C. Install accessible wall-mounted lavatories at handicapped/elderly mounting height for people with disabilities or the elderly, according to ICC/ANSI A117.1.
- D. Install wall flanges or escutcheons at piping wall penetrations in exposed, finished locations. Use deep-pattern escutcheons if required to conceal protruding fittings. Comply with escutcheon requirements specified in Section 220518 "Escutcheons for Plumbing Piping."
- E. Seal joints between lavatories, counters, and walls using sanitary-type, one-part, mildew-resistant silicone sealant. Match sealant color to fixture color. Comply with sealant requirements specified in Section 079200 "Joint Sealants."

- F. Install protective shielding pipe covers and enclosures on exposed supplies and waste piping of accessible lavatories. Comply with requirements in Section 220719 "Plumbing Piping Insulation."

3.3 CONNECTIONS

- A. Connect fixtures with water supplies, stops, and risers, and with traps, soil, waste, and vent piping. Use size fittings required to match fixtures.
- B. Comply with water piping requirements specified in Section 221116 "Domestic Water Piping."
- C. Comply with soil and waste piping requirements specified in Section 221316 "Sanitary Waste and Vent Piping."

3.4 ADJUSTING

- A. Operate and adjust lavatories and controls. Replace damaged and malfunctioning lavatories, fittings, and controls.
- B. Adjust water pressure at faucets to produce proper flow.

3.5 CLEANING AND PROTECTION

- A. After completing installation of lavatories, inspect and repair damaged finishes.
- B. Clean lavatories, faucets, and other fittings with manufacturers' recommended cleaning methods and materials.
- C. Provide protective covering for installed lavatories and fittings.
- D. Do not allow use of lavatories for temporary facilities unless approved in writing by Owner.

END OF SECTION 224216.14

THIS PAGE LEFT INENTIONALLY BLANK

SECTION 224223 - COMMERCIAL SHOWERS, RECEPTORS, AND BASINS

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

- A. Drawings and general provisions of the Contract, including General and Supplementary Conditions and Division 01 Specification Sections, apply to this Section.

1.2 SUMMARY

- A. Section Includes:
1. Shower faucets.
 2. Shower basins.
 3. Grout.

1.3 ACTION SUBMITTALS

- A. Product Data: For each type of product.
1. Include construction details, material descriptions, dimensions of individual components and profiles, and finishes for showers and basins.
 2. Include rated capacities, operating characteristics, and furnished specialties and accessories.

1.4 CLOSEOUT SUBMITTALS

- A. Maintenance Data: For shower faucets to include in maintenance manuals.

PART 2 - PRODUCTS

2.1 INDIVIDUAL SHOWERS

2.2 SHOWER FAUCETS

- A. NSF Standard: Comply with NSF 61, "Drinking Water System Components - Health Effects," for shower materials that will be in contact with potable water.
- B. Per new Federal Lead Free Law, any product designed for dispensing potable water meet both the NSF 61 and NSF 372 test standards via third-party testing and certification.
- C. Shower Faucets SH-1 and SH-2:
1. Manufacturers: Subject to compliance with requirements, available manufacturers offering products that may be incorporated into the Work include, but are not limited to, the following:
 - a. Symmons equal to Temptrol #25-500-B30-V
 - b. Chicago Faucets.
 - c. Kohler Co.
 - d. Moen Incorporated.
 - e. Powers; a division of Watts Water Technologies, Inc.
 - f. Speakman Company.
 2. Description: Single-handle, pressure-balance mixing valve with hot- and cold-water indicators; check stops; and shower head.
 3. Faucet:
 - a. Standards: ASME A112.18.1/CSA B125.1 and ASSE 1016.

- b. Body Material: Solid brass.
 - c. Finish: Polished chrome plate.
 - d. Maximum Flow Rate: 2.5 gpm unless otherwise indicated.
 - e. Mounting: Concealed.
 - f. Operation: Single-handle, twist or rotate control.
 - g. Antiscald Device: Integral with mixing valve.
 - h. Check Stops: Check-valve type, integral with or attached to body; on hot- and cold-water supply connections.
 - 4. Supply Connections: NPS 1/2.
 - 5. Shower Heads (one fixed and one hand held):
 - a. Standard: ASME A112.18.1/CSA B125.1.
 - b. Type: Ball joint with arm and flange.
 - c. Shower Head Material: Metallic with chrome-plated finish.
 - d. Spray Pattern: Adjustable.
 - e. Integral Volume Control: Required.
 - f. Wall/Hand shower head with in-line vacuum breaker, 5' metal hose, wall connection and flange with 30" slide bar and associated diverter valve.
- D. Shower Faucets SH-3:
- 1. Manufacturers: Subject to compliance with requirements, available manufacturers offering products that may be incorporated into the Work include, but are not limited to, the following:
 - a. Acorn Equal to Penel-Ware 1741ADAF Series
 - b. Bradley
 - c. Speakman Company.
 - d. Powers; a division of Watts Water Technologies, Inc.
 - 2. Description: Surface mount, Stainless Steel wall shower with metered push button and 2 spray heads (one fixed and one hand shower) for use in Decontamination Shower room.
 - 3. Faucet:
 - a. Standards: ASME A112.18.1/CSA B125.1 and ASSE 1016.
 - b. Body Material: Solid brass.
 - c. Finish: Stainless Steel.
 - d. Accessories: recessed soap dish.
 - e. Maximum Flow Rate: 2.5 gpm unless otherwise indicated.
 - f. Mounting: Surface mount, with stainless steel shroud extension up to ceiling.
 - g. Operation: Metered push button with remote mixing valve (MV-3). Set push button at max. duration (min. 60 secs – max. 10 mins)
 - h. Antiscald Device: Integral with mixing valve.
 - i. Check Stops: Check-valve type, integral with or attached to body; on hot- and cold-water supply connections.
 - 4. Supply Connections: NPS 1/2.
 - 5. Shower Heads (one fixed and one hand held):
 - a. Standard: ASME A112.18.1/CSA B125.1.
 - b. Type: Ball joint with arm and flange.
 - c. Shower Head Material: Metallic with chrome-plated finish.
 - d. Spray Pattern: Adjustable.
 - e. Integral Volume Control: Required.
 - f. Wall/Hand shower head with in-line vacuum breaker, 5' metal hose and associated diverter valve.

2.3 SHOWER BASINS

- A. Shower Basins SH-1: FRP shower basin.
1. Manufacturers: Subject to compliance with requirements, available manufacturers offering products that may be incorporated into the Work include, but are not limited to, the following:
 - a. Best Bath System, Div.of Fiberglass Systems, Inc. equal to P3838A5T.
 - b. Crane Plumbing, L.L.C.
 - c. LASCO Bathware.
 - d. Mustee, E. L. & Sons, Inc.
 - e. Swan Corporation (The).
 2. General: FRP base for built-up-type shower fixture.
 3. Standard: ANSI Z124.1.3 for FRP bases.
 4. Type: Handicapped/wheelchair.
 5. Nominal Size and Shape: 36 by 36 inches square.
 6. Color: White.
 7. Outlet: Drain with NPS 2 outlet.
 8. Bathing Surface: Slip resistant according to ASTM F 462.
- B. Shower Basins SH-2: FRP shower basin.
1. Manufacturers: Subject to compliance with requirements, available manufacturers offering products that may be incorporated into the Work include, but are not limited to, the following:
 - a. Best Bath System, Div.of Fiberglass Systems, Inc. equal to P6331A1B.
 - b. Crane Plumbing, L.L.C.
 - c. LASCO Bathware.
 - d. Mustee, E. L. & Sons, Inc.
 - e. Swan Corporation (The).
 2. General: FRP base for built-up-type shower fixture.
 3. Standard: ANSI Z124.1.3 for FRP bases.
 4. Type: Handicapped/wheelchair.
 5. Nominal Size and Shape: 30 by 60 inches square.
 6. Color: White.
 7. Outlet: Drain with NPS 2 outlet.
 8. Bathing Surface: Slip resistant according to ASTM F 462.

2.4 DECON SHOWERS

- A. Group Wall-Mounted Showers SH-3:
1. Manufacturers: Subject to compliance with requirements, available manufacturers offering products that may be incorporated into the Work include, but are not limited to, the following:
 - a. Acorn Engineering Company.Penal Ware 1741-FA-3
 - b. Bradley Corporation.
 - c. Willoughby Industries, Inc.
 2. Description: Stainless-steel, wall-mounted, surface-enclosure shower fixture with individual nozzles.
 3. Standards: ASME A112.18.1/CSA B125.1 and ASSE 1016.
 4. Metal Nominal Thickness: 0.050 inch minimum.
 5. Number of Shower Nozzles: One.
 6. Height to Nozzles: 72 inches.

7. Control: Thermostatic valve with individual, tempered-water supply and push-button operation.
8. Flow Control: 2.5 gpm for each shower head.
9. Soap Dish: Required for each shower head.
10. Mounting: Wall bracket.
11. Supplies: NPS 3/4 copper tubing with valves.

2.5 GROUT

- A. Standard: ASTM C 1107/C 1107M, Grade B, post-hardening and volume-adjusting, dry, hydraulic-cement grout.
- B. Characteristics: Nonshrink; recommended for interior and exterior applications.
- C. Design Mix: 5000-psi, 28-day compressive strength.
- D. Packaging: Premixed and factory packaged.

PART 3 - EXECUTION

3.1 EXAMINATION

- A. Examine roughing-in of water-supply and sanitary drainage and vent piping systems to verify actual locations of piping connections before shower installation.
- B. Examine walls and floors for suitable conditions where showers will be installed.
- C. Proceed with installation only after unsatisfactory conditions have been corrected.

3.2 INSTALLATION

- A. Assemble shower components according to manufacturers' written instructions.
- B. Install showers level and plumb according to roughing-in drawings.
- C. Install water-supply piping with stop on each supply to each shower faucet.
 1. Exception: Use ball, gate, or globe valves if supply stops are not specified with shower. Comply with valve requirements specified in Section 220523 "General-Duty Valves for Plumbing Piping."
 2. Install stops in locations where they can be easily reached for operation.
- D. Install shower flow-control fittings with specified maximum flow rates in shower arms.
- E. Set shower receptors in leveling bed of cement grout.
- F. Install wall flanges or escutcheons at piping wall penetrations in exposed, finished locations. Use deep-pattern escutcheons if required to conceal protruding fittings. Comply with escutcheons requirements specified in Section 220518 "Escutcheons for Plumbing Piping."
- G. Seal joints between showers and floors and walls using sanitary-type, one-part, mildew-resistant silicone sealant. Match sealant color to fixture color. Comply with sealant requirements specified in Section 079200 "Joint Sealants."

3.3 CONNECTIONS

- A. Connect fixtures with water supplies, stops, and risers, and with traps, soil, waste, and vent piping. Use size fittings required to match fixtures.
- B. Comply with water piping requirements specified in Section 221116 "Domestic Water Piping."

- C. Comply with traps and soil and waste piping requirements specified in Section 221316 "Sanitary Waste and Vent Piping."

3.4 ADJUSTING

- A. Operate and adjust showers and controls. Replace damaged and malfunctioning showers, fittings, and controls.
- B. Adjust water pressure at faucets to produce proper flow.

3.5 CLEANING AND PROTECTION

- A. After completing installation of showers and basins, inspect and repair damaged finishes.
- B. Clean showers and basins, faucets, and other fittings with manufacturers' recommended cleaning methods and materials.
- C. Provide protective covering for installed fixtures and fittings.
- D. Do not allow use of showers and basins for temporary facilities unless approved in writing by Owner.

END OF SECTION 224223

THIS PAGE LEFT BLANK INTENTIONALLY

SECTION 224500 - EMERGENCY PLUMBING FIXTURES

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

- A. Drawings and general provisions of the Contract, including General and Supplementary Conditions and Division 01 Specification Sections, apply to this Section.

1.2 SUMMARY

- A. Section Includes:
 - 1. Eyewash equipment.
 - 2. Combination eyewash/Shower equipment.
 - 3. Water-tempering equipment.

1.3 DEFINITIONS

- A. Accessible Fixture: Emergency plumbing fixture that can be approached, entered, and used by people with disabilities.
- B. Plumbed Emergency Plumbing Fixture: Fixture with fixed, potable-water supply.
- C. Tepid: Moderately warm.

1.4 ACTION SUBMITTALS

- A. Product Data: For each type of product indicated. Include flow rates and capacities, furnished specialties, and accessories.
- B. Shop Drawings: Diagram power, signal, and control wiring.

1.5 INFORMATIONAL SUBMITTALS

- A. Product Certificates: Submit certificates of performance testing specified in "Source Quality Control" Article.
- B. Field quality-control test reports.

1.6 CLOSEOUT SUBMITTALS

- A. Operation and Maintenance Data: For emergency plumbing fixtures to include in operation and maintenance manuals.

1.7 QUALITY ASSURANCE

- A. Electrical Components, Devices, and Accessories: Listed and labeled as defined in NFPA 70, by a qualified testing agency, and marked for intended location and application.
- B. ANSI Standard: Comply with ANSI Z358.1, "Emergency Eyewash and Shower Equipment."
- C. NSF Standard: Comply with NSF 61, "Drinking Water System Components - Health Effects," for fixture materials that will be in contact with potable water.
- D. Regulatory Requirements: Comply with requirements in ICC/ANSI A117.1, "Accessible and Usable Buildings and Facilities"; Public Law 90-480, "Architectural Barriers Act"; and Public Law 101-336, "Americans with Disabilities Act"; for plumbing fixtures for people with disabilities.

PART 2 - PRODUCTS

2.1 EYEWASH EQUIPMENT

- A. Accessible, Wall-Mounted, Plumbed Eyewash Units, EW-1:
1. Manufacturers: Subject to compliance with requirements, available manufacturers offering products that may be incorporated into the Work include, but are not limited to, the following:
 - a. Bradley Corporation. Equal to S19-220
 - b. Acorn Safety; a division of Acorn Engineering Company.
 - c. Encon Safety Products.
 - d. Guardian Equipment Co.
 - e. Haws Corporation.
 - f. Speakman Company.
 2. Capacity: Not less than 0.4 gpm for at least 15 minutes.
 3. Supply Piping: NPS 1/2 chrome-plated brass or stainless steel with flow regulator and stay-open control valve.
 4. Control-Valve Actuator: Paddle.
 5. Spray-Head Assembly: Two receptor-mounted spray heads.
 6. Receptor: Plastic bowl.
 7. Drain Piping: NPS 1-1/4 minimum, chrome-plated brass, receptor drain, P-trap, waste to wall, and wall flange complying with ASME A112.18.2/CSA B125.2.
 8. Mounting: Wall bracket.
 9. Special Construction: Comply with ICC/ANSI A117.1.
 10. Use with MV-2 thermostatic mixing valve.

2.2 COMBINATION SHOWER/EYEWASH EQUIPMENT

- A. Accessible, Plumbed Emergency Shower with Eyewash Combination Units, ES-1:
1. Manufacturers: Subject to compliance with requirements, available manufacturers offering products that may be incorporated into the Work include, but are not limited to, the following:
 - a. Bradley Corporation. Equal to S19314
 - b. Acorn Safety; a division of Acorn Engineering Company.
 - c. Encon Safety Products.
 - d. Guardian Equipment Co.
 - e. Haws Corporation.
 - f. Sellstrom Manufacturing Company.
 - g. Speakman Company.
 - h. WaterSaver Faucet Co.
 2. Piping:
 - a. Material: Galvanized steel with yellow coating.
 - b. Unit Supply: NPS 1-1/4 minimum.
 - c. Unit Drain: Outlet at back or side near bottom.
 - d. Provide separate floor drain at base of shower, FD-1
 3. Shower:
 - a. Capacity: Not less than 20 gpm for at least 15 minutes.
 - b. Supply Piping: NPS 1 with flow regulator and stay-open control valve.
 - c. Control-Valve Actuator: Pull rod.
 - d. Shower Head: 8-inch- minimum diameter, plastic.
 - e. Mounting: Pedestal.
 - f. Use with MV-4 thermostatic mixing valve.

4. Eyewash Unit:
 - a. Capacity: Not less than 0.4 gpm for at least 15 minutes.
 - b. Supply Piping: NPS 1/2 with flow regulator and stay-open control valve.
 - c. Control-Valve Actuator: Paddle.
 - d. Spray-Head Assembly: Two receptor-mounted spray heads.
 - e. Receptor: Plastic bowl.
 - f. Mounting: Attached shower pedestal.
 - g. Drench-Hose Option: May be provided instead of eyewash unit.
 - 1) Capacity: Not less than 0.4 gpm for at least 15 minutes.
 - 2) Drench Hose: Hand-held spray head with squeeze-handle actuator and hose.
 - 3) Mounting: Bracket on shower pedestal.

2.3 WATER-TEMPERING EQUIPMENT

- A. Hot- and Cold-Water, Water-Tempering Equipment, MV-2, for EW-1:
 1. Manufacturers: Subject to compliance with requirements, available manufacturers offering products that may be incorporated into the Work include, but are not limited to, the following:
 - a. Powers; a division of Watts Water Technologies, Inc. Equal to Hydroguard XP ES150
 - b. Bradley Corporation.
 - c. Encon Safety Products.
 - d. Guardian Equipment Co.
 - e. Haws Corporation.
 - f. Leonard Valve Company.
 - g. Speakman Company.
 2. Description: Factory-fabricated equipment with thermostatic mixing valve.
 - a. Thermostatic Mixing Valve: Designed to provide 85 deg F tepid, potable water at emergency plumbing fixtures, to maintain temperature at plus or minus 5 deg F throughout required 15-minute test period, and in case of unit failure to continue cold-water flow, with union connections, controls, metal piping, and corrosion-resistant enclosure.
 - b. Supply Connections: For hot and cold water with spring check valve on each service.
 - c. Flow rate: 7.1 gpm at 20 psi
- B. Hot- and Cold-Water, Water-Tempering Equipment, MV-4, for ES-1:
 1. Manufacturers: Subject to compliance with requirements, available manufacturers offering products that may be incorporated into the Work include, but are not limited to, the following:
 - a. Powers; a division of Watts Water Technologies, Inc. Equal to Hydroguard XP ETV200
 - b. Bradley Corporation.
 - c. Encon Safety Products.
 - d. Guardian Equipment Co.
 - e. Haws Corporation.
 - f. Leonard Valve Company.
 - g. Speakman Company.
 2. Description: Factory-fabricated equipment with thermostatic mixing valve.
 - a. Thermostatic Mixing Valve: Designed to provide 85 deg F tepid, potable water at emergency plumbing fixtures, to maintain temperature at plus or minus 5 deg F throughout required 15-minute test period, and in case of unit failure to continue

- cold-water flow, with union connections, controls, metal piping, and corrosion-resistant enclosure.
- b. Supply Connections: For hot and cold water with spring check valve on each service.
- c. Flow rate: 26.8 gpm at 20 psi (min. 3 gpm for low flow with eye wash only)

PART 3 - EXECUTION

3.1 EXAMINATION

- A. Examine roughing-in for water and waste piping systems to verify actual locations of piping connections before plumbed emergency plumbing fixture installation.
- B. Proceed with installation only after unsatisfactory conditions have been corrected.

3.2 EMERGENCY PLUMBING FIXTURE INSTALLATION

- A. Assemble emergency plumbing fixture piping, fittings, control valves, and other components.
- B. Install fixtures level and plumb.
- C. Fasten fixtures to substrate.
- D. Install shutoff valves in water-supply piping to fixtures. Use ball, gate, or globe valve if specific type valve is not indicated. Install valves chained or locked in open position if permitted. Install valves in locations where they can easily be reached for operation. Comply with requirements for valves specified in Section 220523 "General-Duty Valves for Plumbing Piping."
- E. Install spring check valves on both hot and cold water service to each mixing valve to prevent cold to hot water cross connection.
- F. Install dielectric fitting in supply piping to emergency equipment if piping and equipment connections are made of different metals. Comply with requirements for dielectric fittings specified in Section 221116 "Domestic Water Piping."
- G. Install thermometers in supply and outlet piping connections to water-tempering equipment. Comply with requirements for thermometers specified in Section 220519 "Meters and Gages for Plumbing Piping."
- H. Install trap and waste piping on drain outlet of emergency equipment receptors that are indicated to be directly connected to drainage system. Comply with requirements for waste piping specified in Section 221316 "Sanitary Waste and Vent Piping."
- I. Install escutcheons on piping wall and ceiling penetrations in exposed, finished locations. Comply with requirements for escutcheons specified in Section 220518 "Escutcheons for Plumbing Piping."

3.3 CONNECTIONS

- A. Connect hot- and cold-water-supply piping to hot- and cold-water, water-tempering equipment. Connect output from water-tempering equipment to emergency plumbing fixtures. Comply with requirements for hot- and cold-water piping specified in Section 221116 "Domestic Water Piping."
- B. Directly connect emergency plumbing fixture receptors with trapped drain outlet to sanitary waste and vent piping. Comply with requirements for waste piping specified in Section 221316 "Sanitary Waste and Vent Piping."

- C. Where installing piping adjacent to emergency plumbing fixtures, allow space for service and maintenance of fixtures.

3.4 IDENTIFICATION

- A. Install equipment nameplates or equipment markers on emergency plumbing fixtures and equipment and equipment signs on water-tempering equipment. Comply with requirements for identification materials specified in Section 220553 "Identification for Plumbing Piping and Equipment."

3.5 FIELD QUALITY CONTROL

- A. Mechanical-Component Testing: After plumbing connections have been made, test for compliance with requirements. Verify ability to achieve indicated capacities.
- B. Tests and Inspections:
 - 1. Perform each visual and mechanical inspection.
 - 2. Leak Test: After installation, charge system and test for leaks. Repair leaks and retest until no leaks exist.
 - 3. Operational Test: After electrical circuitry has been energized, start units to confirm proper unit operation.
 - 4. Test and adjust controls and safeties. Replace damaged and malfunctioning controls and equipment.
- C. Emergency plumbing fixtures and water-tempering equipment will be considered defective if they do not pass tests and inspections.
- D. Prepare test and inspection reports.

3.6 ADJUSTING

- A. Adjust or replace fixture flow regulators for proper flow.
- B. Adjust equipment temperature settings.

END OF SECTION 224500

THIS PAGE LEFT INTENTIONALLY BLANK

SECTION 230001 - GENERAL PROVISIONS FOR MECHANICAL WORK

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

- A. Drawings and general provisions of the Contract, including General and Supplementary Conditions and Division 01 Specification Sections, apply to this Section.
- B. Requirements of this Section apply to work in every Section of Division 23 equally as if incorporated therein.

1.2 WORK INCLUDED

- A. Work included in Division 23 - Mechanical: Materials, equipment, fabrication, installation and tests in conformity with applicable codes and authorities having jurisdiction for Mechanical Work covered by all sections within this Division.

1.3 SCOPE

- A. Division of the Specification into sections is for the purpose of simplification alone. Responsibility for the work of various trades shall rest with the Contractor. Various sections of this Division are related to each other as well as the mechanical drawings. Examine all drawings and read all applicable parts of the project manual in order to insure complete execution of all work in this Division, coordinating where required with other trades in order to avoid conflicts.
- B. These specifications and accompanying drawings are intended to cover the furnishing of all labor, materials, equipment and services necessary for the complete installation and acceptable performance of the mechanical systems. Small items of material, equipment and appurtenances not mentioned in detail or shown on the drawings, but necessary for complete and operating systems shall be provided by this contractor without additional charge to the Owner and shall be included under this contract.
- C. In general, specifications establish the quality of material, equipment and workmanship. The contract documents are intended to secure for the Owner, a first-class installation in every respect. Labor shall be performed by skilled mechanics, and the entire facility, when delivered to the Owner, shall be ready for satisfactory and efficient operation.
- D. The Contractor shall carefully examine the drawings and specifications before accepting the contract. He shall call attention to any changes or additions which, in his opinion, are necessary to make possible the fulfillment of any guarantee called for by these specifications; failing which, it shall be deemed that he has accepted full responsibility for all such guarantees.
- E. The contractor shall put his work in place as fast as is reasonably possible. He shall, at all times, keep a competent foreman in charge of the work, to make decisions necessary for the diligent advancement of the work. The Contractor shall facilitate the inspection of the work by the Owner's Representative.

- F. The Contractor shall coordinate all work in the building in order to facilitate intelligent execution of the work. He shall also remove any rubbish as expeditiously as possible.
- G. Materials or products specified herein and/or indicated on the drawings by trade's names, manufacturer's names, model number or catalog numbers establish the quality of materials or products to be furnished. Model numbers are to be confirmed by the manufacturer to provide required capacities and material to meet the specifications and design intent. In no instance shall an obsolete, incomplete or inaccurate trade name, manufacturer name, model number or catalog number indicated on the drawings, result in additional charges to the owner.
- H. Points of connection or continuation of work under this contract are so marked on drawings or herein specified. In case of any doubt as to the required exact location of such points, the Owner's Representative shall decide and direct.
- I. The plumbing contractor shall provide water services to within two (2) feet of HVAC equipment requiring same, and shall terminate service with a shutoff valve. The mechanical contractor shall make the final connection to the equipment.

1.4 REFERENCE STANDARDS, CODES AND REGULATIONS

A. Requirements of Regulatory Agencies:

- 1. Nothing contained in these specifications or shown on the drawings shall be construed to conflict with any State or local laws, ordinances, rules and regulations, the UL and NFPA regulations. The Contractor shall make all changes required by the enforcing authorities. Where alterations to and / or deviations from the Contract Documents are required by the authorities having jurisdiction, report the requirements to the Engineer and secure acceptance before work is started. All such changes shall be made in a manner acceptable to the Engineer and shall be made without cost to the Owner.
- 2. When drawings or specifications exceed requirements of applicable laws, ordinances, rules and regulations, comply with documents establishing the more stringent requirement. All work shall be done in full conformity with the requirements of all authorities having jurisdiction. Installation shall be made in compliance with all applicable regulations, and utility company rules, all of which shall be considered a part of this specification and shall take precedence in the order of listing.
- 3. It is not the intent of drawings or specifications to repeat requirements of codes except where necessary for completeness in individual sections.

B. Published specifications, standards, tests or recommended method of trade, industry or governmental organizations as listed below apply to all work in this Division, in addition to other standards which may be specified in individual sections:

- 1. AABC Associated Air Balance Council
- 2. ADC Air Diffuser Balance Council
- 3. AMCA Air Moving and Conditioning Association
- 4. AGA American Gas Association
- 5. ANSI American National Standards Institute
- 6. ARI Air Conditioning and Refrigeration Institute
- 7. ASHRAE American Society of Heating, Refrigeration and Air Conditioning Engineers
- 8. ASME American Society of Mechanical Engineers
- 9. ASTM American Society for Testing and Materials
- 10. CISPI Cast Iron Soil Pipe Institute

- | | | |
|-----|--------|---|
| 11. | ETL | ETL Testing Laboratories |
| 12. | FMS | Factory Mutual Engineering and Research Corporation |
| 13. | NAPHCC | National Standard Plumbing Code |
| 14. | NEMA | National Electrical Manufacturer's Association |
| 15. | NFPA | National Fire Protection Association |
| 16. | NBFU | National Board of Fire Underwriters |
| 17. | NEC | National Electric Code |
| 18. | OSHA | Occupational Safety and Health Administration |
| 19. | PDI | Plumbing Drainage Institute |
| 20. | SMACNA | Sheet Metal & Air Conditioning Contractors National Association |
| 21. | UL | Underwriters Laboratories, Inc. |

- C. Furnish and file with the proper authorities, all drawings required by them in connection with the work. Contractor shall secure and obtain all approvals, permits, licenses and inspections and pay all legal and proper fees and charges in this connection, before commencing work in order to avoid delays during construction. He shall deliver the official records of the granting of the permits, etc., to the Owner's Representative.

1.5 1.5 QUALITY ASSURANCE

- A. All equipment and accessories to be the product of a manufacturer regularly engaged in its manufacture.
- B. Supply all equipment and accessories new and free from defects.
- C. Supply all equipment and accessories in compliance with the applicable standards listed in Article 1.4 of this section with all applicable national, state and local codes.
- D. All items of a given type shall be the product of same manufacturer.

1.6 DESCRIPTION OF BID DOCUMENTS

- A. Specifications:
1. Specifications, in general, describe quality and character of materials and equipment.
 2. Specifications are of simplified form and include incomplete sentences.
 3. Words or phrases such as "The Contractor shall", "shall be", "furnish", "provide", "a", "an", "the", and "all" may have been omitted for brevity.
- B. Drawings: Mechanical drawings under this contract are made a part of these specifications. Deviations from these specifications as noted below must have the approval of the Engineer or Construction Manager without an increase in contract price.
1. The drawings shall be considered as being diagrammatic and for bidding purposes only. Intention is to show size, capacity, approximate location, direction and general relationship of one work phase to another, but not exact detail or arrangement. The attention of the contractor is called to the fact that while these drawings are generally to scale and are made as accurately as the scale will permit, all critical dimensions shall be determined in the field. They are not to be considered as erection drawings.
 2. The drawings do not indicate every fitting, elbow, offset, valve, etc. which is required to complete the job. Contractor shall prepare field erection drawings as required for the use of his mechanics to insure proper installation.

3. Scaled and figured dimensions are approximate and are for estimating purposes only. Indicated dimensions are limiting dimensions.
 4. Before proceeding with work check and verify all dimensions in field.
 5. Assume all responsibility for fitting of materials and equipment to other parts of equipment and structure.
 6. Make adjustments that may be necessary or requested in order to resolve space problems, preserve headroom, and avoid architectural openings, structural members and work of other trades.
 7. For exact locations of building elements, refer to dimensional Architectural/Structural drawings.
- C. Description of systems: Provide all materials to provide functioning systems in compliance with performance requirements specified, and any modifications resulting from reviewed shop drawings and field coordinated drawings.
1. Installation of all systems and equipment is subject to clarification as indicated in reviewed shop drawings and field coordination drawings.
- D. Do not use equipment exceeding dimensions indicated or equipment or arrangements that reduce required clearances or exceed specified maximum dimensions.
- E. If any part of Specifications or Drawings appears unclear or contradictory, apply to Architect for his interpretation and decision as early as possible, including during bidding period.
1. Do not proceed with work without Engineer's decision.

1.7 EQUIPMENT MANUFACTURERS

- A. The first named manufacturer is used as the basis of design. Other named manufacturers are identified as equivalent manufacturers, not equivalent products. Naming other manufacturers does not necessarily imply conformance of any specific product with the written specifications.
- B. The contractor is required to verify that equipment and material to be used on the project meets the requirements of the specifications and will physically fit the available space, clearance and service requirements of the particular piece of equipment and include all pertinent information when he submits material for acceptance. Contractor shall also be responsible for and bear the cost of any modifications to openings available or anticipated as being available for rigging equipment to its final installation place. This shall include openings in exterior envelope, walls and roofs, interior walls, corridors, passage ways or door openings. Any on site dismantling and any reassembly of equipment made necessary by impediment to the rigging of said equipment shall be the sole responsibility of the contractor.
- C. Contract document indicates power and physical requirements based on the equipment manufacturer's data as first named. If equipment requiring more system capacity is furnished, the contractor shall be responsible for the cost associated with modifying the design and installation of associated services, including any redesign costs associated with the engineer's review.

1.8 DEFINITIONS

- A. "Provide": To supply, furnish, install and connect up complete and ready safe and regular operation of particular work referred to unless specifically noted.

- B. "Install": To erect, mount and connect complete with related accessories.
- C. "Supply", "Furnish": To purchase, procure, acquire and deliver complete with related accessories.
- D. "Work": Labor, materials, equipment, apparatus, controls, accessories, and other items required for proper and complete installation.
- E. "Piping": Pipe, tube, fittings, flanges, valves, controls, strainers, hangers, supports, unions, traps, drains, insulation, and related items.
- F. "Wiring": Raceway, fittings, wire, boxes and related items.
- G. "Concealed": Items referred to as hidden from normal sight, embedded in masonry or other construction, installed in furred spaces, within double partitions or hung ceilings, in trenches, in crawl spaces, or in enclosures.
- H. "Exposed": Not installed underground or "concealed" as defined above.
- I. "Indicated", "Shown", or "Noted": As indicated, shown or noted on drawings or specifications.
- J. "Directed": Directed by Engineer.
- K. "Similar" or "Equal": Of base bid manufacture, equal in materials, weight, size, design, and efficiency of specified product.
- L. "Reviewed", "Satisfactory", or "Directed": As reviewed, satisfactory, or directed by or to Engineer.
- M. "Motor Controllers": Manual or magnetic starters (with or without switches), individual pushbuttons or hand-off-automatic (HOA) switches controlling the operation of motors.
- N. "Control or Actuating Devices": Automatic sensing and switching devices such as thermostats, pressure, float, electro-pneumatic switches and electrodes controlling operation of equipment.
- O. "Remove": Dismantle, demolish and take away from the site and dispose of in accordance with all applicable rules and regulations or, should the Owner so require, deliver to a location as designated by the Owner for the use of the Owner, at no additional cost to the Owner.
- P. "Replace": Remove existing and provide an equivalent product or material as specified.
- Q. "Extract (and Reinstall) ": Carefully disassemble, dismantle existing, save or store where directed by the Owner, in such a manner as to preserve the existing condition and reinstall as indicated on the drawings or as described in the specifications.
- R. Where any device or piece of equipment is referred to in the singular number, such reference shall be deemed to apply to as many devices as are required to complete the installation.

1.9 JOB CONDITIONS

- A. This contractor shall investigate all conditions affecting his work and shall provide such offsets, fittings, valves, sheet metal work, etc., as may be required to meet conditions at the building.
- B. The contractor shall verify all measurements at the building site and shall be responsible for the correctness of same before ordering materials or before starting work of any Section.
 - 1. Report to Architect, in writing, conditions which will prevent proper provision of this work.
 - 2. Beginning work of any Section without reporting unsuitable conditions to Architect constitutes acceptance of conditions by Contractor.
 - 3. Perform any required removal, repair or replacement of this work caused by unsuitable conditions at no additional cost to Owner.
- C. Piping and ductwork shall be concealed or run behind furring in finished spaces unless otherwise noted to be run exposed.
- D. Horizontal piping and ductwork not run below slabs on grade shall be run as close as possible to underside of roof or floor slab above and parallel to building lines. Maintain maximum headroom in all areas.
- E. Determine possible interference between trades before the work is fabricated or installed. The contractor must coordinate his work to insure that erection will proceed without such interference. Coordination is of paramount importance and no request for additional payment will be considered where such request is based upon interference between trades.
- F. Connections to Existing Work:
 - 1. Install new work and connect to existing work with minimum of interference to existing facilities.
 - 2. Temporary shutdowns of existing services:
 - a. At no additional charges
 - b. At times not to interfere with normal operation of existing facilities.
 - c. Only with written consent of Owner.
 - 3. Maintain continuous operation of existing facilities as required with necessary temporary connections between new and existing work.
 - 4. Restore existing disturbed work to original condition.
- G. Removal, extraction and relocation of existing work.
 - 1. The work includes demolition or removal of all construction indicated or specified. All materials resulting from demolition work, except as indicated or specified otherwise, shall become the property of the Contractor and shall be removed from the site. Rubbish and debris shall be removed from the site daily unless otherwise directed so as to not allow accumulation inside or outside the building. Materials that cannot be removed daily shall be stored in areas specified by the Owner.
 - 2. Title to all materials and equipment to be demolished, excepting Owner salvage and historical items, is vested in the Contractor upon receipt of notice to proceed. The Owner will not be responsible for the condition, loss or damage to such property after notice to proceed.
 - 3. The Owner reserves the "Right of First Refusal" on all material for salvage. Material for salvage shall be stored as approved by the Owner. Salvage materials shall be removed

- from the site before completion of the Contract. Material for salvage shall not be sold on the site.
4. Property of the Owner: Salvaged items remaining the property of the Owner shall be removed in a manner to prevent damage and packed or crated to protect the items from damage while in storage or during shipment and relocated by the contractor at no cost, to the Owners designated storage facility on the site. Containers shall be properly identified as to contents.
 5. Damaged Items: Items damaged during removal or storage shall be repaired or replaced to match existing.
 6. Disconnect, remove or relocate material, equipment, plumbing fixtures, piping and other work noted and required by removal or changes in existing conditions.
 7. Where existing pipes, conduits and/or ducts which are to remain prevent installation of new work as indicated, relocate, or arrange for relocation, of existing pipes, conduits, and/or ducts.
 8. Provide new material and equipment required for relocated equipment.
 9. Plug or cap active piping or ductwork behind or below finish.
 10. Do not leave long dead-end branches.
 - a. Cap or plug as close as possible to active line.
 11. Remove unused piping, ductwork and equipment.
 12. Dispose of unusable piping, ductwork and material.

1.10 CLEARANCE FROM ELECTRICAL EQUIPMENT

- A. Piping or ductwork:
1. Prohibited, except as noted, in:
 - a. Electric rooms and closets.
 - b. Telephone rooms and closets.
 - c. Elevator machine rooms.
 - d. Electric switchboard room.
 2. Prohibited, except as noted, over or within 5 ft. of:
 - a. Transformers.
 - b. Substations.
 - c. Switchboards.
 - d. Motor control centers.
 - e. Standby power plant.
 - f. Bus ducts.
 - g. Electrical panels.
 3. Drip pans under piping:
 - a. Only where unavoidable and approved.
 - b. 18 gauge galvanized steel.
 - 1) With bituminous paint coating.
 - c. Reinforced and supported.
 - d. Watertight.
 - e. With 1-1/4 inch drain outlet piped to floor drain or service sink.

1.11 TEMPORARY FACILITIES

- A. Temporary facilities are not included within this Section.

1.12 SPECIAL TOOLS

- A. Furnish to Owner at completion of work:
 - 1. One set of any special tools required to operate, adjust, dismantle or repair equipment furnished under any section of the Division.
 - 2. "Special tools": those not normally found in possession of mechanics or maintenance personnel.
 - 3. One pressure grease gun for each type of grease required.
 - a. With adapters to fit all lubricating fittings on equipment.
 - b. Include lubricant for lubricated plug valves.

1.13 PRODUCT DELIVERY, HANDING AND STORAGE

- A. Provide adequate and secure storage facilities for materials and equipment during the progress of the work.
- B. Contractor shall be responsible for the condition of all materials and equipment employed in the mechanical installation until final acceptance by the Owner. Protect same from any cause whatsoever.
- C. Where necessary, ship in crated sections of size to permit passing through available space.
- D. Ship equipment in original packages, to prevent damaging or entrance of foreign matter.
- E. Handle and ship in accordance with manufacturer's recommendations.
- F. Provide protective coverings during construction.
- G. Replace at no expense to Owner, equipment or material damaged during storage or handling, as directed by Engineer.
- H. Tag all items with weatherproof tag, identifying equipment by name and purchase order number.
- I. Include packing and shipping lists.
- J. Adhere to special requirements as specified in individual sections.

1.14 PROTECTION OF MATERIALS

- A. Protect from damage, water, dust, etc., material, equipment and apparatus provided under this Division, both in storage and installed, until Notice of Completion has been filed.
- B. Provide temporary storage facilities for materials and equipment.
- C. Material, equipment or apparatus damaged because of improper storage or protection will be rejected.
 - 1. Remove from site and provide new, duplicate, material, equipment or apparatus in replacement of that rejected.

- D. Cover motors and other moving machinery to protect from dirt and water during construction. Rotate moving equipment, shafts, bearings, motors etc. to prevent corrosion and to circulate lubricants.
- E. Protect premises and work of other Divisions from damage arising out of installation of work of this Division.
 - 1. Contractor shall be responsible for the replacement of all damaged or defective work, materials or equipment. Do not install sensitive or delicate equipment until major construction work is completed.
 - 2. Remove replaced parts from premises.
- F. Make good any damage to the work caused by floods, storms, accidents, acts of God, acts of negligence, strikes, violence or theft up to time of final acceptance by the Owner.
- G. Do not leave any mechanical work in a hazardous condition, even temporarily.

1.15 REVIEW OF CONSTRUCTION

- A. Work may be reviewed at any time by representative of the Engineer.
- B. Advise Architect and Engineer that work is ready for review at following times:
 - 1. Prior to backfilling buried work.
 - 2. Prior to concealment of work in walls and above ceilings.
 - 3. When all requirements of Contract have been completed.
- C. Neither backfill nor conceal work without Engineer's consent.
- D. Maintain on job a set of Specifications and Drawings for use by Engineer's representatives.

1.16 SCHEDULE OF WORK

- A. Arrange work to conform to schedule of construction established or required to comply with Contract Documents.
- B. In scheduling, anticipate means of installing equipment through available openings in structure.
- C. Confirm in writing to Architect and Engineer, within 30 days of signing of contract, anticipated number of days required to perform test, balance, and acceptance testing of mechanical systems.
 - 1. This phase must occur after completion of mechanical systems, including all control calibration and adjustment, and requires substantial completion of the building, including closure, ceilings, lighting, partitioning, etc.
 - 2. Submit for approval at this time, names and qualifications of test and balancing agencies to be used.
- D. Arrange with Owner schedule for work in each area.
- E. Unless otherwise directed by Owner, perform work during normal working hours.
- F. Work delays:

1. In case noisy work interferes with Owner's operations, Owner may require work to be stopped and performed at some other time, or after normal working hours.

1.17 ACCESS TO MECHANICAL WORK

- A. Access doors in walls and ceilings.
- B. Access Units Fire-Resistance Ratings: Where fire-resistance rating is indicated for construction penetrated by access units, provide UL listed-and-labeled units, except for units which are smaller than minimum size requiring ratings as recognized by governing authority.
- C. Product Data, Access Units: Submit manufacturer's technical data and installation instructions for each type of access door assembly, including setting drawings, templates, instructions and directions for installation of anchorage devices.
- D. Furnish to the general contractor all access doors necessary for access through inaccessible wall or ceiling construction, for installation by the general contractor. Information on the size and location of the subject access doors is to be communicated in writing to the general contractors during the bidding period.

1.18 CONCRETE FOR MECHANICAL WORK

- A. Concrete for Mechanical Work
 1. Basins and curbs for mechanical equipment.
 2. Mechanical equipment foundations and housekeeping pads.
 3. Inertia bases for isolation of mechanical work.
 4. Rough grouting in and around mechanical work.
 5. Patching concrete cut to accommodate mechanical work.
- B. Quality control testing for concrete is required as work of this section.
- C. Concrete Work Codes and Standards:
 1. Comply with governing regulations and, where not otherwise indicated, comply with the following industry standards; whichever is the most stringent in its application to work in each instance.
 - ACI 301 "Specifications for Structural Concrete for Buildings"
 - ACI 311 "Recommended Practice for Concrete Inspection"
 - ACI 318 "Building Code Requirements for Reinforced Concrete"
 - ACI 347 "Recommended Practice for Concrete Form work"
 - ACI 304 "Recommended Practice for Measuring, Mixing, Transporting and Placing Concrete"
 - Concrete Reinforcing Steel Institute's, "Manual of Standard Practice"
- D. Submittals: Shop Drawings, Mechanical Concrete Work: Submit shop drawings for structural type concrete work, showing dimensions of formed shapes of concrete; bending, placement, sizes and spacing of reinforcing steel; location of anchors, isolation units, hangers and similar devices to be integrated with concrete work; and piping penetrations, access openings, inlets and other accessories and work to be accommodated by concrete work.

- E. Laboratory Test Reports, Mechanical Concrete Work: Submit laboratory test reports for concrete work materials, and for tested samples of placed concrete (where required as work of this section).

1.19 NOISE REDUCTION

- A. Cooperate in reducing objectionable noise or vibration caused by mechanical systems.
 - 1. To extent of adjustments to specified and installed equipment and appurtenances.
- B. Correct noise problems caused by failure to install work in accordance with Contract Documents.
 - 1. Include labor and materials required as result of such failure.

1.20 CUTTING AND PATCHING

- A. Provide all carpentry, cutting and patching required for proper installation of material and equipment specified.
- B. Do not cut or drill structural members without consent of Architect.

1.21 COORDINATION DRAWINGS

- A. Layout Shop Drawings Required:
 - 1. Prepare layout shop drawings for all areas; minimum 3/8 inch scale.
 - 2. Individual coordinated trade layout drawings are to be prepared for all areas.
 - 3. General Contractor is to assure that each trade has coordinated work with other trades, prior to submittal where submittal is required.
 - a. Include stamp on each submittal indicating that layout shop drawing has been coordinated.
 - 4. No layout shop drawing will be reviewed without stamped and signed coordinated assurance by General Contractor.
 - 5. All changes shall be clearly marked on each submitted layout drawing.
 - 6. Drawings shall show work of all trades including but not limited to'
 - a. Ductwork.
 - b. Piping: All Trades.
 - c. Mechanical Equipment.
 - d. Electrical Equipment.
 - e. Main Electrical conduits and bus ducts.
 - f. Equipment supports and suspension devices.
 - g. Structural and architectural constraints.
 - h. Show location of:
 - 1) 1) Valves
 - 2) 2) Piping specialties
 - 3) 3) Dampers
 - 4) 4) Access Doors
 - 5) 5) Control and electrical panels
 - 6) 6) Disconnect switches
 - 7. Drawings shall indicate coordination with work in other Divisions that must be incorporated in mechanical spaces, including, but not limited to:
 - a. Elevator equipment.

- b. Cable trays not furnished under Division 16.
 - c. Computer equipment.
 - 8. Submission of drawings:
 - a. Prepare reproducible drawings.
 - b. Submit to other trades for review of space allocated to all trades.
 - c. Revise drawings to compensate for requirements of existing conditions and conditions created by other trades.
 - d. Review revisions and other trades.
 - e. Submit one reproducible and one blueline print to Engineer for review.
 - 9. Final prepared drawings shall show that other trades affected have made reviews and signed, by each trade, at completions of coordination.
 - a. General Contractor
 - b. Include stamp on each submittal indicating that layout shop drawing has been coordinated.
 - 10. No layout shop drawing will be reviewed without stamped and signed coordination assurance by General Contractor.
- B. Shop Drawings:
 - 1. Layout drawings of mechanical equipment rooms and penthouses showing all related equipment and equipment clearances required by other trades.
 - 2. Layout drawings of areas in which it may be necessary to deviate substantially from layout shown on the drawings. Minor transitions in ductwork, if required due to job conditions, need not be submitted as long as the duct area is maintained. Show major relocation of ductwork and major changes in size of ducts. Coordinate shop drawings with all trades prior to ductwork fabrication.
 - 3. Details of intermediate structural steel members required to span main structural steel for the support of ductwork.
 - 4. Method of attachment of duct hangers to building construction.
 - 5. Duct material, gage, type of joints and duct reinforcing for each size range, including sketches or SMACNA plate numbers for joints, method of fabrication and reinforcing.

1.22 GUARANTEE

- A. Furnish guarantee covering all work in accordance with general requirements of the contract for minimum period of one year. This personal guarantee shall exist for a period of one (1) year from the date of final acceptance of the work and shall apply to defects in materials and to defective workmanship of any kind.
- B. For factory-assembled equipment and devices on which the manufacturers furnish standard published guarantees as regular trade practice, obtain such guarantees and replace any such equipment that proves defective during the life of these guarantees.
- C. Guarantee all work for which materials are furnished, fabricated or field erected by the contractor, all factory-assembled equipment for which no specific manufacturer's guarantee is furnished, and all work in connection with installing manufacturer's guarantee is furnished, and all work in connection with installing manufacturer's guaranteed equipment.
- D. In the event of failure of any work, equipment or device during the life of the guarantee, repair or replace the equipment or defective work. Remove, replace or restore, at no cost to the Owner, any part of the structure or building which may be damaged either as the direct result of the

defective work or in the course of the contractor's making replacement of the defective work or materials. Work shall be done at a time and in a manner as to cause no undue inconvenience to the Owner. Provide new materials, equipment, apparatus and labor to replace that determined by Engineer to be defective or faulty.

- E. This guarantee also applies to services including Instructions, Adjusting, Testing, Noise, Balancing, etc.
- F. Additional equipment and material guarantees and warranties may be indicated in other sections. In all cases, the more stringent guarantee or warranty shall be provided.

PART 2 - PRODUCTS

2.1 MATERIALS AND EQUIPMENT QUALITY

- A. Material and equipment furnished under this Division of specification shall be new. Defective or inferior materials must be replaced by contractor at no cost to Owner regardless of the stage of construction. Inferior material shall be defined as material or equipment of a quality or performance less than that specified as determined by the Owner's Representative.
- B. Provide each item of equipment with manufacturer's identification tag which is readily accessible and clearly shows model and size.

2.2 ACCESS TO MECHANICAL WORK

- A. Access Doors:
 - 1. General: Where walls and ceilings must be penetrated for access to mechanical work, access doors shall be provided. Furnish adequate size for intended and necessary access. Furnish doors with UL Fire Rating to match wall or ceiling construction. Furnish manufacturer's complete units, of type recommended for application in indicated substrate construction, in each case, complete with anchorages and hardware.
- B. Access Door Construction: Refer to Section 083113 – ACCESS DOORS AND FRAMES

PART 3 - EXECUTION

3.1 FIELD QUALITY CONTROL

- A. Tests:
 - 1. Perform as specified in individual sections, and as required by authorities having jurisdiction.
 - 2. Duration as noted.
- B. Provide required labor, material, equipment, and connections.
- C. Furnish written report and certification those tests have been satisfactorily completed.
- D. Repair or replace defective work, as directed.

- E. Pay for restoring or replacing damaged work due to tests as directed.
- F. Pay for restoring or replacing damaged work of others, due to tests, as directed.

3.2 3.2 ACCESS TO MECHANICAL WORK

- A. Coordinate installation and placement of access doors and panels with contractor for general construction.
- B. Remove or replace panels or frames that are warped, bowed, or otherwise damaged.

END OF SECTION 230001

SECTION 230002 – MECHANICAL AND ELECTRICAL COORDINATION

PART 1 - GENERAL

1.1 WORK INCLUDED

- A. Work Included in This Section: Materials, equipment, fabrication, installation, and tests in conformity with applicable codes and authorities having jurisdiction for the following:
1. Motors.
 2. Factory-wired equipment (FWE).
 3. Factory-wired control panels (FWCP).
 4. Motor controllers where provided as part of mechanical equipment.
 5. Motor controllers where supplied under Division 23 - Mechanical Work.
 6. Disconnects and safety switches for mechanical equipment.
 7. Fuses for equipment provided, and starters and disconnect switches.

1.2 RELATED WORK SPECIFIED ELSEWHERE

- A. Division 23 - HVAC Instrumentation and Controls, Motors.
- B. Division 26 - Electrical: Installation and Power Wiring of Motor Controllers.

1.3 REFERENCE STANDARDS

- A. Published specifications standards, tests, or recommended methods of trade, industry or governmental organization as apply to work in this section where cited below:
1. ANSI - American National Standards Institute.
 2. NEMA - National Electrical Manufacturer's Association.
 3. IEEE - Institute of Electrical and Electronic Engineers.

1.4 QUALITY ASSURANCE

- A. All equipment and accessories to be the product of a manufacturer regularly engaged in its manufacture.
- B. Supply all equipment and accessories new and free from defects.
- C. Supply all equipment and accessories in compliance with the applicable standards listed in Article 1.03 of this Section and with all applicable National, State and local codes.
- D. All items of a given-type shall be the products of the same manufacturer.

1.5 DIVISION OF WORK

- A. This section delineates the work required to be performed by Contractors under Divisions 23 and 26.

1.6 WORK REQUIRED UNDER DIVISION 23

- A. Furnish motors, manual and combination starters, pushbutton devices, contactors, disconnect switches, electric thermostats, low voltage transformers, Emergency Break Glass Stations and other electrical devices required for equipment furnished.
- B. Install all items in piping and ductwork such as control valves, aquastats, ductstats, etc.

- C. All external wiring of equipment, all temperature control wiring, external wiring of control circuits of magnetic starters, interlocking wiring, boiler wiring, Emergency Break Glass Stations, and mounting of control devices, etc., shall be included under Division 23. All external wiring shall be in conduit. (Unless specifically shown to be provided by the Electrical Contractor)
- D. The Electrical Contractor, under Division 26, shall furnish and install all power wiring and conduit to junction box, to disconnect switch on unit, to motor starters and contactors, and between motor starters and contactors to motor or other load. Electrical Contractor shall be responsible for proper direction of rotation for all three phase equipment. The Electrical Contractor shall mount all starters, disconnects.
- E. Wiring required under Division 23 shall comply with the specifications as described in Division 26.
- F. The Plumbing Contractor, under Division 22, shall provide water and natural gas services to within two (2) feet of HVAC equipment requiring same and terminating with shut-off valves. The HVAC Contractor, under Division 23, shall make final connections to equipment.
- G. Provide disconnect switches or safety switches for equipment. (Unless specifically shown to be provided by the Electrical Contractor, starters and disconnects shown on the electrical drawings are for installation and do not require the Electrical Contractor to furnish units)
- H. Emergency Generator - Exhaust muffler and flexible exhaust connection shall be furnished by the generator manufacturer under Division 26. Installation of the exhaust system including providing piping, insulation and accessories shall be included under Division 23.

1.7 SUBMITTALS

- A. Shop Drawings: Complete wiring diagrams of all power and control connections (standard diagrams will not be accepted). Deliver 2 copies of approved wiring diagrams to the Electric Contractor for installation of wiring and connections required under the Electric Contract.
- B. Product Data for Motor Controllers and Disconnect Switches: Manufacturer's catalog sheets, specifications and installation instructions. Submit enclosure type coordinated for service and location. Submit simultaneously with product data required for motors. Identify each controller for use with corresponding motor. Submit shop drawings and product data in accordance with project requirements.
- C. All warranties shall be delivered as part of the close-out submission.
- D. A receipt shall be delivered as part of the close-out submission that states all required spare parts have been delivered to the owner. This receipt must be signed and dated by the owner.

PART 2 - PRODUCTS

2.1 ACCEPTABLE MANUFACTURERS

- A. Motor Controllers and Disconnects
 - 1. Square D
 - 2. Allen-Bradley
 - 3. General Electric
 - 4. Cutler-Hammer

2.2 MOTOR CONTROLLERS

- A. General: All starters shall be correctly sized to motor connected thereto. Provide one (1) additional auxiliary contact over and above that normally furnished, at least two (2) required.

Provide overload heaters for each phase. Coordinate starters and controllers with the temperature control Contractor and sequence of operations.

- B. Minimum Size: The minimum allowable size of single or three phase magnetic motor controller is NEMA size 0.
- C. Enclosures: Unless otherwise indicated furnish NEMA 1 enclosures, except where installed outdoors furnish NEMA 3R enclosures.
- D. Control Power: Furnish control power transformer (maximum control voltage 120 volts) mounted within each magnetic motor controller enclosure.
- E. Local Control Devices: Where indicated, furnish standard duty push buttons or 3-position hand-off-auto selector switch mounted in the controller enclosure.
- F. Pilot Lights: Furnish pilot lights of the neon lamp type mounted in the controller enclosure, green for running, red for not running.
- G. Motor Controller Types:
 - 1. Type A (Full Voltage, Manual, Non-Magnetic):
 - a. Allen-Bradley Co. Bulletin 609 (or Bulletin 600 - single phase, 1 HP or less only).
 - b. General Electric Co. CR-1062 (or CR-101 - single phase, 1 HP or less only).
 - c. Square D Co. Class 2510, Type M (or Class 2510, Type F - single phase, 1 HP or less only).
 - d. Cutler-Hammer. B100 (or MS - single phase, 1 HP or less only).
 - 2. Type A2 (2 Speed, 2 Winding, Full Voltage, Manual, Non-Magnetic):
 - a. Allen-Bradley Co. Bulletin 609TS (or Bulletin 600 - single phase, 1 HP or less only).
 - b. General Electric Co. CR-1062 (or CR-101 - single phase, 1 HP or less only).
 - c. Square D Co. Class 2512, Type M (or Class 2512, Type F - single phase, 1 HP or less only).
 - 3. Type B (Full Voltage Magnetic):
 - a. Allen-Bradley Co. Bulletin 709.
 - b. General Electric Co. CR-206.
 - c. Square D Co. Class 8536.
 - d. Cutler-Hammer. ECN05.
 - 4. Type B-COM (Combination Full Voltage Magnetic/Safety Switch):
 - a. Allen-Bradley Co. Bulletin 712.
 - b. General Electric Co. CR-208.
 - c. Square D Co. Class 8538.
 - d. Cutler-Hammer. ECN16.
 - 5. Type B2 (2 Speed, 2 Winding, Full Voltage, Magnetic):
 - a. Allen-Bradley Co. Bulletin 715.
 - b. General Electric Co. CR209.
 - c. Square D Co. Class 8810.
 - d. Cutler-Hammer. ECN33.
 - 6. Type C (Automatic, Reduced Voltage, Magnetic):
 - a. Allen-Bradley Co. Bulletin 746.
 - b. General Electric Co. CR-231.
 - c. Square D Co. Class 8606.
 - d. Cutler-Hammer. ECA42.
 - 7. Type C-COM (Combination Automatic, Reduced Voltage, Magnetic/ Safety Switch):
 - a. Allen-Bradley Co. Bulletin 746C.

- b. Square D Co. Class 8606.
- c. Cutler-Hammer. ECA43.
- 8. Type D (Part Winding, Magnetic):
 - a. Allen-Bradley Co. Bulletin 736.
 - b. General Electric Co. CR-230.
 - c. Square D Co. Class 8640.
 - d. Cutler-Hammer. ECA45.

2.3 REMOTE PUSH BUTTON STATIONS

- A. Start-Stop with pilot light in NEMA 1 enclosure unless otherwise indicated.
 - 1. Allen-Bradley Co. Bulletin 800S.
 - 2. General Electric Co. CR-2943.
 - 3. Square D Co. Class 9001.
 - 4. Cutler-Hammer. Class 10250.

2.4 SAFETY SWITCHES

- A. General Electric Co. Type TH; Square D Co. Heavy Duty Series; Cutler-Hammer HD Series; with the following:
 - 1. Fused or unfused as required.
 - 2. Fused switches equipped with fuseholders to accept only the fuses specified in Section 16181 (U.L. Class RK-1, RK-5, L).
 - 3. NEMA 1 enclosure unless otherwise indicated on drawing or required. 3R for devices installed outdoors.
 - 4. Switch rated 240V for 120V, 208V, 240V, circuits; 600 V for 277V, 480V circuits.
 - 5. Switch rated 600V for 277V, 480V circuits.
 - 6. Solid neutral bus when neutral or grounding conductor is included with circuit.
 - 7. Current rating and number of poles as indicated on drawings.

2.5 NAMEPLATES

- A. Phenolic Type: Standard phenolic nameplates with 3/8" minimum size lettering engraved thereon.
- B. Embossed Aluminum: Standard stamped or embossed aluminum tags: Tech Products, Inc., Seton Name Plate Corp.

PART 3 - EXECUTION

3.1 GENERAL

- A. Equipment shall be connected in a neat and skillful manner. Equipment delivered with terminal boxes that are inadequate shall be equipped with special boxes that suit the conditions by the Mechanical Contractor furnishing the equipment.
- B. In general, rigid conduit or tubing shall be used, but equipment that requires movement or that would transmit vibration to conduit shall be wired with flexible (liquid tight) steel conduit not over 18" long.
- C. All equipment shall be grounded with a green-covered ground wire run inside the conduit and connected to equipment frame on one end and to grounding system on the other end.
- D. All electrical work required in the Mechanical Contract shall conform to the applicable requirements of Division 26 of these Specifications.

- E. The Heating, Ventilating, and Air Conditioning Contractor shall assign all Electrical Work required under his contract to the approved Automatic Temperature Control Contractor, who shall perform this work with qualified electricians employed by that Contractor.
- F. The Mechanical Contractors shall cooperate with the Contractor for Electrical Work in making all necessary tests and in receiving, storing, and setting all motor-driven equipment, electrical devices, and controls furnished and/or installed under these contracts.
- G. Install heaters correlated with full load current of motors provided.
- H. Set overload devices to suit motors provided.

3.2 INSTALLATION

- A. Control Wiring:
 - 1. Provide control wiring and connections.
 - 2. Where control circuit interlocking is required between individually mounted motor controllers, provide a single pole on-off switch in a threaded type box mounted adjacent to motor safety switches which are remote from the control transformer (to enable interlock circuit to be opened when the motor safety switch is opened).
- B. Nameplates: Rivet or bolt the nameplate on the cover of NEMA 1 enclosures. Rivet or bolt and gasket the nameplate on cover of NEMA 3R or NEMA 12 enclosures. Provide phenolic or embossed aluminum nameplates as follows:
 - 1. On each remote control station, indicating motor controlled.
 - 2. On each interlock circuit switch, indicating purpose of switch.

3.3 TYPES OF MOTOR CONTROLLERS REQUIRED FOR SINGLE SPEED MOTORS (SYSTEMS UNDER 250 VOLTS)

- A. Single Phase Motors Less than 1/2 HP - Automatically Operated: Type A.
- B. Single Phase Motors 1/2 to 5 HP - Automatically Operated: Type B.
- C. Three Phase Squirrel Cage Motors Less than 7-1/2 HP: Type B (B-COM when indicated on drawings).
- D. Three Phase Squirrel Cage Motors 7-1/2 HP and Larger: Type C (C-COM when indicated on drawings).
- E. Three Phase Hermetically Sealed Compressor Motors Less than 7-1/2 HP: Type B.
- F. Three Phase Hermetically Sealed Compressor Motors 7-1/2 HP and Larger: Type D.

3.4 TYPES OF MOTOR CONTROLLERS REQUIRED FOR 2 SPEED MOTORS (SYSTEMS UNDER 250 VOLTS)

- A. Single Phase Motors Less than 1/2 HP - Automatically Operated: Type A2.
- B. Single Phase Motors 1/2 to 5 HP - Automatically Operated: Type B2.
- C. Three Phase Squirrel Cage Motors Less than 7-1/2 HP: Type B2.

3.5 DISCONNECTS

- A. Motor Controllers: Provide safety switch for all motor controllers. Provide combination type starter-disconnect unless otherwise noted on drawings.

- B. Motors: Provide a disconnect switch for all motors. Provide a separate safety switch for motors which are not within sight of the starter.
- C. Provide safety switches for all factory packaged equipment.
- D. Provide NEMA 3R safety switch for all rooftop and outdoor equipment.
- E. Provide unit mounted disconnect switches for all equipment such as unit heaters, fans, unit ventilators, incremental units, etc

END OF SECTION 230002

SECTION 230130 - HVAC AIR-DISTRIBUTION SYSTEM CLEANING

PART 1 - GENERAL

1.1 SUMMARY

- A. Section includes cleaning HVAC air-distribution equipment, ducts, plenums, and system components.
- B. Provide labor, materials, equipment and services required to thoroughly clean the HVAC / ductwork systems as designated in the Contract Documents.
- C. Provide all labor, material, and services to obtain access to HVAC systems to be cleaned including:
 - 1. Removal and reinstallation of ceiling systems
 - 2. Cutting and patching of wall and ceiling systems

1.2 QUALITY ASSURANCE

- A. The duct system shall be free of construction debris.
- B. New HVAC ductwork system installations shall comply with level "B", the Intermediate Level of SMACNA Duct Cleanliness for New Construction.
- C. Existing HVAC ductwork system cleaning shall comply with The NADCA Standard for Assessment Cleaning & Restoration of HVAC Systems 2013 (ACR-2013), as published by the National Air Duct Cleaners Association.
- D. The Duct Cleaning Contractor or subcontractor shall be a member of the National Air Duct Cleaners Association (NADCA) and shall have at least two certified Air Systems Cleaning Specialists (ASCS) on regular staff, two years of experience in this field. The Contractor shall produce a reference list to the Owner and Project Engineer of projects successfully completed of a similar size and scope.
- E. Supervisor qualifications: The project shall be supervised by an ASCS at all times.

1.3 SUBMITTALS TO THE ARCHITECT/ENGINEER

- A. Provide MSDS sheets on all solvents, cleaners, microbial reduction agents, and disinfectants to be used on project.
- B. Contractor credentials, including NADCA certificates, project references, and cleaning methods and application methods for microbial reduction agents and coatings.

1.4 SUBMITTALS TO THE OWNER

- A. Since the systems must be operational during the normal work hours, the Contractor shall submit to the Owner a procedure for cleaning the ductwork and installing filters which will minimize contamination of already cleaned areas. This sequence must be approved by the Owner and Project Engineer prior to starting work

PART 2 - PRODUCTS

2.1 MICROBIAL REDUCTION AGENTS

- A. Microbial reduction agents shall only be applied if active fungal growth is reasonably suspected, or where an unacceptable level of fungal contamination has been verified through testing.

- B. All products for application on non-porous surfaces inside HVAC / ductwork systems shall have an E.P.A. registration specifically for this application.

2.2 COATING FOR POROUS (FIBERGLASS LINED) COMPONENTS

- A. A mechanical insulation repair coating, Tough Coat, as manufactured by Vac System Industries, Inc., or approved equal shall be used. The coating material shall contain an anti-microbial agent, shall not affect the thermal or acoustic properties of the insulation, and shall conform to NFPA Standards 90A and 90B.

2.3 PLENUM PAINT

- A. Porous Surface: The paint shall be Porta-Sept as manufactured by Porter Paints, Inc., or approved equal. Paint shall contain an EPA registered anti-microbial preservative known as Intersept, which inhibits the growth of bacteria, mold, mildew, and fungi.

PART 3 - EXECUTION

3.1 HEALTH AND SAFETY

- A. Cleaning contractors shall comply with all applicable federal, state and local requirements for protecting the safety of the contractors' employees, building occupants, and the environment. In particular, all applicable standards of the Occupational Safety and Health Administration (OSHA) should be followed when working in accordance with this standard.
- B. No processes or materials shall be employed in such a manner that they will create adverse health effects to the building occupants, cleaning contractors, or general public.
- C. Disposal of Debris. All debris removed from the ACS shall be disposed of in accordance with all applicable federal, state, and local requirements.

3.2 PREPARATION

- A. Prior to start of work, the HVAC system is to be carefully inspected and checked for all conditions affecting the cleaning. Defects are to be reported in writing to the Project Engineer and work will not proceed until all defects have been documented. Commencement of work will constitute acceptance of the conditions of the area to which the cleaning work is to be performed and all defects in work resulting from such accepted service will be corrected by this trade without additional expense to the Owner. No cleaning is to be performed to ducts where the process has the capability of damaging the duct lining. The decision to clean and/or encapsulate these areas will be made by the Project Engineer after review of the Contractor's findings and the Project Engineer has seen the field conditions.
- B. Disassemble all removable items as required for access to work area. Store the removables in a Project Engineer or Owner approved storage area until the completion of the cleaning work.
- C. Fire protection devices (such as smoke detectors, panels, etc.) shall be protected prior to cleaning procedures. They are to be cleaned and tested at the conclusion of work.
- D. The Contractor shall coordinate the shutdown and reactivating of the fire alarm system to avoid accidental alarms during the cleaning process and related work.
- E. The Contractor shall coordinate the shutdown of the air handling equipment with the Owner before starting work, and shall conform to OSHA requirements regarding fan motor disconnect lock-out/tag-out.

- F. Report to Project Engineer any system defects discovered during the cleaning operation which will require repair to an HVAC system component that is outside of the scope of work as specified herein. Any defects should be identified in a 'Conditions Found Report'.

3.3 GENERAL REQUIREMENTS

- A. Mechanical Cleaning Methodology:
1. Comply with NADCA ACR 2006.
 2. Cleaning methods shall be employed such that all Non-Porous surface components must be Visibly Clean (per section 13 of ACR-2006).
 3. Source-Removal Cleaning Methods: The HVAC system shall be cleaned using source-removal mechanical cleaning methods designed to extract contaminants from within the HVAC system and to safely remove these contaminants from the facility. No cleaning method, or combination of methods, shall be used that could potentially damage components of the HVAC system or negatively alter the integrity of the system.
 - a. Use continuously operating vacuum-collection devices to keep each section being cleaned under negative pressure.
 - b. Cleaning methods that require mechanical agitation devices to dislodge debris that is adhered to interior surfaces of HVAC system components shall be equipped to safely remove these devices. Cleaning methods shall not damage the integrity of HVAC system components or damage porous surface materials such as duct and plenum liners.
 4. Cleaning Mineral-Fiber Insulation Components:
 - a. Fibrous-glass thermal or acoustical insulation elements present in equipment or ductwork shall be thoroughly cleaned with HEPA vacuuming equipment while the HVAC system is under constant negative pressure and shall not be permitted to get wet according to NADCA ACR 2006.
 - b. Cleaning methods used shall not cause damage to fibrous-glass components and will render the system capable of passing the HVAC System Cleanliness Tests (see NADCA ACR 2006).
 - c. Fibrous materials that become wet shall be discarded and replaced.
- B. Containment: Debris removed during cleaning shall be collected and precautions must be taken to ensure that debris is not otherwise dispersed outside the ACS during the cleaning process. After ACS cleaning, any areas which could be affected by the cleaning contractor's work must be as clean as their condition prior to the commencement of the cleaning operation.
- C. Collect debris removed during cleaning. Ensure that debris is not dispersed outside the HVAC system during the cleaning process. Debris removed from the HVAC system shall be disposed of according to applicable Federal, state, and local requirements.
- D. Particulate Collection.
1. Where the Particulate Collection Equipment is exhausting inside the building, HEPA filtration with 99.97% collection efficiency for 0.3-micron size particles shall be used (See EPA's Building Air Quality).
 2. When the Particulate Collection Equipment is exhausting outside the building, Mechanical cleaning operations shall be undertaken only with Particulate Collection Equipment in place, including adequate filtration to control debris removed from the ductwork or ceiling plenum. When the Particulate Collection Equipment is exhausting outside the building, precautions shall be taken to ensure that exhausted air does not re-enter the building.

- E. Controlling Odors. Control odors and mist vapors during the cleaning and restoration process. All reasonable measures shall be taken to control offensive odors and/or mist vapors during the cleaning process.
- F. Air-Volume Control Devices. Dampers and any air-directional mechanical devices inside the ductwork must have their position marked prior to cleaning and, upon completion, must be restored to their marked position.
- G. Mark the position of manual volume dampers and air-directional mechanical devices inside the system prior to cleaning. Restore them to their marked position on completion of cleaning.

3.4 SYSTEMS AND COMPONENTS:

~~A. Air Handling Units:~~

- ~~1. The interior of air handling units shall be cleaned in accordance with the NADCA standard, ACR 2006.~~
- ~~2. No cleaning method should be used which could potentially damage components of the ductwork or negatively alter the integrity of the system.~~
- ~~3. Clean air handling units, airstream surfaces, components, condensate collectors, and drains. Air handling unit cleaning shall include plenums, filter section, mixing boxes, return air fans, dampers and all components.~~
- ~~4. Ensure that a suitable operative drainage system is in place prior to beginning wash-down procedures.~~
- ~~5. Clean evaporator coils, cooling coils, heating coils and other airstream components.~~
- ~~6. Clean fibrous glass duct liner with HEPA vacuuming equipment, or other methods without damaging the integrity of the duct liner. Apply mechanical insulation repair coating to fiberglass lined surfaces in ductwork and air handlings units after cleaning. Replace fibrous gall ductliner that is severely damaged, deteriorated, mold infested or wet.~~
- ~~7. Replace all air filters with Owner's stock at the completion of cleaning~~

~~B. Air Handling Unit Coil Cleaning:~~

- ~~1. See NADCA ACR 2006, "Coil Surface Cleaning" Section. Type 1, or Type 1 and Type 2, cleaning methods shall be used to render the coil visibly clean and capable of passing Coil Cleaning Verification (see applicable NADCA ACR 2006).~~
- ~~2. Coil drain pans shall be subject to NADCA ACR 2006, "Non-Porous Surfaces Cleaning Verification." Ensure that condensate drain pans are operational.~~
- ~~3. Electric resistance coils shall be de-energized, locked out, and tagged before cleaning.~~
- ~~4. Cleaning methods shall not cause any appreciable damage to, cause displacement of, inhibit heat transfer, or cause erosion of the coil surface or fins, and shall comply with coil manufacturer's written recommendations when available.~~
- ~~5. Rinse thoroughly with clean water to remove any latent residues.~~

~~C.A. Ductwork Systems:~~

- ~~1. Applies to:
 - a. Return-air ducts to the air-handling unit.~~
- ~~2. Mechanically clean ductwork systems specified to remove all visible contaminants so that the systems are capable of passing the HVAC System Cleanliness Tests in accordance with the NADCA standard, ACR 2006.~~
- ~~3. No cleaning method should be used which could potentially damage components of the ductwork or negatively alter the integrity of the system.~~
- ~~4. Mechanical cleaning and agitation methods shall be capable of cleaning minimum 50 foot sections of ductwork in each direction per access point so as to minimize the number of service openings and thus preserve the integrity of the ductwork and minimize leakage.~~

The agitation tool shall be required to contact all sides of the duct regardless of size and configuration. The Contractor shall produce a detailed description of procedures and methods to the Engineer/Owner.

5. Use vacuum-collection devices that are operated continuously during cleaning. Connect vacuum device to downstream end of ducts so areas being cleaned are under negative pressure.
6. Where ductwork is large enough and able to support the weight of a worker, hand tools and HEPA shop vacs may be used. If workers enter the inside of the duct they must follow the OSHA confined space requirements (OSHA 29 CFR 1910.146) Collection equipment must be used during this process to assure capture of any residual or airborne debris.
7. Clean fibrous-glass duct liner with HEPA vacuuming equipment, or other methods without damaging the integrity of the duct liner. Apply mechanical insulation repair coating to fiberglass lined surfaces in ductwork and air handlings units after cleaning. Replace fibrous-gall ductliner that is severely damaged, deteriorated, mold infested or wet.

~~D. Duct Reheat Coils:~~

- ~~1. Duct mounted coils shall be hand washed (air or water) on both coil faces.~~
- ~~2. Thoroughly clean coil faces insuring the removal of debris while avoiding damage to the fins.~~
- ~~3. Remove corrosion from around the coil frames, and paint all corroded metal surfaces.~~
- ~~4. Perform pressure differential readings across the coil to verify cleanliness.~~
- ~~5. Final pressure differentials across the coil shall be within 10% of manufacturer's original ratings.~~

~~E. Volume, Fire and Zone Dampers:~~

- ~~1. Duct mounted volume, fire and zone damper sets are to be marked to their current setting, then inspected and cleaned if necessary.~~
- ~~2. External moving parts are to be treated with an approved dry lubricant material.~~
- ~~3. After cleaning, the dampers shall be repaired as necessary to insure proper operation and returned to original settings.~~
- ~~4. Contractor shall indicate locations of damaged and/or repaired dampers.~~

3.5 CLEANLINESS VERIFICATION

- A. Verify cleanliness according to NADCA ACR 2006, "Verification of HVAC System Cleanliness" Section.
- B. Verification of cleanliness will be determined after Mechanical Cleaning and before the application of any treatment or introduction of any treatment-related substance. Verification of Non-Porous Surface Cleaning and Verification of Coil Cleaning shall be conducted after Mechanical Cleaning and before the system is restored to normal operation.
- C. Verification of Non-Porous Surface Cleaning:
 1. All Non-Porous Interior Duct/Air Handling Unit Surfaces must be Visibly Clean.
 2. An interior surface is considered visibly clean when it is free from non-adhered substances and debris.
 3. Where contaminants are discovered, re-clean and re-inspect duct systems.
 4. In the event there is a discrepancy with regard to if the surface is visibly clean, contractor shall conduct Surface Comparison Testing per Section 13.2 of the NADCA ACR-2006.
 5. Photo documentation of representative sections and components of cleaned systems shall be provided by the Contractor.
- D. Verification of Coil Cleaning:

1. Mechanical Cleaning must restore the Coil-Pressure Drop to within 10 percent of the Pressure Drop measured when the Coil was first installed. If original pressure drop is not known, the coil will be considered clean based on visual inspection.

3.6 MICROBIAL REDUCTION AGENT APPLICATION

- A. A microbial reduction agent shall be applied to all supply and return air metal only ductwork cleaned as part of this project. Application and preparation shall be as per manufacturer's recommendations.
- B. The Contractor must demonstrate to the Project Engineer how the application method is capable of dispensing the sanitizing solution to the entire surface areas of the ductwork.

3.7 RESTORATION

- A. Restore and repair HVAC air-distribution equipment, ducts, plenums, and components according to NADCA ACR 2006, "Restoration and Repair of Mechanical Systems" Section.
- B. Comply with Division 23 Sections "Metal Ducts" and Air Duct Accessories" for duct materials, accessories, and hardware required for Work of this Section.
- C. Ensure that closures do not hinder or alter airflow.
- D. New closure materials, including insulation, shall match opened materials and shall have removable closure panels fitted with gaskets and fasteners.
- E. Reseal fibrous-glass ducts. Comply with requirements in Division 23 Section "Nonmetal Ducts."

3.8 POST PROJECT REPORT

- A. Prepare a written cleanliness verification report. At a minimum, include the following:
 1. Written documentation of the success of the cleaning.
 2. Site inspection reports.
 3. Photographic Documentation.
 4. Areas of the system found to be damaged, in need of repair, and / or requiring more aggressive cleaning.

END OF SECTION 230130

THIS PAGE LEFT INTENTIONALLY BLANK

THIS PAGE INTENTIONALLY LEFT BLANK

SECTION 230513 - COMMON MOTOR REQUIREMENTS FOR HVAC EQUIPMENT

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

- A. Drawings and general provisions of the Contract, including General and Supplementary Conditions and Division 01 Specification Sections, apply to this Section.

1.2 SUMMARY

- A. Section includes general requirements for single-phase and polyphase, general-purpose, horizontal, small and medium, squirrel-cage induction motors for use on ac power systems up to 600 V and installed at equipment manufacturer's factory or shipped separately by equipment manufacturer for field installation.

1.3 COORDINATION

- A. Coordinate features of motors, installed units, and accessory devices to be compatible with the following:
 - 1. Motor controllers.
 - 2. Torque, speed, and horsepower requirements of the load.
 - 3. Ratings and characteristics of supply circuit and required control sequence.
 - 4. Ambient and environmental conditions of installation location.

PART 2 - PRODUCTS

2.1 GENERAL MOTOR REQUIREMENTS

- A. Comply with NEMA MG 1 unless otherwise indicated.
- B. Comply with IEEE 841 for severe-duty motors.

2.2 MOTOR CHARACTERISTICS

- A. Duty: Continuous duty at ambient temperature of 40 deg C and at altitude of 3300 feet above sea level.
- B. Capacity and Torque Characteristics: Sufficient to start, accelerate, and operate connected loads at designated speeds, at installed altitude and environment, with indicated operating sequence, and without exceeding nameplate ratings or considering service factor.

2.3 POLYPHASE MOTORS

- A. Description: NEMA MG 1, Design B, medium induction motor.
- B. Efficiency: Premium energy efficient, as defined in NEMA MG 1.
- C. Service Factor: 1.15.
- D. Multispeed Motors: Variable torque.
 - 1. For motors with 2:1 speed ratio, consequent pole, single winding.
 - 2. For motors with other than 2:1 speed ratio, separate winding for each speed.
- E. Multispeed Motors: Separate winding for each speed.
- F. Rotor: Random-wound, squirrel cage.

- G. Bearings: Regreasable, shielded, antifriction ball bearings suitable for radial and thrust loading.
- H. Temperature Rise: Match insulation rating.
- I. Insulation: Class F.
- J. Code Letter Designation:
 - 1. Motors 15 HP and Larger: NEMA starting Code F or Code G.
 - 2. Motors Smaller than 15 HP: Manufacturer's standard starting characteristic.
- K. Enclosure Material: Cast iron for motor frame sizes 324T and larger; rolled steel for motor frame sizes smaller than 324T.

2.4 POLYPHASE MOTORS WITH ADDITIONAL REQUIREMENTS

- A. Motors Used with Reduced-Voltage and Multispeed Controllers: Match wiring connection requirements for controller with required motor leads. Provide terminals in motor terminal box, suited to control method.
- B. Motors Used with Variable Frequency Controllers: Ratings, characteristics, and features coordinated with and approved by controller manufacturer.
 - 1. Windings: Copper magnet wire with moisture-resistant insulation varnish, designed and tested to resist transient spikes, high frequencies, and short time rise pulses produced by pulse-width modulated inverters.
 - 2. Energy- and Premium-Efficient Motors: Class B temperature rise; Class F insulation.
 - 3. Thermal Protection: Comply with NEMA MG 1 requirements for thermally protected motors.
- C. Severe-Duty Motors: Comply with IEEE 841, with 1.15 minimum service factor.

2.5 SINGLE-PHASE MOTORS

- A. Motors larger than 1/20 hp shall be one of the following, to suit starting torque and requirements of specific motor application:
 - 1. Permanent-split capacitor.
 - 2. Split phase.
 - 3. Capacitor start, inductor run.
 - 4. Capacitor start, capacitor run.
- B. Multispeed Motors: Variable-torque, permanent-split-capacitor type.
- C. Bearings: Prelubricated, antifriction ball bearings or sleeve bearings suitable for radial and thrust loading.
- D. Motors 1/20 HP and Smaller: Shaded-pole type.
- E. Thermal Protection: Internal protection to automatically open power supply circuit to motor when winding temperature exceeds a safe value calibrated to temperature rating of motor insulation. Thermal-protection device shall automatically reset when motor temperature returns to normal range.

PART 3 - EXECUTION (Not Applicable)

END OF SECTION 230513

SECTION 230517 - SLEEVES AND SLEEVE SEALS FOR HVAC PIPING

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

- A. Drawings and general provisions of the Contract, including General and Supplementary Conditions and Division 01 Specification Sections, apply to this Section.

1.2 SUMMARY

- A. Section Includes:
 - 1. Sleeves.
 - 2. Stack-sleeve fittings.
 - 3. Sleeve-seal systems.
 - 4. Sleeve-seal fittings.
 - 5. Grout.

1.3 ACTION SUBMITTALS

- A. Product Data: For each type of product indicated.

PART 2 - PRODUCTS

2.1 SLEEVES

- A. Cast-Iron Wall Pipes: Cast or fabricated of cast or ductile iron and equivalent to ductile-iron pressure pipe, with plain ends and integral waterstop unless otherwise indicated.
- B. Galvanized-Steel Wall Pipes: ASTM A 53/A 53M, Schedule 40, with plain ends and welded steel collar; zinc coated.
- C. Galvanized-Steel-Pipe Sleeves: ASTM A 53/A 53M, Type E, Grade B, Schedule 40, zinc coated, with plain ends.
- D. PVC-Pipe Sleeves: ASTM D 1785, Schedule 40.
- E. Galvanized-Steel-Sheet Sleeves: 0.0239-inch minimum thickness; round tube closed with welded longitudinal joint.
- F. Molded-PE or -PP Sleeves: Removable, tapered-cup shaped, and smooth outer surface with nailing flange for attaching to wooden forms.
- G. Molded-PVC Sleeves: With nailing flange for attaching to wooden forms.

2.2 STACK-SLEEVE FITTINGS

- A. Manufacturers: Subject to compliance with requirements, available manufacturers offering products that may be incorporated into the Work include, but are not limited to, the following:
 - 1. Smith, Jay R. Mfg. Co.
 - 2. Zurn Specification Drainage Operation; Zurn Plumbing Products Group.
- B. Description: Manufactured, cast-iron sleeve with integral clamping flange. Include clamping ring, bolts, and nuts for membrane flashing.
 - 1. Underdeck Clamp: Clamping ring with setscrews.

2.3 SLEEVE-SEAL SYSTEMS

- A. Manufacturers: Subject to compliance with requirements, provide products by one of the following:
 - 1. Advance Products & Systems, Inc.
 - 2. CALPICO, Inc.
 - 3. Metraflex Company (The).
 - 4. Pipeline Seal and Insulator, Inc.
 - 5. Proco Products, Inc.
- B. Description: Modular sealing-element unit, designed for field assembly, for filling annular space between piping and sleeve.
 - 1. Sealing Elements: EPDM-rubber interlocking links shaped to fit surface of pipe. Include type and number required for pipe material and size of pipe.
 - 2. Pressure Plates: Carbon steel.
 - 3. Connecting Bolts and Nuts: Carbon steel, with corrosion-resistant coating, of length required to secure pressure plates to sealing elements.

2.4 SLEEVE-SEAL FITTINGS

- A. Manufacturers: Subject to compliance with requirements, available manufacturers offering products that may be incorporated into the Work include, but are not limited to, the following:
 - 1. Presealed Systems.
- B. Description: Manufactured plastic, sleeve-type, waterstop assembly made for imbedding in concrete slab or wall. Unit has plastic or rubber waterstop collar with center opening to match piping OD.

2.5 GROUT

- A. Standard: ASTM C 1107/C 1107M, Grade B, post-hardening and volume-adjusting, dry, hydraulic-cement grout.
- B. Characteristics: Nonshrink; recommended for interior and exterior applications.
- C. Design Mix: 5000-psi, 28-day compressive strength.
- D. Packaging: Premixed and factory packaged.

PART 3 - EXECUTION

3.1 SLEEVE INSTALLATION

- A. Install sleeves for piping passing through penetrations in floors, partitions, roofs, and walls.
- B. For sleeves that will have sleeve-seal system installed, select sleeves of size large enough to provide 1-inch annular clear space between piping and concrete slabs and walls.
 - 1. Sleeves are not required for core-drilled holes.
- C. Install sleeves in concrete floors, concrete roof slabs, and concrete walls as new slabs and walls are constructed.
 - 1. Permanent sleeves are not required for holes in slabs formed by molded-PE or -PP sleeves.
 - 2. Cut sleeves to length for mounting flush with both surfaces.
 - a. Exception: Extend sleeves installed in floors of mechanical equipment areas or other wet areas 2 inches above finished floor level.

3. Using grout, seal the space outside of sleeves in slabs and walls without sleeve-seal system.
- D. Install sleeves for pipes passing through interior partitions.
 1. Cut sleeves to length for mounting flush with both surfaces.
 2. Install sleeves that are large enough to provide 1/4-inch annular clear space between sleeve and pipe or pipe insulation.
 3. Seal annular space between sleeve and piping or piping insulation; use joint sealants appropriate for size, depth, and location of joint. Comply with requirements for sealants specified in Section 079200 "Joint Sealants."
- E. Fire-Barrier Penetrations: Maintain indicated fire rating of walls, partitions, ceilings, and floors at pipe penetrations. Seal pipe penetrations with firestop materials. Comply with requirements for firestopping specified in Section 078413 "Penetration Firestopping."

3.2 STACK-SLEEVE-FITTING INSTALLATION

- A. Install stack-sleeve fittings in new slabs as slabs are constructed.
 1. Install fittings that are large enough to provide 1/4-inch annular clear space between sleeve and pipe or pipe insulation.
 2. Secure flashing between clamping flanges for pipes penetrating floors with membrane waterproofing. Comply with requirements for flashing specified in Section 076200 "Sheet Metal Flashing and Trim."
 3. Install section of cast-iron soil pipe to extend sleeve to 2 inches above finished floor level.
 4. Extend cast-iron sleeve fittings below floor slab as required to secure clamping ring if ring is specified.
 5. Using grout, seal the space around outside of stack-sleeve fittings.
- B. Fire-Barrier Penetrations: Maintain indicated fire rating of floors at pipe penetrations. Seal pipe penetrations with firestop materials. Comply with requirements for firestopping specified in Section 078413 "Penetration Firestopping."

3.3 SLEEVE-SEAL-SYSTEM INSTALLATION

- A. Install sleeve-seal systems in sleeves in exterior concrete walls and slabs-on-grade at service piping entries into building.
- B. Select type, size, and number of sealing elements required for piping material and size and for sleeve ID or hole size. Position piping in center of sleeve. Center piping in penetration, assemble sleeve-seal system components, and install in annular space between piping and sleeve. Tighten bolts against pressure plates that cause sealing elements to expand and make a watertight seal.

3.4 SLEEVE-SEAL-FITTING INSTALLATION

- A. Install sleeve-seal fittings in new walls and slabs as they are constructed.
- B. Assemble fitting components of length to be flush with both surfaces of concrete slabs and walls. Position waterstop flange to be centered in concrete slab or wall.
- C. Secure nailing flanges to concrete forms.
- D. Using grout, seal the space around outside of sleeve-seal fittings.

3.5 SLEEVE AND SLEEVE-SEAL SCHEDULE

- A. Use sleeves and sleeve seals for the following piping-penetration applications:

1. Exterior Concrete Walls above Grade:
 - a. Piping Smaller Than NPS 6: Galvanized-steel-pipe sleeves.
 - b. Piping NPS 6 and Larger: Galvanized-steel-pipe sleeves.
2. Concrete Slabs-on-Grade:
 - a. Piping Smaller Than NPS 6: Cast-iron wall sleeves with sleeve-seal system.
 - 1) Select sleeve size to allow for 1-inch annular clear space between piping and sleeve for installing sleeve-seal system.
 - b. Piping NPS 6 and Larger: Cast-iron wall sleeves with sleeve-seal system.
 - 1) Select sleeve size to allow for 1-inch annular clear space between piping and sleeve for installing sleeve-seal system.
3. Concrete Slabs above Grade:
 - a. Piping Smaller Than NPS 6: Galvanized-steel-pipe sleeves.
 - b. Piping NPS 6 and Larger: Galvanized-steel-pipe sleeves.
4. Interior Partitions:
 - a. Piping Smaller Than NPS 6: Galvanized-steel-pipe sleeves.
 - b. Piping NPS 6 and Larger: Galvanized-steel-sheet.

END OF SECTION 230517

SECTION 230518 - ESCUTCHEONS FOR HVAC PIPING

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

- A. Drawings and general provisions of the Contract, including General and Supplementary Conditions and Division 01 Specification Sections, apply to this Section.

1.2 SUMMARY

- A. Section Includes:
 - 1. Escutcheons.
 - 2. Floor plates.

1.3 ACTION SUBMITTALS

- A. Product Data: For each type of product indicated.

PART 2 - PRODUCTS

2.1 ESCUTCHEONS

- A. One-Piece, Cast-Brass Type: With polished, chrome-plated finish and setscrew fastener.
- B. One-Piece, Stamped-Steel Type: With chrome-plated finish and spring-clip fasteners.

2.2 FLOOR PLATES

- A. One-Piece Floor Plates: Cast-iron flange with holes for fasteners.
- B. Split-Casting Floor Plates: Cast brass with concealed hinge.

PART 3 - EXECUTION

3.1 INSTALLATION

- A. Install escutcheons for exposed piping penetrations of walls, ceilings, finished floors, and millwork, except in mechanical equipment rooms or unoccupied areas.
- B. Install escutcheons with ID to closely fit around pipe, tube, and insulation of piping and with OD that completely covers opening.
- C. Install floor plates for piping penetrations of equipment-room floors.
- D. Install floor plates with ID to closely fit around pipe, tube, and insulation of piping and with OD that completely covers opening.

3.2 FIELD QUALITY CONTROL

- A. Replace broken and damaged escutcheons and floor plates using new materials.

END OF SECTION 230518

THIS PAGE INTENTIONALLY LEFT BLANK

SECTION 230519 - METERS AND GAGES

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

- A. Drawings and general provisions of the Contract, including General and Supplementary Conditions and Division 01 Specification Sections, apply to this Section.

1.2 SUMMARY

- A. Section Includes:
 - 1. Bimetallic-actuated thermometers.
 - 2. Liquid-in-glass thermometers.
 - 3. Duct-thermometer mounting brackets.
 - 4. Thermowells.
 - 5. Dial-type pressure gages.
 - 6. Gage attachments.
 - 7. Test plugs.
 - 8. Test-plug kits.

1.3 ACTION SUBMITTALS

- A. Product Data: For each type of product.
- B. Shop Drawings:
 - 1. Include diagrams for power, signal, and control wiring.

1.4 INFORMATIONAL SUBMITTALS

- A. Product Certificates: For each type of meter and gage.

1.5 CLOSEOUT SUBMITTALS

- A. Operation and Maintenance Data: For meters and gages to include in operation and maintenance manuals.

PART 2 - PRODUCTS

2.1 BIMETALLIC-ACTUATED THERMOMETERS

- A. Manufacturers:
 - 1. Ashcroft Inc.
 - 2. Nanmac Corporation
 - 3. Tel-Tru Manufacturing Company
 - 4. Trerice
 - 5. Weiss Instruments, Inc.
- B. Standard: ASME B40.200.
- C. Case: Liquid-filled and sealed type; stainless steel with 3-inch nominal diameter.
- D. Dial: Nonreflective aluminum with permanently etched scale markings and scales in deg F and deg C.
- E. Connector Type(s): Union joint, adjustable angle, with unified-inch screw threads.

- F. Connector Size: 1/2 inch, with ASME B1.1 screw threads.
- G. Stem: 0.25 or 0.375 inch in diameter; stainless steel.
- H. Window: Plain glass.
- I. Ring: Stainless steel.
- J. Element: Bimetal coil.
- K. Pointer: Dark-colored metal.
- L. Accuracy: Plus or minus 1 percent of scale range.

2.2 LIQUID-IN-GLASS THERMOMETERS

- A. Metal-Case, Compact-Style, Liquid-in-Glass Thermometers:
 - 1. Manufacturers:
 - a. Terice
 - 2. Standard: ASME B40.200.
 - 3. Case: Cast aluminum; 6-inch nominal size.
 - 4. Case Form: Back angle unless otherwise indicated.
 - 5. Tube: Glass with magnifying lens and blue organic liquid.
 - 6. Tube Background: Nonreflective aluminum with permanently etched scale markings graduated in deg F and deg C.
 - 7. Window: Glass.
 - 8. Stem: Aluminum or brass and of length to suit installation.
 - a. Design for Air-Duct Installation: With ventilated shroud.
 - b. Design for Thermowell Installation: Bare stem.
 - 9. Connector: 3/4 inch, with ASME B1.1 screw threads.
 - 10. Accuracy: Plus or minus 1 percent of scale range or one scale division, to a maximum of 1.5 percent of scale range.
- B. Metal-Case, Industrial-Style, Liquid-in-Glass Thermometers:
 - 1. Manufacturers:
 - a. Tel-Tru Manufacturing Company
 - b. Terice
 - c. Weiss Instruments Inc.
 - 2. Standard: ASME B40.200.
 - 3. Case: Cast aluminum; 7-inch nominal size unless otherwise indicated.
 - 4. Case Form: Adjustable angle unless otherwise indicated.
 - 5. Tube: Glass with magnifying lens and blue organic liquid.
 - 6. Tube Background: Nonreflective aluminum with permanently etched scale markings graduated in deg F and deg C.
 - 7. Window: Glass.
 - 8. Stem: Aluminum and of length to suit installation.
 - a. Design for Air-Duct Installation: With ventilated shroud.
 - b. Design for Thermowell Installation: Bare stem.
 - 9. Connector: 1-1/4 inches, with ASME B1.1 screw threads.
 - 10. Accuracy: Plus or minus 1 percent of scale range or one scale division, to a maximum of 1.5 percent of scale range.

2.3 DUCT-THERMOMETER MOUNTING BRACKETS

- A. Description: Flanged bracket with screw holes, for attachment to air duct and made to hold thermometer stem.

2.4 THERMOWELLS

- A. Thermowells:
1. Standard: ASME B40.200.
 2. Description: Pressure-tight, socket-type fitting made for insertion in piping tee fitting.
 3. Material for Use with Copper Tubing: CNR or CUNI.
 4. Material for Use with Steel Piping: CRES or CSA.
 5. Type: Stepped shank unless straight or tapered shank is indicated.
 6. External Threads: NPS 3/4 ASME B1.20.1 pipe threads.
 7. Internal Threads: 1/2-inch, with ASME B1.1 screw threads.
 8. Bore: Diameter required to match thermometer bulb or stem.
 9. Insertion Length: Length required to match thermometer bulb or stem.
 10. Lagging Extension: Include on thermowells for insulated piping and tubing.
 11. Bushings: For converting size of thermowell's internal screw thread to size of thermometer connection.
- B. Heat-Transfer Medium: Mixture of graphite and glycerin.

2.5 DIAL-TYPE PRESSURE GAGES

- A. Direct-Mounted, Metal-Case, Dial-Type Pressure Gages:
1. Manufacturers:
 - a. Ametek U.S. Gauge
 - b. Ashcroft Inc.
 - c. Tel-Tru Manufacturing Company
 - d. Terice
 - e. Weiss Instruments, Inc.
 2. Standard: ASME B40.100.
 3. Case: Liquid-filled type; cast aluminum or drawn steel; 4-1/2-inch nominal diameter.
 4. Pressure-Element Assembly: Bourdon tube unless otherwise indicated.
 5. Pressure Connection: Brass, with NPS 1/4, ASME B1.20.1 pipe threads and bottom-outlet type unless back-outlet type is indicated.
 6. Movement: Mechanical, with link to pressure element and connection to pointer.
 7. Dial: Nonreflective aluminum with permanently etched scale markings graduated in psi and kPa.
 8. Pointer: Dark-colored metal.
 9. Window: Glass.
 10. Ring: Metal.
 11. Accuracy: Grade A, plus or minus 1 percent of middle half of scale range.

2.6 GAGE ATTACHMENTS

- A. Valves: Brass ball, with NPS 1/4, ASME B1.20.1 pipe threads.

2.7 TEST PLUGS

- A. Manufacturers:
1. Flow Design, Inc.
 2. Terice

- 3. Watts
- 4. Weiss Instruments, Inc.
- B. Description: Test-station fitting made for insertion in piping tee fitting.
- C. Body: Brass or stainless steel with core inserts and gasketed and threaded cap. Include extended stem on units to be installed in insulated piping.
- D. Thread Size: NPS 1/2, ASME B1.20.1 pipe thread.
- E. Minimum Pressure and Temperature Rating: 500 psig at 200 deg F .
- F. Core Inserts: Chlorosulfonated polyethylene synthetic and EPDM self-sealing rubber.

2.8 TEST-PLUG KITS

- A. Manufacturers:
 - 1. Flow Design, Inc.
 - 2. Trerice
 - 3. Watts
 - 4. Weiss Instruments, Inc.
- B. Furnish one test-plug kits containing one thermometer, one pressure gage and adapter, and carrying case. Thermometer sensing elements, pressure gage, and adapter probes shall be of diameter to fit test plugs and of length to project into piping.
- C. High-Range Thermometer: Small, bimetallic insertion type with 1- to 2-inch-diameter dial and tapered-end sensing element. Dial range shall be at least 0 to 220 deg F.
- D. Pressure Gage: Small, Bourdon-tube insertion type with 2- to 3-inch-diameter dial and probe. Dial range shall be at least 0 to 100 psig.
- E. Carrying Case: Metal or plastic, with formed instrument padding.

PART 3 - EXECUTION

3.1 INSTALLATION

- A. Install thermowells with socket extending a minimum of 2 inches and in vertical position in piping tees.
- B. Install thermowells of sizes required to match thermometer connectors. Include bushings if required to match sizes.
- C. Install thermowells with extension on insulated piping.
- D. Fill thermowells with heat-transfer medium.
- E. Install direct-mounted thermometers in thermowells and adjust vertical and tilted positions.
- F. Install duct-thermometer mounting brackets in walls of ducts. Attach to duct with screws.
- G. Install direct-mounted pressure gages in piping tees with pressure gage located on pipe at the most readable position.
- H. Install valve in piping for each pressure gage for fluids.
- I. Install test plugs in piping tees.
- J. Install permanent indicators on walls or brackets in accessible and readable positions.

- K. Install connection fittings in accessible locations for attachment to portable indicators.
- L. Install thermometers in the following locations:
 - 1. Inlet and outlet of each hydronic zone.
 - 2. Inlet and outlet of each hydronic boiler.
 - 3. Inlet and outlet of each hydronic coil in air-handling units.
 - 4. Return-air and supply-air ducts.
- M. Install pressure gages in the following locations:
 - 1. Discharge of each pressure-reducing valve.
 - 2. Suction and discharge of each pump.
 - 3. Inlet and outlet of each hydronic coil in air-handling units.

3.2 CONNECTIONS

- A. Install meters and gages adjacent to machines and equipment to allow space for service and maintenance of meters, gages, machines, and equipment.

3.3 ADJUSTING

- A. After installation, calibrate meters according to manufacturer's written instructions.
- B. Adjust faces of meters and gages to proper angle for best visibility.

3.4 THERMOMETER SCALE-RANGE SCHEDULE

- A. Scale Range for Heating, Hot-Water Piping: 0 to 250 deg F and 0 to 150 deg C.
- B. Scale Range for Air Ducts: 0 to 150 deg F and minus 20 to plus 70 deg C.

3.5 PRESSURE-GAGE SCALE-RANGE SCHEDULE

- A. Scale Range for Heating, Hot-Water Piping: 0 to 100 psi and 0 to 600 kPa.

END OF SECTION 230519

THIS PAGE INTENTIONALLY LEFT BLANK

SECTION 230523 - GENERAL-DUTY VALVES FOR HVAC PIPING

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

- A. Drawings and general provisions of the Contract, including General and Supplementary Conditions and Division 01 Specification Sections, apply to this Section.

1.2 SUMMARY

- A. Section Includes:
 - 1. Bronze ball valves.
 - 2. Iron ball valves.
 - 3. Iron, single-flange butterfly valves.
 - 4. Iron, grooved-end butterfly valves.
 - 5. Bronze swing check valves.
 - 6. Iron swing check valves.
 - 7. Iron gate valves.
- B. Related Sections:
 - 1. Section 230553 "Identification for HVAC Piping and Equipment" for valve tags and schedules.

1.3 DEFINITIONS

- A. CWP: Cold working pressure.
- B. EPDM: Ethylene propylene copolymer rubber.
- C. NBR: Acrylonitrile-butadiene, Buna-N, or nitrile rubber.
- D. NRS: Nonrising stem.
- E. OS&Y: Outside screw and yoke.
- F. RS: Rising stem.

1.4 ACTION SUBMITTALS

- A. Product Data: For each type of valve indicated.

1.5 QUALITY ASSURANCE

- A. Source Limitations for Valves: Obtain each type of valve from single source from single manufacturer.
- B. ASME Compliance:
 - 1. ASME B16.10 and ASME B16.34 for ferrous valve dimensions and design criteria.
 - 2. ASME B31.1 for power piping valves.
 - 3. ASME B31.9 for building services piping valves.
- C. To assure uniformity and compatibility, all grooved end valves and adjoining couplings shall be supplied by a single manufacturer.

1.6 DELIVERY, STORAGE, AND HANDLING

- A. Prepare valves for shipping as follows:
 - 1. Protect internal parts against rust and corrosion.
 - 2. Protect threads, flange faces, grooves, and weld ends.
 - 3. Set angle, gate, and globe valves closed to prevent rattling.
 - 4. Set ball and plug valves open to minimize exposure of functional surfaces.
 - 5. Set butterfly valves closed or slightly open.
 - 6. Block check valves in either closed or open position.
- B. Use the following precautions during storage:
 - 1. Maintain valve end protection.
 - 2. Store valves indoors and maintain at higher than ambient dew point temperature. If outdoor storage is necessary, store valves off the ground in watertight enclosures.
- C. Use sling to handle large valves; rig sling to avoid damage to exposed parts. Do not use handwheels or stems as lifting or rigging points.

PART 2 - PRODUCTS

2.1 GENERAL REQUIREMENTS FOR VALVES

- A. Refer to HVAC valve schedule articles for applications of valves.
- B. Valve Pressure and Temperature Ratings: Not less than indicated and as required for system pressures and temperatures.
- C. Valve Sizes: Same as upstream piping unless otherwise indicated.
- D. Valve Actuator Types:
 - 1. Handwheel: For valves other than quarter-turn types.
 - 2. Handlever: For quarter-turn valves NPS 6 and smaller.
 - 3. Wrench: For plug valves with square heads. Furnish Owner with 1 wrench for every 5 plug valves, for each size square plug-valve head.
- E. Valves in Insulated Piping: With 2-inch stem extensions and the following features:
 - 1. Gate Valves: With rising stem.
 - 2. Ball Valves: With extended operating handle of non-thermal-conductive material, and protective sleeve that allows operation of valve without breaking the vapor seal or disturbing insulation.
 - 3. Butterfly Valves: With extended neck.
- F. Valve-End Connections:
 - 1. Flanged: With flanges according to ASME B16.1 for iron valves.
 - 2. Grooved: With grooves according to AWWA C606.
 - 3. Solder Joint: With sockets according to ASME B16.18.
 - 4. Threaded: With threads according to ASME B1.20.1.
- G. Valve Bypass and Drain Connections: MSS SP-45.

2.2 BRONZE BALL VALVES

- A. Two-Piece, Full-Port, Bronze Ball Valves with Stainless-Steel Trim:
 - 1. Manufacturers: Subject to compliance with requirements, provide products by one of the following:
 - a. Conbraco Industries, Inc.; Apollo Valves.

- b. Crane Co.; Crane Valve Group; Crane Valves.
- c. Hammond Valve.
- d. Lance Valves; a division of Advanced Thermal Systems, Inc.
- e. Milwaukee Valve Company.
- f. NIBCO INC.
- g. Watts Regulator Co.; a division of Watts Water Technologies, Inc.
- 2. Description:
 - a. Standard: MSS SP-110.
 - b. SWP Rating: 150 psig.
 - c. CWP Rating: 600 psig.
 - d. Body Design: Two piece.
 - e. Body Material: Bronze.
 - f. Ends: Threaded.
 - g. Seats: PTFE or TFE.
 - h. Stem: Stainless steel.
 - i. Ball: Stainless steel, vented.
 - j. Port: Full.

2.3 IRON BALL VALVES

- A. Class 125, Iron Ball Valves:
 - 1. Manufacturers: Subject to compliance with requirements, provide products by one of the following:
 - a. American Valve, Inc.
 - b. Conbraco Industries, Inc.; Apollo Valves.
 - c. Kitz Corporation.
 - d. Sure Flow Equipment Inc.
 - e. Watts Regulator Co.; a division of Watts Water Technologies, Inc.
 - 2. Description:
 - a. Standard: MSS SP-72.
 - b. CWP Rating: 200 psig.
 - c. Body Design: Split body.
 - d. Body Material: ASTM A 126, gray iron.
 - e. Ends: Flanged.
 - f. Seats: PTFE or TFE.
 - g. Stem: Stainless steel.
 - h. Ball: Stainless steel.
 - i. Port: Full.
- B. 800 CWP, Ductile Iron Ball Valves:
 - 1. Manufacturers: Subject to compliance with requirements, provide products by one of the following:
 - a. Victaulic Series 726.
 - 2. Description:
 - a. Standard: Meets the Intent of MSS SP-72.
 - b. CWP Rating: 800 psig.
 - c. Body Design: Split body.
 - d. Body Material: ASTM A 396, ductile iron.
 - e. Ends: Grooved.
 - f. Seats: TFE.
 - g. Stem: Chrome-plated carbon steel.
 - h. Ball: Chrome-plated carbon steel.

- i. Port: Standard.

2.4 IRON, SINGLE-FLANGE BUTTERFLY VALVES

A. 200 CWP, Iron, Single-Flange Butterfly Valves with EPDM Seat and Aluminum-Bronze Disc:

- 1. Manufacturers: Subject to compliance with requirements, provide products by one of the following:
 - a. ABZ Valve and Controls; a division of ABZ Manufacturing, Inc.
 - b. Conbraco Industries, Inc.; Apollo Valves.
 - c. Cooper Cameron Valves; a division of Cooper Cameron Corp.
 - d. Crane Co.; Crane Valve Group; Jenkins Valves.
 - e. Crane Co.; Crane Valve Group; Stockham Division.
 - f. DeZurik Water Controls.
 - g. Flo Fab Inc.
 - h. Hammond Valve.
 - i. Kitz Corporation.
 - j. Legend Valve.
 - k. Milwaukee Valve Company.
 - l. NIBCO INC.
 - m. Norriseal; a Dover Corporation company.
 - n. Red-White Valve Corporation.
 - o. Spence Strainers International; a division of CIRCOR International.
 - p. Watts Regulator Co.; a division of Watts Water Technologies, Inc.
- 2. Description:
 - a. Standard: MSS SP-67, Type I.
 - b. CWP Rating: 200 psig.
 - c. Body Design: Lug type; suitable for bidirectional dead-end service at rated pressure without use of downstream flange.
 - d. Body Material: ASTM A 126, cast iron or ASTM A 536, ductile iron.
 - e. Seat: EPDM.
 - f. Stem: One- or two-piece stainless steel.
 - g. Disc: Aluminum bronze.

2.5 IRON, GROOVED-END BUTTERFLY VALVES

A. 300 CWP, Iron, Grooved-End Butterfly Valves:

- 1. Manufacturers: Subject to compliance with requirements, provide products by one of the following:
 - a. Kennedy Valve; a division of McWane, Inc.
 - b. Tyco Fire Products LP; Grinnell Mechanical Products.
 - c. Victaulic Company Vic-300 MasterSeal™ and Vic-300 AGS™.
- 2. Description:
 - a. Standard: MSS SP-67, Type I.
 - b. CWP Rating: 300 psig.
 - c. Body Material: Coated, ductile iron.
 - d. Stem: Two-piece stainless steel.
 - e. Disc: Coated, ductile iron.
 - f. Seal: EPDM.
 - g. Design: Offset disc providing continuous 360 degree seating.

2.6 BRONZE SWING CHECK VALVES

- A. Class 150, Bronze Swing Check Valves with Non-metallic Disc:
1. Manufacturers: Subject to compliance with requirements, provide products by one of the following:
 - a. American Valve, Inc.
 - b. Crane Co.; Crane Valve Group; Crane Valves.
 - c. Crane Co.; Crane Valve Group; Jenkins Valves.
 - d. Crane Co.; Crane Valve Group; Stockham Division.
 - e. Kitz Corporation.
 - f. Milwaukee Valve Company.
 - g. NIBCO INC.
 - h. Red-White Valve Corporation.
 - i. Zy-Tech Global Industries, Inc.
 2. Description:
 - a. Standard: MSS SP-80, Type 3.
 - b. CWP Rating: 300 psig.
 - c. Body Design: Horizontal flow.
 - d. Body Material: ASTM B 62, bronze.
 - e. Ends: Threaded.
 - f. Disc: Non-metallic.

2.7 IRON SWING CHECK VALVES

- A. Class 125, Iron Swing Check Valves with Nonmetallic-to-Metal Seats:
1. Manufacturers: Subject to compliance with requirements, available manufacturers offering products that may be incorporated into the Work include, but are not limited to, the following:
 - a. Crane Co.; Crane Valve Group; Crane Valves.
 - b. Crane Co.; Crane Valve Group; Stockham Division.
 2. Description:
 - a. Standard: MSS SP-71, Type I.
 - b. NPS 2-1/2 to NPS 12, CWP Rating: 200 psig.
 - c. NPS 14 to NPS 24, CWP Rating: 150 psig.
 - d. Body Design: Clear or full waterway.
 - e. Body Material: ASTM A 126, gray iron with bolted bonnet.
 - f. Ends: Flanged.
 - g. Trim: Composition.
 - h. Seat Ring: Bronze.
 - i. Disc Holder: Bronze.
 - j. Disc: PTFE or TFE.
 - k. Gasket: Asbestos free.

2.8 IRON GATE VALVES

- A. Class 125, NRS, Iron Gate Valves:
1. Manufacturers: Subject to compliance with requirements, provide products by one of the following:
 - a. Crane Co.; Crane Valve Group; Crane Valves.
 - b. Crane Co.; Crane Valve Group; Jenkins Valves.
 - c. Crane Co.; Crane Valve Group; Stockham Division.
 - d. Flo Fab Inc.

- e. Hammond Valve.
 - f. Kitz Corporation.
 - g. Legend Valve.
 - h. Milwaukee Valve Company.
 - i. NIBCO INC.
 - j. Powell Valves.
 - k. Red-White Valve Corporation.
 - l. Watts Regulator Co.; a division of Watts Water Technologies, Inc.
 - m. Zy-Tech Global Industries, Inc.
 - 2. Description:
 - a. Standard: MSS SP-70, Type I.
 - b. NPS 2-1/2 to NPS 12, CWP Rating: 200 psig.
 - c. NPS 14 to NPS 24, CWP Rating: 150 psig.
 - d. Body Material: ASTM A 126, gray iron with bolted bonnet.
 - e. Ends: Flanged.
 - f. Trim: Bronze.
 - g. Disc: Solid wedge.
 - h. Packing and Gasket: Asbestos free.
- B. Class 125, OS&Y, Iron Gate Valves:
- 1. Manufacturers: Subject to compliance with requirements, provide products by one of the following:
 - a. Crane Co.; Crane Valve Group; Crane Valves.
 - b. Crane Co.; Crane Valve Group; Jenkins Valves.
 - c. Crane Co.; Crane Valve Group; Stockham Division.
 - d. Flo Fab Inc.
 - e. Hammond Valve.
 - f. Kitz Corporation.
 - g. Legend Valve.
 - h. Milwaukee Valve Company.
 - i. NIBCO INC.
 - j. Powell Valves.
 - k. Red-White Valve Corporation.
 - l. Watts Regulator Co.; a division of Watts Water Technologies, Inc.
 - m. Zy-Tech Global Industries, Inc.
 - 2. Description:
 - a. Standard: MSS SP-70, Type I.
 - b. NPS 2-1/2 to NPS 12, CWP Rating: 200 psig.
 - c. NPS 14 to NPS 24, CWP Rating: 150 psig.
 - d. Body Material: ASTM A 126, gray iron with bolted bonnet.
 - e. Ends: Flanged.
 - f. Trim: Bronze.
 - g. Disc: Solid wedge.
 - h. Packing and Gasket: Asbestos free.

PART 3 - EXECUTION

3.1 EXAMINATION

- A. Examine valve interior for cleanliness, freedom from foreign matter, and corrosion. Remove special packing materials, such as blocks, used to prevent disc movement during shipping and handling.
- B. Operate valves in positions from fully open to fully closed. Examine guides and seats made accessible by such operations.
- C. Examine threads on valve and mating pipe for form and cleanliness.
- D. Examine mating flange faces for conditions that might cause leakage. Check bolting for proper size, length, and material. Verify that gasket is of proper size, that its material composition is suitable for service, and that it is free from defects and damage.
- E. Do not attempt to repair defective valves; replace with new valves.

3.2 VALVE INSTALLATION

- A. Install valves with unions, grooved mechanical-joint couplings, or flanges at each piece of equipment arranged to allow service, maintenance, and equipment removal without system shutdown.
- B. Locate valves for easy access and provide separate support where necessary.
- C. Install valves in horizontal piping with stem at or above center of pipe.
- D. Install valves in position to allow full stem movement.
- E. Install check valves for proper direction of flow and as follows:
 - 1. Swing Check Valves: In horizontal position with hinge pin level.
- F. Grooved end valves shall be installed in accordance with the manufacturer's guidelines and recommendations. All grooved end valves and adjoining couplings shall be the products of a single manufacturer. Grooved end shall be clean and free from indentations and projections in the area from pipe end to groove for proper gasket sealing. A factory-trained field representative shall provide on-site training for contractor's field personnel in the installation of grooved piping products. Factory-trained representative shall periodically review the product installation. Contractor shall remove and replace any improperly installed products.

3.3 ADJUSTING

- A. Adjust or replace valve packing after piping systems have been tested and put into service but before final adjusting and balancing. Replace valves if persistent leaking occurs.

3.4 GENERAL REQUIREMENTS FOR VALVE APPLICATIONS

- A. If valve applications are not indicated, use the following:
 - 1. Shutoff Service: Ball, butterfly or gate valves.
 - 2. Butterfly Valve Dead-End Service: Single-flange (lug) type.
 - 3. Throttling Service except Steam: ball valves.
- B. If valves with specified SWP classes or CWP ratings are not available, the same types of valves with higher SWP classes or CWP ratings may be substituted.
- C. Select valves, except wafer types, with the following end connections:

1. For Copper Tubing, NPS 2 and Smaller: Threaded ends except where solder-joint valve-end option is indicated in valve schedules below.
2. For Steel Piping, NPS 2-1/2 to NPS 4: Flanged ends.
3. For Grooved-End Steel Piping except Steam and Steam Condensate Piping: Valve ends may be grooved.

3.5 HEATING-WATER VALVE SCHEDULE

A. Pipe NPS 2 and Smaller:

1. Bronze Valves: May be provided with solder-joint ends instead of threaded ends.
2. Ball Valves: Two piece, full port, bronze with stainless-steel trim.
3. Bronze Swing Check Valves: Class 150, nonmetallic disc.
4. Bronze Gate Valves: Class 150, bronze.

B. Pipe NPS 2-1/2 and Larger:

1. Iron Ball Valves, NPS 2-1/2 to NPS 10: Class 150.
2. Iron, Single-Flange Butterfly Valves, NPS 2-1/2 to NPS 12: 200 CWP, EPDM seat, aluminum-bronze disc.
3. Iron, Grooved-End Butterfly Valves, NPS 2-1/2 to NPS 12: 175 CWP.
4. Iron Swing Check Valves: Class 125, nonmetallic-to-metal seats.
5. Iron Gate Valves: Class 125, OS&Y.

END OF SECTION 230523

SECTION 230529 - HANGERS AND SUPPORTS FOR HVAC PIPING AND EQUIPMENT

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

- A. Drawings and general provisions of the Contract, including General and Supplementary Conditions and Division 01 Specification Sections, apply to this Section.

1.2 SUMMARY

- A. Section Includes:
 - 1. Metal pipe hangers and supports.
 - 2. Metal framing systems.
 - 3. Thermal-hanger shield inserts.
 - 4. Fastener systems.
 - 5. Equipment supports.
- B. Related Sections:
 - 1. Section 055000 "Metal Fabrications" for structural-steel shapes and plates for trapeze hangers for pipe and equipment supports.
 - 2. Section 233113 "Metal Ducts" for duct hangers and supports.

1.3 DEFINITIONS

- A. MSS: Manufacturers Standardization Society of The Valve and Fittings Industry Inc.

1.4 PERFORMANCE REQUIREMENTS

- A. Delegated Design: Design trapeze pipe hangers and equipment supports, including comprehensive engineering analysis by a qualified professional engineer, using performance requirements and design criteria indicated.
- B. Structural Performance: Hangers and supports for HVAC piping and equipment shall withstand the effects of gravity loads and stresses within limits and under conditions indicated according to ASCE/SEI 7.
 - 1. Design supports for multiple pipes, including pipe stands, capable of supporting combined weight of supported systems, system contents, and test water.
 - 2. Design equipment supports capable of supporting combined operating weight of supported equipment and connected systems and components.

1.5 ACTION SUBMITTALS

- A. Product Data: For each type of product indicated.
- B. Shop Drawings: Show fabrication and installation details and include calculations for the following; include Product Data for components:
 - 1. Metal framing systems.
 - 2. Equipment supports.

1.6 INFORMATIONAL SUBMITTALS

- A. Welding certificates.

1.7 QUALITY ASSURANCE

- A. Structural Steel Welding Qualifications: Qualify procedures and personnel according to AWS D1.1/D1.1M, "Structural Welding Code - Steel."
- B. Pipe Welding Qualifications: Qualify procedures and operators according to ASME Boiler and Pressure Vessel Code.

PART 2 - PRODUCTS

2.1 METAL PIPE HANGERS AND SUPPORTS

- A. Carbon-Steel Pipe Hangers and Supports:
 - 1. Description: MSS SP-58, Types 1 through 58, factory-fabricated components.
 - 2. Galvanized Metallic Coatings: Pregalvanized or hot dipped.
 - 3. Nonmetallic Coatings: Plastic coating, jacket, or liner.
 - 4. Padded Hangers: Hanger with fiberglass or other pipe insulation pad or cushion to support bearing surface of piping.
 - 5. Hanger Rods: Continuous-thread rod, nuts, and washer made of carbon steel.
- B. Copper Pipe Hangers:
 - 1. Description: MSS SP-58, Types 1 through 58, copper-coated-steel, factory-fabricated components.
 - 2. Hanger Rods: Continuous-thread rod, nuts, and washer made of copper-coated steel.

2.2 METAL FRAMING SYSTEMS

- A. MFMA Manufacturer Metal Framing Systems:
 - 1. Manufacturers: Subject to compliance with requirements, provide products by one of the following:
 - a. Allied Tube & Conduit.
 - b. Cooper B-Line, Inc.
 - c. Flex-Strut Inc.
 - d. GS Metals Corp.
 - e. Thomas & Betts Corporation.
 - f. Unistrut Corporation; Tyco International, Ltd.
 - g. Wesanco, Inc.
 - 2. Description: Shop- or field-fabricated pipe-support assembly for supporting multiple parallel pipes.
 - 3. Standard: MFMA-4.
 - 4. Channels: Continuous slotted steel channel with intumed lips.
 - 5. Channel Nuts: Formed or stamped steel nuts or other devices designed to fit into channel slot and, when tightened, prevent slipping along channel.
 - 6. Hanger Rods: Continuous-thread rod, nuts, and washer made of carbon steel.
 - 7. Metallic Coating: Galvanized.
 - 8. Paint Coating: Epoxy.
- B. Non-MFMA Manufacturer Metal Framing Systems:
 - 1. Manufacturers: Subject to compliance with requirements, provide products by one of the following:
 - a. Anvil International; a subsidiary of Mueller Water Products Inc.
 - b. Empire Industries, Inc.
 - c. ERICO International Corporation.

- d. Haydon Corporation; H-Strut Division.
- e. NIBCO INC.
- f. PHD Manufacturing, Inc.
- g. PHS Industries, Inc.
2. Description: Shop- or field-fabricated pipe-support assembly made of steel channels, accessories, fittings, and other components for supporting multiple parallel pipes.
3. Standard: Comply with MFMA-4.
4. Channels: Continuous slotted steel channel with inturned lips.
5. Channel Nuts: Formed or stamped steel nuts or other devices designed to fit into channel slot and, when tightened, prevent slipping along channel.
6. Hanger Rods: Continuous-thread rod, nuts, and washer made of carbon steel.
7. Coating: Paint.

2.3 THERMAL-HANGER SHIELD INSERTS

- A. Manufacturers: Subject to compliance with requirements, provide products by one of the following:
 1. Carpenter & Paterson, Inc.
 2. Clement Support Services.
 3. ERICO International Corporation.
 4. National Pipe Hanger Corporation.
 5. PHS Industries, Inc.
 6. Pipe Shields, Inc.; a subsidiary of Piping Technology & Products, Inc.
 7. Piping Technology & Products, Inc.
 8. Rilco Manufacturing Co., Inc.
 9. Value Engineered Products, Inc.
- B. Insulation-Insert Material for Hot Piping:
 1. Water-repellent treated, ASTM C 533, Type I calcium silicate with 100-psig minimum compressive strength.
 2. ASTM C 552, Type II cellular glass with 100-psig minimum compressive strength.
 3. ASTM C 591, Type VI, Grade 1 polyisocyanurate with 125-psig minimum compressive strength.
- C. For Trapeze or Clamped Systems: Insert and shield shall cover entire circumference of pipe.
- D. For Clevis or Band Hangers: Insert and shield shall cover lower 180 degrees of pipe.
- E. Insert Length: Extend 2 inches beyond sheet metal shield for piping operating below ambient air temperature.

2.4 FASTENER SYSTEMS

- A. Powder-Actuated Fasteners: Threaded-steel stud, for use in hardened portland cement concrete with pull-out, tension, and shear capacities appropriate for supported loads and building materials where used.
- B. Mechanical-Expansion Anchors: Insert-wedge-type, stainless-steel anchors, for use in hardened portland cement concrete; with pull-out, tension, and shear capacities appropriate for supported loads and building materials where used.

2.5 EQUIPMENT SUPPORTS

- A. Description: Welded, shop- or field-fabricated equipment support made from structural carbon-steel shapes.

2.6 MISCELLANEOUS MATERIALS

- A. Structural Steel: ASTM A 36/A 36M, carbon-steel plates, shapes, and bars; black and galvanized.
- B. Grout: ASTM C 1107, factory-mixed and -packaged, dry, hydraulic-cement, nonshrink and nonmetallic grout; suitable for interior and exterior applications.
 - 1. Properties: Nonstaining, noncorrosive, and nongaseous.
 - 2. Design Mix: 5000-psi, 28-day compressive strength.

PART 3 - EXECUTION

3.1 HANGER AND SUPPORT INSTALLATION

- A. Metal Pipe-Hanger Installation: Comply with MSS SP-69 and MSS SP-89. Install hangers, supports, clamps, and attachments as required to properly support piping from the building structure.
- B. Metal Framing System Installation: Arrange for grouping of parallel runs of piping, and support together on field-assembled metal framing systems.
- C. Thermal-Hanger Shield Installation: Install in pipe hanger or shield for insulated piping.
- D. Fastener System Installation:
 - 1. Install powder-actuated fasteners for use in lightweight concrete or concrete slabs less than 4 inches thick in concrete after concrete is placed and completely cured. Use operators that are licensed by powder-actuated tool manufacturer. Install fasteners according to powder-actuated tool manufacturer's operating manual.
 - 2. Install mechanical-expansion anchors in concrete after concrete is placed and completely cured. Install fasteners according to manufacturer's written instructions.
- E. Install hangers and supports complete with necessary attachments, inserts, bolts, rods, nuts, washers, and other accessories.
- F. Equipment Support Installation: Fabricate from welded-structural-steel shapes.
- G. Install hangers and supports to allow controlled thermal of piping systems, to permit freedom of movement between pipe anchors, and to facilitate action of expansion joints, expansion loops, expansion bends, and similar units.
- H. Install lateral bracing with pipe hangers and supports to prevent swaying.
- I. Install building attachments within concrete slabs or attach to structural steel. Install additional attachments at concentrated loads, including valves, flanges, and strainers, NPS 2-1/2 and larger and at changes in direction of piping. Install concrete inserts before concrete is placed; fasten inserts to forms and install reinforcing bars through openings at top of inserts.
- J. Load Distribution: Install hangers and supports so that piping live and dead loads and stresses from movement will not be transmitted to connected equipment.
- K. Pipe Slopes: Install hangers and supports to provide indicated pipe slopes and to not exceed maximum pipe deflections allowed by ASME B31.9 for building services piping.
- L. Insulated Piping:
 - 1. Attach clamps and spacers to piping.
 - a. Piping Operating above Ambient Air Temperature: Clamp may project through insulation.

- b. Piping Operating below Ambient Air Temperature: Use thermal-hanger shield insert with clamp sized to match OD of insert.
 - c. Do not exceed pipe stress limits allowed by ASME B31.9 for building services piping.
- 2. Install MSS SP-58, Type 39, protection saddles if insulation without vapor barrier is indicated. Fill interior voids with insulation that matches adjoining insulation.
 - a. Option: Thermal-hanger shield inserts may be used. Include steel weight-distribution plate for pipe NPS 4 and larger if pipe is installed on rollers.
- 3. Install MSS SP-58, Type 40, protective shields on cold piping with vapor barrier. Shields shall span an arc of 180 degrees.
 - a. Option: Thermal-hanger shield inserts may be used. Include steel weight-distribution plate for pipe NPS 4 and larger if pipe is installed on rollers.
- 4. Shield Dimensions for Pipe: Not less than the following:
 - a. NPS 1/4 to NPS 3-1/2: 12 inches long and 0.048 inch thick.
 - b. NPS 4: 12 inches long and 0.06 inch thick.
 - c. NPS 5 and NPS 6: 18 inches long and 0.06 inch thick.
 - d. NPS 8 to NPS 14: 24 inches long and 0.075 inch thick.
- 5. Pipes NPS 8 and Larger: Include wood or reinforced calcium-silicate-insulation inserts of length at least as long as protective shield.
- 6. Thermal-Hanger Shields: Install with insulation same thickness as piping insulation.

3.2 EQUIPMENT SUPPORTS

- A. Fabricate structural-steel stands to suspend equipment from structure overhead or to support equipment above floor.
- B. Grouting: Place grout under supports for equipment and make bearing surface smooth.
- C. Provide lateral bracing, to prevent swaying, for equipment supports.

3.3 METAL FABRICATIONS

- A. Cut, drill, and fit miscellaneous metal fabrications for trapeze pipe hangers equipment supports.
- B. Fit exposed connections together to form hairline joints. Field weld connections that cannot be shop welded because of shipping size limitations.
- C. Field Welding: Comply with AWS D1.1/D1.1M procedures for shielded, metal arc welding; appearance and quality of welds; and methods used in correcting welding work; and with the following:
 - 1. Use materials and methods that minimize distortion and develop strength and corrosion resistance of base metals.
 - 2. Obtain fusion without undercut or overlap.
 - 3. Remove welding flux immediately.
 - 4. Finish welds at exposed connections so no roughness shows after finishing and so contours of welded surfaces match adjacent contours.

3.4 ADJUSTING

- A. Hanger Adjustments: Adjust hangers to distribute loads equally on attachments and to achieve indicated slope of pipe.
- B. Trim excess length of continuous-thread hanger and support rods to 1-1/2 inches.

3.5 PAINTING

- A. Touchup: Clean field welds and abraded areas of shop paint. Paint exposed areas immediately after erecting hangers and supports. Use same materials as used for shop painting. Comply with SSPC-PA 1 requirements for touching up field-painted surfaces.
 - 1. Apply paint by brush or spray to provide a minimum dry film thickness of 2.0 mils.
- B. Galvanized Surfaces: Clean welds, bolted connections, and abraded areas and apply galvanizing-repair paint to comply with ASTM A 780.

3.6 HANGER AND SUPPORT SCHEDULE

- A. Specific hanger and support requirements are in Sections specifying piping systems and equipment.
- B. Comply with MSS SP-69 for pipe-hanger selections and applications that are not specified in piping system Sections.
- C. Use hangers and supports with galvanized metallic coatings for piping and equipment that will not have field-applied finish.
- D. Use nonmetallic coatings on attachments for electrolytic protection where attachments are in direct contact with copper tubing.
- E. Use carbon-steel pipe hangers and supports, metal trapeze pipe hangers, and metal framing systems and attachments for general service applications.
- F. Use copper-plated pipe hangers and copper attachments for copper piping and tubing.
- G. Use padded hangers for piping that is subject to scratching.
- H. Use thermal-hanger shield inserts for insulated piping and tubing.
- I. Horizontal-Piping Hangers and Supports: Unless otherwise indicated and except as specified in piping system Sections, install the following types:
 - 1. Adjustable, Steel Clevis Hangers (MSS Type 1): For suspension of noninsulated or insulated, stationary pipes NPS 1/2 to NPS 30.
 - 2. Carbon- or Alloy-Steel, Double-Bolt Pipe Clamps (MSS Type 3): For suspension of pipes NPS 3/4 to NPS 36, requiring clamp flexibility and up to 4 inches of insulation.
 - 3. Steel Pipe Clamps (MSS Type 4): For suspension of cold and hot pipes NPS 1/2 to NPS 24 if little or no insulation is required.
 - 4. Pipe Hangers (MSS Type 5): For suspension of pipes NPS 1/2 to NPS 4, to allow off-center closure for hanger installation before pipe erection.
 - 5. Adjustable, Swivel Split- or Solid-Ring Hangers (MSS Type 6): For suspension of noninsulated, stationary pipes NPS 3/4 to NPS 8.
 - 6. Adjustable, Steel Band Hangers (MSS Type 7): For suspension of noninsulated, stationary pipes NPS 1/2 to NPS 8.
 - 7. Adjustable Band Hangers (MSS Type 9): For suspension of noninsulated, stationary pipes NPS 1/2 to NPS 8.
 - 8. Split Pipe Ring with or without Turnbuckle Hangers (MSS Type 11): For suspension of noninsulated, stationary pipes NPS 3/8 to NPS 8.
 - 9. Extension Hinged or Two-Bolt Split Pipe Clamps (MSS Type 12): For suspension of noninsulated, stationary pipes NPS 3/8 to NPS 3.
 - 10. U-Bolts (MSS Type 24): For support of heavy pipes NPS 1/2 to NPS 30.
 - 11. Clips (MSS Type 26): For support of insulated pipes not subject to expansion or contraction.

12. Pipe Saddle Supports (MSS Type 36): For support of pipes NPS 4 to NPS 36, with steel-pipe base stanchion support and cast-iron floor flange or carbon-steel plate.
 13. Pipe Stanchion Saddles (MSS Type 37): For support of pipes NPS 4 to NPS 36, with steel-pipe base stanchion support and cast-iron floor flange or carbon-steel plate, and with U-bolt to retain pipe.
 14. Adjustable Pipe Saddle Supports (MSS Type 38): For stanchion-type support for pipes NPS 2-1/2 to NPS 36 if vertical adjustment is required, with steel-pipe base stanchion support and cast-iron floor flange.
 15. Single-Pipe Rolls (MSS Type 41): For suspension of pipes NPS 1 to NPS 30, from two rods if longitudinal movement caused by expansion and contraction might occur.
 16. Adjustable Roller Hangers (MSS Type 43): For suspension of pipes NPS 2-1/2 to NPS 24, from single rod if horizontal movement caused by expansion and contraction might occur.
 17. Complete Pipe Rolls (MSS Type 44): For support of pipes NPS 2 to NPS 42 if longitudinal movement caused by expansion and contraction might occur but vertical adjustment is not necessary.
 18. Pipe Roll and Plate Units (MSS Type 45): For support of pipes NPS 2 to NPS 24 if small horizontal movement caused by expansion and contraction might occur and vertical adjustment is not necessary.
 19. Adjustable Pipe Roll and Base Units (MSS Type 46): For support of pipes NPS 2 to NPS 30 if vertical and lateral adjustment during installation might be required in addition to expansion and contraction.
- J. Vertical-Piping Clamps: Unless otherwise indicated and except as specified in piping system Sections, install the following types:
1. Extension Pipe or Riser Clamps (MSS Type 8): For support of pipe risers NPS 3/4 to NPS 24.
 2. Carbon- or Alloy-Steel Riser Clamps (MSS Type 42): For support of pipe risers NPS 3/4 to NPS 24 if longer ends are required for riser clamps.
- K. Hanger-Rod Attachments: Unless otherwise indicated and except as specified in piping system Sections, install the following types:
1. Steel Turnbuckles (MSS Type 13): For adjustment up to 6 inches for heavy loads.
 2. Steel Clevises (MSS Type 14): For 120 to 450 deg F piping installations.
 3. Swivel Turnbuckles (MSS Type 15): For use with MSS Type 11, split pipe rings.
 4. Malleable-Iron Sockets (MSS Type 16): For attaching hanger rods to various types of building attachments.
 5. Steel Weldless Eye Nuts (MSS Type 17): For 120 to 450 deg F piping installations.
- L. Building Attachments: Unless otherwise indicated and except as specified in piping system Sections, install the following types:
1. Steel or Malleable Concrete Inserts (MSS Type 18): For upper attachment to suspend pipe hangers from concrete ceiling.
 2. Top-Beam C-Clamps (MSS Type 19): For use under roof installations with bar-joist construction, to attach to top flange of structural shape.
 3. Side-Beam or Channel Clamps (MSS Type 20): For attaching to bottom flange of beams, channels, or angles.
 4. Center-Beam Clamps (MSS Type 21): For attaching to center of bottom flange of beams.
 5. Welded Beam Attachments (MSS Type 22): For attaching to bottom of beams if loads are considerable and rod sizes are large.
 6. C-Clamps (MSS Type 23): For structural shapes.

7. Top-Beam Clamps (MSS Type 25): For top of beams if hanger rod is required tangent to flange edge.
 8. Side-Beam Clamps (MSS Type 27): For bottom of steel I-beams.
 9. Steel-Beam Clamps with Eye Nuts (MSS Type 28): For attaching to bottom of steel I-beams for heavy loads.
 10. Linked-Steel Clamps with Eye Nuts (MSS Type 29): For attaching to bottom of steel I-beams for heavy loads, with link extensions.
 11. Malleable-Beam Clamps with Extension Pieces (MSS Type 30): For attaching to structural steel.
 12. Welded-Steel Brackets: For support of pipes from below or for suspending from above by using clip and rod. Use one of the following for indicated loads:
 - a. Light (MSS Type 31): 750 lb.
 - b. Medium (MSS Type 32): 1500 lb.
 - c. Heavy (MSS Type 33): 3000 lb.
 13. Side-Beam Brackets (MSS Type 34): For sides of steel or wooden beams.
 14. Plate Lugs (MSS Type 57): For attaching to steel beams if flexibility at beam is required.
 15. Horizontal Travelers (MSS Type 58): For supporting piping systems subject to linear horizontal movement where headroom is limited.
- M. Saddles and Shields: Unless otherwise indicated and except as specified in piping system Sections, install the following types:
1. Steel-Pipe-Covering Protection Saddles (MSS Type 39): To fill interior voids with insulation that matches adjoining insulation.
 2. Protection Shields (MSS Type 40): Of length recommended in writing by manufacturer to prevent crushing insulation.
 3. Thermal-Hanger Shield Inserts: For supporting insulated pipe.
- N. Spring Hangers and Supports: Unless otherwise indicated and except as specified in piping system Sections, install the following types:
1. Restraint-Control Devices (MSS Type 47): Where indicated to control piping movement.
 2. Spring Cushions (MSS Type 48): For light loads if vertical movement does not exceed 1-1/4 inches.
 3. Spring-Cushion Roll Hangers (MSS Type 49): For equipping Type 41, roll hanger with springs.
 4. Spring Sway Braces (MSS Type 50): To retard sway, shock, vibration, or thermal expansion in piping systems.
 5. Variable-Spring Hangers (MSS Type 51): Preset to indicated load and limit variability factor to 25 percent to allow expansion and contraction of piping system from hanger.
 6. Variable-Spring Base Supports (MSS Type 52): Preset to indicated load and limit variability factor to 25 percent to allow expansion and contraction of piping system from base support.
 7. Variable-Spring Trapeze Hangers (MSS Type 53): Preset to indicated load and limit variability factor to 25 percent to allow expansion and contraction of piping system from trapeze support.
 8. Constant Supports: For critical piping stress and if necessary to avoid transfer of stress from one support to another support, critical terminal, or connected equipment. Include auxiliary stops for erection, hydrostatic test, and load-adjustment capability. These supports include the following types:
 - a. Horizontal (MSS Type 54): Mounted horizontally.
 - b. Vertical (MSS Type 55): Mounted vertically.
 - c. Trapeze (MSS Type 56): Two vertical-type supports and one trapeze member.

- O. Comply with MSS SP-69 for trapeze pipe-hanger selections and applications that are not specified in piping system Sections.
- P. Comply with MFMA-103 for metal framing system selections and applications that are not specified in piping system Sections.
- Q. Use powder-actuated fasteners or mechanical-expansion anchors instead of building attachments where required in concrete construction.

END OF SECTION 230529

THIS PAGE INTENTIONALLY LEFT BLANK

SECTION 230553 - IDENTIFICATION FOR HVAC PIPING AND EQUIPMENT

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

- A. Drawings and general provisions of the Contract, including General and Supplementary Conditions and Division 01 Specification Sections, apply to this Section.

1.2 SUMMARY

- A. Section Includes:
 - 1. Equipment labels.
 - 2. Warning signs and labels.
 - 3. Pipe labels.
 - 4. Duct labels.
 - 5. Stencils.
 - 6. Valve tags.
 - 7. Warning tags.

1.3 ACTION SUBMITTALS

- A. Product Data: For each type of product indicated.
- B. Equipment Label Schedule: Include a listing of all equipment to be labeled with the proposed content for each label.
- C. Valve numbering scheme.
- D. Valve Schedules: For each piping system to include in maintenance manuals.

1.4 COORDINATION

- A. Coordinate installation of identifying devices with completion of covering and painting of surfaces where devices are to be applied.
- B. Coordinate installation of identifying devices with locations of access panels and doors.
- C. Install identifying devices before installing acoustical ceilings and similar concealment.

PART 2 - PRODUCTS

2.1 EQUIPMENT LABELS

- A. Metal Labels for Equipment:
 - 1. Material and Thickness: Aluminum, 0.032-inch minimum thickness, and having predrilled or stamped holes for attachment hardware.
 - 2. Minimum Label Size: Length and width vary for required label content, but not less than 2-1/2 by 3/4 inch.
 - 3. Minimum Letter Size: 1/4 inch for name of units if viewing distance is less than 24 inches, 1/2 inch for viewing distances up to 72 inches, and proportionately larger lettering for greater viewing distances. Include secondary lettering two-thirds to three-fourths the size of principal lettering.
 - 4. Fasteners: Stainless-steel rivets or self-tapping screws.
 - 5. Adhesive: Contact-type permanent adhesive, compatible with label and with substrate.

- B. Plastic Labels for Equipment:
1. Material and Thickness: Multilayer, multicolor, plastic labels for mechanical engraving, 1/8 inch thick, and having predrilled holes for attachment hardware.
 2. Letter Color: White.
 3. Background Color: Black.
 4. Maximum Temperature: Able to withstand temperatures up to 160 deg F.
 5. Minimum Label Size: Length and width vary for required label content, but not less than 2-1/2 by 3/4 inch.
 6. Minimum Letter Size: 1/4 inch for name of units if viewing distance is less than 24 inches, 1/2 inch for viewing distances up to 72 inches, and proportionately larger lettering for greater viewing distances. Include secondary lettering two-thirds to three-fourths the size of principal lettering.
 7. Fasteners: Stainless-steel rivets or self-tapping screws.
 8. Adhesive: Contact-type permanent adhesive, compatible with label and with substrate.
- C. Label Content: Include equipment's Drawing designation or unique equipment number, Drawing numbers where equipment is indicated (plans, details, and schedules), plus the Specification Section number and title where equipment is specified.
- D. Equipment Label Schedule: For each item of equipment to be labeled, on 8-1/2-by-11-inch bond paper. Tabulate equipment identification number and identify Drawing numbers where equipment is indicated (plans, details, and schedules), plus the Specification Section number and title where equipment is specified. Equipment schedule shall be included in operation and maintenance data.

2.2 WARNING SIGNS AND LABELS

- A. Material and Thickness: Multilayer, multicolor, plastic labels for mechanical engraving, 1/8 inch thick, and having predrilled holes for attachment hardware.
- B. Letter Color: Black.
- C. Background Color: Red.
- D. Maximum Temperature: Able to withstand temperatures up to 160 deg F.
- E. Minimum Label Size: Length and width vary for required label content, but not less than 2-1/2 by 3/4 inch.
- F. Minimum Letter Size: 1/4 inch for name of units if viewing distance is less than 24 inches, 1/2 inch for viewing distances up to 72 inches, and proportionately larger lettering for greater viewing distances. Include secondary lettering two-thirds to three-fourths the size of principal lettering.
- G. Fasteners: Stainless-steel rivets or self-tapping screws.
- H. Adhesive: Contact-type permanent adhesive, compatible with label and with substrate.
- I. Label Content: Include caution and warning information, plus emergency notification instructions.

2.3 PIPE LABELS

- A. General Requirements for Manufactured Pipe Labels: Preprinted, color-coded, with lettering indicating service, and showing flow direction.
- B. Pretensioned Pipe Labels: Precoiled, semirigid plastic formed to cover full circumference of pipe and to attach to pipe without fasteners or adhesive.

- C. Self-Adhesive Pipe Labels: Printed plastic with contact-type, permanent-adhesive backing.
- D. Pipe Label Contents: Include identification of piping service using same designations or abbreviations as used on Drawings, pipe size, and an arrow indicating flow direction.
 - 1. Flow-Direction Arrows: Integral with piping system service lettering to accommodate both directions, or as separate unit on each pipe label to indicate flow direction.
 - 2. Lettering Size: At least 1-1/2 inches high.

2.4 DUCT LABELS

- A. General Requirements for Manufactured Duct Labels: Preprinted, color-coded, with lettering indicating service, and showing flow direction.
- B. Self-Adhesive Duct Labels: Printed plastic with contact-type, permanent-adhesive backing.
- C. Duct Label Contents: Include identification of duct service using same designations or abbreviations as used on Drawings, duct size, and an arrow indicating flow direction.
 - 1. Flow-Direction Arrows: Integral with duct system service lettering to accommodate both directions, or as separate unit on each duct label to indicate flow direction.
 - 2. Lettering Size: At least 1-1/2 inches high.

2.5 STENCILS

- A. Stencils: Prepared with letter sizes according to ASME A13.1 for piping; minimum letter height of 1-1/4 inches for ducts; and minimum letter height of 3/4 inch for access panel and door labels, equipment labels, and similar operational instructions.
 - 1. Stencil Material: Fiberboard or metal.
 - 2. Stencil Paint: Exterior, gloss, acrylic enamel black unless otherwise indicated. Paint may be in pressurized spray-can form.
 - 3. Identification Paint: Exterior, acrylic enamel in colors according to ASME A13.1 unless otherwise indicated.

2.6 VALVE TAGS

- A. Valve Tags: Stamped or engraved with 1/4-inch letters for piping system abbreviation and 1/2-inch numbers.
 - 1. Tag Material: Brass, 0.032-inch minimum thickness, and having predrilled or stamped holes for attachment hardware.
 - 2. Fasteners: Brass wire-link or beaded chain; or S-hook.
- B. Valve Schedules: For each piping system, on 8-1/2-by-11-inch bond paper. Tabulate valve number, piping system, system abbreviation (as shown on valve tag), location of valve (room or space), normal-operating position (open, closed, or modulating), and variations for identification. Mark valves for emergency shutoff and similar special uses.
 - 1. Valve-tag schedule shall be included in operation and maintenance data.

2.7 WARNING TAGS

- A. Warning Tags: Preprinted or partially preprinted, accident-prevention tags, of plasticized card stock with matte finish suitable for writing.
 - 1. Size: Approximately 4 by 7 inches.
 - 2. Fasteners: Brass grommet and wire.
 - 3. Nomenclature: Large-size primary caption such as "DANGER," "CAUTION," or "DO NOT OPERATE."
 - 4. Color: Yellow background with black lettering.

PART 3 - EXECUTION

3.1 PREPARATION

- A. Clean piping and equipment surfaces of substances that could impair bond of identification devices, including dirt, oil, grease, release agents, and incompatible primers, paints, and encapsulants.

3.2 EQUIPMENT LABEL INSTALLATION

- A. Install or permanently fasten labels on each major item of mechanical equipment.
- B. Locate equipment labels where accessible and visible.

3.3 PIPE LABEL INSTALLATION

- A. Stenciled Pipe Label Option: Stenciled labels may be provided instead of manufactured pipe labels, at Installer's option. Install stenciled pipe labels with painted, color-coded bands or rectangles, complying with ASME A13.1, on each piping system.
 - 1. Identification Paint: Use for contrasting background.
 - 2. Stencil Paint: Use for pipe marking.
- B. Locate pipe labels where piping is exposed or above accessible ceilings in finished spaces; machine rooms; accessible maintenance spaces such as shafts, tunnels, and plenums; and exterior exposed locations as follows:
 - 1. Near each valve and control device.
 - 2. Near each branch connection, excluding short takeoffs for fixtures and terminal units. Where flow pattern is not obvious, mark each pipe at branch.
 - 3. Near penetrations through walls, floors, ceilings, and inaccessible enclosures.
 - 4. At access doors, manholes, and similar access points that permit view of concealed piping.
 - 5. Near major equipment items and other points of origination and termination.
 - 6. Spaced at maximum intervals of 50 feet along each run. Reduce intervals to 25 feet in areas of congested piping and equipment.
 - 7. On piping above removable acoustical ceilings. Omit intermediately spaced labels.
- C. Pipe Label Color Schedule:
 - 1. Heating Water Piping:
 - a. Background Color: White.
 - b. Letter Color: Black.
 - 2. Refrigerant Piping:
 - a. Background Color: Black.
 - b. Letter Color: Yellow.

3.4 DUCT LABEL INSTALLATION

- A. Install self-adhesive duct labels with permanent adhesive on air ducts in the following color codes:
 - 1. Blue: For cold-air supply ducts.
 - 2. Yellow: For hot-air supply ducts.
 - 3. Green: For exhaust-, outside-, relief-, return-, and mixed-air ducts.
 - 4. ASME A13.1 Colors and Designs: For hazardous material exhaust.

- B. Stenciled Duct Label Option: Stenciled labels, showing service and flow direction, may be provided instead of plastic-laminated duct labels, at Installer's option, if lettering larger than 1 inch high is needed for proper identification because of distance from normal location of required identification.
- C. Locate labels near points where ducts enter into concealed spaces and at maximum intervals of 50 feet in each space where ducts are exposed or concealed by removable ceiling system.

3.5 VALVE-TAG INSTALLATION

- A. Install tags on valves and control devices in piping systems, except check valves; valves within factory-fabricated equipment units; shutoff valves; faucets; convenience and lawn-watering hose connections; and HVAC terminal devices and similar roughing-in connections of end-use fixtures and units. List tagged valves in a valve schedule.
- B. Valve-Tag Application Schedule: Tag valves according to size, shape, and color scheme and with captions similar to those indicated in the following subparagraphs:
 - 1. Valve-Tag Size and Shape:
 - a. All services: 1-1/2 inches round.

3.6 WARNING-TAG INSTALLATION

- A. Write required message on, and attach warning tags to, equipment and other items where required.

END OF SECTION 230553

THIS PAGE INTENTIONALLY LEFT BLANK

SECTION 230593 - TESTING, ADJUSTING, AND BALANCING FOR HVAC

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

- A. Drawings and general provisions of the Contract, including General and Supplementary Conditions and Division 01 Specification Sections, apply to this Section.

1.2 SUMMARY

- A. Section Includes:
 - 1. Balancing Air Systems:
 - a. Constant-volume air systems.
 - 2. Balancing Hydronic Piping Systems: Field verify existing system.
 - a. Constant-flow hydronic systems.
 - b. Variable-flow hydronic systems.
 - c. Primary-secondary hydronic systems.

1.3 DEFINITIONS

- A. AABC: Associated Air Balance Council.
- B. NEBB: National Environmental Balancing Bureau.
- C. TAB: Testing, adjusting, and balancing.

1.4 INFORMATIONAL SUBMITTALS

- A. Qualification Data: Within 45 days of Contractor's Notice to Proceed, submit documentation that the TAB contractor and this Project's TAB team members meet the qualifications specified in "Quality Assurance" Article.
- B. Contract Documents Examination Report: Within 30 days of Contractor's Notice to Proceed, submit the Contract Documents review report as specified in Part 3.
- C. Certified TAB reports.
- D. Sample report forms.
- E. Instrument calibration reports, to include the following:
 - 1. Instrument type and make.
 - 2. Serial number.
 - 3. Application.
 - 4. Dates of use.
 - 5. Dates of calibration.

1.5 QUALITY ASSURANCE

- A. TAB Contractor Qualifications: Engage a TAB entity certified by AABC or NEBB.
 - 1. TAB Field Supervisor: Employee of the TAB contractor and certified by AABC or NEBB.
 - 2. TAB Technician: Employee of the TAB contractor and who is certified by AABC or NEBB as a TAB technician.
- B. Certify TAB field data reports and perform the following:

1. Review field data reports to validate accuracy of data and to prepare certified TAB reports.
 2. Certify that the TAB team complied with the approved TAB plan and the procedures specified and referenced in this Specification.
- C. TAB Report Forms: Use standard TAB contractor's forms approved by Engineer.
- D. Instrumentation Type, Quantity, Accuracy, and Calibration: As described in ASHRAE 111, Section 5, "Instrumentation."
- E. ASHRAE Compliance: Applicable requirements in ASHRAE 62.1, Section 7.2.2 - "Air Balancing."
- F. ASHRAE/IESNA Compliance: Applicable requirements in ASHRAE/IESNA 90.1, Section 6.7.2.3 - "System Balancing."

1.6 PROJECT CONDITIONS

- A. Partial Owner Occupancy: Owner may occupy completed areas of building before Substantial Completion. Cooperate with Owner during TAB operations to minimize conflicts with Owner's operations.

1.7 COORDINATION

- A. Perform TAB after leakage and pressure tests on air and water distribution systems have been satisfactorily completed.

PART 2 - PRODUCTS (Not Applicable)

PART 3 - EXECUTION

3.1 EXAMINATION

- A. Examine the Contract Documents to become familiar with Project requirements and to discover conditions in systems' designs that may preclude proper TAB of systems and equipment.
- B. Examine systems for installed balancing devices, such as test ports, gage cocks, thermometer wells, flow-control devices, balancing valves and fittings, and manual volume dampers. Verify that locations of these balancing devices are accessible.
- C. Examine the approved submittals for HVAC systems and equipment.
- D. Examine design data including HVAC system descriptions, statements of design assumptions for environmental conditions and systems' output, and statements of philosophies and assumptions about HVAC system and equipment controls.
- E. Examine ceiling plenums and underfloor air plenums used for supply, return, or relief air to verify that they meet the leakage class of connected ducts as specified in Section 233113 "Metal Ducts" and are properly separated from adjacent areas. Verify that penetrations in plenum walls are sealed and fire-stopped if required.
- F. Examine equipment performance data including fan and pump curves.
1. Relate performance data to Project conditions and requirements, including system effects that can create undesired or unpredicted conditions that cause reduced capacities in all or part of a system.

2. Calculate system-effect factors to reduce performance ratings of HVAC equipment when installed under conditions different from the conditions used to rate equipment performance. To calculate system effects for air systems, use tables and charts found in AMCA 201, "Fans and Systems," or in SMACNA's "HVAC Systems - Duct Design." Compare results with the design data and installed conditions.
- G. Examine system and equipment installations and verify that field quality-control testing, cleaning, and adjusting specified in individual Sections have been performed.
- H. Examine test reports specified in individual system and equipment Sections.
- I. Examine HVAC equipment and filters and verify that bearings are greased, belts are aligned and tight, and equipment with functioning controls is ready for operation.
- J. Examine terminal units, such as variable-air-volume boxes, and verify that they are accessible and their controls are connected and functioning.
- K. Examine strainers. Verify that startup screens are replaced by permanent screens with indicated perforations.
- L. Examine three-way valves for proper installation for their intended function of diverting or mixing fluid flows.
- M. Examine heat-transfer coils for correct piping connections and for clean and straight fins.
- N. Examine system pumps to ensure absence of entrained air in the suction piping.
- O. Examine operating safety interlocks and controls on HVAC equipment.
- P. Report deficiencies discovered before and during performance of TAB procedures. Observe and record system reactions to changes in conditions. Record default set points if different from indicated values.

3.2 PREPARATION

- A. Complete system-readiness checks and prepare reports. Verify the following:
 1. Permanent electrical-power wiring is complete.
 2. Hydronic systems are filled, clean, and free of air.
 3. Automatic temperature-control systems are operational.
 4. Equipment and duct access doors are securely closed.
 5. Balance, smoke, and fire dampers are open.
 6. Isolating and balancing valves are open and control valves are operational.
 7. Ceilings are installed in critical areas where air-pattern adjustments are required and access to balancing devices is provided.
 8. Windows and doors can be closed so indicated conditions for system operations can be met.

3.3 GENERAL PROCEDURES FOR TESTING AND BALANCING

- A. Perform testing and balancing procedures on each system according to the procedures contained in AABC's "National Standards for Total System Balance", ASHRAE 111, or NEBB's "Procedural Standards for Testing, Adjusting, and Balancing of Environmental Systems" and in this Section.
 1. Comply with requirements in ASHRAE 62.1, Section 7.2.2 - "Air Balancing."
- B. Cut insulation, ducts, pipes, and equipment cabinets for installation of test probes to the minimum extent necessary for TAB procedures.

1. After testing and balancing, patch probe holes in ducts with same material and thickness as used to construct ducts.
 2. After testing and balancing, install test ports and duct access doors that comply with requirements in Section 233300 "Air Duct Accessories."
 3. Install and join new insulation that matches removed materials. Restore insulation, coverings, vapor barrier, and finish according to Section 230713 "Duct Insulation," Section 230716 "HVAC Equipment Insulation," and Section 230719 "HVAC Piping Insulation."
- C. Mark equipment and balancing devices, including damper-control positions, valve position indicators, fan-speed-control levers, and similar controls and devices, with paint or other suitable, permanent identification material to show final settings.
- D. Take and report testing and balancing measurements in inch-pound (IP) units.

3.4 GENERAL PROCEDURES FOR BALANCING AIR SYSTEMS

- A. Prepare test reports for both fans and outlets. Obtain manufacturer's outlet factors and recommended testing procedures. Crosscheck the summation of required outlet volumes with required fan volumes.
- B. Prepare schematic diagrams of systems' "as-built" duct layouts.
- C. For variable-air-volume systems, develop a plan to simulate diversity.
- D. Determine the best locations in main and branch ducts for accurate duct-airflow measurements.
- E. Check airflow patterns from the outdoor-air louvers and dampers and the return- and exhaust-air dampers through the supply-fan discharge and mixing dampers.
- F. Locate start-stop and disconnect switches, electrical interlocks, and motor starters.
- G. Verify that motor starters are equipped with properly sized thermal protection.
- H. Check dampers for proper position to achieve desired airflow path.
- I. Check for airflow blockages.
- J. Check condensate drains for proper connections and functioning.
- K. Check for proper sealing of air-handling-unit components.
- L. Verify that air duct system is sealed as specified in Section 233113 "Metal Ducts."

3.5 PROCEDURES FOR CONSTANT-VOLUME AIR SYSTEMS

- A. Adjust fans to deliver total indicated airflows within the maximum allowable fan speed listed by fan manufacturer.
1. Measure total airflow.
 - a. Where sufficient space in ducts is unavailable for Pitot-tube traverse measurements, measure airflow at terminal outlets and inlets and calculate the total airflow.
 2. Measure fan static pressures as follows to determine actual static pressure:
 - a. Measure outlet static pressure as far downstream from the fan as practical and upstream from restrictions in ducts such as elbows and transitions.
 - b. Measure static pressure directly at the fan outlet or through the flexible connection.

- c. Measure inlet static pressure of single-inlet fans in the inlet duct as near the fan as possible, upstream from the flexible connection, and downstream from duct restrictions.
 - d. Measure inlet static pressure of double-inlet fans through the wall of the plenum that houses the fan.
 3. Measure static pressure across each component that makes up an air-handling unit, rooftop unit, and other air-handling and -treating equipment.
 - a. Report the cleanliness status of filters and the time static pressures are measured.
 4. Measure static pressures entering and leaving other devices, such as sound traps, heat-recovery equipment, and air washers, under final balanced conditions.
 5. Review Record Documents to determine variations in design static pressures versus actual static pressures. Calculate actual system-effect factors. Recommend adjustments to accommodate actual conditions.
 6. Obtain approval from Engineer for adjustment of fan speed higher or lower than indicated speed. Comply with requirements in HVAC Sections for air-handling units for adjustment of fans, belts, and pulley sizes to achieve indicated air-handling-unit performance.
 7. Do not make fan-speed adjustments that result in motor overload. Consult equipment manufacturers about fan-speed safety factors. Modulate dampers and measure fan-motor amperage to ensure that no overload will occur. Measure amperage in full-cooling, full-heating, economizer, and any other operating mode to determine the maximum required brake horsepower.
- B. Adjust volume dampers for main duct, submain ducts, and major branch ducts to indicated airflows within specified tolerances.
 1. Measure airflow of submain and branch ducts.
 - a. Where sufficient space in submain and branch ducts is unavailable for Pitot-tube traverse measurements, measure airflow at terminal outlets and inlets and calculate the total airflow for that zone.
 2. Measure static pressure at a point downstream from the balancing damper, and adjust volume dampers until the proper static pressure is achieved.
 3. Remeasure each submain and branch duct after all have been adjusted. Continue to adjust submain and branch ducts to indicated airflows within specified tolerances.
- C. Measure air outlets and inlets without making adjustments.
 1. Measure terminal outlets using a direct-reading hood or outlet manufacturer's written instructions and calculating factors.
- D. Adjust air outlets and inlets for each space to indicated airflows within specified tolerances of indicated values. Make adjustments using branch volume dampers rather than extractors and the dampers at air terminals.
 1. Adjust each outlet in same room or space to within specified tolerances of indicated quantities without generating noise levels above the limitations prescribed by the Contract Documents.
 2. Adjust patterns of adjustable outlets for proper distribution without drafts.

3.6 GENERAL PROCEDURES FOR HYDRONIC SYSTEMS

- A. Prepare test reports with pertinent design data, and number in sequence starting at pump to end of system. Check the sum of branch-circuit flows against the approved pump flow rate. Correct variations that exceed plus or minus 5 percent.
- B. Prepare schematic diagrams of systems' "as-built" piping layouts.

- C. Prepare hydronic systems for testing and balancing according to the following, in addition to the general preparation procedures specified above:
1. Open all manual valves for maximum flow.
 2. Check liquid level in expansion tank.
 3. Check makeup water-station pressure gage for adequate pressure for highest vent.
 4. Check flow-control valves for specified sequence of operation, and set at indicated flow.
 5. Set differential-pressure control valves at the specified differential pressure. Do not set at fully closed position when pump is positive-displacement type unless several terminal valves are kept open.
 6. Set system controls so automatic valves are wide open to heat exchangers.
 7. Check pump-motor load. If motor is overloaded, throttle main flow-balancing device so motor nameplate rating is not exceeded.
 8. Check air vents for a forceful liquid flow exiting from vents when manually operated.

3.7 PROCEDURES FOR CONSTANT-FLOW HYDRONIC SYSTEMS

- A. Measure water flow at pumps. Use the following procedures except for positive-displacement pumps:
1. Verify impeller size by operating the pump with the discharge valve closed. Read pressure differential across the pump. Convert pressure to head and correct for differences in gage heights. Note the point on manufacturer's pump curve at zero flow and verify that the pump has the intended impeller size.
 - a. If impeller sizes must be adjusted to achieve pump performance, obtain approval from Engineer and comply with requirements in Section 232123 "Hydronic Pumps."
 2. Check system resistance. With all valves open, read pressure differential across the pump and mark pump manufacturer's head-capacity curve. Adjust pump discharge valve until indicated water flow is achieved.
 - a. Monitor motor performance during procedures and do not operate motors in overload conditions.
 3. Verify pump-motor brake horsepower. Calculate the intended brake horsepower for the system based on pump manufacturer's performance data. Compare calculated brake horsepower with nameplate data on the pump motor. Report conditions where actual amperage exceeds motor nameplate amperage.
 4. Report flow rates that are not within plus or minus 10 percent of design.
- B. Measure flow at all automatic flow control valves to verify that valves are functioning as designed.
- C. Measure flow at all pressure-independent characterized control valves, with valves in fully open position, to verify that valves are functioning as designed.
- D. Set calibrated balancing valves, if installed, at calculated presettings.
- E. Measure flow at all stations and adjust, where necessary, to obtain first balance.
1. System components that have Cv rating or an accurately cataloged flow-pressure-drop relationship may be used as a flow-indicating device.
- F. Measure flow at main balancing station and set main balancing device to achieve flow that is 5 percent greater than indicated flow.
- G. Adjust balancing stations to within specified tolerances of indicated flow rate as follows:
1. Determine the balancing station with the highest percentage over indicated flow.

2. Adjust each station in turn, beginning with the station with the highest percentage over indicated flow and proceeding to the station with the lowest percentage over indicated flow.
 3. Record settings and mark balancing devices.
- H. Measure pump flow rate and make final measurements of pump amperage, voltage, rpm, pump heads, and systems' pressures and temperatures including outdoor-air temperature.
- I. Measure the differential-pressure-control-valve settings existing at the conclusion of balancing.
- J. Check settings and operation of each safety valve. Record settings.

3.8 PROCEDURES FOR VARIABLE-FLOW HYDRONIC SYSTEMS

- A. Balance systems with automatic two- and three-way control valves by setting systems at maximum flow through heat-exchange terminals and proceed as specified above for hydronic systems.

3.9 PROCEDURES FOR PRIMARY-SECONDARY HYDRONIC SYSTEMS

- A. Balance the primary circuit flow first and then balance the secondary circuits.

3.10 PROCEDURES FOR HEAT EXCHANGERS

- A. Measure water flow through all circuits.
- B. Adjust water flow to within specified tolerances.
- C. Measure inlet and outlet water temperatures.
- D. Measure inlet steam pressure.
- E. Check settings and operation of safety and relief valves. Record settings.

3.11 PROCEDURES FOR MOTORS

- A. Motors, 1/2 HP and Larger: Test at final balanced conditions and record the following data:
1. Manufacturer's name, model number, and serial number.
 2. Motor horsepower rating.
 3. Motor rpm.
 4. Efficiency rating.
 5. Nameplate and measured voltage, each phase.
 6. Nameplate and measured amperage, each phase.
 7. Starter thermal-protection-element rating.
- B. Motors Driven by Variable-Frequency Controllers: Test for proper operation at speeds varying from minimum to maximum. Test the manual bypass of the controller to prove proper operation. Record observations including name of controller manufacturer, model number, serial number, and nameplate data.

3.12 PROCEDURES FOR CONDENSING UNITS

- A. Verify proper rotation of fans.
- B. Measure entering- and leaving-air temperatures.
- C. Record compressor data.

3.13 PROCEDURES FOR HEAT-TRANSFER COILS

- A. Measure, adjust, and record the following data for each water coil:
 - 1. Entering- and leaving-water temperature.
 - 2. Water flow rate.
 - 3. Water pressure drop.
 - 4. Dry-bulb temperature of entering and leaving air.
 - 5. Wet-bulb temperature of entering and leaving air for cooling coils.
 - 6. Airflow.
 - 7. Air pressure drop.
- B. Measure, adjust, and record the following data for each electric heating coil:
 - 1. Nameplate data.
 - 2. Airflow.
 - 3. Entering- and leaving-air temperature at full load.
 - 4. Voltage and amperage input of each phase at full load and at each incremental stage.
 - 5. Calculated kilowatt at full load.
 - 6. Fuse or circuit-breaker rating for overload protection.
- C. Measure, adjust, and record the following data for each steam coil:
 - 1. Dry-bulb temperature of entering and leaving air.
 - 2. Airflow.
 - 3. Air pressure drop.
 - 4. Inlet steam pressure.
- D. Measure, adjust, and record the following data for each refrigerant coil:
 - 1. Dry-bulb temperature of entering and leaving air.
 - 2. Wet-bulb temperature of entering and leaving air.
 - 3. Airflow.
 - 4. Air pressure drop.
 - 5. Refrigerant suction pressure and temperature.

3.14 PROCEDURES FOR TESTING, ADJUSTING, AND BALANCING EXISTING SYSTEMS

- A. Perform a preconstruction inspection of existing equipment that is to remain and be reused.
 - 1. Measure and record the operating speed, airflow, and static pressure of each fan.
 - 2. Measure motor voltage and amperage. Compare the values to motor nameplate information.
 - 3. Check the refrigerant charge.
 - 4. Check the condition of filters.
 - 5. Check the condition of coils.
 - 6. Check the operation of the drain pan and condensate-drain trap.
 - 7. Check bearings and other lubricated parts for proper lubrication.
 - 8. Report on the operating condition of the equipment and the results of the measurements taken. Report deficiencies.
- B. Before performing testing and balancing of existing systems, inspect existing equipment that is to remain and be reused to verify that existing equipment has been cleaned and refurbished. Verify the following:
 - 1. New filters are installed.
 - 2. Coils are clean and fins combed.
 - 3. Drain pans are clean.
 - 4. Fans are clean.

5. Bearings and other parts are properly lubricated.
 6. Deficiencies noted in the preconstruction report are corrected.
- C. Perform testing and balancing of existing systems to the extent that existing systems are affected by the renovation work.
1. Compare the indicated airflow of the renovated work to the measured fan airflows, and determine the new fan speed and the face velocity of filters and coils.
 2. Verify that the indicated airflows of the renovated work result in filter and coil face velocities and fan speeds that are within the acceptable limits defined by equipment manufacturer.
 3. If calculations increase or decrease the air flow rates and water flow rates by more than 5 percent, make equipment adjustments to achieve the calculated rates. If increase or decrease is 5 percent or less, equipment adjustments are not required.
 4. Balance each air outlet.

3.15 TOLERANCES

- A. Set HVAC system's air flow rates and water flow rates within the following tolerances:
1. Supply, Return, and Exhaust Fans and Equipment with Fans: Plus or minus 10 percent.
 2. Air Outlets and Inlets: Plus or minus 10 percent.
 3. Heating-Water Flow Rate: Plus or minus 10 percent.
 4. Cooling-Water Flow Rate: Plus or minus 10 percent.

3.16 REPORTING

- A. Initial Construction-Phase Report: Based on examination of the Contract Documents as specified in "Examination" Article, prepare a report on the adequacy of design for systems' balancing devices. Recommend changes and additions to systems' balancing devices to facilitate proper performance measuring and balancing. Recommend changes and additions to HVAC systems and general construction to allow access for performance measuring and balancing devices.
- B. Status Reports: Prepare biweekly progress reports to describe completed procedures, procedures in progress, and scheduled procedures. Include a list of deficiencies and problems found in systems being tested and balanced. Prepare a separate report for each system and each building floor for systems serving multiple floors.

3.17 FINAL REPORT

- A. General: Prepare a certified written report; tabulate and divide the report into separate sections for tested systems and balanced systems.
1. Include a certification sheet at the front of the report's binder, signed and sealed by the certified testing and balancing engineer.
 2. Include a list of instruments used for procedures, along with proof of calibration.
- B. Final Report Contents: In addition to certified field-report data, include the following:
1. Pump curves.
 2. Fan curves.
 3. Manufacturers' test data.
 4. Field test reports prepared by system and equipment installers.
 5. Other information relative to equipment performance; do not include Shop Drawings and product data.
- C. General Report Data: In addition to form titles and entries, include the following data:
1. Title page.

2. Name and address of the TAB contractor.
 3. Project name.
 4. Project location.
 5. Architect's name and address.
 6. Engineer's name and address.
 7. Contractor's name and address.
 8. Report date.
 9. Signature of TAB supervisor who certifies the report.
 10. Table of Contents with the total number of pages defined for each section of the report. Number each page in the report.
 11. Summary of contents including the following:
 - a. Indicated versus final performance.
 - b. Notable characteristics of systems.
 - c. Description of system operation sequence if it varies from the Contract Documents.
 12. Nomenclature sheets for each item of equipment.
 13. Data for terminal units, including manufacturer's name, type, size, and fittings.
 14. Notes to explain why certain final data in the body of reports vary from indicated values.
 15. Test conditions for fans and pump performance forms including the following:
 - a. Settings for outdoor-, return-, and exhaust-air dampers.
 - b. Conditions of filters.
 - c. Cooling coil, wet- and dry-bulb conditions.
 - d. Face and bypass damper settings at coils.
 - e. Fan drive settings including settings and percentage of maximum pitch diameter.
 - f. Inlet vane settings for variable-air-volume systems.
 - g. Settings for supply-air, static-pressure controller.
 - h. Other system operating conditions that affect performance.
- D. System Diagrams: Include schematic layouts of air and hydronic distribution systems. Present each system with single-line diagram and include the following:
1. Quantities of outdoor, supply, return, and exhaust airflows.
 2. Water and steam flow rates.
 3. Duct, outlet, and inlet sizes.
 4. Pipe and valve sizes and locations.
 5. Terminal units.
 6. Balancing stations.
 7. Position of balancing devices.
- E. Air-Handling-Unit Test Reports: For air-handling units with coils, include the following:
1. Unit Data:
 - a. Unit identification.
 - b. Location.
 - c. Make and type.
 - d. Model number and unit size.
 - e. Manufacturer's serial number.
 - f. Unit arrangement and class.
 - g. Discharge arrangement.
 - h. Sheave make, size in inches, and bore.
 - i. Center-to-center dimensions of sheave, and amount of adjustments in inches.
 - j. Number, make, and size of belts.
 - k. Number, type, and size of filters.

2. Motor Data:
 - a. Motor make, and frame type and size.
 - b. Horsepower and rpm.
 - c. Volts, phase, and hertz.
 - d. Full-load amperage and service factor.
 - e. Sheave make, size in inches, and bore.
 - f. Center-to-center dimensions of sheave, and amount of adjustments in inches.
 3. Test Data (Indicated and Actual Values):
 - a. Total air flow rate in cfm.
 - b. Total system static pressure in inches wg.
 - c. Fan rpm.
 - d. Discharge static pressure in inches wg.
 - e. Filter static-pressure differential in inches wg.
 - f. Preheat-coil static-pressure differential in inches wg.
 - g. Cooling-coil static-pressure differential in inches wg.
 - h. Heating-coil static-pressure differential in inches wg.
 - i. Outdoor airflow in cfm.
 - j. Return airflow in cfm.
 - k. Outdoor-air damper position.
 - l. Return-air damper position.
 - m. Vortex damper position.
- F. Apparatus-Coil Test Reports:
1. Coil Data:
 - a. System identification.
 - b. Location.
 - c. Coil type.
 - d. Number of rows.
 - e. Fin spacing in fins per inch o.c.
 - f. Make and model number.
 - g. Face area in sq. ft..
 - h. Tube size in NPS.
 - i. Tube and fin materials.
 - j. Circuiting arrangement.
 2. Test Data (Indicated and Actual Values):
 - a. Air flow rate in cfm.
 - b. Average face velocity in fpm.
 - c. Air pressure drop in inches wg.
 - d. Outdoor-air, wet- and dry-bulb temperatures in deg F.
 - e. Return-air, wet- and dry-bulb temperatures in deg F.
 - f. Entering-air, wet- and dry-bulb temperatures in deg F.
 - g. Leaving-air, wet- and dry-bulb temperatures in deg F.
 - h. Water flow rate in gpm.
 - i. Water pressure differential in feet of head or psig.
 - j. Entering-water temperature in deg F.
 - k. Leaving-water temperature in deg F.
 - l. Refrigerant expansion valve and refrigerant types.
 - m. Refrigerant suction pressure in psig.
 - n. Refrigerant suction temperature in deg F.
 - o. Inlet steam pressure in psig.
- G. Fan Test Reports: For supply, return, and exhaust fans, include the following:

1. Fan Data:
 - a. System identification.
 - b. Location.
 - c. Make and type.
 - d. Model number and size.
 - e. Manufacturer's serial number.
 - f. Arrangement and class.
 - g. Sheave make, size in inches, and bore.
 - h. Center-to-center dimensions of sheave, and amount of adjustments in inches.
 2. Motor Data:
 - a. Motor make, and frame type and size.
 - b. Horsepower and rpm.
 - c. Volts, phase, and hertz.
 - d. Full-load amperage and service factor.
 - e. Sheave make, size in inches, and bore.
 - f. Center-to-center dimensions of sheave, and amount of adjustments in inches.
 - g. Number, make, and size of belts.
 3. Test Data (Indicated and Actual Values):
 - a. Total airflow rate in cfm.
 - b. Total system static pressure in inches wg.
 - c. Fan rpm.
 - d. Discharge static pressure in inches wg.
 - e. Suction static pressure in inches wg.
- H. Round, Flat-Oval, and Rectangular Duct Traverse Reports: Include a diagram with a grid representing the duct cross-section and record the following:
1. Report Data:
 - a. System and air-handling-unit number.
 - b. Location and zone.
 - c. Traverse air temperature in deg F.
 - d. Duct static pressure in inches wg.
 - e. Duct size in inches.
 - f. Duct area in sq. ft..
 - g. Indicated air flow rate in cfm.
 - h. Indicated velocity in fpm.
 - i. Actual air flow rate in cfm.
 - j. Actual average velocity in fpm.
 - k. Barometric pressure in psig.
- I. Air-Terminal-Device Reports:
1. Unit Data:
 - a. System and air-handling unit identification.
 - b. Location and zone.
 - c. Apparatus used for test.
 - d. Area served.
 - e. Make.
 - f. Number from system diagram.
 - g. Type and model number.
 - h. Size.
 - i. Effective area in sq. ft..
 2. Test Data (Indicated and Actual Values):
 - a. Air flow rate in cfm.

- b. Air velocity in fpm.
 - c. Preliminary air flow rate as needed in cfm.
 - d. Preliminary velocity as needed in fpm.
 - e. Final air flow rate in cfm.
 - f. Final velocity in fpm.
 - g. Space temperature in deg F.
- J. System-Coil Reports: For reheat coils and water coils of terminal units, include the following:
 - 1. Unit Data:
 - a. System and air-handling-unit identification.
 - b. Location and zone.
 - c. Room or riser served.
 - d. Coil make and size.
 - e. Flowmeter type.
 - 2. Test Data (Indicated and Actual Values):
 - a. Air flow rate in cfm.
 - b. Entering-water temperature in deg F.
 - c. Leaving-water temperature in deg F.
 - d. Water pressure drop in feet of head or psig.
 - e. Entering-air temperature in deg F.
 - f. Leaving-air temperature in deg F.
- K. Pump Test Reports: Calculate impeller size by plotting the shutoff head on pump curves and include the following:
 - 1. Unit Data:
 - a. Unit identification.
 - b. Location.
 - c. Service.
 - d. Make and size.
 - e. Model number and serial number.
 - f. Water flow rate in gpm.
 - g. Water pressure differential in feet of head or psig.
 - h. Required net positive suction head in feet of head or psig.
 - i. Pump rpm.
 - j. Impeller diameter in inches.
 - k. Motor make and frame size.
 - l. Motor horsepower and rpm.
 - m. Voltage at each connection.
 - n. Amperage for each phase.
 - o. Full-load amperage and service factor.
 - p. Seal type.
 - 2. Test Data (Indicated and Actual Values):
 - a. Static head in feet of head or psig.
 - b. Pump shutoff pressure in feet of head or psig.
 - c. Actual impeller size in inches.
 - d. Full-open flow rate in gpm.
 - e. Full-open pressure in feet of head or psig.
 - f. Final discharge pressure in feet of head or psig.
 - g. Final suction pressure in feet of head or psig.
 - h. Final total pressure in feet of head or psig.
 - i. Final water flow rate in gpm.

- j. Voltage at each connection.
 - k. Amperage for each phase.
- L. Instrument Calibration Reports:
- 1. Report Data:
 - a. Instrument type and make.
 - b. Serial number.
 - c. Application.
 - d. Dates of use.
 - e. Dates of calibration.

3.18 INSPECTIONS

- A. Initial Inspection:
- 1. After testing and balancing are complete, operate each system and randomly check measurements to verify that the system is operating according to the final test and balance readings documented in the final report.
 - 2. Check the following for each system:
 - a. Measure airflow of at least 10 percent of air outlets.
 - b. Measure water flow of at least 5 percent of terminals.
 - c. Measure room temperature at each thermostat/temperature sensor. Compare the reading to the set point.
 - d. Verify that balancing devices are marked with final balance position.
 - e. Note deviations from the Contract Documents in the final report.
- B. Final Inspection:
- 1. After initial inspection is complete and documentation by random checks verifies that testing and balancing are complete and accurately documented in the final report, request that a final inspection be made by Engineer.
 - 2. Engineer shall randomly select measurements, documented in the final report, to be rechecked. Rechecking shall be limited to either 10 percent of the total measurements recorded or the extent of measurements that can be accomplished in a normal 8-hour business day.
 - 3. If rechecks yield measurements that differ from the measurements documented in the final report by more than the tolerances allowed, the measurements shall be noted as "FAILED."
 - 4. If the number of "FAILED" measurements is greater than 10 percent of the total measurements checked during the final inspection, the testing and balancing shall be considered incomplete and shall be rejected.
- C. TAB Work will be considered defective if it does not pass final inspections. If TAB Work fails, proceed as follows:
- 1. Recheck all measurements and make adjustments. Revise the final report and balancing device settings to include all changes; resubmit the final report and request a second final inspection.
 - 2. If the second final inspection also fails, Owner may contract the services of another TAB contractor to complete TAB Work according to the Contract Documents and deduct the cost of the services from the original TAB contractor's final payment.
- D. Prepare test and inspection reports.

3.19 ADDITIONAL TESTS

- A. Within 90 days of completing TAB, perform additional TAB to verify that balanced conditions are being maintained throughout and to correct unusual conditions.
- B. Seasonal Periods: If initial TAB procedures were not performed during near-peak summer and winter conditions, perform additional TAB during near-peak summer and winter conditions.

END OF SECTION 230593

THIS PAGE LEFT INTENTIONALLY BLANK

SECTION 230713 - DUCT INSULATION

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

- A. Drawings and general provisions of the Contract, including General and Supplementary Conditions and Division 01 Specification Sections, apply to this Section.

1.2 SUMMARY

- A. Section includes insulating the following duct services:
 - 1. Indoor, concealed supply and outdoor air.
 - 2. Indoor, exposed supply and outdoor air.
 - 3. Indoor, concealed return located in unconditioned space.
 - 4. Indoor, exposed return located in unconditioned space.
 - 5. Indoor, concealed exhaust between isolation damper and penetration of building exterior.
 - 6. Indoor, exposed exhaust between isolation damper and penetration of building exterior.
 - 7. Outdoor, concealed supply and return.
 - 8. Outdoor, exposed supply and return.
- B. Related Sections:
 - 1. Section 230719 "HVAC Piping Insulation."

1.3 ACTION SUBMITTALS

- A. Product Data: For each type of product indicated. Include thermal conductivity, water-vapor permeance thickness, and jackets (both factory- and field-applied if any).
- B. Shop Drawings: Include plans, elevations, sections, details, and attachments to other work.
 - 1. Detail application of protective shields, saddles, and inserts at hangers for each type of insulation and hanger.
 - 2. Detail insulation application at elbows, fittings, dampers, specialties and flanges for each type of insulation.
 - 3. Detail application of field-applied jackets.
 - 4. Detail application at linkages of control devices.

1.4 INFORMATIONAL SUBMITTALS

- A. Qualification Data: For qualified Installer.
- B. Material Test Reports: From a qualified testing agency acceptable to authorities having jurisdiction indicating, interpreting, and certifying test results for compliance of insulation materials, sealers, attachments, cements, and jackets, with requirements indicated. Include dates of tests and test methods employed.
- C. Field quality-control reports.

1.5 QUALITY ASSURANCE

- A. Surface-Burning Characteristics: For insulation and related materials, as determined by testing identical products according to ASTM E 84, by a testing agency acceptable to authorities having jurisdiction. Factory label insulation and jacket materials and adhesive, mastic, tapes, and cement material containers, with appropriate markings of applicable testing agency.

1. Insulation Installed Indoors: Flame-spread index of 25 or less, and smoke-developed index of 50 or less.
2. Insulation Installed Outdoors: Flame-spread index of 75 or less, and smoke-developed index of 150 or less.

1.6 DELIVERY, STORAGE, AND HANDLING

- A. Packaging: Insulation material containers shall be marked by manufacturer with appropriate ASTM standard designation, type and grade, and maximum use temperature.

1.7 COORDINATION

- A. Coordinate sizes and locations of supports, hangers, and insulation shields specified in Section 230529 "Hangers and Supports for HVAC Piping and Equipment."
- B. Coordinate clearance requirements with duct Installer for duct insulation application. Before preparing ductwork Shop Drawings, establish and maintain clearance requirements for installation of insulation and field-applied jackets and finishes and for space required for maintenance.
- C. Coordinate installation and testing of heat tracing.

1.8 SCHEDULING

- A. Schedule insulation application after pressure testing systems and, where required, after installing and testing heat tracing. Insulation application may begin on segments that have satisfactory test results.
- B. Complete installation and concealment of plastic materials as rapidly as possible in each area of construction.

PART 2 - PRODUCTS

2.1 INSULATION MATERIALS

- A. Comply with requirements in "Duct Insulation Schedule, General," "Indoor Duct and Plenum Insulation Schedule," and "Aboveground, Outdoor Duct and Plenum Insulation Schedule" articles for where insulating materials shall be applied.
- B. Products shall not contain asbestos, lead, mercury, or mercury compounds.
- C. Products that come in contact with stainless steel shall have a leachable chloride content of less than 50 ppm when tested according to ASTM C 871.
- D. Insulation materials for use on austenitic stainless steel shall be qualified as acceptable according to ASTM C 795.
- E. Foam insulation materials shall not use CFC or HCFC blowing agents in the manufacturing process.
- F. Expanded Polyisocyanurate Insulation: Closed-cell, light-weight, resilient, foamed plastic composed of hydrogen and carbon.
 1. Products: Subject to compliance with requirements available products that may be incorporated into the Work include, but are not limited to, the following:
 - a. Rmax Thermasheath Polyisocyanurate.

- G. Mineral-Fiber Blanket Insulation: Mineral or glass fibers bonded with a thermosetting resin. Comply with ASTM C 553, Type II and ASTM C 1290, Type III with factory-applied FSK jacket. Factory-applied jacket requirements are specified in "Factory-Applied Jackets" Article.
1. Products: Subject to compliance with requirements, provide one of the following:
 - a. CertainTeed Corp.; SoftTouch Duct Wrap.
 - b. Johns Manville; Microlite.
 - c. Knauf Insulation; Friendly Feel Duct Wrap.
 - d. Manson Insulation Inc.; Alley Wrap.
 - e. Owens Corning; SOFTR All-Service Duct Wrap.
- H. Mineral-Fiber Board Insulation: Mineral or glass fibers bonded with a thermosetting resin. Comply with ASTM C 612, Type IA or Type IB. For duct and plenum applications, provide insulation with factory-applied FSK jacket. Factory-applied jacket requirements are specified in "Factory-Applied Jackets" Article.
1. Products: Subject to compliance with requirements, provide one of the following:
 - a. CertainTeed Corp.; Commercial Board.
 - b. Fibrex Insulations Inc.; FBX.
 - c. Johns Manville; 800 Series Spin-Glas.
 - d. Knauf Insulation; Insulation Board.
 - e. Manson Insulation Inc.; AK Board.
 - f. Owens Corning; Fiberglas 700 Series.

2.2 ADHESIVES

- A. Materials shall be compatible with insulation materials, jackets, and substrates and for bonding insulation to itself and to surfaces to be insulated unless otherwise indicated.
- B. Mineral-Fiber Adhesive: Comply with MIL-A-3316C, Class 2, Grade A.
1. Products: Subject to compliance with requirements, provide one of the following:
 - a. Childers Brand, Specialty Construction Brands, Inc., a business of H. B. Fuller Company; CP-127.Eagle Bridges - Marathon Industries; 225.
 - b. Foster Brand, Specialty Construction Brands, Inc., a business of H. B. Fuller Company; 85-60/85-70.Mon-Eco Industries, Inc.; 22-25.
 2. For indoor applications, adhesive shall have a VOC content of 80 g/L or less when calculated according to 40 CFR 59, Subpart D (EPA Method 24).
 3. Adhesive shall comply with the testing and product requirements of the California Department of Health Services' "Standard Practice for the Testing of Volatile Organic Emissions from Various Sources Using Small-Scale Environmental Chambers."
- C. ASJ Adhesive, and FSK Jacket Adhesive: Comply with MIL-A-3316C, Class 2, Grade A for bonding insulation jacket lap seams and joints.
1. Products: Subject to compliance with requirements, provide one of the following:
 - a. Childers Brand, Specialty Construction Brands, Inc., a business of H. B. Fuller Company; CP-82.
 - b. Eagle Bridges - Marathon Industries; 225.
 - c. Foster Brand, Specialty Construction Brands, Inc., a business of H. B. Fuller Company; 85-50.Mon-Eco Industries, Inc.; 22-25.
 2. For indoor applications, adhesive shall have a VOC content of 50 g/L or less when calculated according to 40 CFR 59, Subpart D (EPA Method 24).
 3. Adhesive shall comply with the testing and product requirements of the California Department of Health Services' "Standard Practice for the Testing of Volatile Organic Emissions from Various Sources Using Small-Scale Environmental Chambers."

2.3 MASTICS

- A. Materials shall be compatible with insulation materials, jackets, and substrates; comply with MIL-PRF-19565C, Type II.
1. For indoor applications, use mastics that have a VOC content of 50 g/L or less when calculated according to 40 CFR 59, Subpart D (EPA Method 24).
- B. Vapor-Barrier Mastic: Water based; suitable for indoor use on below ambient services.
1. Products: Subject to compliance with requirements, provide one of the following:
 - a. Foster Brand, Specialty Construction Brands, Inc., a business of H. B. Fuller Company; 30-80/30-90.
 - b. Vimasco Corporation; 749.
 2. Water-Vapor Permeance: ASTM E 96/E 96M, Procedure B, 0.013 perm at 43-mil dry film thickness.
 3. Service Temperature Range: Minus 20 to plus 180 deg F.
 4. Solids Content: ASTM D 1644, 58 percent by volume and 70 percent by weight.
 5. Color: White.
- C. Vapor-Barrier Mastic: Solvent based; suitable for indoor use on below ambient services.
1. Products: Subject to compliance with requirements, provide one of the following:
 - a. Childers Brand, Specialty Construction Brands, Inc., a business of H. B. Fuller Company; CP-30.
 - b. Eagle Bridges - Marathon Industries; 501.
 - c. Foster Brand, Specialty Construction Brands, Inc., a business of H. B. Fuller Company; 30-35.
 - d. Mon-Eco Industries, Inc.; 55-10.
 2. Water-Vapor Permeance: ASTM F 1249, 0.05 perm at 35-mil dry film thickness.
 3. Service Temperature Range: 0 to 180 deg F.
 4. Solids Content: ASTM D 1644, 44 percent by volume and 62 percent by weight.
 5. Color: White.
- D. Vapor-Barrier Mastic: Solvent based; suitable for outdoor use on below ambient services.
1. Products: Subject to compliance with requirements, provide one of the following:
 - a. Childers Brand, Specialty Construction Brands, Inc., a business of H. B. Fuller Company; Encacel.
 - b. Eagle Bridges - Marathon Industries; 570.
 - c. Foster Brand, Specialty Construction Brands, Inc., a business of H. B. Fuller Company; 60-95/60-96.
 2. Water-Vapor Permeance: ASTM F 1249, 0.05 perm at 30-mil dry film thickness.
 3. Service Temperature Range: Minus 50 to plus 220 deg F.
 4. Solids Content: ASTM D 1644, 33 percent by volume and 46 percent by weight.
 5. Color: White.

2.4 LAGGING ADHESIVES

- A. Description: Comply with MIL-A-3316C, Class I, Grade A and shall be compatible with insulation materials, jackets, and substrates.
1. For indoor applications, use lagging adhesives that have a VOC content of 50 g/L or less when calculated according to 40 CFR 59, Subpart D (EPA Method 24).
 2. Products: Subject to compliance with requirements, provide one of the following:
 - a. Childers Brand, Specialty Construction Brands, Inc., a business of H. B. Fuller Company; CP-50 AHV2.Foster Brand, Specialty Construction Brands, Inc., a business of H. B. Fuller Company; 30-36.

- b. Vimasco Corporation; 713 and 714.
3. Fire-resistant, water-based lagging adhesive and coating for use indoors to adhere fire-resistant lagging cloths over duct insulation.
4. Service Temperature Range: 0 to plus 180 deg F.
5. Color: White.

2.5 SEALANTS

A. FSK and Metal Jacket Flashing Sealants:

1. Products: Subject to compliance with requirements, provide one of the following:
 - a. Childers Brand, Specialty Construction Brands, Inc., a business of H. B. Fuller Company; CP-76.Eagle Bridges - Marathon Industries; 405.
 - b. Foster Brand, Specialty Construction Brands, Inc., a business of H. B. Fuller Company; 95-44.
 - c. Mon-Eco Industries, Inc.; 44-05.
2. Materials shall be compatible with insulation materials, jackets, and substrates.
3. Fire- and water-resistant, flexible, elastomeric sealant.
4. Service Temperature Range: Minus 40 to plus 250 deg F.
5. Color: Aluminum.
6. For indoor applications, sealants shall have a VOC content of 420 g/L or less when calculated according to 40 CFR 59, Subpart D (EPA Method 24).
7. Sealants shall comply with the testing and product requirements of the California Department of Health Services' "Standard Practice for the Testing of Volatile Organic Emissions from Various Sources Using Small-Scale Environmental Chambers."

B. ASJ Flashing Sealants, and Vinyl and PVC Jacket Flashing Sealants:

1. Products: Subject to compliance with requirements, available products that may be incorporated into the Work include, but are not limited to, the following:
 - a. Childers Brand, Specialty Construction Brands, Inc., a business of H. B. Fuller Company; CP-76.
2. Materials shall be compatible with insulation materials, jackets, and substrates.
3. Fire- and water-resistant, flexible, elastomeric sealant.
4. Service Temperature Range: Minus 40 to plus 250 deg F.
5. Color: White.
6. For indoor applications, sealants shall have a VOC content of 420 g/L or less when calculated according to 40 CFR 59, Subpart D (EPA Method 24).
7. Sealants shall comply with the testing and product requirements of the California Department of Health Services' "Standard Practice for the Testing of Volatile Organic Emissions from Various Sources Using Small-Scale Environmental Chambers."

2.6 FACTORY-APPLIED JACKETS

A. Insulation system schedules indicate factory-applied jackets on various applications. When factory-applied jackets are indicated, comply with the following:

1. ASJ: White, kraft-paper, fiberglass-reinforced scrim with aluminum-foil backing; complying with ASTM C 1136, Type I.
2. ASJ-SSL: ASJ with self-sealing, pressure-sensitive, acrylic-based adhesive covered by a removable protective strip; complying with ASTM C 1136, Type I.
3. FSK Jacket: Aluminum-foil, fiberglass-reinforced scrim with kraft-paper backing; complying with ASTM C 1136, Type II.
4. FSP Jacket: Aluminum-foil, fiberglass-reinforced scrim with polyethylene backing; complying with ASTM C 1136, Type II.

5. Vinyl Jacket: White vinyl with a permeance of 1.3 perms when tested according to ASTM E 96/E 96M, Procedure A, and complying with NFPA 90A and NFPA 90B.

2.7 FIELD-APPLIED CLOTHS

- A. Woven Glass-Fiber Fabric: Comply with MIL-C-20079H, Type I, plain weave, and presized a minimum of 8 oz./sq. yd..
 1. Products: Subject to compliance with requirements, available products that may be incorporated into the Work include, but are not limited to, the following:
 - a. Alpha Associates, Inc.; Alpha-Maritex 84215 and 84217/9485RW, Luben 59.

2.8 FIELD-APPLIED JACKETS

- A. Field-applied jackets shall comply with ASTM C 921, Type I, unless otherwise indicated.
- B. FSK Jacket: Aluminum-foil-face, fiberglass-reinforced scrim with kraft-paper backing.
- C. Metal Jacket:
 1. Products: Subject to compliance with requirements, provide one of the following:
 - a. Childers Brand, Specialty Construction Brands, Inc., a business of H. B. Fuller Company; Metal Jacketing Systems.
 - b. ITW Insulation Systems; Aluminum and Stainless Steel Jacketing.
 - c. RPR Products, Inc.; Insul-Mate.
 2. Aluminum Jacket: Comply with ASTM B 209, Alloy 3003, 3005, 3105, or 5005, Temper H-14.
 - a. Factory cut and rolled to size.
 - b. Finish and thickness are indicated in field-applied jacket schedules.

2.9 TAPES

- A. ASJ Tape: White vapor-retarder tape matching factory-applied jacket with acrylic adhesive, complying with ASTM C 1136.
 1. Products: Subject to compliance with requirements, provide one of the following:
 - a. ABI, Ideal Tape Division; 428 AWF ASJ.
 - b. Avery Dennison Corporation, Specialty Tapes Division; Fasson 0836.
 - c. Compac Corporation; 104 and 105.
 - d. Venture Tape; 1540 CW Plus, 1542 CW Plus, and 1542 CW Plus/SQ.
 2. Width: 3 inches.
 3. Thickness: 11.5 mils.
 4. Adhesion: 90 ounces force/inch in width.
 5. Elongation: 2 percent.
 6. Tensile Strength: 40 lbf/inch in width.
 7. ASJ Tape Disks and Squares: Precut disks or squares of ASJ tape.
- B. FSK Tape: Foil-face, vapor-retarder tape matching factory-applied jacket with acrylic adhesive; complying with ASTM C 1136.
 1. Products: Subject to compliance with requirements, provide one of the following:
 - a. ABI, Ideal Tape Division; 491 AWF FSK.
 - b. Avery Dennison Corporation, Specialty Tapes Division; Fasson 0827.
 - c. Compac Corporation; 110 and 111.
 - d. Venture Tape; 1525 CW NT, 1528 CW, and 1528 CW/SQ.
 2. Width: 3 inches.
 3. Thickness: 6.5 mils.
 4. Adhesion: 90 ounces force/inch in width.

5. Elongation: 2 percent.
 6. Tensile Strength: 40 lbf/inch in width.
 7. FSK Tape Disks and Squares: Precut disks or squares of FSK tape.
- C. Aluminum-Foil Tape: Vapor-retarder tape with acrylic adhesive.
1. Products: Subject to compliance with requirements, provide one of the following:
 - a. ABI, Ideal Tape Division; 488 AWF.
 - b. Avery Dennison Corporation, Specialty Tapes Division; Fasson 0800.
 - c. Compac Corporation; 120.
 - d. Venture Tape; 3520 CW.
 2. Width: 2 inches.
 3. Thickness: 3.7 mils.
 4. Adhesion: 100 ounces force/inch in width.
 5. Elongation: 5 percent.
 6. Tensile Strength: 34 lbf/inch in width.

2.10 SECUREMENTS

- A. Bands:
1. Products: Subject to compliance with requirements, available products that may be incorporated into the Work include, but are not limited to, the following:
 - a. ITW Insulation Systems; Gerrard Strapping and Seals.
 - b. RPR Products, Inc.; Insul-Mate Strapping, Seals, and Springs.
 2. Aluminum: ASTM B 209, Alloy 3003, 3005, 3105, or 5005; Temper H-14, 0.020 inch thick, 3/4 inch wide with wing or closed seal.
 3. Springs: Twin spring set constructed of stainless steel with ends flat and slotted to accept metal bands. Spring size determined by manufacturer for application.
- B. Insulation Pins and Hangers:
1. Capacitor-Discharge-Weld Pins: Copper- or zinc-coated steel pin, fully annealed for capacitor-discharge welding, 0.135-inch- diameter shank, length to suit depth of insulation indicated.
 - a. Products: Subject to compliance with requirements, provide one of the following:
 - 1) AGM Industries, Inc.; CWP-1.
 - 2) GEMCO; CD.
 - 3) Midwest Fasteners, Inc.; CD.
 - 4) Nelson Stud Welding; TPA, TPC, and TPS.
 2. Cupped-Head, Capacitor-Discharge-Weld Pins: Copper- or zinc-coated steel pin, fully annealed for capacitor-discharge welding, 0.135-inch- diameter shank, length to suit depth of insulation indicated with integral 1-1/2-inch galvanized carbon-steel washer.
 - a. Products: Subject to compliance with requirements, provide one of the following:
 - 1) AGM Industries, Inc.; CHP-1.
 - 2) GEMCO; Cupped Head Weld Pin.
 - 3) Midwest Fasteners, Inc.; Cupped Head.
 - 4) Nelson Stud Welding; CHP.
 3. Insulation-Retaining Washers: Self-locking washers formed from 0.016-inch- thick, aluminum sheet, with beveled edge sized as required to hold insulation securely in place but not less than 1-1/2 inches in diameter.
 - a. Products: Subject to compliance with requirements, provide one of the following:

- 1) AGM Industries, Inc.; RC-150.
 - 2) GEMCO; R-150.
 - 3) Midwest Fasteners, Inc.; WA-150.
 - 4) Nelson Stud Welding; Speed Clips.
 - b. Protect ends with capped self-locking washers incorporating a spring steel insert to ensure permanent retention of cap in exposed locations.
4. Nonmetal Insulation-Retaining Washers: Self-locking washers formed from 0.016-inch-thick nylon sheet, with beveled edge sized as required to hold insulation securely in place but not less than 1-1/2 inches in diameter.
 - a. Manufacturers: Subject to compliance with requirements, available manufacturers offering products that may be incorporated into the Work include, but are not limited to, the following:
 - 1) GEMCO.
 - 2) Midwest Fasteners, Inc.

2.11 CORNER ANGLES

- A. Aluminum Corner Angles: 0.040 inch thick, minimum 1 by 1 inch, aluminum according to ASTM B 209, Alloy 3003, 3005, 3105, or 5005; Temper H-14.
- B. Stainless-Steel Corner Angles: 0.024 inch thick, minimum 1 by 1 inch, stainless steel according to ASTM A 167 or ASTM A 240/A 240M, Type 304 or Type 316.

PART 3 - EXECUTION

3.1 EXAMINATION

- A. Examine substrates and conditions for compliance with requirements for installation tolerances and other conditions affecting performance of insulation application.
 1. Verify that systems to be insulated have been tested and are free of defects.
 2. Verify that surfaces to be insulated are clean and dry.
- B. Proceed with installation only after unsatisfactory conditions have been corrected.

3.2 PREPARATION

- A. Surface Preparation: Clean and dry surfaces to receive insulation. Remove materials that will adversely affect insulation application.

3.3 GENERAL INSTALLATION REQUIREMENTS

- A. Install insulation materials, accessories, and finishes with smooth, straight, and even surfaces; free of voids throughout the length of ducts and fittings.
- B. Install insulation materials, vapor barriers or retarders, jackets, and thicknesses required for each item of duct system as specified in insulation system schedules.
- C. Install accessories compatible with insulation materials and suitable for the service. Install accessories that do not corrode, soften, or otherwise attack insulation or jacket in either wet or dry state.
- D. Install insulation with longitudinal seams at top and bottom of horizontal runs.
- E. Install multiple layers of insulation with longitudinal and end seams staggered.
- F. Keep insulation materials dry during application and finishing.

- G. Install insulation with tight longitudinal seams and end joints. Bond seams and joints with adhesive recommended by insulation material manufacturer.
- H. Install insulation with least number of joints practical.
- I. Where vapor barrier is indicated, seal joints, seams, and penetrations in insulation at hangers, supports, anchors, and other projections with vapor-barrier mastic.
 - 1. Install insulation continuously through hangers and around anchor attachments.
 - 2. For insulation application where vapor barriers are indicated, extend insulation on anchor legs from point of attachment to supported item to point of attachment to structure. Taper and seal ends at attachment to structure with vapor-barrier mastic.
 - 3. Install insert materials and install insulation to tightly join the insert. Seal insulation to insulation inserts with adhesive or sealing compound recommended by insulation material manufacturer.
- J. Apply adhesives, mastics, and sealants at manufacturer's recommended coverage rate and wet and dry film thicknesses.
- K. Install insulation with factory-applied jackets as follows:
 - 1. Draw jacket tight and smooth.
 - 2. Cover circumferential joints with 3-inch- wide strips, of same material as insulation jacket. Secure strips with adhesive and outward clinching staples along both edges of strip, spaced 4 inches o.c.
 - 3. Overlap jacket longitudinal seams at least 1-1/2 inches. Clean and dry surface to receive self-sealing lap. Staple laps with outward clinching staples along edge at 4 inches o.c.
 - a. For below ambient services, apply vapor-barrier mastic over staples.
 - 4. Cover joints and seams with tape, according to insulation material manufacturer's written instructions, to maintain vapor seal.
 - 5. Where vapor barriers are indicated, apply vapor-barrier mastic on seams and joints and at ends adjacent to duct flanges and fittings.
- L. Cut insulation in a manner to avoid compressing insulation more than 75 percent of its nominal thickness.
- M. Finish installation with systems at operating conditions. Repair joint separations and cracking due to thermal movement.
- N. Repair damaged insulation facings by applying same facing material over damaged areas. Extend patches at least 4 inches beyond damaged areas. Adhere, staple, and seal patches similar to butt joints.

3.4 PENETRATIONS

- A. Insulation Installation at Roof Penetrations: Install insulation continuously through roof penetrations.
 - 1. Seal penetrations with flashing sealant.
 - 2. For applications requiring only indoor insulation, terminate insulation above roof surface and seal with joint sealant. For applications requiring indoor and outdoor insulation, install insulation for outdoor applications tightly joined to indoor insulation ends. Seal joint with joint sealant.
 - 3. Extend jacket of outdoor insulation outside roof flashing at least 2 inches below top of roof flashing.
 - 4. Seal jacket to roof flashing with flashing sealant.

- B. Insulation Installation at Aboveground Exterior Wall Penetrations: Install insulation continuously through wall penetrations.
 - 1. Seal penetrations with flashing sealant.
 - 2. For applications requiring only indoor insulation, terminate insulation inside wall surface and seal with joint sealant. For applications requiring indoor and outdoor insulation, install insulation for outdoor applications tightly joined to indoor insulation ends. Seal joint with joint sealant.
 - 3. Extend jacket of outdoor insulation outside wall flashing and overlap wall flashing at least 2 inches.
 - 4. Seal jacket to wall flashing with flashing sealant.
- C. Insulation Installation at Interior Wall and Partition Penetrations (That Are Not Fire Rated): Install insulation continuously through walls and partitions.
- D. Insulation Installation at Fire-Rated Wall and Partition Penetrations: Terminate insulation at fire damper sleeves for fire-rated wall and partition penetrations. Externally insulate damper sleeves to match adjacent insulation and overlap duct insulation at least 2 inches.
 - 1. Comply with requirements in Section 078413 "Penetration Firestopping" firestopping and fire-resistive joint sealers.
- E. Insulation Installation at Floor Penetrations:
 - 1. Duct: For penetrations through fire-rated assemblies, terminate insulation at fire damper sleeves and externally insulate damper sleeve beyond floor to match adjacent duct insulation. Overlap damper sleeve and duct insulation at least 2 inches.
 - 2. Seal penetrations through fire-rated assemblies. Comply with requirements in Section 078413 "Penetration Firestopping."

3.5 INSTALLATION OF INSULATION

- A. Blanket Insulation Installation on Ducts and Plenums: Secure with adhesive and insulation pins.
 - 1. Apply adhesives according to manufacturer's recommended coverage rates per unit area, for 100 percent coverage of duct and plenum surfaces.
 - 2. Apply adhesive to entire circumference of ducts and to all surfaces of fittings and transitions.
 - 3. Install either capacitor-discharge-weld pins and speed washers or cupped-head, capacitor-discharge-weld pins on sides and bottom of horizontal ducts and sides of vertical ducts as follows:
 - a. On duct sides with dimensions 18 inches and smaller, place pins along longitudinal centerline of duct. Space 3 inches maximum from insulation end joints, and 16 inches o.c.
 - b. On duct sides with dimensions larger than 18 inches, place pins 16 inches o.c. each way, and 3 inches maximum from insulation joints. Install additional pins to hold insulation tightly against surface at cross bracing.
 - c. Pins may be omitted from top surface of horizontal, rectangular ducts and plenums.
 - d. Do not overcompress insulation during installation.
 - e. Impale insulation over pins and attach speed washers.
 - f. Cut excess portion of pins extending beyond speed washers or bend parallel with insulation surface. Cover exposed pins and washers with tape matching insulation facing.
 - 4. For ducts and plenums with surface temperatures below ambient, install a continuous unbroken vapor barrier. Create a facing lap for longitudinal seams and end joints with insulation by removing 2 inches from one edge and one end of insulation segment.

- Secure laps to adjacent insulation section with 1/2-inch outward-clinching staples, 1 inch o.c. Install vapor barrier consisting of factory- or field-applied jacket, adhesive, vapor-barrier mastic, and sealant at joints, seams, and protrusions.
- a. Repair punctures, tears, and penetrations with tape or mastic to maintain vapor-barrier seal.
 - b. Install vapor stops for ductwork and plenums operating below 50 deg F at 18-foot intervals. Vapor stops shall consist of vapor-barrier mastic applied in a Z-shaped pattern over insulation face, along butt end of insulation, and over the surface. Cover insulation face and surface to be insulated a width equal to two times the insulation thickness, but not less than 3 inches.
5. Overlap unfaced blankets a minimum of 2 inches on longitudinal seams and end joints. At end joints, secure with steel bands spaced a maximum of 18 inches o.c.
 6. Install insulation on rectangular duct elbows and transitions with a full insulation section for each surface. Install insulation on round and flat-oval duct elbows with individually mitered gores cut to fit the elbow.
 7. Insulate duct stiffeners, hangers, and flanges that protrude beyond insulation surface with 6-inch- wide strips of same material used to insulate duct. Secure on alternating sides of stiffener, hanger, and flange with pins spaced 6 inches o.c.
- B. Board Insulation Installation on Ducts and Plenums: Secure with adhesive and insulation pins.
1. Apply adhesives according to manufacturer's recommended coverage rates per unit area, for 100 percent coverage of duct and plenum surfaces.
 2. Apply adhesive to entire circumference of ducts and to all surfaces of fittings and transitions.
 3. Install either capacitor-discharge-weld pins and speed washers or cupped-head, capacitor-discharge-weld pins on sides and bottom of horizontal ducts and sides of vertical ducts as follows:
 - a. On duct sides with dimensions 18 inches and smaller, place pins along longitudinal centerline of duct. Space 3 inches maximum from insulation end joints, and 16 inches o.c.
 - b. On duct sides with dimensions larger than 18 inches, space pins 16 inches o.c. each way, and 3 inches maximum from insulation joints. Install additional pins to hold insulation tightly against surface at cross bracing.
 - c. Pins may be omitted from top surface of horizontal, rectangular ducts and plenums.
 - d. Do not overcompress insulation during installation.
 - e. Cut excess portion of pins extending beyond speed washers or bend parallel with insulation surface. Cover exposed pins and washers with tape matching insulation facing.
 4. For ducts and plenums with surface temperatures below ambient, install a continuous unbroken vapor barrier. Create a facing lap for longitudinal seams and end joints with insulation by removing 2 inches from one edge and one end of insulation segment. Secure laps to adjacent insulation section with 1/2-inch outward-clinching staples, 1 inch o.c. Install vapor barrier consisting of factory- or field-applied jacket, adhesive, vapor-barrier mastic, and sealant at joints, seams, and protrusions.
 - a. Repair punctures, tears, and penetrations with tape or mastic to maintain vapor-barrier seal.
 - b. Install vapor stops for ductwork and plenums operating below 50 deg F at 18-foot intervals. Vapor stops shall consist of vapor-barrier mastic applied in a Z-shaped pattern over insulation face, along butt end of insulation, and over the

surface. Cover insulation face and surface to be insulated a width equal to two times the insulation thickness, but not less than 3 inches.

5. Install insulation on rectangular duct elbows and transitions with a full insulation section for each surface. Groove and score insulation to fit as closely as possible to outside and inside radius of elbows. Install insulation on round and flat-oval duct elbows with individually mitered gores cut to fit the elbow.
6. Insulate duct stiffeners, hangers, and flanges that protrude beyond insulation surface with 6-inch- wide strips of same material used to insulate duct. Secure on alternating sides of stiffener, hanger, and flange with pins spaced 6 inches o.c.

3.6 FIELD-APPLIED JACKET INSTALLATION

- A. Where glass-cloth jackets are indicated, install directly over bare insulation or insulation with factory-applied jackets.
 1. Draw jacket smooth and tight to surface with 2-inch overlap at seams and joints.
 2. Embed glass cloth between two 0.062-inch- thick coats of lagging adhesive.
 3. Completely encapsulate insulation with coating, leaving no exposed insulation.
- B. Where FSK jackets are indicated, install as follows:
 1. Draw jacket material smooth and tight.
 2. Install lap or joint strips with same material as jacket.
 3. Secure jacket to insulation with manufacturer's recommended adhesive.
 4. Install jacket with 1-1/2-inch laps at longitudinal seams and 3-inch- wide joint strips at end joints.
 5. Seal openings, punctures, and breaks in vapor-retarder jackets and exposed insulation with vapor-barrier mastic.
- C. Where PVC jackets are indicated, install with 1-inch overlap at longitudinal seams and end joints; for horizontal applications, install with longitudinal seams along top and bottom of tanks and vessels. Seal with manufacturer's recommended adhesive.
 1. Apply two continuous beads of adhesive to seams and joints, one bead under lap and the finish bead along seam and joint edge.
- D. Where metal jackets are indicated, install with 2-inch overlap at longitudinal seams and end joints. Overlap longitudinal seams arranged to shed water. Seal end joints with weatherproof sealant recommended by insulation manufacturer. Secure jacket with stainless-steel bands 12 inches o.c. and at end joints.

3.7 FINISHES

- A. Insulation with ASJ, Glass-Cloth, or Other Paintable Jacket Material: Paint jacket with paint system identified below and as specified in Section 099113 "Exterior Painting" and Section 099123 "Interior Painting."
 1. Flat Acrylic Finish: Two finish coats over a primer that is compatible with jacket material and finish coat paint. Add fungicidal agent to render fabric mildew proof.
 - a. Finish Coat Material: Interior, flat, latex-emulsion size.
- B. Flexible Elastomeric Thermal Insulation: After adhesive has fully cured, apply two coats of insulation manufacturer's recommended protective coating.
- C. Color: Final color as selected by Architect. Vary first and second coats to allow visual inspection of the completed Work.
- D. Do not field paint aluminum or stainless-steel jackets.

3.8 FIELD QUALITY CONTROL

- A. Tests and Inspections:
 - 1. Inspect ductwork, randomly selected by Architect, by removing field-applied jacket and insulation in layers in reverse order of their installation. Extent of inspection shall be limited to one location(s) for each duct system defined in the "Duct Insulation Schedule, General" Article.
- B. All insulation applications will be considered defective Work if sample inspection reveals noncompliance with requirements.

3.9 DUCT INSULATION SCHEDULE, GENERAL

- A. Plenums and Ducts Requiring Insulation:
 - 1. Indoor, concealed supply and outdoor air.
 - 2. Indoor, exposed supply and outdoor air.
 - 3. Indoor, concealed return located in unconditioned space.
 - 4. Indoor, exposed return located in unconditioned space.
 - 5. Indoor, concealed exhaust between isolation damper and penetration of building exterior.
 - 6. Indoor, exposed exhaust between isolation damper and penetration of building exterior.
 - 7. Outdoor, supply and return.
- B. Items Not Insulated:
 - 1. Metal ducts with duct liner of sufficient thickness to comply with energy code and ASHRAE/IESNA 90.1.
 - 2. Factory-insulated flexible ducts.
 - 3. Factory-insulated plenums and casings.
 - 4. Flexible connectors.
 - 5. Vibration-control devices.
 - 6. Factory-insulated access panels and doors.

3.10 INDOOR DUCT AND PLENUM INSULATION SCHEDULE

- A. Concealed, round and flat-oval, supply-air duct insulation shall be the following:
 - 1. Mineral-Fiber Blanket: 1-1/2 inches thick and 1.5-lb/cu. ft. nominal density.
- B. Concealed, round and flat-oval, return-air duct insulation shall be one of the following:
 - 1. Mineral-Fiber Blanket: 1-1/2 inches thick and 1.5-lb/cu. ft. nominal density.
- C. Concealed, round and flat-oval, outdoor-air duct insulation shall be the following:
 - 1. Mineral-Fiber Blanket: 1-1/2 inches thick and 1.5-lb/cu. ft. nominal density.
- D. Concealed, round and flat-oval, exhaust-air duct insulation shall be the following:
 - 1. Mineral-Fiber Blanket: 1-1/2 inches thick and 1.5-lb/cu. ft. nominal density.
- E. Concealed, rectangular, supply-air duct insulation shall be the following:
 - 1. Mineral-Fiber Blanket: 2 inches thick and 1.5-lb/cu. ft. nominal density.
- F. Concealed, rectangular, return-air duct insulation shall be the following:
 - 1. Mineral-Fiber Blanket: 1-1/2 inches thick and 1.5-lb/cu. ft. nominal density.
- G. Concealed, rectangular, outdoor-air duct insulation shall be the following:
 - 1. Mineral-Fiber Blanket: 2 inches thick and 1.5-lb/cu. ft. nominal density.
- H. Concealed, rectangular, exhaust-air duct insulation between isolation damper and penetration of building exterior shall be one of the following:
 - 1. Mineral-Fiber Blanket: 2 inches thick and 1.5-lb/cu. ft. nominal density.

- I. Concealed, return-air plenum insulation shall be the following:
 - 1. Mineral-Fiber Blanket: 2 inches thick and 1.5-lb/cu. ft. nominal density.
- J. Concealed, supply-air plenum insulation shall be the following:
 - 1. Mineral-Fiber Blanket: 2 inches thick and 1.5-lb/cu. ft. nominal density.
- K. Concealed, outdoor-air plenum insulation shall be the following:
 - 1. Mineral-Fiber Blanket: 2 inches thick and 1.5-lb/cu. ft. nominal density.
- L. Concealed, exhaust-air plenum insulation shall ~~be~~^{be the} the following:
 - 1. Mineral-Fiber Blanket: 2 inches thick and 1.5-lb/cu. ft. nominal density.
- M. Exposed, round and flat-oval, supply-air duct insulation shall be the following:
 - 1. Mineral-Fiber Blanket: 2 inches thick and 1.5-lb/cu. ft. nominal density.
- N. Exposed, round and flat-oval, return-air duct insulation shall be the following:
 - 1. Mineral-Fiber Blanket: 1-1/2 inches thick and 1.5-lb/cu. ft. nominal density.
- O. Exposed, round and flat-oval, outdoor-air duct insulation shall be the following:
 - 1. Mineral-Fiber Blanket: 2 inches thick and 1.5-lb/cu. ft. nominal density.
- P. Exposed, round and flat-oval, exhaust-air duct insulation shall ~~be~~^{be the} the following:
 - 1. Mineral-Fiber Blanket: 2 inches thick and 1.5-lb/cu. ft. nominal density.
- Q. Exposed, rectangular, supply-air duct insulation located in mech. Equipment rooms shall be the following:
 - 1. Mineral-Fiber Board: 2 inches thick and 3-lb/cu. ft. nominal density.
- R. Exposed, rectangular, return-air duct insulation shall be the following:
 - 1. Mineral-Fiber Board: 1-1/2 inches thick and 3-lb/cu. ft. nominal density.
- S. Exposed, rectangular, outdoor-air duct insulation shall be the following:
 - 1. Mineral-Fiber Board: 2 inches thick and 3-lb/cu. ft. nominal density.
- T. Exposed, rectangular, exhaust-air duct insulation shall be the following:
 - 1. Mineral-Fiber Board: 1-1/2 inches thick and 3-lb/cu. ft. nominal density.
- U. Exposed, supply-air plenum insulation shall be the following:
 - 1. Mineral-Fiber Board: 1-1/2 inches thick and 3-lb/cu. ft. nominal density.
- V. Exposed, return-air plenum insulation shall be the following:
 - 1. Mineral-Fiber Board: 1-1/2 inches thick and 3-lb/cu. ft. nominal density.
- W. Exposed, outdoor-air plenum insulation shall be the following:
 - 1. Mineral-Fiber Board: 2 inches thick and 3-lb/cu. ft. nominal density.
- X. Exposed, exhaust-air plenum insulation shall be the following:
 - 1. Mineral-Fiber Board: 2 inches thick and 3-lb/cu. ft. nominal density.

3.11 ABOVEGROUND, OUTDOOR DUCT AND PLENUM INSULATION SCHEDULE

- A. Insulation materials and thicknesses are identified below. If more than one material is listed for a duct system, selection from materials listed is Contractor's option.
- B. Rectangular and round, supply-air duct insulation shall be the following:
 - 1. Expanded Polyisocyanurate: 2 inches
 - 2. Number of Layers : One.
 - 3. Vapor Retarder Required: Yes.
- C. Rectangular, return-air duct insulation shall be the following:

1. Expanded Polyisocyanurate: 2 inches
2. Number of Layers: One.
3. Vapor Retarder Required: Yes.

3.12 OUTDOOR, FIELD-APPLIED JACKET SCHEDULE

- A. Install jacket over insulation material. For insulation with factory-applied jacket, install the field-applied jacket over the factory-applied jacket.
- B. If more than one material is listed, selection from materials listed is Contractor's option.
- C. Ducts and Plenums:
 1. Cover: 8oz. fabric with two coats of weather barrier mastic.
 2. Jacket: Aluminum, Corrugated: 0.032 inch thick.

END OF SECTION 230713

THIS PAGE INTENTIONALLY LEFT BLANK

SECTION 230719 - HVAC PIPING INSULATION

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

- A. Drawings and general provisions of the Contract, including General and Supplementary Conditions and Division 01 Specification Sections, apply to this Section.

1.2 SUMMARY

- A. Section includes insulating the following HVAC piping systems:
 - 1. Heating hot-water piping, indoors and outdoors.
 - 2. Refrigerant suction and hot-gas piping, indoors and outdoors.
- B. Related Sections:
 - 1. Section 230713 "Duct Insulation."

1.3 ACTION SUBMITTALS

- A. Product Data: For each type of product indicated. Include thermal conductivity, water-vapor permeance thickness, and jackets (both factory and field applied if any).

1.4 QUALITY ASSURANCE

- A. Surface-Burning Characteristics: For insulation and related materials, as determined by testing identical products according to ASTM E 84, by a testing and inspecting agency acceptable to authorities having jurisdiction. Factory label insulation and jacket materials and adhesive, mastic, tapes, and cement material containers, with appropriate markings of applicable testing agency.
 - 1. Insulation Installed Indoors: Flame-spread index of 25 or less, and smoke-developed index of 50 or less.
 - 2. Insulation Installed Outdoors: Flame-spread index of 75 or less, and smoke-developed index of 150 or less.

1.5 DELIVERY, STORAGE, AND HANDLING

- A. Packaging: Insulation material containers shall be marked by manufacturer with appropriate ASTM standard designation, type and grade, and maximum use temperature.

1.6 COORDINATION

- A. Coordinate sizes and locations of supports, hangers, and insulation shields specified in Section 230529 "Hangers and Supports for HVAC Piping and Equipment."
- B. Coordinate clearance requirements with piping Installer for piping insulation application. Before preparing piping Shop Drawings, establish and maintain clearance requirements for installation of insulation and field-applied jackets and finishes and for space required for maintenance.
- C. Coordinate installation and testing of heat tracing.

1.7 SCHEDULING

- A. Schedule insulation application after pressure testing systems and, where required, after installing and testing heat tracing. Insulation application may begin on segments that have satisfactory test results.

- B. Complete installation and concealment of plastic materials as rapidly as possible in each area of construction.

PART 2 - PRODUCTS

2.1 INSULATION MATERIALS

- A. Comply with requirements in "Piping Insulation Schedule, General," "Indoor Piping Insulation Schedule," "Outdoor, Aboveground Piping Insulation Schedule," and "Outdoor, Underground Piping Insulation Schedule" articles for where insulating materials shall be applied.
- B. Products shall not contain asbestos, lead, mercury, or mercury compounds.
- C. Products that come in contact with stainless steel shall have a leachable chloride content of less than 50 ppm when tested according to ASTM C 871.
- D. Insulation materials for use on austenitic stainless steel shall be qualified as acceptable according to ASTM C 795.
- E. Foam insulation materials shall not use CFC or HCFC blowing agents in the manufacturing process.
- F. Flexible Elastomeric Insulation: Closed-cell, sponge- or expanded-rubber materials. Comply with ASTM C 534, Type I for tubular materials.
1. Products: Subject to compliance with requirements, provide one of the following:
 - a. Aeroflex USA, Inc.; Aerocel.
 - b. Armacell LLC; AP Armaflex.
 - c. K-Flex USA; Insul-Lock, Insul-Tube, and K-FLEX LS.
- G. Mineral-Fiber, Preformed Pipe Insulation:
1. Products: Subject to compliance with requirements, provide one of the following:
 - a. Fibrex Insulations Inc.; Coreplus 1200.
 - b. Johns Manville; Micro-Lok.
 - c. Knauf Insulation; 1000-Degree Pipe Insulation.
 - d. Manson Insulation Inc.; Alley-K.
 - e. Owens Corning; Fiberglas Pipe Insulation.
 2. Type I, 850 deg F Materials: Mineral or glass fibers bonded with a thermosetting resin. Comply with ASTM C 547, Type I, Grade A, with factory-applied ASJ. Factory-applied jacket requirements are specified in "Factory-Applied Jackets" Article.
- H. Mineral-Fiber, Pipe Insulation Wicking System: Preformed pipe insulation complying with ASTM C 547, Type I, Grade A, with absorbent cloth factory-applied to the entire inside surface of preformed pipe insulation and extended through the longitudinal joint to outside surface of insulation under insulation jacket. Factory apply a white, polymer, vapor-retarder jacket with self-sealing adhesive tape seam and evaporation holes running continuously along the longitudinal seam, exposing the absorbent cloth.
1. Products: Subject to compliance with requirements, available products that may be incorporated into the Work include, but are not limited to, the following:
 - a. Knauf Insulation; Permawick Pipe Insulation.
 - b. Owens Corning; VaporWick Pipe Insulation.

2.2 INSULATING CEMENTS

- A. Mineral-Fiber Insulating Cement: Comply with ASTM C 195.

1. Products: Subject to compliance with requirements, available products that may be incorporated into the Work include, but are not limited to, the following:
 - a. Ramco Insulation, Inc.; Super-Stik.
- B. Expanded or Exfoliated Vermiculite Insulating Cement: Comply with ASTM C 196.
 1. Products: Subject to compliance with requirements, available products that may be incorporated into the Work include, but are not limited to, the following:
 - a. Ramco Insulation, Inc.; Thermokote V.
- C. Mineral-Fiber, Hydraulic-Setting Insulating and Finishing Cement: Comply with ASTM C 449.
 1. Products: Subject to compliance with requirements, available products that may be incorporated into the Work include, but are not limited to, the following:
 - a. Ramco Insulation, Inc.; Ramcote 1200 and Quik-Cote.

2.3 ADHESIVES

- A. Materials shall be compatible with insulation materials, jackets, and substrates and for bonding insulation to itself and to surfaces to be insulated unless otherwise indicated.
- B. Flexible Elastomeric and Polyolefin Adhesive: Comply with MIL-A-24179A, Type II, Class I.
 1. Products: Subject to compliance with requirements, provide one of the following:
 - a. Aeroflex USA, Inc.; Aero seal.
 - b. Armacell LLC; Armaflex 520 Adhesive.
 - c. Foster Brand, Specialty Construction Brands, Inc., a business of H. B. Fuller Company; 85-75.
 - d. K-Flex USA; R-373 Contact Adhesive.
 2. For indoor applications, adhesive shall have a VOC content of 50 g/L or less when calculated according to 40 CFR 59, Subpart D (EPA Method 24).
 3. Adhesive shall comply with the testing and product requirements of the California Department of Health Services' "Standard Practice for the Testing of Volatile Organic Emissions from Various Sources Using Small-Scale Environmental Chambers."
- C. Mineral-Fiber Adhesive: Comply with MIL-A-3316C, Class 2, Grade A.
 1. Products: Subject to compliance with requirements, provide one of the following:
 - a. Childers Brand, Specialty Construction Brands, Inc., a business of H. B. Fuller Company; CP-127.
 - b. Eagle Bridges - Marathon Industries; 225.
 - c. Foster Brand, Specialty Construction Brands, Inc., a business of H. B. Fuller Company; 85-60/85-70.
 - d. Mon-Eco Industries, Inc.; 22-25.
 2. For indoor applications, adhesive shall have a VOC content of 80 g/L or less when calculated according to 40 CFR 59, Subpart D (EPA Method 24).
 3. Adhesive shall comply with the testing and product requirements of the California Department of Health Services' "Standard Practice for the Testing of Volatile Organic Emissions from Various Sources Using Small-Scale Environmental Chambers."
- D. ASJ Adhesive, and FSK and PVDC Jacket Adhesive: Comply with MIL-A-3316C, Class 2, Grade A for bonding insulation jacket lap seams and joints.
 1. Products: Subject to compliance with requirements, provide one of the following:
 - a. Childers Brand, Specialty Construction Brands, Inc., a business of H. B. Fuller Company; CP-82.
 - b. Eagle Bridges - Marathon Industries; 225.
 - c. Foster Brand, Specialty Construction Brands, Inc., a business of H. B. Fuller Company; 85-50.

- d. Mon-Eco Industries, Inc.; 22-25.
 2. For indoor applications, adhesive shall have a VOC content of 50 g/L or less when calculated according to 40 CFR 59, Subpart D (EPA Method 24).
 3. Adhesive shall comply with the testing and product requirements of the California Department of Health Services' "Standard Practice for the Testing of Volatile Organic Emissions from Various Sources Using Small-Scale Environmental Chambers."
- E. PVC Jacket Adhesive: Compatible with PVC jacket.
1. Products: Subject to compliance with requirements, provide one of the following:
 - a. Dow Corning Corporation; 739, Dow Silicone.
 - b. Johns Manville; Zeston Perma-Weld, CEEL-TITE Solvent Welding Adhesive.
 - c. P.I.C. Plastics, Inc.; Welding Adhesive.
 - d. Speedline Corporation; Polyco VP Adhesive.
 2. For indoor applications, adhesive shall have a VOC content of 50 g/L or less when calculated according to 40 CFR 59, Subpart D (EPA Method 24).
 3. Adhesive shall comply with the testing and product requirements of the California Department of Health Services' "Standard Practice for the Testing of Volatile Organic Emissions from Various Sources Using Small-Scale Environmental Chambers."

2.4 MASTICS

- A. Materials shall be compatible with insulation materials, jackets, and substrates; comply with MIL-PRF-19565C, Type II.
1. For indoor applications, use mastics that have a VOC content of 50 g/L or less when calculated according to 40 CFR 59, Subpart D (EPA Method 24).
- B. Vapor-Barrier Mastic: Water based; suitable for indoor use on below-ambient services.
1. Products: Subject to compliance with requirements, provide one of the following:
 - a. Foster Brand, Specialty Construction Brands, Inc., a business of H. B. Fuller Company; 30-80/30-90.
 - b. Vimasco Corporation; 749.
 2. Water-Vapor Permeance: ASTM E 96/E 96M, Procedure B, 0.013 perm at 43-mil dry film thickness.
 3. Service Temperature Range: Minus 20 to plus 180 deg F.
 4. Solids Content: ASTM D 1644, 58 percent by volume and 70 percent by weight.
 5. Color: White.
- C. Vapor-Barrier Mastic: Solvent based; suitable for indoor use on below-ambient services.
1. Products: Subject to compliance with requirements, provide one of the following:
 - a. Childers Brand, Specialty Construction Brands, Inc., a business of H. B. Fuller Company; CP-30.
 - b. Eagle Bridges - Marathon Industries; 501.
 - c. Foster Brand, Specialty Construction Brands, Inc., a business of H. B. Fuller Company; 30-35.
 - d. Mon-Eco Industries, Inc.; 55-10.
 2. Water-Vapor Permeance: ASTM F 1249, 0.05 perm at 35-mil dry film thickness.
 3. Service Temperature Range: 0 to 180 deg F.
 4. Solids Content: ASTM D 1644, 44 percent by volume and 62 percent by weight.
 5. Color: White.
- D. Vapor-Barrier Mastic: Solvent based; suitable for outdoor use on below-ambient services.
1. Products: Subject to compliance with requirements, provide one of the following:

- a. Childers Brand, Specialty Construction Brands, Inc., a business of H. B. Fuller Company; Encacel.
 - b. Eagle Bridges - Marathon Industries; 570.
 - c. Foster Brand, Specialty Construction Brands, Inc., a business of H. B. Fuller Company; 60-95/60-96.
 2. Water-Vapor Permeance: ASTM F 1249, 0.05 perm at 30-mil dry film thickness.
 3. Service Temperature Range: Minus 50 to plus 220 deg F.
 4. Solids Content: ASTM D 1644, 33 percent by volume and 46 percent by weight.
 5. Color: White.
- E. Breather Mastic: Water based; suitable for indoor and outdoor use on above-ambient services.
1. Products: Subject to compliance with requirements, provide one of the following:
 - a. Childers Brand, Specialty Construction Brands, Inc., a business of H. B. Fuller Company; CP-10.
 - b. Eagle Bridges - Marathon Industries; 550.
 - c. Foster Brand, Specialty Construction Brands, Inc., a business of H. B. Fuller Company; 46-50.
 - d. Mon-Eco Industries, Inc.; 55-50.
 - e. Vimasco Corporation; WC-1/WC-5.
 2. Water-Vapor Permeance: ASTM F 1249, 1.8 perms at 0.0625-inch dry film thickness.
 3. Service Temperature Range: Minus 20 to plus 180 deg F.
 4. Solids Content: 60 percent by volume and 66 percent by weight.
 5. Color: White.

2.5 LAGGING ADHESIVES

- A. Description: Comply with MIL-A-3316C, Class I, Grade A and shall be compatible with insulation materials, jackets, and substrates.
1. For indoor applications, use lagging adhesives that have a VOC content of 50 g/L or less when calculated according to 40 CFR 59, Subpart D (EPA Method 24).
 2. Products: Subject to compliance with requirements, provide one of the following:
 - a. Childers Brand, Specialty Construction Brands, Inc., a business of H. B. Fuller Company; CP-50 AHV2.
 - b. Foster Brand, Specialty Construction Brands, Inc., a business of H. B. Fuller Company; 30-36.
 - c. Vimasco Corporation; 713 and 714.
 3. Fire-resistant, water-based lagging adhesive and coating for use indoors to adhere fire-resistant lagging cloths over pipe insulation.
 4. Service Temperature Range: 0 to plus 180 deg F.
 5. Color: White.

2.6 SEALANTS

- A. Joint Sealants:
1. Joint Sealants for Cellular-Glass, Phenolic, and Polyisocyanurate Products: Subject to compliance with requirements, provide one of the following:
 - a. Childers Brand, Specialty Construction Brands, Inc., a business of H. B. Fuller Company; CP-76.
 - b. Eagle Bridges - Marathon Industries; 405.
 - c. Foster Brand, Specialty Construction Brands, Inc., a business of H. B. Fuller Company; 30-45.
 - d. Mon-Eco Industries, Inc.; 44-05.

- e. Pittsburgh Corning Corporation; Pittseal 444.
 2. Joint Sealants for Polystyrene Products: Subject to compliance with requirements, provide one of the following:
 - a. Childers Brand, Specialty Construction Brands, Inc., a business of H. B. Fuller Company; CP-70.
 - b. Eagle Bridges - Marathon Industries; 405.
 - c. Foster Brand, Specialty Construction Brands, Inc., a business of H. B. Fuller Company; 30-45.
 - d. Mon-Eco Industries, Inc.; 44-05.
 3. Materials shall be compatible with insulation materials, jackets, and substrates.
 4. Permanently flexible, elastomeric sealant.
 5. Service Temperature Range: Minus 100 to plus 300 deg F.
 6. Color: White or gray.
 7. For indoor applications, sealants shall have a VOC content of 420 g/L or less when calculated according to 40 CFR 59, Subpart D (EPA Method 24).
 8. Sealants shall comply with the testing and product requirements of the California Department of Health Services' "Standard Practice for the Testing of Volatile Organic Emissions from Various Sources Using Small-Scale Environmental Chambers."
- B. FSK and Metal Jacket Flashing Sealants:
 1. Products: Subject to compliance with requirements, provide one of the following:
 - a. Childers Brand, Specialty Construction Brands, Inc., a business of H. B. Fuller Company; CP-76.
 - b. Eagle Bridges - Marathon Industries; 405.
 - c. Foster Brand, Specialty Construction Brands, Inc., a business of H. B. Fuller Company; 95-44.
 - d. Mon-Eco Industries, Inc.; 44-05.
 2. Materials shall be compatible with insulation materials, jackets, and substrates.
 3. Fire- and water-resistant, flexible, elastomeric sealant.
 4. Service Temperature Range: Minus 40 to plus 250 deg F.
 5. Color: Aluminum.
 6. For indoor applications, sealants shall have a VOC content of 420 g/L or less when calculated according to 40 CFR 59, Subpart D (EPA Method 24).
 7. Sealants shall comply with the testing and product requirements of the California Department of Health Services' "Standard Practice for the Testing of Volatile Organic Emissions from Various Sources Using Small-Scale Environmental Chambers."
- C. ASJ Flashing Sealants, and Vinyl, PVDC, and PVC Jacket Flashing Sealants:
 1. Products: Subject to compliance with requirements, provide one of the following:
 - a. Childers Brand, Specialty Construction Brands, Inc., a business of H. B. Fuller Company; CP-76.
 2. Materials shall be compatible with insulation materials, jackets, and substrates.
 3. Fire- and water-resistant, flexible, elastomeric sealant.
 4. Service Temperature Range: Minus 40 to plus 250 deg F.
 5. Color: White.
 6. For indoor applications, sealants shall have a VOC content of 420 g/L or less when calculated according to 40 CFR 59, Subpart D (EPA Method 24).
 7. Sealants shall comply with the testing and product requirements of the California Department of Health Services' "Standard Practice for the Testing of Volatile Organic Emissions from Various Sources Using Small-Scale Environmental Chambers."

2.7 FACTORY-APPLIED JACKETS

- A. Insulation system schedules indicate factory-applied jackets on various applications. When factory-applied jackets are indicated, comply with the following:
1. ASJ: White, kraft-paper, fiberglass-reinforced scrim with aluminum-foil backing; complying with ASTM C 1136, Type I.

2.8 FIELD-APPLIED CLOTHS

- A. Woven Glass-Fiber Fabric: Comply with MIL-C-20079H, Type I, plain weave, and presized a minimum of 8 oz./sq. yd..
1. Products: Subject to compliance with requirements, available products that may be incorporated into the Work include, but are not limited to, the following:
 - a. Alpha Associates, Inc.; Alpha-Maritex 84215 and 84217/9485RW, Luben 59.

2.9 FIELD-APPLIED JACKETS

- A. Field-applied jackets shall comply with ASTM C 921, Type I, unless otherwise indicated.
- B. PVC Jacket: High-impact-resistant, UV-resistant PVC complying with ASTM D 1784, Class 16354-C; thickness as scheduled; roll stock ready for shop or field cutting and forming. Thickness is indicated in field-applied jacket schedules.
1. Products: Subject to compliance with requirements, provide one of the following:
 - a. Johns Manville; Zeston.
 - b. P.I.C. Plastics, Inc.; FG Series.
 - c. Proto Corporation; LoSmoke.
 - d. Speedline Corporation; SmokeSafe.
 2. Adhesive: As recommended by jacket material manufacturer.
 3. Color: White.
 4. Factory-fabricated fitting covers to match jacket if available; otherwise, field fabricate.
 - a. Shapes: 45- and 90-degree, short- and long-radius elbows, tees, valves, flanges, unions, reducers, end caps, soil-pipe hubs, traps, mechanical joints, and P-trap and supply covers for lavatories.
- C. Metal Jacket:
1. Products: Subject to compliance with requirements, provide one of the following:
 - a. Childers Brand, Specialty Construction Brands, Inc., a business of H. B. Fuller Company; Metal Jacketing Systems.
 - b. ITW Insulation Systems; Aluminum and Stainless Steel Jacketing.
 - c. RPR Products, Inc.; Insul-Mate.
 2. Aluminum Jacket: Comply with ASTM B 209, Alloy 3003, 3005, 3105, or 5005, Temper H-14.
 - a. Factory cut and rolled to size.
 - b. Finish and thickness are indicated in field-applied jacket schedules.
 - c. Moisture Barrier for Outdoor Applications: 3-mil- thick, heat-bonded polyethylene and kraft paper.
 - d. Factory-Fabricated Fitting Covers:
 - 1) Same material, finish, and thickness as jacket.
 - 2) Preformed 2-piece or gore, 45- and 90-degree, short- and long-radius elbows.
 - 3) Tee covers.
 - 4) Flange and union covers.
 - 5) End caps.

- 6) Beveled collars.
- 7) Valve covers.
- 8) Field fabricate fitting covers only if factory-fabricated fitting covers are not available.

2.10 TAPES

- A. ASJ Tape: White vapor-retarder tape matching factory-applied jacket with acrylic adhesive, complying with ASTM C 1136.
 1. Products: Subject to compliance with requirements, provide one of the following:
 - a. ABI, Ideal Tape Division; 428 AWF ASJ.
 - b. Avery Dennison Corporation, Specialty Tapes Division; Fasson 0836.
 - c. Compac Corporation; 104 and 105.
 - d. Venture Tape; 1540 CW Plus, 1542 CW Plus, and 1542 CW Plus/SQ.
 2. Width: 3 inches.
 3. Thickness: 11.5 mils.
 4. Adhesion: 90 ounces force/inch in width.
 5. Elongation: 2 percent.
 6. Tensile Strength: 40 lbf/inch in width.
 7. ASJ Tape Disks and Squares: Precut disks or squares of ASJ tape.
- B. PVC Tape: White vapor-retarder tape matching field-applied PVC jacket with acrylic adhesive; suitable for indoor and outdoor applications.
 1. Products: Subject to compliance with requirements, provide one of the following:
 - a. ABI, Ideal Tape Division; 370 White PVC tape.
 - b. Compac Corporation; 130.
 - c. Venture Tape; 1506 CW NS.
 2. Width: 2 inches.
 3. Thickness: 6 mils.
 4. Adhesion: 64 ounces force/inch in width.
 5. Elongation: 500 percent.
 6. Tensile Strength: 18 lbf/inch in width.

2.11 SECUREMENTS

- A. Bands:
 1. Products: Subject to compliance with requirements, available products that may be incorporated into the Work include, but are not limited to, the following:
 - a. ITW Insulation Systems; Gerrard Strapping and Seals.
 - b. RPR Products, Inc.; Insul-Mate Strapping, Seals, and Springs.
 2. Aluminum: ASTM B 209, Alloy 3003, 3005, 3105, or 5005; Temper H-14, 0.020 inch thick, 1/2 inch wide with wing seal or closed seal.
- B. Staples: Outward-clinching insulation staples, nominal 3/4-inch- wide, stainless steel or Monel.

PART 3 - EXECUTION

3.1 EXAMINATION

- A. Examine substrates and conditions for compliance with requirements for installation tolerances and other conditions affecting performance of insulation application.
 1. Verify that systems to be insulated have been tested and are free of defects.
 2. Verify that surfaces to be insulated are clean and dry.

3. Proceed with installation only after unsatisfactory conditions have been corrected.

3.2 PREPARATION

- A. Surface Preparation: Clean and dry surfaces to receive insulation. Remove materials that will adversely affect insulation application.
- B. Surface Preparation: Clean and prepare surfaces to be insulated. Before insulating, apply a corrosion coating to insulated surfaces as follows:
 1. Stainless Steel: Coat 300 series stainless steel with an epoxy primer 5 mils thick and an epoxy finish 5 mils thick if operating in a temperature range between 140 and 300 deg F. Consult coating manufacturer for appropriate coating materials and application methods for operating temperature range.
 2. Carbon Steel: Coat carbon steel operating at a service temperature between 32 and 300 deg F with an epoxy coating. Consult coating manufacturer for appropriate coating materials and application methods for operating temperature range.
- C. Coordinate insulation installation with the trade installing heat tracing. Comply with requirements for heat tracing that apply to insulation.
- D. Mix insulating cements with clean potable water; if insulating cements are to be in contact with stainless-steel surfaces, use demineralized water.

3.3 GENERAL INSTALLATION REQUIREMENTS

- A. Install insulation materials, accessories, and finishes with smooth, straight, and even surfaces; free of voids throughout the length of piping including fittings, valves, and specialties.
- B. Install insulation materials, forms, vapor barriers or retarders, jackets, and thicknesses required for each item of pipe system as specified in insulation system schedules.
- C. Install accessories compatible with insulation materials and suitable for the service. Install accessories that do not corrode, soften, or otherwise attack insulation or jacket in either wet or dry state.
- D. Install insulation with longitudinal seams at top and bottom of horizontal runs.
- E. Install multiple layers of insulation with longitudinal and end seams staggered.
- F. Do not weld brackets, clips, or other attachment devices to piping, fittings, and specialties.
- G. Keep insulation materials dry during application and finishing.
- H. Install insulation with tight longitudinal seams and end joints. Bond seams and joints with adhesive recommended by insulation material manufacturer.
- I. Install insulation with least number of joints practical.
- J. Where vapor barrier is indicated, seal joints, seams, and penetrations in insulation at hangers, supports, anchors, and other projections with vapor-barrier mastic.
 1. Install insulation continuously through hangers and around anchor attachments.
 2. For insulation application where vapor barriers are indicated, extend insulation on anchor legs from point of attachment to supported item to point of attachment to structure. Taper and seal ends at attachment to structure with vapor-barrier mastic.
 3. Install insert materials and install insulation to tightly join the insert. Seal insulation to insulation inserts with adhesive or sealing compound recommended by insulation material manufacturer.

4. Cover inserts with jacket material matching adjacent pipe insulation. Install shields over jacket, arranged to protect jacket from tear or puncture by hanger, support, and shield.
- K. Apply adhesives, mastics, and sealants at manufacturer's recommended coverage rate and wet and dry film thicknesses.
- L. Install insulation with factory-applied jackets as follows:
 1. Draw jacket tight and smooth.
 2. Cover circumferential joints with 3-inch- wide strips, of same material as insulation jacket. Secure strips with adhesive and outward clinching staples along both edges of strip, spaced 4 inches o.c.
 3. Overlap jacket longitudinal seams at least 1-1/2 inches. Install insulation with longitudinal seams at bottom of pipe. Clean and dry surface to receive self-sealing lap. Staple laps with outward clinching staples along edge at 2 inches o.c.
 - a. For below-ambient services, apply vapor-barrier mastic over staples.
 4. Cover joints and seams with tape, according to insulation material manufacturer's written instructions, to maintain vapor seal.
 5. Where vapor barriers are indicated, apply vapor-barrier mastic on seams and joints and at ends adjacent to pipe flanges and fittings.
- M. Cut insulation in a manner to avoid compressing insulation more than 75 percent of its nominal thickness.
- N. Finish installation with systems at operating conditions. Repair joint separations and cracking due to thermal movement.
- O. Repair damaged insulation facings by applying same facing material over damaged areas. Extend patches at least 4 inches beyond damaged areas. Adhere, staple, and seal patches similar to butt joints.
- P. For above-ambient services, do not install insulation to the following:
 1. Vibration-control devices.
 2. Testing agency labels and stamps.
 3. Nameplates and data plates.
 4. Manholes.
 5. Handholes.
 6. Cleanouts.

3.4 PENETRATIONS

- A. Insulation Installation at Roof Penetrations: Install insulation continuously through roof penetrations.
 1. Seal penetrations with flashing sealant.
 2. For applications requiring only indoor insulation, terminate insulation above roof surface and seal with joint sealant. For applications requiring indoor and outdoor insulation, install insulation for outdoor applications tightly joined to indoor insulation ends. Seal joint with joint sealant.
 3. Extend jacket of outdoor insulation outside roof flashing at least 2 inches below top of roof flashing.
 4. Seal jacket to roof flashing with flashing sealant.
- B. Insulation Installation at Underground Exterior Wall Penetrations: Terminate insulation flush with sleeve seal. Seal terminations with flashing sealant.

- C. Insulation Installation at Aboveground Exterior Wall Penetrations: Install insulation continuously through wall penetrations.
 - 1. Seal penetrations with flashing sealant.
 - 2. For applications requiring only indoor insulation, terminate insulation inside wall surface and seal with joint sealant. For applications requiring indoor and outdoor insulation, install insulation for outdoor applications tightly joined to indoor insulation ends. Seal joint with joint sealant.
 - 3. Extend jacket of outdoor insulation outside wall flashing and overlap wall flashing at least 2 inches.
 - 4. Seal jacket to wall flashing with flashing sealant.
- D. Insulation Installation at Interior Wall and Partition Penetrations (That Are Not Fire Rated): Install insulation continuously through walls and partitions.
- E. Insulation Installation at Fire-Rated Wall and Partition Penetrations: Install insulation continuously through penetrations of fire-rated walls and partitions.
 - 1. Comply with requirements in Section 078413 "Penetration Firestopping" for firestopping and fire-resistive joint sealers.
- F. Insulation Installation at Floor Penetrations:
 - 1. Pipe: Install insulation continuously through floor penetrations.
 - 2. Seal penetrations through fire-rated assemblies. Comply with requirements in Section 078413 "Penetration Firestopping."

3.5 GENERAL PIPE INSULATION INSTALLATION

- A. Requirements in this article generally apply to all insulation materials except where more specific requirements are specified in various pipe insulation material installation articles.
- B. Insulation Installation on Fittings, Valves, Strainers, Flanges, and Unions:
 - 1. Install insulation over fittings, valves, strainers, flanges, unions, and other specialties with continuous thermal and vapor-retarder integrity unless otherwise indicated.
 - 2. Insulate pipe elbows using preformed fitting insulation or mitered fittings made from same material and density as adjacent pipe insulation. Each piece shall be butted tightly against adjoining piece and bonded with adhesive. Fill joints, seams, voids, and irregular surfaces with insulating cement finished to a smooth, hard, and uniform contour that is uniform with adjoining pipe insulation.
 - 3. Insulate tee fittings with preformed fitting insulation or sectional pipe insulation of same material and thickness as used for adjacent pipe. Cut sectional pipe insulation to fit. Butt each section closely to the next and hold in place with tie wire. Bond pieces with adhesive.
 - 4. Insulate valves using preformed fitting insulation or sectional pipe insulation of same material, density, and thickness as used for adjacent pipe. Overlap adjoining pipe insulation by not less than two times the thickness of pipe insulation, or one pipe diameter, whichever is thicker. For valves, insulate up to and including the bonnets, valve stuffing-box studs, bolts, and nuts. Fill joints, seams, and irregular surfaces with insulating cement.
 - 5. Insulate strainers using preformed fitting insulation or sectional pipe insulation of same material, density, and thickness as used for adjacent pipe. Overlap adjoining pipe insulation by not less than two times the thickness of pipe insulation, or one pipe diameter, whichever is thicker. Fill joints, seams, and irregular surfaces with insulating cement. Insulate strainers so strainer basket flange or plug can be easily removed and replaced without damaging the insulation and jacket. Provide a removable reusable

- insulation cover. For below-ambient services, provide a design that maintains vapor barrier.
6. Insulate flanges and unions using a section of oversized preformed pipe insulation. Overlap adjoining pipe insulation by not less than two times the thickness of pipe insulation, or one pipe diameter, whichever is thicker.
 7. Cover segmented insulated surfaces with a layer of finishing cement and coat with a mastic. Install vapor-barrier mastic for below-ambient services and a breather mastic for above-ambient services. Reinforce the mastic with fabric-reinforcing mesh. Trowel the mastic to a smooth and well-shaped contour.
 8. For services not specified to receive a field-applied jacket except for flexible elastomeric and polyolefin, install fitted PVC cover over elbows, tees, strainers, valves, flanges, and unions. Terminate ends with PVC end caps. Tape PVC covers to adjoining insulation facing using PVC tape.
 9. Stencil or label the outside insulation jacket of each union with the word "union." Match size and color of pipe labels.
- C. Insulate instrument connections for thermometers, pressure gages, pressure temperature taps, test connections, flow meters, sensors, switches, and transmitters on insulated pipes. Shape insulation at these connections by tapering it to and around the connection with insulating cement and finish with finishing cement, mastic, and flashing sealant.
- D. Install removable insulation covers at locations indicated. Installation shall conform to the following:
1. Make removable flange and union insulation from sectional pipe insulation of same thickness as that on adjoining pipe. Install same insulation jacket as adjoining pipe insulation.
 2. When flange and union covers are made from sectional pipe insulation, extend insulation from flanges or union long at least two times the insulation thickness over adjacent pipe insulation on each side of flange or union. Secure flange cover in place with stainless-steel or aluminum bands. Select band material compatible with insulation and jacket.
 3. Construct removable valve insulation covers in same manner as for flanges, except divide the two-part section on the vertical center line of valve body.
 4. When covers are made from block insulation, make two halves, each consisting of mitered blocks wired to stainless-steel fabric. Secure this wire frame, with its attached insulation, to flanges with tie wire. Extend insulation at least 2 inches over adjacent pipe insulation on each side of valve. Fill space between flange or union cover and pipe insulation with insulating cement. Finish cover assembly with insulating cement applied in two coats. After first coat is dry, apply and trowel second coat to a smooth finish.
 5. Unless a PVC jacket is indicated in field-applied jacket schedules, finish exposed surfaces with a metal jacket.

3.6 INSTALLATION OF FLEXIBLE ELASTOMERIC INSULATION

- A. Seal longitudinal seams and end joints with manufacturer's recommended adhesive to eliminate openings in insulation that allow passage of air to surface being insulated.
- B. Insulation Installation on Pipe Flanges:
1. Install pipe insulation to outer diameter of pipe flange.
 2. Make width of insulation section same as overall width of flange and bolts, plus twice the thickness of pipe insulation.
 3. Fill voids between inner circumference of flange insulation and outer circumference of adjacent straight pipe segments with cut sections of sheet insulation of same thickness as pipe insulation.

4. Secure insulation to flanges and seal seams with manufacturer's recommended adhesive to eliminate openings in insulation that allow passage of air to surface being insulated.
- C. Insulation Installation on Pipe Fittings and Elbows:
 1. Install mitered sections of pipe insulation.
 2. Secure insulation materials and seal seams with manufacturer's recommended adhesive to eliminate openings in insulation that allow passage of air to surface being insulated.
- D. Insulation Installation on Valves and Pipe Specialties:
 1. Install preformed valve covers manufactured of same material as pipe insulation when available.
 2. When preformed valve covers are not available, install cut sections of pipe and sheet insulation to valve body. Arrange insulation to permit access to packing and to allow valve operation without disturbing insulation.
 3. Install insulation to flanges as specified for flange insulation application.
 4. Secure insulation to valves and specialties and seal seams with manufacturer's recommended adhesive to eliminate openings in insulation that allow passage of air to surface being insulated.

3.7 INSTALLATION OF MINERAL-FIBER INSULATION

- A. Insulation Installation on Straight Pipes and Tubes:
 1. Secure each layer of preformed pipe insulation to pipe with wire or bands and tighten bands without deforming insulation materials.
 2. Where vapor barriers are indicated, seal longitudinal seams, end joints, and protrusions with vapor-barrier mastic and joint sealant.
 3. For insulation with factory-applied jackets on above-ambient surfaces, secure laps with outward-clinched staples at 6 inches o.c.
 4. For insulation with factory-applied jackets on below-ambient surfaces, do not staple longitudinal tabs. Instead, secure tabs with additional adhesive as recommended by insulation material manufacturer and seal with vapor-barrier mastic and flashing sealant.
- B. Insulation Installation on Pipe Flanges:
 1. Install preformed pipe insulation to outer diameter of pipe flange.
 2. Make width of insulation section same as overall width of flange and bolts, plus twice the thickness of pipe insulation.
 3. Fill voids between inner circumference of flange insulation and outer circumference of adjacent straight pipe segments with mineral-fiber blanket insulation.
 4. Install jacket material with manufacturer's recommended adhesive, overlap seams at least 1 inch, and seal joints with flashing sealant.
- C. Insulation Installation on Pipe Fittings and Elbows:
 1. Install preformed sections of same material as straight segments of pipe insulation when available.
 2. When preformed insulation elbows and fittings are not available, install mitered sections of pipe insulation, to a thickness equal to adjoining pipe insulation. Secure insulation materials with wire or bands.
- D. Insulation Installation on Valves and Pipe Specialties:
 1. Install preformed sections of same material as straight segments of pipe insulation when available.
 2. When preformed sections are not available, install mitered sections of pipe insulation to valve body.

3. Arrange insulation to permit access to packing and to allow valve operation without disturbing insulation.
4. Install insulation to flanges as specified for flange insulation application.

3.8 FIELD-APPLIED JACKET INSTALLATION

- A. Where glass-cloth jackets are indicated, install directly over bare insulation or insulation with factory-applied jackets.
 1. Draw jacket smooth and tight to surface with 2-inch overlap at seams and joints.
 2. Embed glass cloth between two 0.062-inch- thick coats of lagging adhesive.
 3. Completely encapsulate insulation with coating, leaving no exposed insulation.
- B. Where PVC jackets are indicated, install with 1-inch overlap at longitudinal seams and end joints; for horizontal applications. Seal with manufacturer's recommended adhesive.
 1. Apply two continuous beads of adhesive to seams and joints, one bead under lap and the finish bead along seam and joint edge.
- C. Where metal jackets are indicated, install with 2-inch overlap at longitudinal seams and end joints. Overlap longitudinal seams arranged to shed water. Seal end joints with weatherproof sealant recommended by insulation manufacturer. Secure jacket with stainless-steel bands 12 inches o.c. and at end joints.

3.9 FINISHES

- A. Pipe Insulation with ASJ, Glass-Cloth, or Other Paintable Jacket Material: Paint jacket with paint system identified below and as specified in Section 099113 "Exterior Painting" and Section 099123 "Interior Painting."
 1. Flat Acrylic Finish: Two finish coats over a primer that is compatible with jacket material and finish coat paint. Add fungicidal agent to render fabric mildew proof.
 - a. Finish Coat Material: Interior, flat, latex-emulsion size.
- B. Flexible Elastomeric Thermal Insulation: After adhesive has fully cured, apply two coats of insulation manufacturer's recommended protective coating.
- C. Color: Final color as selected by Architect. Vary first and second coats to allow visual inspection of the completed Work.
- D. Do not field paint aluminum or stainless-steel jackets.

3.10 FIELD QUALITY CONTROL

- A. Tests and Inspections:
 1. Inspect pipe, fittings, strainers, and valves, randomly selected by Architect, by removing field-applied jacket and insulation in layers in reverse order of their installation. Extent of inspection shall be limited to three locations of straight pipe, three locations of threaded fittings, three locations of welded fittings, two locations of threaded strainers, two locations of welded strainers, three locations of threaded valves, and three locations of flanged valves for each pipe service defined in the "Piping Insulation Schedule, General" Article.
- B. All insulation applications will be considered defective Work if sample inspection reveals noncompliance with requirements.

3.11 PIPING INSULATION SCHEDULE, GENERAL

- A. Acceptable preformed pipe and tubular insulation materials and thicknesses are identified for each piping system and pipe size range. If more than one material is listed for a piping system, selection from materials listed is Contractor's option.
- B. Items Not Insulated: Unless otherwise indicated, do not install insulation on the following:
 - 1. Drainage piping located in crawl spaces.
 - 2. Underground piping.
 - 3. Chrome-plated pipes and fittings unless there is a potential for personnel injury.

3.12 INDOOR PIPING INSULATION SCHEDULE

- A. Heating-Hot-Water Supply and Return, 200 Deg F and Below:
 - 1. NPS 1-1/4 and Smaller: Insulation shall be the following:
 - a. Mineral-Fiber, Preformed Pipe, Type I: 1-1/2 inches thick.
 - 2. NPS 1-1/2 and Larger: Insulation shall be the following:
 - a. Mineral-Fiber, Preformed Pipe, Type I: 2 inches thick.

3.13 OUTDOOR, ABOVEGROUND PIPING INSULATION SCHEDULE

- A. Refrigerant Suction and Hot-Gas Piping:
 - 1. All Pipe Sizes: Insulation shall be the following:
 - a. Flexible Elastomeric: 2 inches thick.
- B. Refrigerant Suction and Hot-Gas Flexible Tubing:
 - 1. All Pipe Sizes: Insulation shall be the following:
 - a. Flexible Elastomeric: 2 inches thick.

3.14 INDOOR, FIELD-APPLIED JACKET SCHEDULE

- A. Install jacket over insulation material. For insulation with factory-applied jacket, install the field-applied jacket over the factory-applied jacket.
- B. Flanges, Fittings, Valves, and Specialties Concealed:
 - 1. PVC: 20 mils thick.
- C. Piping, Flanges, Fittings, Valves, and Specialties Exposed:
 - 1. PVC: 20 mils thick.

3.15 OUTDOOR, FIELD-APPLIED JACKET SCHEDULE

- A. Install jacket over insulation material. For insulation with factory-applied jacket, install the field-applied jacket over the factory-applied jacket.
- B. Piping, Exposed:
 - 1. Aluminum, Corrugated: 0.032 inch thick.

END OF SECTION 230719

THIS PAGE LEFT INTENTIONALLY BLANK

SECTION 230900 - INSTRUMENTATION AND CONTROL FOR HVAC

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

- A. Drawings and general provisions of the Contract, including General and Supplementary Conditions and Division 01 Specification Sections, apply to this Section.

1.2 SUMMARY

- A. Controls shall be compatible with the Johnson Facility Explorer Hardware/Software.
- B. Controls shall be integrated into the existing controls system.
- C. This Section includes control equipment for HVAC systems and components, including control components for terminal heating and cooling units not supplied with factory-wired controls.
- D. Related Sections include the following:
 - 1. Section 230519 "Meters and Gages for HVAC Piping" for measuring equipment that relates to this Section.
 - 2. Section 230993 "Sequence of Operations for HVAC Controls" for requirements that relate to this Section.

1.3 DEFINITIONS

- A. DDC: Direct digital control.
- B. I/O: Input/output.
- C. LonWorks: A control network technology platform for designing and implementing interoperable control devices and networks.
- D. MS/TP: Master slave/token passing.
- E. PC: Personal computer.
- F. PID: Proportional plus integral plus derivative.
- G. RTD: Resistance temperature detector.

1.4 SUBMITTALS

- A. Product Data: Include manufacturer's technical literature for each control device. Indicate dimensions, capacities, performance characteristics, electrical characteristics, finishes for materials, and installation and startup instructions for each type of product indicated.
 - 1. DDC System Hardware: Bill of materials of equipment indicating quantity, manufacturer, and model number. Include technical data for operator workstation equipment, interface equipment, control units, transducers/transmitters, sensors, actuators, valves, relays/switches, control panels, and operator interface equipment.
 - 2. Control System Software: Include technical data for operating system software, operator interface, color graphics, and other third-party applications.
 - 3. Controlled Systems: Instrumentation list with element name, type of device, manufacturer, model number, and product data. Include written description of sequence of operation including schematic diagram.
- B. Shop Drawings: Detail equipment assemblies and indicate dimensions, weights, loads, required clearances, method of field assembly, components, and location and size of each field connection.

1. Bill of materials of equipment indicating quantity, manufacturer, and model number.
2. Schematic flow diagrams showing fans, pumps, coils, dampers, valves, and control devices.
3. Wiring Diagrams: Power, signal, and control wiring.
4. Details of control panel faces, including controls, instruments, and labeling.
5. Written description of sequence of operation.
6. Schedule of dampers including size, leakage, and flow characteristics.
7. Schedule of valves including flow characteristics.
8. DDC System Hardware:
 - a. Wiring diagrams for control units with termination numbers.
 - b. Schematic diagrams and floor plans for field sensors and control hardware.
 - c. Schematic diagrams for control, communication, and power wiring, showing trunk data conductors and wiring between operator workstation and control unit locations.
9. Control System Software: List of color graphics indicating monitored systems, data (connected and calculated) point addresses, output schedule, and operator notations.
10. Controlled Systems:
 - a. Schematic diagrams of each controlled system with control points labeled and control elements graphically shown, with wiring.
 - b. Scaled drawings showing mounting, routing, and wiring of elements including bases and special construction.
 - c. Written description of sequence of operation including schematic diagram.
 - d. Points list.

1.5 PROJECT RECORD DOCUMENTS

- A. Operation and Maintenance Data: For HVAC instrumentation and control system to include in emergency, operation, and maintenance manuals. In addition to items specified in Section 017823 "Operation and Maintenance Data," include the following:
 1. Maintenance instructions and lists of spare parts for each type of control device.
 2. Interconnection wiring diagrams with identified and numbered system components and devices.
 3. Inspection period, cleaning methods, cleaning materials recommended, and calibration tolerances.
 4. Calibration records and list of set points.

1.6 QUALITY ASSURANCE

- A. Installer Qualifications: Automatic control system manufacturer's authorized representative who is trained and approved for installation of system components required for this Project.
- B. Electrical Components, Devices, and Accessories: Listed and labeled as defined in NFPA 70, Article 100, by a testing agency acceptable to authorities having jurisdiction, and marked for intended use.
- C. Comply with ASHRAE 135 for DDC system components.

1.7 DELIVERY, STORAGE, AND HANDLING

- A. Factory-Mounted Components: Where control devices specified in this Section are indicated to be factory mounted on equipment, arrange for shipping of control devices to equipment manufacturer.
- B. System Software: Update to latest version of software at Project completion.

1.8 COORDINATION

- A. Coordinate location of thermostats, humidistats, and other exposed control sensors with plans and room details before installation.
- B. Coordinate equipment and installation with Sections 26, 27, and 28, as appropriate, for systems integration requirements.
- C. Coordinate supply of conditioned electrical branch circuits for control units and operator workstation.
- D. Coordinate equipment with Section 262416 "Panelboards" to achieve compatibility with starter coils and annunciation devices.
- E. Coordinate equipment with Section 262419 "Motor-Control Centers" to achieve compatibility with motor starters and annunciation devices.
- F. All external wiring of equipment, all temperature control wiring, external wiring of control circuits of magnetic starters, interlocking wiring, boiler wiring, Emergency Break Glass Stations, and mounting of control devices, etc., shall be included under Division 23. All external wiring shall be in conduit. Provide 120V power to all necessary control panels, controllers, etc. from nearest spare panelboard circuit breaker location. Furnish and install necessary circuit breakers. If facility contains emergency power, connect circuit(s) to emergency panelboards.

PART 2 - PRODUCTS

2.1 MANUFACTURERS

- A. In other Part 2 articles where titles below introduce lists, the following requirements apply to product selection:
 - 1. Manufacturers: Subject to compliance with requirements, provide products by one of the manufacturers specified.
 - 2. Compatible with Johnson Facility Explorer.
 - 3. Compatible with the existing controls system, field verify and coordinate with owner.
- B. Service Requirements: The manufacturer's service representative must be located within 50 miles of the project site, and have a maximum service call response time of 24 hours. The service representative must have a minimum of 5 years experience maintaining the control system manufacturer's equipment.

2.2 CONTROL SYSTEM

- A. Control system shall consist of sensors, indicators, actuators, final control elements, interface equipment, other apparatus, accessories, and software connected to distributed controllers operating in multiuser, multitasking environment on token-passing network and programmed to control mechanical systems. An operator workstation permits interface with the network via dynamic color graphics with each mechanical system, building floor plan, and control device depicted by point-and-click graphics.

2.3 DDC EQUIPMENT

- A. Control Units: Modular, comprising processor board with programmable, nonvolatile, random-access memory; local operator access and display panel; integral interface equipment; and backup power source.

1. Units monitor or control each I/O point; process information; execute commands from other control units, devices, and operator stations; and download from or upload to operator workstation or diagnostic terminal unit.
 2. Stand-alone mode control functions operate regardless of network status. Functions include the following:
 - a. Global communications.
 - b. Discrete/digital, analog, and pulse I/O.
 - c. Monitoring, controlling, or addressing data points.
 - d. Software applications, scheduling, and alarm processing.
 - e. Testing and developing control algorithms without disrupting field hardware and controlled environment.
 3. Standard Application Programs:
 - a. Electric Control Programs: Demand limiting, duty cycling, automatic time scheduling, start/stop time optimization, night setback/setup, on-off control with differential sequencing, staggered start, antishort cycling, PID control, DDC with fine tuning, and trend logging.
 - b. HVAC Control Programs: Optimal run time, supply-air reset, and enthalpy switchover.
 - c. Chiller Control Programs: Control function of condenser-water reset, chilled-water reset, and equipment sequencing.
 - d. Programming Application Features: Include trend point; alarm processing and messaging; weekly, monthly, and annual scheduling; energy calculations; run-time totalization; and security access.
 - e. Remote communications.
 - f. Maintenance management.
 - g. Units of Measure: Inch-pound and SI (metric).
 4. Local operator interface provides for download from or upload to operator workstation or diagnostic terminal unit.
 5. ASHRAE 135 Compliance: Control units shall use ASHRAE 135 protocol and communicate using ISO 8802-3 (Ethernet) datalink/physical layer protocol.
- B. Local Control Units: Modular, comprising processor board with electronically programmable, nonvolatile, read-only memory; and backup power source.
1. Units monitor or control each I/O point, process information, and download from or upload to operator workstation or diagnostic terminal unit.
 2. Stand-alone mode control functions operate regardless of network status. Functions include the following:
 - a. Global communications.
 - b. Discrete/digital, analog, and pulse I/O.
 - c. Monitoring, controlling, or addressing data points.
 3. Local operator interface provides for download from or upload to operator workstation or diagnostic terminal unit.
 4. ASHRAE 135 Compliance: Control units shall use ASHRAE 135 protocol and communicate using ISO 8802-3 (Ethernet) datalink/physical layer protocol.
- C. I/O Interface: Hardwired inputs and outputs may tie into system through controllers. Protect points so that shorting will not cause damage to controllers.
1. Binary Inputs: Allow monitoring of on-off signals without external power.
 2. Pulse Accumulation Inputs: Accept up to 10 pulses per second.
 3. Analog Inputs: Allow monitoring of low-voltage (0- to 10-V dc), current (4 to 20 mA), or resistance signals.

4. Binary Outputs: Provide on-off or pulsed low-voltage signal, selectable for normally open or normally closed operation.
 5. Analog Outputs: Provide modulating signal, either low voltage (0- to 10-V dc) or current (4 to 20 mA).
 6. Tri-State Outputs: Provide two coordinated binary outputs for control of three-point, floating-type electronic actuators.
 7. Universal I/Os: Provide software selectable binary or analog outputs.
- D. Power Supplies: Transformers with Class 2 current-limiting type or overcurrent protection; limit connected loads to 80 percent of rated capacity. DC power supply shall match output current and voltage requirements and be full-wave rectifier type with the following:
1. Output ripple of 5.0 mV maximum peak to peak.
 2. Combined 1 percent line and load regulation with 100-mic.sec. response time for 50 percent load changes.
 3. Built-in overvoltage and overcurrent protection and be able to withstand 150 percent overload for at least 3 seconds without failure.
- E. Power Line Filtering: Internal or external transient voltage and surge suppression for workstations or controllers with the following:
1. Minimum dielectric strength of 1000 V.
 2. Maximum response time of 10 nanoseconds.
 3. Minimum transverse-mode noise attenuation of 65 dB.
 4. Minimum common-mode noise attenuation of 150 dB at 40 to 100 Hz.

2.4 UNITARY CONTROLLERS

- A. Unitized, capable of stand-alone operation with sufficient memory to support its operating system, database, and programming requirements, and with sufficient I/O capacity for the application.
1. Configuration: Local keypad and display; diagnostic LEDs for power, communication, and processor; wiring termination to terminal strip or card connected with ribbon cable; memory with bios; and 72-hour battery backup.
 2. Operating System: Manage I/O communication to allow distributed controllers to share real and virtual object information and allow central monitoring and alarms. Perform scheduling with real-time clock. Perform automatic system diagnostics; monitor system and report failures.
 3. ASHRAE 135 Compliance: Communicate using read (execute and initiate) and write (execute and initiate) property services defined in ASHRAE 135. Reside on network using MS/TP datalink/physical layer protocol and have service communication port for connection to diagnostic terminal unit.
 4. Enclosure: Dustproof rated for operation at 32 to 120 deg F.

2.5 ALARM PANELS

- A. Unitized cabinet with suitable brackets for wall or floor mounting. Fabricate of 0.06-inch- thick, furniture-quality steel or extruded-aluminum alloy, totally enclosed, with hinged doors and keyed lock and with manufacturer's standard shop-painted finish. Provide common keying for all panels.
- B. Indicating light for each alarm point, single horn, acknowledge switch, and test switch, mounted on hinged cover.
1. Alarm Condition: Indicating light flashes and horn sounds.
 2. Acknowledge Switch: Horn is silent and indicating light is steady.

3. Second Alarm: Horn sounds and indicating light is steady.
4. Alarm Condition Cleared: System is reset and indicating light is extinguished.
5. Contacts in alarm panel allow remote monitoring by independent alarm company.

2.6 ANALOG CONTROLLERS

- A. Step Controllers: 6- or 10-stage type, with heavy-duty switching rated to handle loads and operated by electric motor.
- B. Electric, Outdoor-Reset Controllers: Remote-bulb or bimetal rod-and-tube type, proportioning action with adjustable throttling range, adjustable set point, scale range minus 10 to plus 70 deg F, and single- or double-pole contacts.
- C. Electronic Controllers: Wheatstone-bridge-amplifier type, in steel enclosure with provision for remote-resistance readjustment. Identify adjustments on controllers, including proportional band and authority.
 1. Single controllers can be integral with control motor if provided with accessible control readjustment potentiometer.
- D. Fan-Speed Controllers: Solid-state model providing field-adjustable proportional control of motor speed from maximum to minimum of 55 percent and on-off action below minimum fan speed. Controller shall briefly apply full voltage, when motor is started, to rapidly bring motor up to minimum speed. Equip with filtered circuit to eliminate radio interference.
- E. Receiver Controllers: Single- or multiple-input models with control-point adjustment, direct or reverse acting with mechanical set-point adjustment with locking device, proportional band adjustment, authority adjustment, and proportional control mode.
 1. Remote-control-point adjustment shall be plus or minus 20 percent of sensor span, input signal of 3 to 13 psig.
 2. Proportional band shall extend from 2 to 20 percent for 5 psig.
 3. Authority shall be 20 to 200 percent.
 4. Air-supply pressure of 18 psig, input signal of 3 to 15 psig, and output signal of zero to supply pressure.
 5. Gages: 2-1/2 inches in diameter, 2.5 percent wide-scale accuracy, and range to match transmitter input or output pressure.

2.7 ELECTRONIC SENSORS

- A. Description: Vibration and corrosion resistant; for wall, immersion, or duct mounting as required.
- B. Thermistor Temperature Sensors and Transmitters:
 1. Manufacturers:
 - a. BEC Controls Corporation.
 - b. Ebtron, Inc.
 - c. Heat-Timer Corporation.
 - d. I.T.M. Instruments Inc.
 - e. MAMAC Systems, Inc.
 - f. RDF Corporation.
 2. Accuracy: Plus or minus 0.5 deg F at calibration point.
 3. Wire: Twisted, shielded-pair cable.
 4. Insertion Elements in Ducts: Single point, 8 inches long; use where not affected by temperature stratification or where ducts are smaller than 9 sq. ft..

5. Averaging Elements in Ducts: 60 inches in length per 10 sq. ft. of duct cross-sectional area; use where prone to temperature stratification or where ducts are larger than 10 sq. ft.
 6. Insertion Elements for Liquids: Brass or stainless-steel socket with minimum insertion length of 2-1/2 inches.
 7. Room Sensor Cover Construction: Manufacturer's standard locking covers.
 - a. Set-Point Adjustment: Concealed in public spaces and exposed in staff spaces.
 - b. Set-Point Indication: Concealed in public spaces and exposed in staff areas.
 8. Outside-Air Sensors: Watertight inlet fitting, shielded from direct sunlight.
- C. RTDs and Transmitters:
1. Manufacturers:
 - a. BEC Controls Corporation.
 - b. MAMAC Systems, Inc.
 - c. RDF Corporation.
 2. Accuracy: Plus or minus 0.2 percent at calibration point.
 3. Wire: Twisted, shielded-pair cable.
 4. Insertion Elements in Ducts: Single point, 8 inches long; use where not affected by temperature stratification or where ducts are smaller than 9 sq. ft..
 5. Averaging Elements in Ducts: 60 inches in length per 10 sq. ft. of duct cross-sectional area; use where prone to temperature stratification or where ducts are larger than 10 sq. ft.; length as required.
 6. Insertion Elements for Liquids: Brass socket with minimum insertion length of 2-1/2 inches.
 7. Room Sensor Cover Construction: Manufacturer's standard locking covers.
 - a. Set-Point Adjustment: Concealed in public spaces and exposed in staff spaces.
 - b. Set-Point Indication: Concealed in public spaces and exposed in staff areas.
 8. Outside-Air Sensors: Watertight inlet fitting, shielded from direct sunlight.
- D. Humidity Sensors: Bulk polymer sensor element.
1. Manufacturers:
 - a. BEC Controls Corporation.
 - b. General Eastern Instruments.
 - c. MAMAC Systems, Inc.
 - d. ROTRONIC Instrument Corp.
 - e. TCS/Basys Controls.
 - f. Vaisala.
 2. Accuracy: 2 percent full range with linear output.
 3. Room Sensor Range: 20 to 80 percent relative humidity.
 4. Room Sensor Cover Construction: Manufacturer's standard locking covers.
 - a. Set-Point Adjustment: Concealed in public spaces and exposed in staff spaces.
 - b. Set-Point Indication: Concealed in public spaces and exposed in staff areas.
 5. Duct Sensor: 20 to 80 percent relative humidity range with element guard and mounting plate.
 6. Outside-Air Sensor: 20 to 80 percent relative humidity range with mounting enclosure, suitable for operation at outdoor temperatures of minus 20 to plus 170 deg F.
 7. Duct and Sensors: With element guard and mounting plate, range of 0 to 100 percent relative humidity.
- E. Pressure Transmitters/Transducers:
1. Manufacturers:
 - a. BEC Controls Corporation.

- b. General Eastern Instruments.
 - c. MAMAC Systems, Inc.
 - d. ROTRONIC Instrument Corp.
 - e. TCS/Basys Controls.
 - f. Vaisala.
 - 2. Static-Pressure Transmitter: Nondirectional sensor with suitable range for expected input, and temperature compensated.
 - a. Accuracy: 2 percent of full scale with repeatability of 0.5 percent.
 - b. Output: 4 to 20 mA.
 - c. Building Static-Pressure Range: 0- to 0.25-inch wg.
 - d. Duct Static-Pressure Range: 0- to 5-inch wg.
 - 3. Water Pressure Transducers: Stainless-steel diaphragm construction, suitable for service; minimum 150-psig operating pressure; linear output 4 to 20 mA.
 - 4. Water Differential-Pressure Transducers: Stainless-steel diaphragm construction, suitable for service; minimum 150-psig operating pressure and tested to 300-psig; linear output 4 to 20 mA.
 - 5. Differential-Pressure Switch (Air or Water): Snap acting, with pilot-duty rating and with suitable scale range and differential.
 - 6. Pressure Transmitters: Direct acting for gas, liquid, or steam service; range suitable for system; linear output 4 to 20 mA.
- F. Room Sensor Cover Construction: Manufacturer's standard locking covers.
- a. Set-Point Adjustment: Concealed in public spaces and exposed in staff spaces.
 - b. Set-Point Indication: Concealed in public spaces and exposed in staff areas.
- G. Room sensor accessories include the following:
- 1. Insulating Bases: For sensors located on exterior walls.
 - 2. Adjusting Key: As required for calibration and cover screws.

2.8 STATUS SENSORS

- A. Status Inputs for Fans: Differential-pressure switch with pilot-duty rating and with adjustable range of 0- to 5-inch wg.
- B. Status Inputs for Electric Motors: Comply with ISA 50.00.01, current-sensing fixed- or split-core transformers with self-powered transmitter, adjustable and suitable for 175 percent of rated motor current.
- C. Voltage Transmitter (100- to 600-V ac): Comply with ISA 50.00.01, single-loop, self-powered transmitter, adjustable, with suitable range and 1 percent full-scale accuracy.
- D. Power Monitor: 3-phase type with disconnect/shorting switch assembly, listed voltage and current transformers, with pulse kilowatt hour output and 4- to 20-mA kW output, with maximum 2 percent error at 1.0 power factor and 2.5 percent error at 0.5 power factor.
- E. Current Switches: Self-powered, solid-state with adjustable trip current, selected to match current and system output requirements.
- F. Electronic Valve/Damper Position Indicator: Visual scale indicating percent of travel and 2- to 10-V dc, feedback signal.
- G. Water-Flow Switches: Bellows-actuated mercury or snap-acting type with pilot-duty rating, stainless-steel or bronze paddle, with appropriate range and differential adjustment, in NEMA 250, Type 1 enclosure.
 - 1. Manufacturers:

- a. BEC Controls Corporation.
- b. I.T.M. Instruments Inc.

2.9 THERMOSTATS

- A. Manufacturers:
 - 1. Erie Controls.
 - 2. Danfoss Inc.; Air-Conditioning and Refrigeration Div.
 - 3. Heat-Timer Corporation.
 - 4. Sauter Controls Corporation.
 - 5. tekmar Control Systems, Inc.
 - 6. Theben AG - Lumilite Control Technology, Inc.
- B. Combination Thermostat and Fan Switches: Line-voltage thermostat with push-button or lever-operated fan switch.
 - 1. Label switches "FAN ON-OFF", "FAN HIGH-LOW-OFF", "FAN HIGH-MED-LOW-OFF", or as required based on the requirements.
 - 2. Mount on single electric switch box.
- C. Electric, solid-state, microcomputer-based room thermostat with remote sensor.
 - 1. Automatic switching from heating to cooling.
 - 2. Preferential rate control to minimize overshoot and deviation from set point.
 - 3. Set up for four separate temperatures per day.
 - 4. Instant override of set point for continuous or timed period from 1 hour to 31 days.
 - 5. Short-cycle protection.
 - 6. Programming based on every day of week.
 - 7. Selection features include degree F or degree C display, 12- or 24-hour clock, keyboard disable, remote sensor, and fan on-auto.
 - 8. Battery replacement without program loss.
 - 9. Thermostat display features include the following:
 - a. Time of day.
 - b. Actual room temperature.
 - c. Programmed temperature.
 - d. Programmed time.
 - e. Duration of timed override.
 - f. Day of week.
 - g. System mode indications include "heating," "off," "fan auto," and "fan on."
- D. Low-Voltage, On-Off Thermostats: NEMA DC 3, 24-V, bimetal-operated, mercury-switch type, with adjustable or fixed anticipation heater, concealed set-point adjustment, 55 to 85 deg F set-point range, and 2 deg F maximum differential.
- E. Line-Voltage, On-Off Thermostats: Bimetal-actuated, open contact or bellows-actuated, enclosed, snap-switch or equivalent solid-state type, with heat anticipator; listed for electrical rating; with concealed set-point adjustment, 55 to 85 deg F set-point range, and 2 deg F maximum differential.
 - 1. Electric Heating Thermostats: Equip with off position on dial wired to break ungrounded conductors.
 - 2. Selector Switch: Integral, manual on-off-auto.
- F. Remote-Bulb Thermostats: On-off or modulating type, liquid filled to compensate for changes in ambient temperature; with copper capillary and bulb, unless otherwise indicated.
 - 1. Bulbs in water lines with separate wells of same material as bulb.
 - 2. Bulbs in air ducts with flanges and shields.

3. Averaging Elements: Copper tubing with either single- or multiple-unit elements, extended to cover full width of duct or unit; adequately supported.
 4. Scale settings and differential settings are clearly visible and adjustable from front of instrument.
 5. On-Off Thermostat: With precision snap switches and with electrical ratings required by application.
 6. Modulating Thermostats: Construct so complete potentiometer coil and wiper assembly is removable for inspection or replacement without disturbing calibration of instrument.
- G. Immersion Thermostat: Remote-bulb or bimetal rod-and-tube type, proportioning action with adjustable throttling range and adjustable set point.
- H. Airstream Thermostats: Two-pipe, fully proportional, single-temperature type; with adjustable set point in middle of range, adjustable throttling range, plug-in test fitting or permanent pressure gage, remote bulb, bimetal rod and tube, or averaging element.
- I. Electric, Low-Limit Duct Thermostat: Snap-acting, single-pole, single-throw, automatic-reset switch that trips if temperature sensed across any 12 inches of bulb length is equal to or below set point.
1. Bulb Length: Minimum 20 feet.
 2. Quantity: One thermostat for every 20 sq. ft. of coil surface.
- J. Electric, High-Limit Duct Thermostat: Snap-acting, single-pole, single-throw, automatic-reset switch that trips if temperature sensed across any 12 inches of bulb length is equal to or above set point.
1. Bulb Length: Minimum 20 feet.
 2. Quantity: One thermostat for every 20 sq. ft. of coil surface.
- K. Heating/Cooling Valve-Top Thermostats: Proportional acting for proportional flow, with molded-rubber diaphragm, remote-bulb liquid-filled element, direct and reverse acting at minimum shutoff pressure of 25 psig, and cast housing with position indicator and adjusting knob.

2.10 HUMIDISTATS

- A. Manufacturers:
1. MAMAC Systems, Inc.
 2. ROTRONIC Instrument Corp.
- B. Duct-Mounting Humidistats: Electric insertion, 2-position type with adjustable, 2 percent throttling range, 20 to 80 percent operating range, and single- or double-pole contacts.

2.11 ACTUATORS

- A. Electric Motors: Size to operate with sufficient reserve power to provide smooth modulating action or two-position action.
1. Comply with requirements in Section 230513 "Common Motor Requirements for HVAC Equipment."
 2. Permanent Split-Capacitor or Shaded-Pole Type: Gear trains completely oil immersed and sealed. Equip spring-return motors with integral spiral-spring mechanism in housings designed for easy removal for service or adjustment of limit switches, auxiliary switches, or feedback potentiometer.
 3. Nonspring-Return Motors for Valves Larger Than NPS 2-1/2: Size for running torque of 150 in. x lbf and breakaway torque of 300 in. x lbf.

4. Spring-Return Motors for Valves Larger Than NPS 2-1/2: Size for running and breakaway torque of 150 in. x lbf.
 5. Nonspring-Return Motors for Dampers Larger Than 25 Sq. Ft.: Size for running torque of 150 in. x lbf and breakaway torque of 300 in. x lbf.
 6. Spring-Return Motors for Dampers Larger Than 25 Sq. Ft.: Size for running and breakaway torque of 150 in. x lbf.
 7. Manual Positioning: Operators shall be able to manually position each actuator when the actuator is not powered. Non-spring-return actuators shall have an external manual gear release. Spring-return actuators with more than 60 in.-lb. torque capacity shall have a manual crank.
- B. Electronic Actuators: Direct-coupled type designed for minimum 60,000 full-stroke cycles at rated torque.
1. Manufacturers:
 - a. Belimo Aircontrols (USA), Inc.
 2. Valves: Size for torque required for valve close off at maximum pump differential pressure.
 3. Dampers: Size for running torque calculated as follows:
 - a. Parallel-Blade Damper with Edge Seals: 7 inch-lb/sq. ft. of damper.
 - b. Opposed-Blade Damper with Edge Seals: 5 inch-lb/sq. ft. of damper.
 - c. Parallel-Blade Damper without Edge Seals: 4 inch-lb/sq. ft. of damper.
 - d. Opposed-Blade Damper without Edge Seals: 3 inch-lb/sq. ft. of damper.
 - e. Dampers with 2- to 3-Inch wg of Pressure Drop or Face Velocities of 1000 to 2500 fpm: Increase running torque by 1.5.
 - f. Dampers with 3- to 4-Inch wg of Pressure Drop or Face Velocities of 2500 to 3000 fpm: Increase running torque by 2.0.
 4. Coupling: V-bolt and V-shaped, toothed cradle.
 5. Overload Protection: Electronic overload or digital rotation-sensing circuitry.
 6. Fail-Safe Operation: Mechanical, spring-return mechanism. Provide external, manual gear release on nonspring-return actuators.
 7. Manual Positioning: Operators shall be able to manually position each actuator when the actuator is not powered. Non-spring-return actuators shall have an external manual gear release. Spring-return actuators with more than 60 in.-lb. torque capacity shall have a manual crank.
 8. Power Requirements (Two-Position Spring Return): 24-V ac.
 9. Power Requirements (Modulating): Maximum 10 VA at 24-V ac or 8 W at 24-V dc.
 10. Proportional Signal: 2- to 10-V dc or 4 to 20 mA, and 2- to 10-V dc position feedback signal.
 11. Temperature Rating: 40 to 104 deg F, unless used for outdoor applications.
 12. Temperature Rating (Smoke Dampers): Minus 22 to plus 250 deg F.
 13. Run Time: 12 seconds open, 5 seconds closed.

2.12 CONTROL VALVES

- A. Manufacturers:
1. Danfoss Inc.; Air Conditioning & Refrigeration Div.
 2. Erie Controls.
 3. Hayward Industrial Products, Inc.
 4. Magnatrol Valve Corporation.
 5. Neles-Jamesbury.
 6. Parker Hannifin Corporation; Skinner Valve Division.

7. Pneuline Controls.
 8. Sauter Controls Corporation.
- B. Control Valves: Factory fabricated, of type, body material, and pressure class based on maximum pressure and temperature rating of piping system, unless otherwise indicated.
- C. Hydronic system globe valves shall have the following characteristics:
1. NPS 2 and Smaller: Class 125 bronze body, bronze trim, rising stem, renewable composition disc, and screwed ends with backseating capacity repackable under pressure.
 2. NPS 2-1/2 and Larger: Class 125 iron body, bronze trim, rising stem, plug-type disc, flanged ends, and renewable seat and disc.
 3. Internal Construction: Replaceable plugs and stainless-steel or brass seats.
 - a. Single-Seated Valves: Cage trim provides seating and guiding surfaces for plug on top and bottom.
 - b. Double-Seated Valves: Balanced plug; cage trim provides seating and guiding surfaces for plugs on top and bottom.
 4. Sizing: 3-psig maximum pressure drop at design flow rate or the following:
 - a. Two Position: Line size.
 - b. Two-Way Modulating: Either the value specified above or twice the load pressure drop, whichever is more.
 - c. Three-Way Modulating: Twice the load pressure drop, but not more than value specified above.
 5. Flow Characteristics: Two-way valves shall have equal percentage characteristics; three-way valves shall have linear characteristics.
 6. Close-Off (Differential) Pressure Rating: Combination of actuator and trim shall provide minimum close-off pressure rating of 150 percent of total system (pump) head for two-way valves and 100 percent of pressure differential across valve or 100 percent of total system (pump) head.
- D. Butterfly Valves: 200-psig, 150-psig maximum pressure differential, ASTM A 126 cast-iron or ASTM A 536 ductile-iron body and bonnet, extended neck, stainless-steel stem, field-replaceable EPDM or Buna N sleeve and stem seals.
1. Body Style: Lug or Grooved.
 2. Disc Type: Aluminum bronze.
 3. Sizing: 1-psig maximum pressure drop at design flow rate.
- E. Terminal Unit Control Valves: Bronze body, bronze trim, two or three ports as indicated, replaceable plugs and seats, and union and threaded ends.
1. Rating: Class 125 for service at 125 psig and 250 deg F operating conditions.
 2. Sizing: 3-psig maximum pressure drop at design flow rate, to close against pump shutoff head.
 3. Flow Characteristics: Two-way valves shall have equal percentage characteristics; three-way valves shall have linear characteristics.
- F. Self-Contained Control Valves: Bronze body, bronze trim, two or three ports as indicated, replaceable plugs and seats, and union and threaded ends.
1. Rating: Class 125 for service at 125 psig and 250 deg F operating conditions.
 2. Thermostatic Operator: Liquid-filled remote sensor with integral adjustable dial.

2.13 DAMPERS

- A. Manufacturers:
1. Air Balance Inc.

2. Don Park Inc.; Autodamp Div.
 3. TAMCO (T. A. Morrison & Co. Inc.).
 4. United Enertech Corp.
 5. Vent Products Company, Inc.
- B. Dampers: AMCA-rated, parallel and opposed-blade design; 0.108-inch- minimum thick, galvanized-steel or 0.125-inch- minimum thick, extruded-aluminum frames with holes for duct mounting; damper blades shall not be less than 0.064-inch- thick galvanized steel with maximum blade width of 8 inches and length of 48 inches. Blades shall be airfoil type suitable for wide-open face velocity of 2000 fpm.
1. Provide parallel blade design for two-position applications.
 2. Provide opposed-blade design for modulating applications.
 3. Secure blades to 1/2-inch- diameter, zinc-plated axles using zinc-plated hardware, with oil-impregnated sintered bronze blade bearings, blade-linkage hardware of zinc-plated steel and brass, ends sealed against spring-stainless-steel blade bearings, and thrust bearings at each end of every blade.
 4. Operating Temperature Range: From minus 40 to plus 200 deg F.
 5. Edge Seals, Standard Pressure Applications: Closed-cell neoprene.
 6. Edge Seals, Low-Leakage Applications: Use inflatable blade edging or replaceable rubber blade seals and spring-loaded stainless-steel side seals, rated for leakage at less than 10 cfm per sq. ft. of damper area, at differential pressure of 4-inch wg when damper is held by torque of 50 in. x lbf; when tested according to AMCA 500D.
 7. Sections: Damper sections shall not exceed 48 in. x 60 in. Each section shall have at least one damper actuator.
 8. Linkages: Dampers shall have exposed linkages.

2.14 CONTROL CABLE

- A. Electronic and fiber-optic cables for control wiring are specified in Section 271500 "Communications Horizontal Cabling."

PART 3 - EXECUTION

3.1 EXAMINATION

- A. Verify that conditioned power supply is available to control units and operator workstation.

3.2 INSTALLATION

- A. Install software in control units and operator workstation. Implement all features of programs to specified requirements and as appropriate to sequence of operation.
- B. Connect and configure equipment and software to achieve sequence of operation specified.
- C. Verify location of thermostats, humidistats, and other exposed control sensors with Drawings and room details before installation. Install wall-mounted devices 60 inches above the floor.
1. Install averaging elements in ducts and plenums in crossing or zigzag pattern.
- D. Install guards on thermostats in the following locations:
1. Entrances.
 2. Public areas.
 3. Where indicated.
- E. Install automatic dampers according to Section 233300 "Air Duct Accessories."

- F. Install damper motors on outside of duct in warm areas, not in locations exposed to outdoor temperatures.
- G. Install labels and nameplates to identify control components according to Section 230553 "Identification for HVAC Piping and Equipment."
- H. Install hydronic instrument wells, valves, and other accessories according to Section 232116 Hydronic Piping Specialties."
- I. Install steam and condensate instrument wells, valves, and other accessories according to Section 232216 Steam and Condensate Piping Specialties."
- J. Install refrigerant instrument wells, valves, and other accessories according to Section 232300 "Refrigerant Piping."
- K. Install duct volume-control dampers according to Section 233113 "Metal Ducts".
- L. Install electronic and fiber-optic cables according to Section 271500 "Communications Horizontal Cabling."

3.3 ELECTRICAL WIRING AND CONNECTION INSTALLATION

- A. Install raceways, boxes, and cabinets according to Section 260533 "Raceways and Boxes for Electrical Systems."
- B. Install building wire and cable according to Section 260519 "Low-Voltage Electrical Power Conductors and Cables."
- C. Install signal and communication cable according to Section 271500 "Communications Horizontal Cabling."
 - 1. Conceal cable, except in mechanical rooms and areas where other conduit and piping are exposed.
 - 2. Install exposed cable in raceway.
 - 3. Install concealed cable in raceway.
 - 4. Bundle and harness multiconductor instrument cable in place of single cables where several cables follow a common path.
 - 5. Fasten flexible conductors, bridging cabinets and doors, along hinge side; protect against abrasion. Tie and support conductors.
 - 6. Number-code or color-code conductors for future identification and service of control system, except local individual room control cables.
 - 7. Install wire and cable with sufficient slack and flexible connections to allow for vibration of piping and equipment.
- D. Connect manual-reset limit controls independent of manual-control switch positions. Automatic duct heater resets may be connected in interlock circuit of power controllers.
- E. Connect hand-off-auto selector switches to override automatic interlock controls when switch is in hand position.

3.4 FIELD QUALITY CONTROL

- A. Manufacturer's Field Service: Engage a factory-authorized service representative to inspect field-assembled components and equipment installation, including connections, and to assist in field testing. Report results in writing.
- B. Perform the following field tests and inspections and prepare test reports:
 - 1. Operational Test: After electrical circuitry has been energized, start units to confirm proper unit operation. Remove and replace malfunctioning units and retest.

2. Test and adjust controls and safeties.
 3. Leak Test: After installation, charge system and test for leaks. Repair leaks and retest until no leaks exist.
 4. Test calibration of controllers by disconnecting input sensors and stimulating operation with compatible signal generator.
 5. Test each point through its full operating range to verify that safety and operating control set points are as required.
 6. Test each control loop to verify stable mode of operation and compliance with sequence of operation. Adjust PID actions.
 7. Test each system for compliance with sequence of operation.
 8. Test software and hardware interlocks.
- C. DDC Verification:
1. Verify that instruments are installed before calibration, testing, and loop or leak checks.
 2. Check instruments for proper location and accessibility.
 3. Check instrument installation for direction of flow, elevation, orientation, insertion depth, and other applicable considerations.
 4. Check instrument tubing for proper fittings, slope, material, and support.
 5. Check flow instruments. Inspect tag number and line and bore size, and verify that inlet side is identified and that meters are installed correctly.
 6. Check pressure instruments, piping slope, installation of valve manifold, and self-contained pressure regulators.
 7. Check temperature instruments and material and length of sensing elements.
 8. Check control valves. Verify that they are in correct direction.
 9. Verify that pressure gages are provided and that proper blade alignment, either parallel or opposed, has been provided.
 10. Check DDC system as follows:
 - a. Verify that DDC controller power supply is from emergency power supply, if applicable.
 - b. Verify that wires at control panels are tagged with their service designation and approved tagging system.
 - c. Verify that spare I/O capacity has been provided.
 - d. Verify that DDC controllers are protected from power supply surges.
- D. Replace damaged or malfunctioning controls and equipment and repeat testing procedures.

3.5 ADJUSTING

- A. Calibrating and Adjusting:
1. Calibrate instruments.
 2. Make three-point calibration test for both linearity and accuracy for each analog instrument.
 3. Calibrate equipment and procedures using manufacturer's written recommendations and instruction manuals. Use test equipment with accuracy at least double that of instrument being calibrated.
 4. Control System Inputs and Outputs:
 - a. Check analog inputs at 0, 50, and 100 percent of span.
 - b. Check analog outputs using milliampere meter at 0, 50, and 100 percent output.
 - c. Check digital inputs using jumper wire.
 - d. Check digital outputs using ohmmeter to test for contact making or breaking.
 - e. Check resistance temperature inputs at 0, 50, and 100 percent of span using a precision-resistant source.

5. Flow:
 - a. Set differential pressure flow transmitters for 0 and 100 percent values with 3-point calibration accomplished at 50, 90, and 100 percent of span.
 - b. Manually operate flow switches to verify that they make or break contact.
 6. Pressure:
 - a. Calibrate pressure transmitters at 0, 50, and 100 percent of span.
 - b. Calibrate pressure switches to make or break contacts, with adjustable differential set at minimum.
 7. Temperature:
 - a. Calibrate resistance temperature transmitters at 0, 50, and 100 percent of span using a precision-resistance source.
 - b. Calibrate temperature switches to make or break contacts.
 8. Stroke and adjust control valves and dampers without positioners, following the manufacturer's recommended procedure, so that valve or damper is 100 percent open and closed.
 9. Stroke and adjust control valves and dampers with positioners, following manufacturer's recommended procedure, so that valve and damper is 0, 50, and 100 percent closed.
 10. Provide diagnostic and test instruments for calibration and adjustment of system.
 11. Provide written description of procedures and equipment for calibrating each type of instrument. Submit procedures review and approval before initiating startup procedures.
- B. Adjust initial temperature and humidity set points.
- C. Occupancy Adjustments: When requested within 12 months of date of Substantial Completion, provide on-site assistance in adjusting system to suit actual occupied conditions. Provide up to three visits to Project during other than normal occupancy hours for this purpose.

3.6 TRAINING

- A. Provide training for a designated staff of Owner's representatives. Training shall be provided via classroom and on-site training. Training shall be tailored to Owner's requirements.
- B. Provide Owner training for the equivalent of 10 hours each for 3 persons.
- C. Training shall enable students to accomplish the following objectives.
 1. Proficiently operate system
 2. Understand control system architecture and configuration
 3. Understand DDC system components
 4. Understand system operation, including DDC system control and optimizing routines (algorithms)
 5. Adjust and change system setpoints, time schedules, and holiday schedules
 6. Recognize common HVAC system malfunctions by observing system graphics, trend graphs, and other system tools
 7. Understand system drawings and Operation and Maintenance manual
 8. Understand job layout and location of control components
 9. Access data from DDC controllers
 10. Create, delete, and modify alarms, including configuring alarm reactions
 11. Create, delete, and modify point trend logs (graphs) and multi-point trend graphs
 12. Configure and run reports
 13. Add, remove, and modify system's physical points
 14. Create, modify, and delete application programming
 15. Add operator interface stations

16. Add a new controller to system
 17. Download firmware and advanced applications programming to a controller
 18. Configure and calibrate I/O points
 19. Maintain software and prepare backups
 20. Interface with job-specific, third-party operator software
 21. Add new users and understand password security procedures
- D. Instructors shall be factory-trained and experienced in presenting this material.
- E. Perform classroom training using a network of working controllers representative of installed hardware.

END OF SECTION 230900

THIS PAGE LEFT INTENTIONALLY BLANK

SECTION 230993 - SEQUENCE OF OPERATIONS FOR HVAC CONTROLS

PART 1 - GENERAL

1.1 SUMMARY

- A. This Section includes control sequences for HVAC systems, subsystems and equipment.

1.2 DEFINITIONS

- A. BMS: Building Management System.

PART 2 - PRODUCTS (Not Applicable)

PART 3 - EXECUTION

3.1 HVAC CONTROL SEQUENCES

- A. All components shall be compatible with the existing Andover controls system.
- B. All set points shall be adjustable.
- C. Coordinate with Owner on required system alarms.
- D. Obtain building occupancy schedules from Owner.
- E. General
1. All set points, changeover points and reset schedules shall be user adjustable.
 2. Control algorithms shall utilize tuned PID loops to maintain set points and minimum/maximum leaving air temperatures optimally.
 3. Coordinate individual alarm notifications with Owner.
 4. Alarms shall be configured as status only or critical. Status only alarms shall display alarm on the Owner coordinated workstation(s) and device(s). Critical alarms shall incorporate coordinated unit shutdown along with displaying alarms on the Owner coordinated devices and require the alarm to be cleared prior to restarting the equipment.
 5. All HVAC equipment shall operate in occupied/unoccupied modes as determined by the DDC building time clock system. Obtain the building occupancy schedule from the Owner.
 6. All equipment shall utilize optimum start/stop programs.
 7. Assign all equipment a stagger start number to keep to many units from starting at the same time. In effect, this flattens load peaks. This includes start-up on emergency power.
 8. Unoccupied override buttons shall place the space equipment in occupied mode for a period of one-hour (adjustable).
 9. Coordinate chilled water valve and chilled water pump response time with the chiller manufacturer's maximum rate of change in chilled water flow.
- F. Universal Set Points. Unless otherwise noted, use the following space temperature set points. Set points shall be independently adjustable by space through the BMS.

	Occupied Modes		Unoccupied Modes	
	Cooling	Heating	Cooling	Heating
Occupied Spaces	74°F	69°F	85°F	55°F

Unoccupied Spaces	80°F	60°F	85°F	55°F
----------------------	------	------	------	------

G. CES-AHU-1/2 - Gymnasium

1. All Occupied Modes:
 - a. Unit Supply Fan:
 - 1) Run continuously.
 - b. Unit Exhaust Fan:
 - 1) Run continuously.
2. Occupied Heating Mode –space temperature below set point.
 - a. Heating coil: Modulate hot water coil control valve (CV) to maintain space temperature set point.
 - b. Space Temperature Set Points:
 - 1) Heating = 69 degrees (adjustable).
 - c. LAT Temperature Set Points:
Minimum temperature reset schedule:
65 degree LAT at 0 degree OAT.
55 degree LAT at 55 degree OAT.
3. Occupied Economizer Cooling Mode – when there is call for cooling and the outdoor air temperature is below the space temperature.
 - a. Economizer cooling set point: 74°F.
4. All Unoccupied Modes:
 - a. Space Temperature Set Points:
 - 1) Heating = 60 degrees.
 - 2) Cooling = 85 degrees.
 - 3) There shall be a 5 degree deadband for heating and cooling set points.
 - b. Heating Coil:
 - 1) All same as occupied mode with following exceptions:
 - a) Enable and disable unit only to meet temperature set point.
 - b) Disable exhaust fan.
 - c) Open recirculation damper.
5. Warm-up Mode.:
 - a. All units shall start per optimum start program.
 - 1) Optimum start duration shall be determined based on outside air temperature.
 - 2) During the optimum start period, the heating set-point shall be linearly ramped up from unoccupied heating set-point to occupied heating set point.
 - b. Systems shall operate as described in unoccupied heating mode with temperature set point equal to occupied mode.
6. Alarms – Provide an alarm for each of the following:
 - a. Fan motor failures.
 - b. Discharge Air Temperature low/high limits.
 - c. Space Temperature low/high limits +/-5°F.
 - d. VFD Fault.

H. CVMS -RTU-1, CVMS-HC-1, with energy recovery

1. All Occupied Modes:
 - a. RTU Supply Fan:
 - 1) Run continuously.
 - b. RTU Exhaust Fan:

- 1) Run continuously.
2. Occupied Heating Mode –space temperature below set point.
 - a. Duct mounted hot water heating coil: Modulate steam coil control valve (CV) to maintain space temperature set point.
 - b. Space Temperature Set Points:
 - 1) Heating = 69 degrees (adjustable).
 - c. LAT Temperature Set Points:
Minimum temperature reset schedule:
65 degree LAT at 0 degree OAT.
55 degree LAT at 55 degree OAT.
 - d. Heat exchanger face and bypass damper: Modulate damper as recommended by the unit manufacturer for the heat exchanger defrost cycle.
3. Occupied Cooling Mode – space temperature below set point. – where applicable
 - a. Unit mounted DX cooling coil: Modulate DX compressor to maintain space temperature set point.
 - b. Space Temperature Set Points:
 - 1) Cooling = 75 degrees (adjustable).
 - c. LAT Temperature Set Points:
Cooling = 55 degree LAT at 88 degree OAT.
4. Occupied Economizer Cooling Mode – when there is call for cooling and the outdoor air temperature is below the space temperature.
 - a. Economizer cooling set point: 74°F.
 - b. Reheat Coil Control Valve:
 - 1) Modulate full closed.
 - c. Modulate HX bypass damper and exhaust fan to maintain space temperature set point.
5. All Unoccupied Modes:
 - a. Space Temperature Set Points:
 - 1) Heating = 60 degrees.
 - 2) Cooling = 85 degrees.
 - b. RTU and Duct Mounted Heating Coil:
 - 1) All same as occupied mode with following exceptions:
 - a) Enable and disable unit only to meet temperature set point.
 - b) Disable exhaust fan.
 - c) Open recirculation damper.
6. Warm-up Mode.:
 - a. All units shall start per optimum start program.
 - 1) Optimum start duration shall be determined based on outside air temperature.
 - 2) During the optimum start period, the heating set-point shall be linearly ramped up from unoccupied heating set-point to occupied heating set point.
 - b. Systems shall operate as described in unoccupied heating mode with temperature set point equal to occupied mode.
7. Alarms – Provide an alarm for each of the following:
 - a. Fan motor failures.
 - b. Discharge Air Temperature low/high limits.
 - c. Space Temperature low/high limits +/-5°F.
 - d. VFD Fault.

I. CES Boilers, CES-B-1/2/3, CES-FP-1

1. Enable boiler system at outdoor air temperatures below 55°F. 1-hour minimum changeover time. Boilers shall not be commanded on until building heating hot water circulation pumps are proven on.
2. Boilers
 - a. Send demand signal to master boiler to maintain building supply water temperature per reset schedule below

Building Supply Water Reset		
	Building Supply Water	
OAT	Occupied Modes	Unoccupied Modes
55°F	120°F	120°F
0°F	180°F	160°F

- 1) Utilize optimum start program to reach the above temperatures five-minutes prior to any building equipment warm-up modes or unoccupied mode.
 - 2) Provide manual override for building supply water temperature set point. Override shall be maintained for a period of 24-hours prior to automatically resuming reset schedule.
- b. Boiler control system opens the associated control valve(s).
- c. Alarms
 - 1) Boiler alarm.
 - 2) High CO or CH₄. Shutdown if either of these rise to unsafe levels.
 - 3) High/low boiler discharge temp.
 - 4) High/low building supply temp.
3. Building Heating Hot Water Pumps
 - a. Enable lead/standby sequence at all times in heating modes. See lead/standby pump sequence below.
 - b. Modulate the lead pump to maintain the pressure differential set point as determined by balancer.
 - c. If any associated control valve opens to 90%, modulate the pump speed up to compensate.
 - d. Alarms
 - 1) Equipment failure.
 - 2) VFD Alarm.

J. CVMS Boilers, CVMS-B-1/2/3/4, CVMS-P-1/2/3

1. CVMS-B-4 shall maintain existing controls sequence.
2. Enable boiler system at outdoor air temperatures below 55°F. 1-hour minimum changeover time. Boilers shall not be commanded on until building heating hot water circulation pumps are proven on.
3. Boilers
 - a. Send demand signal to master boiler to maintain building supply water temperature per reset schedule below

Building Supply Water Reset		
	Building Supply Water	
OAT	Occupied Modes	Unoccupied Modes
55°F	120°F	120°F
0°F	180°F	160°F

- 1) Utilize optimum start program to reach the above temperatures five-minutes prior to any building equipment warm-up modes or unoccupied mode.

- 2) Provide manual override for building supply water temperature set point. Override shall be maintained for a period of 24-hours prior to automatically resuming reset schedule.
 - b. Boiler control system opens the associated control valve(s).
 - c. Alarms
 - 1) Boiler alarm.
 - 2) High CO or CH4. Shutdown if either of these rise to unsafe levels.
 - 3) High/low boiler discharge temp.
 - 4) High/low building supply temp.
 - 4. Building Heating Hot Water Pumps
 - a. Enable lead/standby sequence at all times in heating modes. See lead/standby pump sequence below.
 - b. Modulate the lead pump to maintain the pressure differential set point as determined by balancer.
 - c. If any associated control valve opens to 90%, modulate the pump speed up to compensate.
 - d. Alarms
 - 1) Equipment failure.
 - 2) VFD Alarm.
- K. PAK Boilers, PAK-B-1/2/3, PAK-P-1/2/3**
- 1. Maintain existing control sequence.
- L. CVES-ERV-1/2**
- 1. Occupied Mode
 - a. Enable supply and exhaust EC fan motors at all times.
 - b. Occupied heating
 - 1) Modulate the duct mounted electric heating coil to maintain the space temperature set point.
 - 2. Unoccupied Modes
 - a. Sequence of operations in unoccupied mode is the same as occupied mode except the ERV shall be disabled unless there is a call for heating or cooling. Control valves shall be closed unless the ERV is enabled.
 - 3. Alarms
 - a. Fan start failure.
 - b. Fan stop failure.
 - c. High/low discharge air temps.
 - d. Dirty filter
- M. PAK-HX-1 – Radiant flooring**
- 1. On a call for heat the associated control valve shall open.
- N. PAK-RTU-1/2, PAK-HC-1/2**
- 1. PAK_RTU-1 has no cooling.
 - 2. All Occupied Modes:
 - a. Unit Supply Fan:
 - 1) Run continuously.
 - b. Unit Exhaust Fan:
 - 1) Run continuously.
 - 3. Occupied Heating Mode –space temperature below set point.
 - a. Heating coil: Modulate heating coil control valve (CV) to maintain space temperature set point.

- b. Space Temperature Set Points:
 - 1) Heating = 69 degrees (adjustable).
- c. LAT Temperature Set Points:
 - Minimum temperature reset schedule:
 - 65 degree LAT at 0 degree OAT.
 - 55 degree LAT at 55 degree OAT.
- d. Heat exchanger face and bypass damper: Modulate damper as recommended by the unit manufacturer for the heat exchanger defrost cycle.
- 4. Occupied Cooling Mode – space temperature below set point. – where applicable
 - a. Unit mounted DX cooling coil: Modulate DX compressor to maintain space temperature set point.
 - b. Space Temperature Set Points:
 - 1) Cooling = 75 degrees (adjustable).
 - c. LAT Temperature Set Points:
 - 1) Cooling = 55 degree LAT at 88 degree OAT
- 5. Occupied Economizer Cooling Mode – when there is call for cooling and the outdoor air temperature is below the space temperature.
 - a. Economizer cooling set point: 74°F.
- 6. All Unoccupied Modes:
 - a. Space Temperature Set Points:
 - 1) Heating = 60 degrees.
 - 2) Cooling = 85 degrees.
 - 3) There shall be a 5 degree deadband for heating and cooling set points.
 - b. Heating Coil:
 - 1) All same as occupied mode with following exceptions:
 - a) Enable and disable unit only to meet temperature set point.
 - b) Disable exhaust fan.
 - c) Open recirculation damper.
- 7. Warm-up Mode.:
 - a. All units shall start per optimum start program.
 - 1) Optimum start duration shall be determined based on outside air temperature.
 - 2) During the optimum start period, the heating set-point shall be linearly ramped up from unoccupied heating set-point to occupied heating set point.
 - b. Systems shall operate as described in unoccupied heating mode with temperature set point equal to occupied mode.
- 8. Alarms – Provide an alarm for each of the following:
 - a. Fan motor failures.
 - b. Discharge Air Temperature low/high limits.
 - c. Space Temperature low/high limits +/-5°F.
 - d. VFD Fault.

O. CVMS-FCU-1/2/3, HS-FCU-1/2/3

- 1. Assign each fan coil unit a stagger start number to keep too many units from starting at the same time. In effect, this flattens load peaks.
- 2. Warm-Up Mode Control:
 - a. Optimum start duration shall be determined based on outside air temperature.
 - b. During the optimum start period, the heating set-point will be linearly ramped up from unoccupied heating set-point to occupied heating set-point.

- c. When the heating set-point crosses above the space temperature, the supply fan will be commanded on, the mixing dampers shall remain in the full return air position and the heating valve will modulate to maintain heating set-point.
- 3. Occupied Mode:
 - a. Supply Fan:
 - 1) Enable continuously.
 - b. Mixed Air Damper:
 - 1) Open to maintain outside air quantity as scheduled, outside air damper shall never be positioned below this minimum except in case of emergency.
 - c. Occupied Heating Mode (OAT is above 55°F and space temperature below set point)
 - 1) Modulate Heating coil control valve to maintain space temperature set point and minimum discharge air set point.
 - a) Minimum leaving air temperature reset schedule:
65 degree LAT at 0 degree OAT.
55 degree LAT at 55 degree OAT.
 - d. Occupied Cooling Mode (OAT is above 60°F and space temperature is above set point)
 - 1) Modulate the HHW coil control valve to the full closed position.
- 4. Unoccupied Mode:
 - a. Supply Fan:
Start (2°F below heating set point) and stop (1°F above heating set point) to maintain space temperature set point.
 - b. Mixed Air Damper:
Fully return air position.
 - c. Hot Water Coil Control Valve:
Same as occupied mode.
- 5. Alarms – Provide an alarm for each of the following:
 - a. Fan fails to run after 30 seconds of being commanded on.
 - b. Fan fails to stop after 30 seconds of being commanded off.
 - c. Software safety trip.
 - d. Software safety lockout (4 safety trips in 3 hours).
 - e. Low or high discharge air temperatures.
 - f. Low or high space temps.

P. HS-RTU-2 with energy recovery, HS-RHC-1

- 1. All Occupied Modes:
 - a. Unit Supply Fan:
 - 1) Run continuously.
 - b. Unit Exhaust Fan:
 - 1) Run continuously.
- 2. Occupied **Heating** Mode – space temperature below set point.
 - a. Heating coil (Above the ceiling in the associated space): Modulate coil control valve (CV) to maintain space temperature set point.
 - b. Space Temperature Set Points:
 - 1) Heating = 69 degrees (adjustable).
 - c. Outdoor Air Temperature Set Points:
Minimum temperature reset schedule:
65 degree LAT at 0 degree OAT.
55 degree LAT at 55 degree OAT.

- d. Heat wheel face and bypass damper: Modulate damper as recommended by the unit manufacturer for the heat wheel defrost cycle.
3. Occupied **Cooling** Mode – space temperature below set point.
 - a. Unit mounted DX cooling coil: Modulate and stage compressors to maintain space temperature set point.
 - b. Space Temperature Set Points:
 - 1) Cooling = 75 degrees (adjustable).
 - c. LAT Temperature Set Points:
 - 1) Cooling = 55 degree LAT at 88 degree OAT
4. Occupied Economizer Cooling Mode – when there is call for cooling and the outdoor air enthalpy is below the return air enthalpy.
 - a. Economizer cooling set point: 74°F.
5. All Unoccupied Modes:
 - a. Space Temperature Set Points:
 - 1) Heating = 60 degrees.
 - 2) Cooling = 85 degrees.
 - 3) There shall be a 2 degree deadband for heating and cooling set points.
 - b. Heating Coil (Above the ceiling in the associated space):
 - 1) All same as occupied mode with following exceptions:
 - a) Enable and disable unit only to meet temperature set point.
 - b) Disable exhaust fan.
 - c) Open recirculation damper.
6. Warm-up Mode.:
 - a. All units shall start per optimum start program.
 - 1) Optimum start duration shall be determined based on outside air temperature.
 - 2) During the optimum start period, the heating set-point shall be linearly ramped up from unoccupied heating set-point to occupied heating set point.
 - 3) The outdoor air damper shall remain closed and the damper shall be open.
 - b. Systems shall operate as described in unoccupied heating mode with temperature set point equal to occupied mode.
7. Alarms – Provide an alarm for each of the following:
 - a. Fan motor failures.
 - b. Discharge Air Temperature low/high limits.
 - c. Space Temperature low/high limits +/-5°F.

Q. HS-B-1 – Summer Domestic hot water and pool heating

- 1) Maintain existing control sequence.

R. Relief Fans

1. Occupied Mode
 - a. Enable fan at all times.
 - b. Enable fan at minimum scheduled airflow unless any of the associated unit ventilators are in economizer mode.
 - 1) When the associated UV's are in economizer mode, modulate fan beyond its minimum scheduled airflow based on the average outdoor air damper position of the associated unit ventilators.
2. Unoccupied Mode (including unoccupied as sensed by occupancy sensor during scheduled occupied mode.)
 - a. Disable fan at all times except as outlined in the unit ventilator Purge Mode.
3. Alarms
 - a. Fan fails to run after 30 seconds of being commanded on.

- b. Fan fails to stop after 30 seconds of being commanded off.
- S. Exhaust Fans**
 - a. Occupied mode: Open damper and enable fan after 15-second delay.
 - b. Unoccupied mode: Disable fan and modulate damper to full closed position after 15-second delay.
- 2. Alarms
 - a. Fan fails to run after 30 seconds of being commanded on.
 - b. Fan fails to stop after 30 seconds of being commanded off.
- T. HS-RTU-1 (POOL UNIT)**
 - 1. The natatorium unit is being supplied with factory controls which control the sequence of operations. The BMS shall interface as outlined below, on the drawings and in the Natatorium unit specifications.
 - 2. BMS interface:
 - a. Set occupied and unoccupied mode.
 - b. Provide space temperature (return air temperature) set point of 82°F (adjustable). Should be maintained 2°F above the pool water temperature.
 - c. Provide space humidity (return air humidity) set point of 60% (adjustable).
 - d. Provide pool water temperature set point of 80°F (adjustable).
 - e. Interface with the natatorium AHU controls to display the points indicated on the controls drawings.
 - f. Enable and disable purge mode. Coordinate with chlorination schedule.
- U. DX Coil HS-CC-1**
 - 1. Unit shall maintain existing controls sequence.
 - 2. Temperature Set Points:
 - a. Occupied ventilation cooling = 75 degrees (adjustable), modulate to maintain setpoint.
- V. (E)CVMS Unit Ventilators (13 units) - Heating only, new control valve only.**
 - 1. Unit ventilator shall operate in occupied/unoccupied modes as determined by the DDC building time clock system and by occupancy sensor.
 - 2. Occupied heating set-point, unoccupied heating set-point, unoccupied cooling set-point and purge enable/disable shall be global and fully adjustable from any interface.
 - 3. Outside air is admitted to meet ventilation and cooling requirements as outlined in the individual unit sequences.
 - 4. Each unit ventilator shall have a software HOA for control of the supply fan.
 - 5. Wire the supply fan normally open at the control relay and fail off.
 - 6. Control cycle to follow ASHRAE Cycle II Standard.
 - 7. Temperature Set Points:
 - a. Occupied heating = 69 degrees (adjustable)
 - b. Occupied ventilation cooling = 75 degrees (adjustable)
 - c. Unoccupied heating = 55 degrees (adjustable)
 - 8. Purge Mode Control:
 - a. Purge mode (fresh air changeover) shall only be permitted during an unoccupied period.
 - b. If the outside air is between 45°F and 60°F and the space temperature rises above 75°F, the supply fan shall be commanded on, the mixing dampers shall be fully open, the heating coil shall be fully closed and the integral relief fan or associated exhaust fan shall be enabled at the maximum airflow. When the space

- temperature drops to 70°F, the fans shall be commanded off and the mixing dampers shall return to the normal position.
9. Warm-Up Mode Control:
 - a. Optimum start duration shall be determined based on outside air temperature.
 - b. During the optimum start period, the heating set-point will be linearly ramped up from unoccupied heating set-point to occupied heating set-point.
 - c. When the heating set-point crosses above the space temperature, the supply fan will be commanded on, the mixing dampers shall remain closed and the heating valve will modulate to maintain heating set-point.
 10. Occupied Mode:
 - a. Unit Ventilator:
 - 1) Supply Fan:
 - a) Enable continuously.
 - 2) Relief Fan (see schedules):
 - a) Enable continuously.
 - 3) Outside Air Damper:
 - a) Open to maintain outside air quantity as scheduled, outside air damper shall never be positioned below this minimum except in case of emergency.
 - b) Modulate outside air damper beyond scheduled minimum position as follows:

Maintain ventilation cooling temperature set point.
 - 4) Hot Water Coil Control Valve:
 - a) LAT schedule

Utilize discharge air minimum temperature reset schedule as outlined below.

55°F LAT at 55°F OAT
65°F LAT at 0°F OAT.

Utilize discharge air temperature PID loop to maintain space temperature set point and minimum LAT.
 - b) Outside air temperature drops below 35 degrees:

Modulate full open. (Valve shall stay full open until O.A. rises above 38 degrees).
 - c) Outside air temperature above 38 degrees:

Modulate to maintain space temperature set point.
Modulate to maintain 65 degree minimum discharge air temperature during heating mode. Note: 55
Modulate to maintain 55 degree minimum discharge air temperature during ventilation cooling mode.
 - 5) Coil Face and By-pass Damper :
 - a) Outside air temperature drops below 35 degrees:

Modulate to maintain space temperature set point.
Modulate to maintain 65 degree minimum discharge air temperature.
Modulate until O.A. rises above 38 degrees.
 - b) Outside air temperature above 38 degrees:

Position to full coil face position.
 - 6) RA Damper (For units without integral relief):
 - a) Modulate with outside air damper to maintain the following balance:

$RA\ CFM = SA\ CFM - OA\ CFM$.
 11. Unoccupied Mode By Occupancy Sensor during DDC scheduled occupied period

- a. During the scheduled occupied mode, when the space is unoccupied as sensed by the room occupancy sensor, the damper will be closed to outside air.
 - b. In heating mode, the space temperature set-point shall be reset to 2°F (adjustable) lower than the occupied set-point. In cooling mode, the space temperature set-point shall be reset to 2°F (adjustable) higher than the occupied set-point.
 - c. The supply fan shall cycle on and off to maintain the space temperature set-point. In heating mode, if the space temperature drops 1°F below the reset heating set-point, the supply fan shall be commanded on, the mixing damper shall remain closed and the heating valve shall modulate open. When the space temperature rises 1°F above the reset heating set-point, the supply fan shall be commanded off.
 - d. When the space is occupied as sensed by the room occupancy sensor, the sequence shall be indexed to the occupied mode.
12. Unoccupied Mode By DDC Schedule:
 - a. Unit Ventilators
 - 1) Supply Fan:
Start (2°F below heating set point) and stop (1°F above heating set point) to maintain space temperature set point.
 - 2) Relief Fan:
Disable.
 - 3) Outside Air Damper:
Fully closed.
 - 4) Steam Coil Control Valve:
Same as occupied mode.
 - 5) Coil Face and By-pass Damper :
Same as occupied mode.
 - 6) RA Damper:
Fully open.
13. Alarms – Provide an alarm for each of the following:
 - a. Fan fails to run after 30 seconds of being commanded on.
 - b. Fan fails to stop after 30 seconds of being commanded off.
 - c. Software safety trip.
 - d. Software safety lockout (4 safety trips in 3 hours).
 - e. Low or high discharge air temperatures.
 - 1) If the discharge air temperature falls below 40°F (adjustable) in heating mode, open the heating hot water control valve, close the outdoor air damper and turn off all fans.
 - f. Low or high space temperatures.
- W. **Unit Ventilators With DX cooling, HS-UV-1,2,3,4**
 1. Associated equipment is fin-tube radiation where indicated on plans.
 2. Unit ventilator shall operate in occupied/unoccupied modes as determined by the DDC building time clock system and by occupancy sensor.
 3. Assign each unit ventilator a stagger start number to keep too many units from starting at the same time. In effect, this flattens load peaks.
 4. Occupied heating set-point, unoccupied heating set-point, unoccupied cooling set-point and purge enable/disable shall be global and fully adjustable from any interface.
 5. Outside air is admitted to meet ventilation and cooling requirements as outlined in the individual unit sequences. Mechanical cooling, if equipped is utilized as outlined in the individual unit sequences.
 6. Each unit ventilator shall have a software HOA for control of the supply fan.

7. Wire the supply fan normally open at the control relay and fail off.
8. Control cycle to follow ASHRAE Cycle II Standard.
9. Purge Mode Control:
 - a. Purge mode (fresh air changeover) shall only be permitted during an unoccupied period.
 - b. If the outside air is between 45°F and 60°F and the space temperature rises above 75°F, the supply fan shall be commanded on, the mixing dampers shall be fully open, the heating coil shall be fully closed and the integral relief fan or associated exhaust fan shall be enabled at the maximum airflow. When the space temperature drops to 70°F, the fans shall be commanded off and the mixing dampers shall return to the normal position.
10. Warm-Up Mode Control:
 - a. Optimum start duration shall be determined based on outside air temperature.
 - b. During the optimum start period, the heating set-point will be linearly ramped up from unoccupied heating set-point to occupied heating set-point.
 - c. When the heating set-point crosses above the space temperature, the supply fan will be commanded on, the mixing dampers shall remain closed and the heating valve will modulate to maintain heating set-point.
11. Cool-Down Mode Control:
 - a. Optimum start duration shall be determined based on outside air temperature.
 - b. During the optimum start period, the cooling set-point will be linearly ramped down from unoccupied cooling set-point to occupied cooling set-point.
 - c. When the cooling set-point crosses below the space temperature, the supply fan will be commanded on, the mixing dampers shall modulate to maintain cooling set-point.
12. Occupied Mode:
 - a. Fin-tube radiation (see plans): Modulate to maintain space temperature set point.
 - b. Unit Ventilator:
 - 1) Supply Fan:
 - a) Enable continuously.
 - 2) Outside Air Damper:
 - a) Open to maintain outside air quantity as scheduled, outside air damper shall never be positioned below this minimum except in case of emergency.
 - b) Modulate outside air damper beyond scheduled minimum position as follows:

Maintain ventilation cooling temperature set point.
 - 3) Hot Water Coil Control Valve:
 - a) LAT schedule
Utilize discharge air minimum temperature reset schedule as outlined below.

55°F LAT at 55°F OAT
65°F LAT at 0°F OAT.

Utilize discharge air temperature PID loop to maintain space temperature set point and minimum LAT.
 - b) Outside air temperature drops below 35 degrees:
Modulate full open. (Valve shall stay full open until O.A. rises above 38 degrees).
 - c) Outside air temperature above 38 degrees:
Modulate to maintain space temperature set point.

- Modulate to maintain 65 degree minimum discharge air temperature during heating mode.
- 4) Coil Face and By-pass Damper :
 - a) Outside air temperature drops below 35 degrees:

Modulate to maintain space temperature set point.
Modulate to maintain 65 degree minimum discharge air temperature.
Modulate until O.A. rises above 38 degrees.
 - b) Outside air temperature above 38 degrees:

Position to full coil face position.
 - 5) RA Damper:
 - a) Modulate with outside air damper to maintain the following balance:
 $RA\ CFM = SA\ CFM - OA\ CFM$.
 - 6) DX Cooling Coil (as indicated on the drawings):
 - a) Modulate valve to maintain space temperature set point.
13. Unoccupied Mode By Occupancy Sensor during DDC scheduled occupied period
- a. During the scheduled occupied mode, when the space is unoccupied as sensed by the room occupancy sensor, the damper will be closed to outside air.
 - b. In heating mode, the space temperature set-point shall be reset to 2°F (adjustable) lower than the occupied set-point. In cooling mode, the space temperature set-point shall be reset to 2°F (adjustable) higher than the occupied set-point.
 - c. The supply fan shall cycle on and off to maintain the space temperature set-point. In heating mode, the finned-tube control valve shall continue to modulate to maintain the space temperature set point. If the space temperature drops 1°F below in the reset heating set-point, the supply fan shall be commanded on, the mixing damper shall remain closed and the heating valve shall modulate open. When the space temperature rises 1°F above the reset heating set-point, the supply fan shall be commanded off. In cooling mode, if the space temperature rises 1°F above in the reset cooling set-point, the supply fan shall be commanded on, the mixing damper shall remain closed and the cooling valve shall modulate open. When the space temperature drops 1°F below the reset cooling set-point, the supply fan shall be commanded off.
 - d. When the space is occupied as sensed by the room occupancy sensor, the sequence shall be indexed to the occupied mode.
14. Unoccupied Mode By DDC Schedule:
- a. Fin-tube radiation: Modulate continuously to maintain space temperature set point.
 - b. Unit Ventilators
 - 1) Supply Fan:

Start (2°F below heating set point) and stop (1°F above heating set point) to maintain space temperature set point.
 - 2) Outside Air Damper:

Fully closed.
 - 3) Hot Water Coil Control Valve:

Same as occupied mode.
 - 4) Coil Face and By-pass Damper :

Same as occupied mode.
 - 5) RA Damper:

Fully open.
 - 6) DX Cooling

- Modulate to full closed position unless night cooling is required. When night cooling is required, modulate valve to maintain space temperature set point.
- 15. Alarms – Provide an alarm for each of the following:
 - a. Fan fails to run after 30 seconds of being commanded on.
 - b. Fan fails to stop after 30 seconds of being commanded off.
 - c. Software safety trip.
 - d. Software safety lockout (4 safety trips in 3 hours).
 - e. Low or high discharge air temperatures.
 - 1) If the discharge air temperature falls below 40°F (adjustable) in heating mode, open the heating hot water control valve, close the outdoor air damper and turn off all fans.
 - f. Low or high space temperatures.
- X. CVMS-CUH-1
 - 1. Enable and disable fan as necessary to maintain space temperature heating set point.
 - 2. Alarms
 - a. Fan start/stop failure
 - b. Space temperature high/low limits.
- Y. Carbon Monoxide Detection
 - 1. Upon rise in carbon monoxide at or above 20ppm as detected by a space sensor, display alarm at operator work station.
 - 2. Upon rise in carbon monoxide level at or above 30ppm as detected by a space sensor, sound audible alarm at sensor and at the associated hallway sensor if applicable.
- Z. Fin-tube:
 - a. Heating mode: Modulate control valve to maintain space temperature set point of 69°F – adjustable.
 - b. Cooling mode: Modulate control valve to full closed position.
 - c. Alarms:
 - 1) High/low space temperature.
- AA. Variable Refrigerant Volume Systems:
 - 1. Building Management System to interface with VRF controls to maintain space temperature set points.
 - 2. BMS to determine occupancy schedule, heating and cooling modes, space temperature set points and load demand based on space temperature.
 - 3. Modulate terminal unit associated outdoor air dampers to maintain scheduled outdoor air flow in all occupied modes.
 - 4. Modulate outdoor air damper to full closed position in unoccupied modes.
 - 5. Disable fans in unoccupied mode. Enable fans only as necessary to maintain space temperature set points.
 - 6. For each terminal unit, send demand signal to VRF controller based on space temperature.
 - a. Occupied mode set points.
 - 1) Heating: 69°F.
 - 2) Cooling: 74°F
 - b. Unoccupied mode set points.
 - 1) Heating: 60°F.
 - 2) Cooling: 80°F.
 - 3) Provide optimized warmup and cool down routines.

- c. Alarms.
 - 1) Equipment failure.
 - 2) High/low space temperature.
 - 3) High/low supply temperature.

SECTION 230993

THIS PAGE LEFT INTENTIONALLY BLANK

SECTION 231000 - VARIABLE TORQUE A-C DRIVE CONTROLLERS

PART 1 - GENERAL

1.1 WORK INCLUDED

- A. Variable frequency A-C drive controllers for mechanical equipment.
- B. Furnish all labor, materials, equipment and service to perform all operations required for the complete installation and related work as required in all contract documents.

1.2 SUBMITTALS

- A. Submit manufacturer's product data shop, drawings, samples, and installation instructions in accordance with the General Conditions.
- B. Shop drawings of VFD, reactors, and wiring diagrams shall be provided with list of parts including fuses and breakers.
- C. Contract Closeout Reports.
- D. Project Record Documents.
- E. Operation and Maintenance Data.
- F. Warranty.

1.3 QUALITY ASSURANCE

- A. The drives shall consist of two major performance-matched components. The VFD manufacturer shall furnish a Variable Torque AC Drive Controller and a performance matched energy efficient motor and will assume responsibility for matching the motor and controller.
- B. The manufacturer of the VFD described in this specification shall have a minimum of twenty (20) years experience in the design, construction and application of adjustable frequency controls and motors.
- C. The VFD manufacturer shall perform, but not be limited to, the following quality assurance controls, procedures and tests to insure VFD performance of ALL manufactured VFD controllers:
 - 1. Circuit Testing:
 - a. All circuits are pre-burned tested for in-circuit component parameters and functional performance.
 - b. All regulator, power supply, and keypad circuits are burned-in for 20 hours. This procedure consists of ten-two hour cycles during which the temperature is varied from -20C to +70C at the rate of 5C per minute. There are dwell times of 30 minutes (hot) and 58 minutes (cold) during each cycle.
 - c. All burned-in circuits are post-burn tested for functional performance.
 - 2. Hi-Pot Testing:
 - a. Post-assembly, all drives are subjected to high potential testing at 2,000 VAC, 2 milliamps maximum, for 1 second.
 - 3. Drive Setup and Functional Tests:

- a. SET-UP: the following VFD variables are factory set prior to shipping:
 - 1) Acceleration ramp
 - 2) Deceleration ramp
 - 3) MIN and MAX Speed
 - 4) Current limit
 - 5) Volts / Hertz Ratio
- b. FINAL TEST: the following VFD functional checks are made and verified prior to shipping:
 - 1) Fault and Function-loss circuit operation
 - 2) Auto-reset function
 - 3) Reversing function
 - 5) Load test using an actual motor at full speed and full load for five (5) minutes while phase currents, phase voltages and motor speed are monitored.

1.4 CODES AND STANDARDS

- A. The VFD and all options shall be UL listed and so labeled. Additionally, the VFD Package when fully assembled with selected options into the common cabinet shall be UL listed and so labeled as a complete system.
- B. AFC (Adjustable Frequency Controller) with all options shall comply with all applicable requirements of the latest standards ANSI; NEMA ICS 1, 2, 3 and 6; National Electrical Code (NEC); NEPU-70; IEEE P598.
- C. AFC shall comply to IEEE-519-1993 standards and the VFD systems shall not produce more than 5% THD voltage waveform distortion on the power distribution system.
- D. The AFC shall comply with Radio Frequency Noise Standard FCC Part15, Subpart J.

PART 2 - PRODUCTS

2.1 ACCEPTABLE MANUFACTURERS

- A. Manufacturer's catalog numbers are used as illustrations. Similar products of the following manufacturers are acceptable equals. All similar items shall be by one manufacturer.
 - 1. ABB
 - 2. Square D
 - 3. Yaskawa

2.2 GENERAL

- A. The variable torque AC drive shall consist of a solid-state adjustable frequency controller with all accessories and performed matched energy efficient motor manufactured by the same vendor.

- B. The AFC shall convert voltage indicated on drawings, + 10%, 3 phase, 60 Hz utility power to an adjustable voltage/frequency, three phase, AC power for stepless motor control from 10% to 110% of base motor speed. The output waveform shall be an adjustable pulse width modulated using flux-vector control. Pulse width modulated types using IGBT Technology shall not be acceptable.
- C. VFD shall be current rated at 8 kHz carrier frequency for VFD's 1-75 HP and 4 kHz for VFD's 100-400 HP. All HP ratings shall meet or exceed Table 430-150 of the National Electric Code. Three Phase Motor Full Load Currents, HP, Maximum Current, and Rated Voltage shall appear on the drive nameplate.
- D. VFD shall not generate damaging voltage pulses at the motor terminals when applied within 500 feet of each other. Both Drive and Motor shall comply with NEMA MG1 section 30.40.4.2 which specifies these limits at a maximum peak.

2.3 DRIVE FUNCTIONS

- A. The VFD shall have the following basic features:
 - 1. An electronic overload circuit designed to protect an AC motor operated by the VFD output from extended overload operation on an inverse time basis. This Electronic overload shall be ULä and NEC recognized as adequate motor protection. No additional hardware such as motor overload relays or motor thermostats shall be required.
 - 2. An LED display mounted on the door of the cabinet that digitally indicates:
 - a. Frequency output
 - b. Voltage output
 - c. Current output
 - d. Motor RPM
 - e. Input kW
 - f. Elapsed Time
 - g. Time Stamped Fault Indication
 - h. DC Bus Volts
- B. The VFD shall have the capability of riding through power dips up to 10 seconds without a controller trip depending on load and operating condition. In this extended ride through, the drive shall use the energy generated by the rotating fan as a power source for all electronic circuits.
- C. RS232 Port and Windows based software for Configuration, Control, and Monitoring.
- D. An isolated 0-20mA, 4-20mA or 0-4, 0-8, 0-10 volt analog speed input follower.
- E. An isolated 0-10 V or 4-20 mA output signal proportional to speed or load.
- F. Provide a Modbus to BACnet interface card. Coordinate requirements with controls vendor.

2.4 PROTECTIVE CIRCUITS AND FEATURES

- A. The VFD shall include the following protective circuits and features:
 - 1. Motor current exceeds 200% of drive continuous current rating.
 - 2. Output phase-to-phase short circuit condition.
 - 3. Total ground fault under any operating condition.
 - 4. High input line voltage.
 - 5. Low input line voltage.
 - 6. Loss of input or output phase.
 - 7. External fault. (This protective circuit shall permit wiring of remote N.C. safety contact to shut down the drive). User supplied end switches, thermal switches, fire-stats, freeze-stats inputs will be connected to this VFD supplied circuit.

8. Metal oxide varistors for surge suppression shall be provided at the VFD input terminals.

2.5 GENERAL OPTIONS AND MODIFICATIONS

- A. The following options shall be included as specified:
 1. Input line fuses shall provide protection for the input rectification circuit using Class J fuses with interrupting rating of 200,000 AIC. The series interrupting rating of the VFD and fuses shall be a minimum of 30,000 AIC and shall be stated in the VFD Instruction Manual as required by UL
 2. A main input disconnect shall mount within the standard NEMA 1 or NEMA 12 enclosure for positive power disconnect of the VFD. It shall have the capability for door padlocking.
 3. A three phase 5% impedance Input Line Reactor shall be provided to minimize drive harmonics on the AC line and protect the drive from damaging electrical system transients.
 4. Temperature Control System interface card for direct connection from the bus architecture. All configuration and control functions can be accessed through this card. Allows direct communication between the microprocessor and the host system. Fault diagnostics, start/stop, speed commands, and all drive feedback's shall be available over a single RS485 communication connection. Discrete signals such as Interlock Open shall also be mapped through the drive terminal strip to the system. The card shall have the ability to be used in a "monitor only" mode where control shall be from a AHU or similar type controller directly wired to the drive.
 5. Provide manual bypass.

PART 3 - EXECUTION

3.1 INSTALLATION

- A. VFD's shall be furnished and programmed by the unit manufacture.
- B. The VFD manufacturer shall maintain and staff local service engineers and must maintain a reasonable supply of spare parts for the VFD's to meet ordinary repair requirements within 100 miles of the installation site. Warehousing of spare parts shall be open to the Engineer for observation.
- C. The manufacturer of the equipment provided shall warrant his equipment against defects in workmanship and parts failure for one (1) year from date of start-up. This warranty shall cover all parts, labor and travel related expenses.

END OF SECTION 23 10 00

SECTION 232113 - HYDRONIC PIPING

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

- A. Drawings and general provisions of the Contract, including General and Supplementary Conditions and Division 01 Specification Sections, apply to this Section.

1.2 SUMMARY

- A. Section includes pipe and fitting materials and joining methods for the following:
1. Hot-water heating piping.
 2. Blowdown-drain piping.
 3. Air-vent piping.
 4. Safety-valve-inlet and -outlet piping.

1.3 ACTION SUBMITTALS

- A. Product Data: For each type of the following:
1. Plastic pipe and fittings with solvent cement.
 2. RTRP and RTRF with adhesive.
 3. Pressure-seal fittings.

1.4 INFORMATIONAL SUBMITTALS

- A. Coordination Drawings: Piping layout, drawn to scale, on which the following items are shown and coordinated with each other, using input from installers of the items involved:
1. Suspended ceiling components.
 2. Other building services.
 3. Structural members.
- B. Qualification Data: For Installer.
- C. Welding certificates.
- D. Field quality-control reports.
- E. Water Analysis: Submit a copy of the water analysis to illustrate water quality available at Project site.

1.5 QUALITY ASSURANCE

- A. Installer Qualifications:
1. Installers of Pressure-Sealed Joints: Installers shall be certified by pressure-seal joint manufacturer as having been trained and qualified to join piping with pressure-seal pipe couplings and fittings.
- B. Steel Support Welding: Qualify procedures and personnel according to AWS D1.1/D1.1M, "Structural Welding Code - Steel."
- C. Pipe Welding: Qualify procedures and operators according to ASME Boiler and Pressure Vessel Code: Section IX.
1. Comply with ASME B31.9, "Building Services Piping," for materials, products, and installation.
 2. Certify that each welder has passed AWS qualification tests for welding processes involved and that certification is current.

- D. To assure uniformity and compatibility of piping components in grooved piping systems, all grooved products utilized shall be supplied by a single manufacturer. Grooving tools shall be supplied from the same manufacturer as the grooved components.

PART 2 - PRODUCTS

2.1 PERFORMANCE REQUIREMENTS

- A. Hydronic piping components and installation shall be capable of withstanding the following minimum working pressure and temperature unless otherwise indicated:
1. Hot-Water Heating Piping: 150 psig at 200 deg F.
 2. Blowdown-Drain Piping: 200 deg F.
 3. Air-Vent Piping: 200 deg F
 4. Safety-Valve-Inlet and -Outlet Piping: Equal to the pressure of the piping system to which it is attached.

2.2 COPPER TUBE AND FITTINGS

- A. Drawn-Temper Copper Tubing: ASTM B 88, Type L
- B. Annealed-Temper Copper Tubing: ASTM B 88, Type K.
- C. DWV Copper Tubing: ASTM B 306, Type DWV.
- D. Copper or Bronze Pressure-Seal Fittings:
1. Manufacturers: Subject to compliance with requirements, provide products by one of the following:
 - a. NIBCO INC.
 - b. Viega.
 2. Housing: Copper.
 3. O-Rings and Pipe Stops: EPDM.
 4. Tools: Manufacturer's special tools.
 5. Minimum 200-psig working-pressure rating at 250 deg F.
- E. Wrought-Copper Unions: ASME B16.22.
- F. Grooved Mechanical-Joint Couplings and Fittings:
1. Manufacturers: Subject to compliance with requirements, provide products by one of the following:
 - a. Victaulic Company.
 2. Joint Fittings: ASME B16.22 wrought copper or ASME B16.18 bronze castings with copper tube dimensioned grooved ends (flaring of tube and fitting ends to IPS dimensions is not permitted).
 3. Couplings: Ductile-iron housings cast with offsetting, angle-pattern bolt pads coated with copper-colored enamel and Grade "EHP" EPDM gasket of central cavity pressure-responsive design suitable for hot water up to 250 deg F; with plated steel nuts and bolts to secure grooved pipe and fittings. Couplings shall be "Installation Ready" stab-on design, for direct 'stab' installation onto roll grooved copper tube without prior field disassembly and no loose parts.

2.3 STEEL PIPE AND FITTINGS

- A. Steel Pipe: ASTM A 53/A 53M, black steel with plain ends; welded and seamless, Grade B, and wall thickness as indicated in "Piping Applications" Article.

- B. Cast-Iron Threaded Fittings: ASME B16.4; Classes 125 and 250 as indicated in "Piping Applications" Article.
- C. Malleable-Iron Threaded Fittings: ASME B16.3, Classes 150 and 300 as indicated in "Piping Applications" Article.
- D. Malleable-Iron Unions: ASME B16.39; Classes 150, 250, and 300 as indicated in "Piping Applications" Article.
- E. Cast-Iron Pipe Flanges and Flanged Fittings: ASME B16.1, Classes 25, 125, and 250; raised ground face, and bolt holes spot faced as indicated in "Piping Applications" Article.
- F. Wrought-Steel Fittings: ASTM A 234/A 234M, wall thickness to match adjoining pipe.
- G. Wrought Cast- and Forged-Steel Flanges and Flanged Fittings: ASME B16.5, including bolts, nuts, and gaskets of the following material group, end connections, and facings:
 - 1. Material Group: 1.1.
 - 2. End Connections: Butt welding.
 - 3. Facings: Raised face.
- H. Grooved Mechanical-Joint Fittings and Couplings:
 - 1. Manufacturers: Subject to compliance with requirements, provide products by one of the following:
 - a. Anvil International, Inc.
 - b. Victaulic Company.
 - 2. Joint Fittings: ASTM A 536, Grade 65-45-12 ductile iron; ASTM A 53/A 53M, Type F, E, or S, Grade B fabricated steel; or ASTM A 106/A 106M, Grade B steel fittings with grooves or shoulders constructed to accept grooved-end couplings; with nuts, bolts, locking pin, locking toggle, or lugs to secure grooved pipe and fittings.
 - 3. Couplings: Ductile-iron housing and EPDM gasket of central cavity pressure-responsive design; with nuts, bolts, locking pin, locking toggle, or lugs to secure grooved pipe and fittings.
 - a. Rigid Type: Housings shall be cast with offsetting, angle-pattern bolt pads to provide system rigidity and support and hanging in accordance with ASME B31.1 and B31.9.
 - 1) 2" through 8": "Installation Ready" stab-on design, for direct 'stab' installation onto grooved end pipe without prior field disassembly and no loose parts with Grade "EHP" EPDM gasket suitable for hot water up to 250 deg F.
 - 2) 10" and 12": Standard rigid coupling with Grade "E" EPDM gasket suitable for hot water up to 230 deg F.
 - b. Flexible Type: Use in seismic areas and locations where vibration attenuation and stress relief are required. Flexible couplings may be used in lieu of flexible connectors for vibration isolation at equipment connections. Three (3) couplings, for each connector, shall be placed in close proximity to the source of vibration.
 - 1) 2" through 8": "Installation Ready" stab-on design, for direct 'stab' installation onto grooved end pipe without prior field disassembly and no loose parts with Grade "EHP" EPDM gasket suitable for hot water up to 250 deg F.
 - 2) 10" and 12": Standard flexible coupling with Grade "E" EPDM gasket suitable for hot water up to 230 deg F.
- I. Steel Pipe Nipples: ASTM A 733, made of same materials and wall thicknesses as pipe in which they are installed.

2.4 JOINING MATERIALS

- A. Pipe-Flange Gasket Materials: Suitable for chemical and thermal conditions of piping system contents.
 - 1. ASME B16.21, nonmetallic, flat, asbestos free, 1/8-inch maximum thickness unless otherwise indicated.
 - a. Full-Face Type: For flat-face, Class 125, cast-iron and cast-bronze flanges.
 - b. Narrow-Face Type: For raised-face, Class 250, cast-iron and steel flanges.
- B. Flange Bolts and Nuts: ASME B18.2.1, carbon steel, unless otherwise indicated.
- C. Solder Filler Metals: ASTM B 32, lead-free alloys. Include water-flushable flux according to ASTM B 813.
- D. Brazing Filler Metals: AWS A5.8/A5.8M, BCuP Series, copper-phosphorus alloys for joining copper with copper; or BAg-1, silver alloy for joining copper with bronze or steel.
- E. Welding Filler Metals: Comply with AWS D10.12M/D10.12 for welding materials appropriate for wall thickness and chemical analysis of steel pipe being welded.
- F. Gasket Material: Thickness, material, and type suitable for fluid to be handled and working temperatures and pressures.

2.5 DIELECTRIC FITTINGS

- A. General Requirements: Assembly of copper alloy and ferrous materials with separating nonconductive insulating material. Include end connections compatible with pipes to be joined.
- B. Dielectric Unions:
 - 1. Manufacturers: Subject to compliance with requirements, provide products by one of the following:
 - a. A.Y. McDonald Mfg. Co.
 - b. Capitol Manufacturing Company.
 - c. Central Plastics Company.
 - d. Hart Industries International, Inc.
 - e. Jomar International Ltd.
 - f. Matco-Norca.
 - g. Watts Regulator Co.
 - h. Zurn Industries, LLC.
 - 2. Description:
 - a. Standard: ASSE 1079.
 - b. Pressure Rating: 250 psig
 - c. End Connections: Solder-joint copper alloy and threaded ferrous.
- C. Dielectric Flanges:
 - 1. Manufacturers: Subject to compliance with requirements, provide products by one of the following:
 - a. Capitol Manufacturing Company.
 - b. Central Plastics Company.
 - c. Matco-Norca.
 - d. Watts Regulator Co.
 - e. Zurn Industries, LLC.
 - 2. Description:
 - a. Standard: ASSE 1079.
 - b. Factory-fabricated, bolted, companion-flange assembly.

- c. Pressure Rating 300 psig
 - d. End Connections: Solder-joint copper alloy and threaded ferrous; threaded solder-joint copper alloy and threaded ferrous.
- D. Dielectric-Flange Insulating Kits:
 - 1. Manufacturers: Subject to compliance with requirements, provide products by one of the following:
 - a. Advance Products & Systems, Inc.
 - b. Calpico, Inc.
 - c. Central Plastics Company.
 - d. Pipeline Seal and Insulator, Inc.
 - 2. Description:
 - a. Nonconducting materials for field assembly of companion flanges.
 - b. Pressure Rating: 300 psig
 - c. Gasket: Neoprene or phenolic.
 - d. Bolt Sleeves: Phenolic or polyethylene.
 - e. Washers: Phenolic with steel backing washers.
- E. Dielectric Nipples:
 - 1. Manufacturers: Subject to compliance with requirements, provide products by one of the following:
 - a. Elster Perfection.
 - b. Victaulic Company.
 - 2. Description:
 - a. Standard: IAPMO PS 66.
 - b. Electroplated steel or ductile iron nipple, complying with ASTM F 1545.
 - c. Pressure Rating: 300 psig at 230 deg F.
 - d. End Connections: Male threaded or grooved.
 - e. Lining: Inert and noncorrosive, propylene.

PART 3 - EXECUTION

3.1 PIPING APPLICATIONS

- A. Hot-water heating piping, aboveground, NPS 2 and smaller, shall be the following:
 - 1. Type L drawn-temper copper tubing, wrought-copper fittings, and soldered and pressure-seal joints.
- B. Hot-water heating piping, aboveground, NPS 2-1/2 and larger range, shall be the following:
 - 1. Schedule 40 steel pipe, wrought-steel fittings and wrought-cast or forged-steel flanges and flange fittings, and welded and flanged joints.
 - 2. Schedule 40 steel pipe; grooved, mechanical joint coupling and fittings; and grooved, mechanical joints.
- C. Hot-water heating piping installed belowground and within slabs shall be the following:
 - 1. Type K, annealed-temper copper tubing, wrought-copper fittings, and soldered joints. Use the fewest possible joints.
- D. Blowdown-Drain Piping: Same materials and joining methods as for piping specified for the service in which blowdown drain is installed.
- E. Air-Vent Piping:
 - 1. Inlet: Same as service where installed with metal-to-plastic transition fittings for plastic piping systems according to piping manufacturer's written instructions.

2. Outlet: Type K, annealed-temper copper tubing with soldered or flared joints.
- F. Safety-Valve-Inlet and -Outlet Piping for Hot-Water Piping: Same materials and joining methods as for piping specified for the service in which safety valve is installed with metal-to-plastic transition fittings for plastic piping systems according to piping manufacturer's written instructions.

3.2 PIPING INSTALLATIONS

- A. Drawing plans, schematics, and diagrams indicate general location and arrangement of piping systems. Install piping as indicated unless deviations to layout are approved on Coordination Drawings.
- B. Install piping in concealed locations unless otherwise indicated and except in equipment rooms and service areas.
- C. Install piping indicated to be exposed and piping in equipment rooms and service areas at right angles or parallel to building walls. Diagonal runs are prohibited unless specifically indicated otherwise.
- D. Install piping above accessible ceilings to allow sufficient space for ceiling panel removal.
- E. Install piping to permit valve servicing.
- F. Install piping at indicated slopes.
- G. Install piping free of sags and bends.
- H. Install fittings for changes in direction and branch connections.
- I. Install piping to allow application of insulation.
- J. Select system components with pressure rating equal to or greater than system operating pressure.
- K. Install groups of pipes parallel to each other, spaced to permit applying insulation and servicing of valves.
- L. Install drains, consisting of a tee fitting, NPS 3/4 ball valve, and short NPS 3/4 threaded nipple with cap, at low points in piping system mains and elsewhere as required for system drainage.
- M. Install piping at a uniform grade of 0.2 percent upward in direction of flow.
- N. Reduce pipe sizes using eccentric reducer fitting installed with level side up.
- O. Install branch connections to mains using tee fittings in main pipe, with the branch connected to the bottom of the main pipe. For up-feed risers, connect the branch to the top of the main pipe.
- P. Install valves according to Section 230523 "General-Duty Valves for HVAC Piping."
- Q. Install unions in piping, NPS 2 and smaller, adjacent to valves, at final connections of equipment, and elsewhere as indicated.
- R. Install flanges or grooved mechanical-joint couplings in piping, NPS 2-1/2 and larger, at final connections of equipment and elsewhere as indicated.
- S. Install shutoff valve immediately upstream of each dielectric fitting.
- T. Comply with requirements in Section 230516 "Expansion Fittings and Loops for HVAC Piping" for installation of expansion loops, expansion joints, anchors, and pipe alignment guides.
- U. Comply with requirements in Section 230553 "Identification for HVAC Piping and Equipment" for identifying piping.

- V. Install sleeves for piping penetrations of walls, ceilings, and floors. Comply with requirements for sleeves specified in Section 230517 "Sleeves and Sleeve Seals for HVAC Piping."
- W. Install sleeve seals for piping penetrations of concrete walls and slabs. Comply with requirements for sleeve seals specified in Section 230517 "Sleeves and Sleeve Seals for HVAC Piping."
- X. Install escutcheons for piping penetrations of walls, ceilings, and floors. Comply with requirements for escutcheons specified in Section 230518 "Escutcheons for HVAC Piping."

3.3 DIELECTRIC FITTING INSTALLATION

- A. Install dielectric fittings in piping at connections of dissimilar metal piping and tubing.
- B. Dielectric Fittings for NPS 2 and Smaller: Use dielectric unions.
- C. Dielectric Fittings for NPS 2-1/2 to NPS 4: Use dielectric flanges.
- D. Dielectric Fittings for NPS 5 and Larger: Use dielectric flange kits.

3.4 HANGERS AND SUPPORTS

- A. Comply with requirements in Section 230529 "Hangers and Supports for HVAC Piping and Equipment" for hanger, support, and anchor devices. Comply with the following requirements for maximum spacing of supports.
- B. Install the following pipe attachments:
 - 1. Adjustable steel clevis hangers for individual horizontal piping less than 20 feet long.
 - 2. Adjustable roller hangers and spring hangers for individual horizontal piping 20 feet or longer.
 - 3. Pipe Roller: MSS SP-58, Type 44 for multiple horizontal piping 20 feet or longer, supported on a trapeze.
 - 4. Spring hangers to support vertical runs.
 - 5. Provide copper-clad hangers and supports for hangers and supports in direct contact with copper pipe.
 - 6. On plastic pipe, install pads or cushions on bearing surfaces to prevent hanger from scratching pipe.
- C. Install hangers for steel piping with the following maximum spacing and minimum rod sizes:
 - 1. NPS 3/4: Maximum span, 7 feet.
 - 2. NPS 1: Maximum span, 7 feet.
 - 3. NPS 1-1/2: Maximum span, 9 feet.
 - 4. NPS 2: Maximum span, 10 feet.
 - 5. NPS 2-1/2: Maximum span, 11 feet.
 - 6. NPS 3 and Larger: Maximum span, 12 feet.
- D. Install hangers for drawn-temper copper piping with the following maximum spacing and minimum rod sizes:
 - 1. NPS 3/4: Maximum span, 5 feet; minimum rod size, 1/4 inch.
 - 2. NPS 1: Maximum span, 6 feet; minimum rod size, 1/4 inch.
 - 3. NPS 1-1/4: Maximum span, 7 feet; minimum rod size, 3/8 inch.
 - 4. NPS 1-1/2: Maximum span, 8 feet; minimum rod size, 3/8 inch.
 - 5. NPS 2: Maximum span, 8 feet; minimum rod size, 3/8 inch.
 - 6. NPS 2-1/2: Maximum span, 9 feet; minimum rod size, 3/8 inch.
 - 7. NPS 3 and Larger: Maximum span, 10 feet; minimum rod size, 3/8 inch.

- E. Support vertical runs at roof, at each floor, and at 8-foot intervals between floors.
- F. Grooved mechanical-joint rigid couplings may be used with IPS steel piping systems, which meet the support and hanging requirements of ASME B31.1 and B31.9. An adequate number of flexible couplings shall also be used to compensate for thermal expansion/contraction of the pipe.

3.5 PIPE JOINT CONSTRUCTION

- A. Ream ends of pipes and tubes and remove burrs. Bevel or groove plain ends of steel pipe.
- B. Remove scale, slag, dirt, and debris from inside and outside of pipe and fittings before assembly.
- C. Soldered Joints: Apply ASTM B 813, water-flushable flux, unless otherwise indicated, to tube end. Construct joints according to ASTM B 828 or CDA's "Copper Tube Handbook," using lead-free solder alloy complying with ASTM B 32.
- D. Brazed Joints: Construct joints according to AWS's "Brazing Handbook," "Pipe and Tube" Chapter, using copper-phosphorus brazing filler metal complying with AWS A5.8/A5.8M.
- E. Threaded Joints: Thread pipe with tapered pipe threads according to ASME B1.20.1. Cut threads full and clean using sharp dies. Ream threaded pipe ends to remove burrs and restore full ID. Join pipe fittings and valves as follows:
 - 1. Apply appropriate tape or thread compound to external pipe threads unless dry seal threading is specified.
 - 2. Damaged Threads: Do not use pipe or pipe fittings with threads that are corroded or damaged. Do not use pipe sections that have cracked or open welds.
- F. Welded Joints: Construct joints according to AWS D10.12M/D10.12, using qualified processes and welding operators according to "Quality Assurance" Article.
- G. Flanged Joints: Select appropriate gasket material, size, type, and thickness for service application. Install gasket concentrically positioned. Use suitable lubricants on bolt threads.
- H. Grooved Joints: Assemble joints with coupling and gasket, lubricant, and bolts. Cut or roll grooves in ends of pipe based on pipe and coupling manufacturer's written instructions for pipe wall thickness. Use grooved-end fittings and rigid, grooved-end-pipe couplings. All grooved couplings, fittings, valves, and specialties shall be the products of a single manufacturer. Grooving tools shall be of the same manufacturer as the grooved components. The gasket style and elastomeric material (grade) shall be verified as suitable for the intended service as specified. Grooved end shall be clean and free from indentations, projections, and roll marks in the area from pipe end to groove for proper gasket sealing. A factory-trained field representative shall provide on-site training for contractor's field personnel in the proper use of grooving tools and installation of grooved piping products. Factory-trained representative shall periodically review the product installation. Contractor shall remove and replace any improperly installed products.
- I. Mechanically Formed, Copper-Tube-Outlet Joints: Use manufacturer-recommended tool and procedure, and brazed joints.
- J. Pressure-Sealed Joints: Use manufacturer-recommended tool and procedure. Leave insertion marks on pipe after assembly.

3.6 TERMINAL EQUIPMENT CONNECTIONS

- A. Sizes for supply and return piping connections shall be the same as or larger than equipment connections.
- B. Install control valves in accessible locations close to connected equipment.

- C. Install bypass piping with globe valve around control valve. If parallel control valves are installed, only one bypass is required.
- D. Install ports for pressure gages and thermometers at coil inlet and outlet connections. Comply with requirements in Section 230519 "Meters and Gages for HVAC Piping."

3.7 FIELD QUALITY CONTROL

- A. Prepare hydronic piping according to ASME B31.9 and as follows:
 - 1. Leave joints, including welds, uninsulated and exposed for examination during test.
 - 2. Provide temporary restraints for expansion joints that cannot sustain reactions due to test pressure. If temporary restraints are impractical, isolate expansion joints from testing.
 - 3. Flush hydronic piping systems with clean water; then remove and clean or replace strainer screens.
 - 4. Isolate equipment from piping. If a valve is used to isolate equipment, its closure shall be capable of sealing against test pressure without damage to valve. Install blinds in flanged joints to isolate equipment.
 - 5. Install safety valve, set at a pressure no more than one-third higher than test pressure, to protect against damage by expanding liquid or other source of overpressure during test.
- B. Perform the following tests on hydronic piping:
 - 1. Use ambient temperature water as a testing medium unless there is risk of damage due to freezing. Another liquid that is safe for workers and compatible with piping may be used.
 - 2. While filling system, use vents installed at high points of system to release air. Use drains installed at low points for complete draining of test liquid.
 - 3. Isolate expansion tanks and determine that hydronic system is full of water.
 - 4. Subject piping system to hydrostatic test pressure that is not less than 1.5 times the system's working pressure. Test pressure shall not exceed maximum pressure for any vessel, pump, valve, or other component in system under test. Verify that stress due to pressure at bottom of vertical runs does not exceed 90 percent of specified minimum yield strength or 1.7 times the "SE" value in Appendix A in ASME B31.9, "Building Services Piping."
 - 5. After hydrostatic test pressure has been applied for at least 15 minutes, examine piping, joints, and connections for leakage. Eliminate leaks by tightening, repairing, or replacing components, and repeat hydrostatic test until there are no leaks.
 - 6. Prepare written report of testing.
- C. Perform the following before operating the system:
 - 1. Open manual valves fully.
 - 2. Inspect pumps for proper rotation.
 - 3. Set makeup pressure-reducing valves for required system pressure.
 - 4. Inspect air vents at high points of system and determine if all are installed and operating freely (automatic type), or bleed air completely (manual type).
 - 5. Set temperature controls so all coils are calling for full flow.
 - 6. Inspect and set operating temperatures of hydronic equipment, such as boilers, chillers, cooling towers, to specified values.
 - 7. Verify lubrication of motors and bearings.

END OF SECTION 232113

THIS PAGE LEFT INTENTIONALLY BLANK

SECTION 232116 - HYDRONIC PIPING SPECIALTIES

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

- A. Drawings and general provisions of the Contract, including General and Supplementary Conditions and Division 01 Specification Sections, apply to this Section.

1.2 SUMMARY

- A. Section includes special-duty valves and specialties for the following:
 - 1. Hot-water heating piping.
 - 2. Condensate-drain piping.
 - 3. Blowdown-drain piping.
 - 4. Air-vent piping.
 - 5. Safety-valve-inlet and -outlet piping.

1.3 ACTION SUBMITTALS

- A. Product Data: For each type of the following:
 - 1. Valves: Include flow and pressure drop curves based on manufacturer's testing for calibrated-orifice balancing valves and automatic flow-control valves.
 - 2. Air-control devices.
 - 3. Hydronic specialties.

1.4 CLOSEOUT SUBMITTALS

- A. Operation and Maintenance Data: For air-control devices, hydronic specialties, and special-duty valves to include in emergency, operation, and maintenance manuals.

1.5 MAINTENANCE MATERIAL SUBMITTALS

- A. Differential Pressure Meter: For each type of balancing valve and automatic flow control valve, include flowmeter, probes, hoses, flow charts, and carrying case.

1.6 QUALITY ASSURANCE

- A. Pipe Welding: Qualify procedures and operators according to ASME Boiler and Pressure Vessel Code: Section IX.
 - 1. Safety valves and pressure vessels shall bear the appropriate ASME label. Fabricate and stamp air separators and expansion tanks to comply with ASME Boiler and Pressure Vessel Code: Section VIII, Division 1.

PART 2 - PRODUCTS

2.1 PERFORMANCE REQUIREMENTS

- A. Hydronic piping components and installation shall be capable of withstanding the following minimum working pressure and temperature unless otherwise indicated:
 - 1. Hot-Water Heating Piping: 150 psig at 200 deg F
 - 2. Condensate-Drain Piping: 150 deg F
 - 3. Blowdown-Drain Piping: 200 deg F
 - 4. Air-Vent Piping: 200 deg F

5. Safety-Valve-Inlet and -Outlet Piping: Equal to the pressure of the piping system to which it is attached.

2.2 VALVES

- A. Gate, Globe, Check, Ball, and Butterfly Valves: Comply with requirements specified in Section 230523 "General-Duty Valves for HVAC Piping."
- B. Automatic Temperature-Control Valves, Actuators, and Sensors: Comply with requirements specified in Section 230900 "Instrumentation and Control for HVAC."
- C. Bronze, Calibrated-Orifice, Balancing Valves:
 1. Manufacturers: Subject to compliance with requirements, provide products by one of the following:
 - a. Armstrong Pumps, Inc.
 - b. Bell & Gossett Domestic Pump.
 - c. Flow Design Inc.
 - d. Gerand Engineering Co.
 - e. Griswold Controls.
 - f. Nexus Valve, Inc.
 - g. Taco.
 - h. Tour & Andersson; available through Victaulic Company.
 2. Body: Bronze type with calibrated orifice or venturi
 3. Ball: Brass or stainless steel.
 4. Plug: Resin.
 5. Seat: PTFE or EPDM.
 6. End Connections: Threaded or socket.
 7. Pressure Gage Connections: Integral seals for portable differential pressure meter.
 8. Handle Style: Lever, with memory stop to retain set position.
 9. CWP Rating: Minimum 250 psig.
 10. Maximum Operating Temperature: 230 deg F.
- D. Cast-Iron or Steel, Calibrated-Orifice, Balancing Valves:
 1. Manufacturers: Subject to compliance with requirements, provide products by one of the following:
 - a. Armstrong Pumps, Inc.
 - b. Bell & Gossett Domestic Pump.
 - c. Flow Design Inc.
 - d. Gerand Engineering Co.
 - e. Griswold Controls.
 - f. Taco.
 - g. Tour & Andersson; available through Victaulic Company.
 2. Body: Cast-iron or steel body, ball, plug, or globe pattern with calibrated orifice or venturi.
 3. Ball: Brass or stainless steel.
 4. Stem Seals: EPDM O-rings.
 1. Disc: Ametal (copper-alloy) or glass and carbon-filled PTFE.
 2. Seat: PTFE.
 3. End Connections: Flanged or grooved.
 4. Pressure Gage Connections: Integral seals for portable differential pressure meter.
 5. Handle Style: Handwheel, Lever, with memory stop to retain set position.
 6. CWP Rating: Minimum 250 psig.
 7. Maximum Operating Temperature: 230 deg F.

- E. Diaphragm-Operated, Pressure-Reducing Valves: ASME labeled.
1. Manufacturers: Subject to compliance with requirements, provide products by one of the following:
 - a. Amtrol, Inc.
 - b. Armstrong Pumps, Inc.
 - c. Bell & Gossett Domestic Pump.
 - d. Conbraco Industries, Inc.
 - e. Spence Engineering Company, Inc.
 - f. Watts Regulator Co.
 2. Body: Bronze or brass.
 3. Disc: Glass and carbon-filled PTFE.
 4. Seat: Brass.
 5. Stem Seals: EPDM O-rings.
 6. Diaphragm: EPT.
 7. Low inlet-pressure check valve.
 8. Inlet Strainer: bronze, removable without system shutdown.
 9. Valve Seat and Stem: Noncorrosive.
 10. Valve Size, Capacity, and Operating Pressure: Selected to suit system in which installed, with operating pressure and capacity factory set and field adjustable.
- F. Diaphragm-Operated Safety Valves: ASME labeled.
1. Manufacturers: Subject to compliance with requirements, provide products by one of the following:
 - a. Amtrol, Inc.
 - b. Armstrong Pumps, Inc.
 - c. Bell & Gossett Domestic Pump.
 - d. Conbraco Industries, Inc.
 - e. Spence Engineering Company, Inc.
 - f. Watts Regulator Co.
 2. Body: Bronze or brass.
 3. Disc: Glass and carbon-filled PTFE.
 4. Seat: Brass.
 5. Stem Seals: EPDM O-rings.
 6. Diaphragm: EPT.
 7. Wetted, Internal Work Parts: Brass and rubber.
 8. Inlet Strainer: bronze, removable without system shutdown.
 9. Valve Seat and Stem: Noncorrosive.
 10. Valve Size, Capacity, and Operating Pressure: Comply with ASME Boiler and Pressure Vessel Code: Section IV, and selected to suit system in which installed, with operating pressure and capacity factory set and field adjustable.
- G. Automatic Flow-Control Valves:
1. Manufacturers: Subject to compliance with requirements, provide products by one of the following:
 - a. Flow Design Inc.
 - b. Griswold Controls.
 - c. Nexus Valve, Inc.
 - d. Victaulic Company
 2. Body: Brass or ferrous metal.
 3. Piston and Spring Assembly: Stainless steel, tamper proof, self-cleaning, and removable.
 4. Combination Assemblies: Include bronze or brass-alloy ball valve.
 5. Identification Tag: Marked with zone identification, valve number, and flow rate.

6. Size: Same as pipe in which installed.
7. Performance: Maintain constant flow, plus or minus 5 percent over system pressure fluctuations.
8. Minimum CWP Rating: 175 psig
9. Maximum Operating Temperature: 250 deg F.

2.3 AIR-CONTROL DEVICES

A. Manual Air Vents:

1. Manufacturers: Subject to compliance with requirements, provide products by one of the following:
 - a. Amtrol, Inc.
 - b. Armstrong Pumps, Inc.
 - c. Bell & Gossett Domestic Pump.
 - d. Nexus Valve, Inc.
 - e. Taco, Inc.
2. Body: Bronze.
3. Internal Parts: Nonferrous.
4. Operator: Screwdriver or thumbscrew.
5. Inlet Connection: NPS 1/2.
6. Discharge Connection: NPS 1/8.
7. CWP Rating: 150 psig.
8. Maximum Operating Temperature: 225 deg F.

B. Automatic Air Vents:

1. Manufacturers: Subject to compliance with requirements, provide products by one of the following:
 - a. Amtrol, Inc.
 - b. Armstrong Pumps, Inc.
 - c. Bell & Gossett Domestic Pump.
 - d. Nexus Valve, Inc.
 - e. Taco, Inc.
2. Body: Bronze or cast iron.
3. Internal Parts: Nonferrous.
4. Operator: Noncorrosive metal float.
5. Inlet Connection: NPS 1/2.
6. Discharge Connection: NPS 1/4.
7. CWP Rating: 150 psig.
8. Maximum Operating Temperature: 240 deg F.

C. Tangential-Type Air Separators:

1. Manufacturers: Subject to compliance with requirements, provide products by one of the following:
 - a. Amtrol, Inc.
 - b. Armstrong Pumps, Inc.
 - c. Bell & Gossett Domestic Pump.
 - d. Taco, Inc.
 - e. Spirotherm.
2. Tank: Welded steel; ASME constructed and labeled for 125-psig minimum working pressure and 375 deg F maximum operating temperature.
3. Air Collector Tube: Perforated stainless steel, constructed to direct released air into expansion tank.

4. Tangential Inlet and Outlet Connections: Threaded for NPS 2 and smaller; flanged connections for NPS 2-1/2 and larger.
5. Blowdown Connection: Threaded.
6. Size: Match system flow capacity.

D. Air Purgers:

1. Manufacturers: Subject to compliance with requirements, provide products by one of the following:
 - a. Amtrol, Inc.
 - b. Armstrong Pumps, Inc.
 - c. Bell & Gossett Domestic Pump.
 - d. Taco, Inc.
2. Body: Cast iron with internal baffles that slow the water velocity to separate the air from solution and divert it to the vent for quick removal.
3. Maximum Working Pressure: 150 psig.
4. Maximum Operating Temperature: 250 deg F.

2.4 HYDRONIC PIPING SPECIALTIES

A. Y-Pattern Strainers:

1. Body: ASTM A 126, Class B, cast iron with bolted cover and bottom drain connection.
2. End Connections: Threaded ends for NPS 2 and smaller; flanged ends for NPS 2-1/2 and larger.
3. Strainer Screen: Stainless-steel, 60-mesh strainer, or perforated stainless-steel basket.
4. CWP Rating: 125 psig.

B. Y-Pattern Grooved End Strainers:

1. Body: Ductile iron body with blow-down port fitted with pipe plug.
2. End Connections: Grooved
3. Strainer Screen: Stainless-steel, 60-mesh strainer, or perforated stainless-steel basket.
4. CWP Rating: 300 psig (2068 kPa).

C. Basket Strainers:

1. Body: ASTM A 126, Class B, high-tensile cast iron with bolted cover and bottom drain connection.
2. End Connections: Threaded ends for NPS 2 and smaller; flanged ends for NPS 2-1/2 and larger.
3. Strainer Screen: 60-mesh startup strainer, and perforated stainless-steel basket with 50 percent free area.
4. CWP Rating: 125 psig.

D. T-Pattern Strainers:

1. Body: Ductile or malleable iron with removable access coupling and end cap for strainer maintenance.
2. End Connections: Grooved ends.
3. Strainer Screen: 60-mesh startup strainer, and perforated stainless-steel basket with 57 percent free area.
4. CWP Rating: 750 psig.

E. Stainless-Steel Bellow, Flexible Connectors:

1. Body: Stainless-steel bellows with woven, flexible, bronze, wire-reinforcing protective jacket.
2. End Connections: Threaded or flanged to match equipment connected.

3. Performance: Capable of 3/4-inch misalignment.
 4. CWP Rating: 150 psig.
 5. Maximum Operating Temperature: 250 deg F.
- F. Spherical, Rubber, Flexible Connectors:
1. Body: Fiber-reinforced rubber body.
 2. End Connections: Steel flanges drilled to align with Classes 150 and 300 steel flanges.
 3. Performance: Capable of misalignment.
 4. CWP Rating: 150 psig.
 5. Maximum Operating Temperature: 250 deg F.
- G. Expansion Fittings: Comply with requirements in Section 230516 "Expansion Fittings and Loops for HVAC Piping."Section 15124 "Expansion Fittings and Loops for HVAC Piping."

PART 3 - EXECUTION

3.1 VALVE APPLICATIONS

- A. Install shutoff-duty valves at each branch connection to supply mains and at supply connection to each piece of equipment.
- B. Install calibrated-orifice, balancing valves at each branch connection to return main.
- C. Install calibrated-orifice, balancing valves in the return pipe of each heating or cooling terminal.
- D. Install check valves at each pump discharge and elsewhere as required to control flow direction.
- E. Install safety valves at hot-water generators and elsewhere as required by ASME Boiler and Pressure Vessel Code. Install drip-pan elbow on safety-valve outlet and pipe without valves to the outdoors; pipe drain to nearest floor drain or as indicated on Drawings. Comply with ASME Boiler and Pressure Vessel Code: Section VIII, Division 1, for installation requirements.
- F. Install pressure-reducing valves at makeup-water connection to regulate system fill pressure.

3.2 HYDRONIC SPECIALTIES INSTALLATION

- A. Install manual air vents at high points in piping, at heat-transfer coils, and elsewhere as required for system air venting.
- B. Install automatic air vents at high points of system piping in mechanical equipment rooms only. Install manual vents at heat-transfer coils and elsewhere as required for air venting.
- C. Install piping from boiler air outlet, air separator, or air purger to expansion tank with a 2 percent upward slope toward tank.
- D. Install tangential air separator in pump suction. Install blowdown piping with gate or full-port ball valve; extend full size to nearest floor drain.

END OF SECTION 232116

SECTION 232123 - HYDRONIC PUMPS

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

- A. Drawings and general provisions of the Contract, including General and Supplementary Conditions and Division 01 Specification Sections, apply to this Section.

1.2 SUMMARY

- A. Section Includes:
 - 1. Separately coupled, vertically mounted, in-line centrifugal pumps.
 - 2. Separately coupled, base-mounted, end-suction centrifugal pumps.
 - 3. Automatic condensate pump units.

1.3 DEFINITIONS

- A. Buna-N: Nitrile rubber.
- B. EPT: Ethylene propylene terpolymer.

1.4 ACTION SUBMITTALS

- A. Product Data: For each type of pump. Include certified performance curves and rated capacities, operating characteristics, furnished specialties, final impeller dimensions, and accessories for each type of product indicated. Indicate pump's operating point on curves.
- B. Shop Drawings: For each pump.
 - 1. Show pump layout and connections.
 - 2. Include setting drawings with templates for installing foundation and anchor bolts and other anchorages.
 - 3. Include diagrams for power, signal, and control wiring.

1.5 CLOSEOUT SUBMITTALS

- A. Operation and Maintenance Data: For pumps to include in emergency, operation, and maintenance manuals.

1.6 MAINTENANCE MATERIAL SUBMITTALS

- A. Furnish extra materials described below that match products installed and that are packaged with protective covering for storage and identified with labels describing contents.
 - 1. Mechanical Seals: One mechanical seal for each pump.

PART 2 - PRODUCTS

2.1 SEPARATELY COUPLED, VERTICALLY MOUNTED, IN-LINE CENTRIFUGAL PUMPS

- A. Manufacturers: Subject to compliance with requirements, provide products by one of the following:
 - 1. Armstrong Pumps Inc.
 - 2. ITT Corporation; Bell & Gossett.

3. Patterson Pump Company.
 4. TACO Incorporated.
- B. Description: Factory-assembled and -tested, centrifugal, overhung-impeller, separately coupled, in-line pump as defined in HI 1.1-1.2 and HI 1.3; designed for installation with pump and motor shafts mounted vertically.
- C. Pump Construction:
1. Casing: Radially split, cast iron, with threaded gage tappings at inlet and outlet, replaceable bronze wear rings, and threaded companion-flange connections.
 2. Impeller: ASTM B 584, cast bronze; statically and dynamically balanced, keyed to shaft, and secured with a locking cap screw. For pumps not frequency-drive controlled, trim impeller to match specified performance.
 3. Pump Shaft: Steel, with copper-alloy shaft sleeve.
 4. Seal: Mechanical seal consisting of carbon rotating ring against a ceramic seat held by a stainless-steel spring, and Buna-N bellows and gasket. Include water slinger on shaft between motor and seal.
 5. Seal: Packing seal consisting of stuffing box with a minimum of four rings of graphite-impregnated braided yarn with bronze lantern ring between center two graphite rings, and bronze packing gland.
 6. Pump Bearings: Permanently lubricated ball bearings.
- D. Shaft Coupling: Axially split spacer coupling.
- E. Motor: Single speed and rigidly mounted to pump casing with lifting eyebolt and supporting lugs in motor enclosure.
1. Electrical Components, Devices, and Accessories: Listed and labeled as defined in NFPA 70, by a qualified testing agency, and marked for intended location and application.
 2. Comply with NEMA designation, temperature rating, service factor, and efficiency requirements for motors specified in Section 230513 "Common Motor Requirements for HVAC Equipment."
 - a. Enclosure: Open, dripproof.
 - b. Enclosure Materials: Cast iron.
 - c. Motor Bearings: Permanently lubricated ball bearings.
 - d. Efficiency: Premium efficient.
 - e. NEMA Design: JM or JP.
 - f. Service Factor: 1.10.

2.2 SEPARATELY COUPLED, BASE-MOUNTED, END-SUCTION CENTRIFUGAL PUMPS

- A. Manufacturers: Subject to compliance with requirements, provide products by one of the following:
1. Armstrong Pumps Inc.
 2. ITT Corporation; Bell & Gossett.
 3. TACO Incorporated.
- B. Description: Factory-assembled and -tested, centrifugal, overhung-impeller, separately coupled, end-suction pump as defined in HI 1.1-1.2 and HI 1.3; designed for base mounting, with pump and motor shafts horizontal.
- C. Pump Construction:

1. Casing: Radially split, cast iron, with replaceable bronze wear rings, threaded gage tappings at inlet and outlet, drain plug at bottom and air vent at top of volute, and flanged connections. Provide integral mount on volute to support the casing, and provide attached piping to allow removal and replacement of impeller without disconnecting piping or requiring the realignment of pump and motor shaft.
 2. Impeller: ASTM B 584, cast bronze; statically and dynamically balanced, keyed to shaft, and secured with a locking cap screw. For pumps not frequency-drive controlled, trim impeller to match specified performance.
 3. Pump Shaft: Steel, with copper-alloy shaft sleeve.
 4. Seal: Mechanical seal consisting of carbon rotating ring against a ceramic seat held by a stainless-steel spring, and Buna-N bellows and gasket.
 5. Pump Bearings: Grease-lubricated ball bearings in cast-iron housing with grease fittings.
- D. Shaft Coupling: Molded-rubber insert and interlocking spider capable of absorbing vibration. Couplings shall be drop-out type to allow disassembly and removal without removing pump shaft or motor. EPDM coupling sleeve for variable-speed applications.
- E. Coupling Guard: Dual rated; ANSI B15.1, Section 8; OSHA 1910.219 approved; steel; removable; attached to mounting frame.
- F. Mounting Frame: Welded-steel frame and cross members, factory fabricated from ASTM A 36/A 36M channels and angles. Fabricate to mount pump casing, coupling guard, and motor.
- G. Motor: Single speed, secured to mounting frame, with adjustable alignment.
1. Electrical Components, Devices, and Accessories: Listed and labeled as defined in NFPA 70, by a qualified testing agency, and marked for intended location and application.
 2. Comply with NEMA designation, temperature rating, service factor, and efficiency requirements for motors specified in Section 230513 "Common Motor Requirements for HVAC Equipment."
 - a. Enclosure: Open, dripproof.
 - b. Enclosure Materials: Rolled steel.
 - c. Motor Bearings: Permanently lubricated ball bearings.
 - d. Efficiency: Premium efficient.
 - e. NEMA Design: Standard for motor size.
 - f. Service Factor: 1.10.

2.3 AUTOMATIC CONDENSATE PUMP UNITS

- A. Manufacturers: Subject to compliance with requirements, provide products by one of the following:
1. Beckett Corporation.
 2. Hartell Pumps Div.; Milton Roy Co.
 3. Little Giant Pump Co.
 4. Mepco, LLC.
- B. Description: Packaged units with corrosion-resistant pump, plastic tank with cover, and automatic controls. Include factory- or field-installed check valve and a ~~72-inch~~ minimum, electrical power cord with plug.

2.4 INTEGRAL PUMP MOTOR VARIABLE-SPEED CONTROLLERS

- A. Where specified or scheduled, provide pumps with an integral pump motor speed controller.
1. Motor: Operates as constant- or variable-speed pump with speed regulated by an integrated variable-speed drive.
 2. Integrated Pump Controller: Supports direct communication with the building management system (BMS) with built-in support for the following protocols: BACnet MS/TP.
 3. Commissioning and pump set up access to pump controls via the following:
 - a. A web interface (data exchange).
 - b. A user interface located on the face of speed controller to adjust modes and mode values.
 - c. An electronic display that reads real-time mode set values, flow, head, speed, and power and that locks out unauthorized adjustment of pump.
 4. Provide electronics with "Auto" as factory default but slope of the proportional curve will automatically match the required system curve, constant pressure control (delta-p/c), variable differential pressure control (delta-p/v), constant curve duty (uncontrolled pump), and rpm regulation. RPM (speed) regulation can be accomplished by the following:
 - a. Manual (via user interface or HTML).
 - b. Remote via 0 to 10 V dc.
 - c. Data protocol communications with the BMS.
 5. Pump Electronics: Standard with multiple digital inputs and one external digital output to be available for additional mechanical room control and pump status monitoring.
 6. Controller: Mounted on or adjacent to the motor. Provide enclosure rated to UL Type 12.
 7. Electronically Protected Pumps: Rated for continuous duty and with built-in startup circuit. Provide overcurrent, line surge and current limit protection, thermal monitoring, heat sink status and over temperature protection.
 8. Pump capable of being monitored continuously via integrated Internet link.
 9. Integrated pump controller system to have the following features:
 - a. Controller software shall be capable of sensorless control in variable-volume systems without need for pump-mounted (internal/external) or remotely mounted differential pressure sensor.
 - b. Integrated Pump Controller Sensorless Control: Operates under Quadratic Pressure Control (QPC) to ensure that head reduction with reducing flow conforms to quadratic control curve.
 - c. Controller:
 - 1) Minimum head of 40 percent of design duty head.
 - 2) User-adjustable control mode settings and minimum/maximum head set points using built-in programming interface.
 - d. Controller Integrated Control Software:
 - 1) Capable of controlling pump performance for non-overloading power at every point of operation.
 - 2) Capable of maintaining flow rate data.

2.5 ELECTRONICALLY COMMUTATED MOTOR (ECM)

- A. Provide pumps so they are specified or scheduled with ECM.
1. Synchronous, constant torque, ECM with permanent magnet rotor. Rotor magnets to be time-stable, nontoxic ceramic magnets (Sr-Fe).

2. Driven by a frequency converter with an integrated power factor correction filter. Conventional induction motors will not be acceptable.
3. Each motor with an integrated variable-frequency drive, tested as one unit by manufacturer.
4. Motor speed adjustable over full range from 0 rpm to maximum scheduled speed.
5. Variable motor speed to be controlled by a 0- to 10 V-dc or 4- to 20-mA input.
6. Integrated motor protection verified by UL to protect the pump against over-/undervoltage, overtemperature of motor and/or electronics, overcurrent, locked rotor, and dry run (no-load condition).

2.6 PUMP SPECIALTY FITTINGS

- A. Suction Diffuser:
 1. Angle pattern.
 2. 175-psig pressure rating, cast or ductile-iron body and end cap, pump-inlet fitting.
 3. Bronze startup and bronze or stainless-steel permanent strainers.
 4. Bronze or stainless-steel straightening vanes.
 5. Drain plug.
 6. Factory-fabricated support.
- B. Triple-Duty Valve:
 1. Angle or straight pattern.
 2. 175-psig pressure rating, cast-iron body, pump-discharge fitting.
 3. Drain plug and bronze-fitted shutoff, balancing, and check valve features.
 4. Brass gage ports with integral check valve and orifice for flow measurement.

PART 3 - EXECUTION

3.1 EXAMINATION

- A. Examine equipment foundations and anchor-bolt locations for compliance with requirements for installation tolerances and other conditions affecting performance of the Work.
- B. Examine roughing-in for piping systems to verify actual locations of piping connections before pump installation.
- C. Examine foundations and inertia bases for suitable conditions where pumps are to be installed.
- D. Proceed with installation only after unsatisfactory conditions have been corrected.

3.2 PUMP INSTALLATION

- A. Comply with HI 1.4 and HI 2.4.
- B. Install pumps to provide access for periodic maintenance including removing motors, impellers, couplings, and accessories.
- C. Independently support pumps and piping so weight of piping is not supported by pumps and weight of pumps is not supported by piping.
- D. Automatic Condensate Pump Units: Install units for collecting condensate and extend to open drain.
- E. Equipment Mounting:

1. Install base-mounted pumps on cast-in-place concrete equipment bases. Comply with requirements for equipment bases and foundations specified in Section 033000 "Cast-in-Place Concrete."
 2. Comply with requirements for vibration isolation and seismic control devices specified in Section 230548 "Vibration and Seismic Controls for HVAC."
 3. Comply with requirements for vibration isolation devices specified in Section 230548.13 "Vibration Controls for HVAC."
- F. Equipment Mounting: Install in-line pumps with continuous-thread hanger rods and spring hangers with vertical-limit stop of size required to support weight of in-line pumps.
1. Comply with requirements for seismic-restraint devices specified in Section 230548 "Vibration and Seismic Controls for HVAC."
 2. Comply with requirements for hangers and supports specified in Section 230529 "Hangers and Supports for HVAC Piping and Equipment."

3.3 ALIGNMENT

- A. Engage a factory-authorized service representative to perform alignment service.
- B. Comply with requirements in Hydronics Institute standards for alignment of pump and motor shaft. Add shims to the motor feet and bolt motor to base frame. Do not use grout between motor feet and base frame.
- C. Comply with pump and coupling manufacturers' written instructions.
- D. After alignment is correct, tighten foundation bolts evenly but not too firmly. Completely fill baseplate with nonshrink, nonmetallic grout while metal blocks and shims or wedges are in place. After grout has cured, fully tighten foundation bolts.

3.4 CONNECTIONS

- A. Comply with requirements for piping specified in Section 232213 "Steam and Condensate Heating Piping" and Section 232216 Steam and Condensate Piping Specialties." Drawings indicate general arrangement of piping, fittings, and specialties.
- B. Where installing piping adjacent to pump, allow space for service and maintenance.
- C. Connect piping to pumps. Install valves that are same size as piping connected to pumps.
- D. Install suction and discharge pipe sizes equal to or greater than diameter of pump nozzles.
- E. For vertical in-line pumps, install check, shutoff, and throttling valves.
- F. For base-mounted end-suction pumps, install triple-duty valve on discharge side of pumps.
- G. For vertical in-line pumps, install Y-type strainer and shutoff valve on suction side of pumps
- H. For base-mounted end-suction pumps, install suction diffuser and shutoff valve on suction side of pumps.
- I. Install flexible connectors on suction and discharge sides of base-mounted pumps between pump casing and valves.
- J. Install pressure gages on pump suction and discharge or at integral pressure-gage tapping, or install single gage with multiple-input selector valve.
- K. Install check valve and gate or ball valve on each condensate pump unit discharge.

3.5 STARTUP SERVICE

- A. Engage a factory-authorized service representative to perform startup service.
 - 1. Complete installation and startup checks according to manufacturer's written instructions.
 - 2. Check piping connections for tightness.
 - 3. Clean strainers on suction piping.
 - 4. Perform the following startup checks for each pump before starting:
 - a. Verify bearing lubrication.
 - b. Verify that pump is free to rotate by hand and that pump for handling hot liquid is free to rotate with pump hot and cold. If pump is bound or drags, do not operate until cause of trouble is determined and corrected.
 - c. Verify that pump is rotating in the correct direction.
 - 5. Prime pump by opening suction valves and closing drains, and prepare pump for operation.
 - 6. Start motor.
 - 7. Open discharge valve slowly.

3.6 DEMONSTRATION

- A. Engage a factory-authorized service representative to train Owner's maintenance personnel to adjust, operate, and maintain hydronic pumps.

END OF SECTION 232123

THIS PAGE LEFT INENTIONALLY BLANK

SECTION 232300 - REFRIGERANT PIPING

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

- A. Drawings and general provisions of the Contract, including General and Supplementary Conditions and Division 01 Specification Sections, apply to this Section.

1.2 SUMMARY

- A. This Section includes refrigerant piping used for air-conditioning applications.

1.3 PERFORMANCE REQUIREMENTS

- A. Line Test Pressure for Refrigerant R-410A:
 - 1. Suction Lines for Air-Conditioning Applications: 300 psig.
 - 2. Suction Lines for Heat-Pump Applications: 535 psig.
 - 3. Hot-Gas and Liquid Lines: 535 psig.

1.4 ACTION SUBMITTALS

- A. Product Data: For each type of valve and refrigerant piping specialty indicated. Include pressure drop, based on manufacturer's test data, for the following:
 - 1. Thermostatic expansion valves.
 - 2. Solenoid valves.
 - 3. Hot-gas bypass valves.
 - 4. Filter dryers.
 - 5. Strainers.
 - 6. Pressure-regulating valves.
- B. Shop Drawings: Show layout of refrigerant piping and specialties, including pipe, tube, and fitting sizes, flow capacities, valve arrangements and locations, slopes of horizontal runs, oil traps, double risers, wall and floor penetrations, and equipment connection details. Show interface and spatial relationships between piping and equipment.
 - 1. Shop Drawing Scale: 1/4 inch equals 1 foot.
 - 2. Refrigerant piping indicated on Drawings is schematic only. Size piping and design actual piping layout, including oil traps, double risers, specialties, and pipe and tube sizes to accommodate, as a minimum, equipment provided, elevation difference between compressor and evaporator, and length of piping to ensure proper operation and compliance with warranties of connected equipment.

1.5 INFORMATIONAL SUBMITTALS

- A. Welding certificates.
- B. Field quality-control test reports.

1.6 CLOSEOUT SUBMITTALS

- A. Operation and Maintenance Data: For refrigerant valves and piping specialties to include in maintenance manuals.

1.7 QUALITY ASSURANCE

- A. Welding: Qualify procedures and personnel according to ASME Boiler and Pressure Vessel Code: Section IX, "Welding and Brazing Qualifications."
- B. Comply with ASHRAE 15, "Safety Code for Refrigeration Systems."
- C. Comply with ASME B31.5, "Refrigeration Piping and Heat Transfer Components."

1.8 PRODUCT STORAGE AND HANDLING

- A. Store piping in a clean and protected area with end caps in place to ensure that piping interior and exterior are clean when installed.

1.9 COORDINATION

- A. Coordinate size and location of roof curbs, equipment supports, and roof penetrations. These items are specified in Section 077200 "Roof Accessories."

PART 2 - PRODUCTS

2.1 COPPER TUBE AND FITTINGS

- A. Copper Tube: ASTM B 280, Type ACR.
- B. Wrought-Copper Fittings: ASME B16.22.
- C. Wrought-Copper Unions: ASME B16.22.
- D. Solder Filler Metals: ASTM B 32. Use 95-5 tin antimony or alloy HB solder to join copper socket fittings on copper pipe.
- E. Brazing Filler Metals: AWS A5.8.
- F. Flexible Connectors:
 - 1. Body: Tin-bronze bellows with woven, flexible, tinned-bronze-wire-reinforced protective jacket.
 - 2. End Connections: Socket ends.
 - 3. Offset Performance: Capable of minimum 3/4-inch misalignment in minimum 7-inch-long assembly.
 - 4. Pressure Rating: Factory test at minimum 500 psig.
 - 5. Maximum Operating Temperature: 250 deg F.

2.2 STEEL PIPE AND FITTINGS

- A. Steel Pipe: ASTM A 53/A 53M, black steel with plain ends; Type, Grade, and wall thickness as selected in Part 3 piping applications articles.
- B. Wrought-Steel Fittings: ASTM A 234/A 234M, for welded joints.
- C. Steel Flanges and Flanged Fittings: ASME B16.5, steel, including bolts, nuts, and gaskets, bevel-welded end connection, and raised face.
- D. Welding Filler Metals: Comply with AWS D10.12/D10.12M for welding materials appropriate for wall thickness and chemical analysis of steel pipe being welded.
- E. Flanged Unions:
 - 1. Body: Forged-steel flanges for NPS 1 to NPS 1-1/2 and ductile iron for NPS 2 to NPS 3. Apply rust-resistant finish at factory.

2. Gasket: Fiber asbestos free.
 3. Fasteners: Four plated-steel bolts, with silicon bronze nuts. Apply rust-resistant finish at factory.
 4. End Connections: Brass tailpiece adapters for solder-end connections to copper tubing.
 5. Offset Performance: Capable of minimum 3/4-inch misalignment in minimum 7-inch-long assembly.
 6. Pressure Rating: Factory test at minimum 400 psig.
 7. Maximum Operating Temperature: 330 deg F.
- F. Flexible Connectors:
1. Body: Stainless-steel bellows with woven, flexible, stainless-steel-wire-reinforced protective jacket
 2. End Connections:
 - a. NPS 2 and Smaller: With threaded-end connections.
 - b. NPS 2-1/2 and Larger: With flanged-end connections.
 3. Offset Performance: Capable of minimum 3/4-inch misalignment in minimum 7-inch-long assembly.
 4. Pressure Rating: Factory test at minimum 500 psig.
 5. Maximum Operating Temperature: 250 deg F.

2.3 VALVES AND SPECIALTIES

- A. Diaphragm Packless Valves:
1. Body and Bonnet: Forged brass or cast bronze; globe design with straight-through or angle pattern.
 2. Diaphragm: Phosphor bronze and stainless steel with stainless-steel spring.
 3. Operator: Rising stem and hand wheel.
 4. Seat: Nylon.
 5. End Connections: Socket, union, or flanged.
 6. Working Pressure Rating: 500 psig.
 7. Maximum Operating Temperature: 275 deg F.
- B. Packed-Angle Valves:
1. Body and Bonnet: Forged brass or cast bronze.
 2. Packing: Molded stem, back seating, and replaceable under pressure.
 3. Operator: Rising stem.
 4. Seat: Nonrotating, self-aligning polytetrafluoroethylene.
 5. Seal Cap: Forged-brass or valox hex cap.
 6. End Connections: Socket, union, threaded, or flanged.
 7. Working Pressure Rating: 500 psig.
 8. Maximum Operating Temperature: 275 deg F.
- C. Check Valves:
1. Body: Ductile iron, forged brass, or cast bronze; globe pattern.
 2. Bonnet: Bolted ductile iron, forged brass, or cast bronze; or brass hex plug.
 3. Piston: Removable polytetrafluoroethylene seat.
 4. Closing Spring: Stainless steel.
 5. Manual Opening Stem: Seal cap, plated-steel stem, and graphite seal.
 6. End Connections: Socket, union, threaded, or flanged.
 7. Maximum Opening Pressure: 0.50 psig.
 8. Working Pressure Rating: 500 psig.
 9. Maximum Operating Temperature: 275 deg F.

- D. Service Valves:
1. Body: Forged brass with brass cap including key end to remove core.
 2. Core: Removable ball-type check valve with stainless-steel spring.
 3. Seat: Polytetrafluoroethylene.
 4. End Connections: Copper spring.
 5. Working Pressure Rating: 500 psig.
- E. Solenoid Valves: Comply with ARI 760 and UL 429; listed and labeled by an NRTL.
1. Body and Bonnet: Plated steel.
 2. Solenoid Tube, Plunger, Closing Spring, and Seat Orifice: Stainless steel.
 3. Seat: Polytetrafluoroethylene.
 4. End Connections: Threaded.
 5. Electrical: Molded, watertight coil in NEMA 250 enclosure of type required by location with 1/2-inch conduit adapter, and 24-V ac coil.
 6. Working Pressure Rating: 400 psig.
 7. Maximum Operating Temperature: 240 deg F.
 8. Manual operator.
- F. Safety Relief Valves: Comply with ASME Boiler and Pressure Vessel Code; listed and labeled by an NRTL.
1. Body and Bonnet: Ductile iron and steel, with neoprene O-ring seal.
 2. Piston, Closing Spring, and Seat Insert: Stainless steel.
 3. Seat Disc: Polytetrafluoroethylene.
 4. End Connections: Threaded.
 5. Working Pressure Rating: 400 psig.
 6. Maximum Operating Temperature: 240 deg F.
- G. Thermostatic Expansion Valves: Comply with ARI 750.
1. Body, Bonnet, and Seal Cap: Forged brass or steel.
 2. Diaphragm, Piston, Closing Spring, and Seat Insert: Stainless steel.
 3. Packing and Gaskets: Non-asbestos.
 4. Capillary and Bulb: Copper tubing filled with refrigerant charge.
 5. Suction Temperature: 40 deg F.
 6. Superheat: Adjustable.
 7. Reverse-flow option (for heat-pump applications).
 8. End Connections: Socket, flare, or threaded union.
 9. Working Pressure Rating: 450 psig.
- H. Hot-Gas Bypass Valves: Comply with UL 429; listed and labeled by an NRTL.
1. Body, Bonnet, and Seal Cap: Ductile iron or steel.
 2. Diaphragm, Piston, Closing Spring, and Seat Insert: Stainless steel.
 3. Packing and Gaskets: Non-asbestos.
 4. Solenoid Tube, Plunger, Closing Spring, and Seat Orifice: Stainless steel.
 5. Seat: Polytetrafluoroethylene.
 6. Equalizer: Internal.
 7. Electrical: Molded, watertight coil in NEMA 250 enclosure of type required by location with 1/2-inch conduit adapter, and 24-V ac coil.
 8. End Connections: Socket.
 9. Throttling Range: Maximum 5 psig.
 10. Working Pressure Rating: 500 psig.
 11. Maximum Operating Temperature: 240 deg F.
- I. Straight-Type Strainers:

1. Body: Welded steel with corrosion-resistant coating.
 2. Screen: 100-mesh stainless steel.
 3. End Connections: Socket or flare.
 4. Working Pressure Rating: 500 psig.
 5. Maximum Operating Temperature: 275 deg F.
- J. Angle-Type Strainers:
1. Body: Forged brass or cast bronze.
 2. Drain Plug: Brass hex plug.
 3. Screen: 100-mesh monel.
 4. End Connections: Socket or flare.
 5. Working Pressure Rating: 500 psig.
 6. Maximum Operating Temperature: 275 deg F.
- K. Moisture/Liquid Indicators:
1. Body: Forged brass.
 2. Window: Replaceable, clear, fused glass window with indicating element protected by filter screen.
 3. Indicator: Color coded to show moisture content in ppm.
 4. Minimum Moisture Indicator Sensitivity: Indicate moisture above 60 ppm.
 5. End Connections: Socket or flare.
 6. Working Pressure Rating: 500 psig.
 7. Maximum Operating Temperature: 240 deg F.
- L. Replaceable-Core Filter Dryers: Comply with ARI 730.
1. Body and Cover: Painted-steel shell with ductile-iron cover, stainless-steel screws, and neoprene gaskets.
 2. Filter Media: 10 micron, pleated with integral end rings; stainless-steel support.
 3. Desiccant Media: Activated alumina or charcoal.
 4. Designed for reverse flow (for heat-pump applications).
 5. End Connections: Socket.
 6. Access Ports: NPS 1/4 connections at entering and leaving sides for pressure differential measurement.
 7. Maximum Pressure Loss: 2 psig.
 8. Working Pressure Rating: 500 psig.
 9. Maximum Operating Temperature: 240 deg F.
- M. Permanent Filter Dryers: Comply with ARI 730.
1. Body and Cover: Painted-steel shell.
 2. Filter Media: 10 micron, pleated with integral end rings; stainless-steel support.
 3. Desiccant Media: Activated alumina or charcoal.
 4. Designed for reverse flow (for heat-pump applications).
 5. End Connections: Socket.
 6. Access Ports: NPS 1/4 connections at entering and leaving sides for pressure differential measurement.
 7. Maximum Pressure Loss: 2 psig.
 8. Working Pressure Rating: 500 psig.
 9. Maximum Operating Temperature: 240 deg F.
- N. Receivers: Comply with ARI 495.
1. Comply with ASME Boiler and Pressure Vessel Code; listed and labeled by an NRTL.
 2. Comply with UL 207; listed and labeled by an NRTL.
 3. Body: Welded steel with corrosion-resistant coating.

4. Tappings: Inlet, outlet, liquid level indicator, and safety relief valve.
 5. End Connections: Socket or threaded.
 6. Working Pressure Rating: 500 psig.
 7. Maximum Operating Temperature: 275 deg F.
- O. Liquid Accumulators: Comply with ARI 495.
1. Body: Welded steel with corrosion-resistant coating.
 2. End Connections: Socket or threaded.
 3. Working Pressure Rating: 500 psig.
 4. Maximum Operating Temperature: 275 deg F.
- 2.4 REFRIGERANTS**
- A. Manufacturers: Subject to compliance with requirements, provide products by one of the following:
1. Atofina Chemicals, Inc.
 2. DuPont Company; Fluorochemicals Div.
 3. Honeywell, Inc.; Genetron Refrigerants.
 4. INEOS Fluor Americas LLC.
- B. ASHRAE 34, R-410A: Pentafluoroethane/Difluoromethane.

PART 3 - EXECUTION

3.1 PIPING APPLICATIONS

- A. Suction Lines NPS 1-1/2 and Smaller for Conventional Air-Conditioning Applications: Copper, Type ACR, annealed-temper tubing and wrought-copper fittings with brazed joints.
- B. Suction Lines NPS 2 to NPS 4 for Conventional Air-Conditioning Applications: Copper, Type ACR, drawn-temper tubing and wrought-copper fittings with brazed joints.
- C. Hot-Gas and Liquid Lines, and Suction Lines for Heat-Pump Applications: Copper, Type ACR, annealed-temper tubing and wrought-copper fittings with brazed joints.
- D. Safety-Relief-Valve Discharge Piping: Copper, Type L, drawn-temper tubing and wrought-copper fittings with soldered joints.

3.2 VALVE AND SPECIALTY APPLICATIONS

- A. Install diaphragm packless or packed-angle valves in suction and discharge lines of compressor.
- B. Install service valves for gage taps at inlet and outlet of hot-gas bypass valves and strainers if they are not an integral part of valves and strainers.
- C. Install a check valve at the compressor discharge and a liquid accumulator at the compressor suction connection.
- D. Except as otherwise indicated, install diaphragm packless or packed-angle valves on inlet and outlet side of filter dryers.
- E. Install a full-sized, three-valve bypass around filter dryers.
- F. Install solenoid valves upstream from each expansion valve and hot-gas bypass valve. Install solenoid valves in horizontal lines with coil at top.
- G. Install thermostatic expansion valves as close as possible to distributors on evaporators.
1. Install valve so diaphragm case is warmer than bulb.

2. Secure bulb to clean, straight, horizontal section of suction line using two bulb straps. Do not mount bulb in a trap or at bottom of the line.
 3. If external equalizer lines are required, make connection where it will reflect suction-line pressure at bulb location.
- H. Install safety relief valves where required by ASME Boiler and Pressure Vessel Code. Pipe safety-relief-valve discharge line to outside according to ASHRAE 15.
- I. Install moisture/liquid indicators in liquid line at the inlet of the thermostatic expansion valve or at the inlet of the evaporator coil capillary tube.
- J. Install strainers upstream from and adjacent to the following unless they are furnished as an integral assembly for device being protected:
1. Solenoid valves.
 2. Thermostatic expansion valves.
 3. Hot-gas bypass valves.
 4. Compressor.
- K. Install filter dryers in liquid line between compressor and thermostatic expansion valve, and in the suction line at the compressor.
- L. Install receivers sized to accommodate pump-down charge.
- M. Install flexible connectors at compressors.

3.3 PIPING INSTALLATION

- A. Drawing plans, schematics, and diagrams indicate general location and arrangement of piping systems; indicated locations and arrangements were used to size pipe and calculate friction loss, expansion, pump sizing, and other design considerations. Install piping as indicated unless deviations to layout are approved on Shop Drawings.
- B. Install refrigerant piping according to ASHRAE 15.
- C. Install piping in concealed locations unless otherwise indicated and except in equipment rooms and service areas.
- D. Install piping indicated to be exposed and piping in equipment rooms and service areas at right angles or parallel to building walls. Diagonal runs are prohibited unless specifically indicated otherwise.
- E. Install piping above accessible ceilings to allow sufficient space for ceiling panel removal.
- F. Install piping adjacent to machines to allow service and maintenance.
- G. Install piping free of sags and bends.
- H. Install fittings for changes in direction and branch connections.
- I. Select system components with pressure rating equal to or greater than system operating pressure.
- J. Refer to Section 230900 "Instrumentation and Control for HVAC" and Section 230993 "Sequence of Operations for HVAC Controls" for solenoid valve controllers, control wiring, and sequence of operation.
- K. Install piping as short and direct as possible, with a minimum number of joints, elbows, and fittings.
- L. Arrange piping to allow inspection and service of refrigeration equipment. Install valves and specialties in accessible locations to allow for service and inspection. Install access doors or

- panels as specified in Section 083113 "Access Doors and Frames" if valves or equipment requiring maintenance is concealed behind finished surfaces.
- M. Install refrigerant piping in protective conduit where installed belowground.
 - N. Install refrigerant piping in rigid or flexible conduit in locations where exposed to mechanical injury.
 - O. Slope refrigerant piping as follows:
 - 1. Install horizontal hot-gas discharge piping with a uniform slope downward away from compressor.
 - 2. Install horizontal suction lines with a uniform slope downward to compressor.
 - 3. Install traps and double risers to entrain oil in vertical runs.
 - 4. Liquid lines may be installed level.
 - P. When brazing or soldering, remove solenoid-valve coils and sight glasses; also remove valve stems, seats, and packing, and accessible internal parts of refrigerant specialties. Do not apply heat near expansion-valve bulb.
 - Q. Install piping with adequate clearance between pipe and adjacent walls and hangers or between pipes for insulation installation.
 - R. Identify refrigerant piping and valves according to Section 230553 "Identification for HVAC Piping and Equipment."
 - S. Install sleeves for piping penetrations of walls, ceilings, and floors. Comply with requirements for sleeves specified in Section 230517 "Sleeves and Sleeve Seals for HVAC Piping."
 - T. Install sleeve seals for piping penetrations of concrete walls and slabs. Comply with requirements for sleeve seals specified in Section 230517 "Sleeves and Sleeve Seals for HVAC Piping."
 - U. Install escutcheons for piping penetrations of walls, ceilings, and floors. Comply with requirements for escutcheons specified in Section 230518 "Escutcheons for HVAC Piping."

3.4 PIPE JOINT CONSTRUCTION

- A. Ream ends of pipes and tubes and remove burrs. Bevel plain ends of steel pipe.
- B. Remove scale, slag, dirt, and debris from inside and outside of pipe and fittings before assembly.
- C. Fill pipe and fittings with an inert gas (nitrogen or carbon dioxide), during brazing or welding, to prevent scale formation.
- D. Brazed Joints: Construct joints according to AWS's "Brazing Handbook," Chapter "Pipe and Tube."
 - 1. Use Type BcuP, copper-phosphorus alloy for joining copper socket fittings with copper pipe.
 - 2. Use Type BAg, cadmium-free silver alloy for joining copper with bronze or steel.

3.5 HANGERS AND SUPPORTS

- A. Hanger, support, and anchor products are specified in Section 230529 "Hangers and Supports for HVAC Piping and Equipment."
- B. Install the following pipe attachments:
 - 1. Adjustable steel clevis hangers for individual horizontal runs less than 20 feet long.
 - 2. Roller hangers and spring hangers for individual horizontal runs 20 feet or longer.

3. Pipe Roller: MSS SP-58, Type 44 for multiple horizontal piping 20 feet or longer, supported on a trapeze.
 4. Spring hangers to support vertical runs.
 5. Copper-clad hangers and supports for hangers and supports in direct contact with copper pipe.
- C. Install hangers for copper tubing with the following maximum spacing and minimum rod sizes:
1. NPS 1/2: Maximum span, 60 inches; minimum rod size, 1/4 inch.
 2. NPS 5/8: Maximum span, 60 inches; minimum rod size, 1/4 inch.
 3. NPS 1: Maximum span, 72 inches; minimum rod size, 1/4 inch.
 4. NPS 1-1/4: Maximum span, 96 inches; minimum rod size, 3/8 inch.
 5. NPS 1-1/2: Maximum span, 96 inches; minimum rod size, 3/8 inch.
 6. NPS 2: Maximum span, 96 inches; minimum rod size, 3/8 inch.
 7. NPS 2-1/2: Maximum span, 108 inches; minimum rod size, 3/8 inch.
 8. NPS 3: Maximum span, 10 feet; minimum rod size, 3/8 inch.
 9. NPS 4: Maximum span, 12 feet; minimum rod size, 1/2 inch.
- D. Install hangers for steel piping with the following maximum spacing and minimum rod sizes:
1. NPS 2: Maximum span, 10 feet; minimum rod size, 3/8 inch.
 2. NPS 2-1/2: Maximum span, 11 feet; minimum rod size, 3/8 inch.
 3. NPS 3: Maximum span, 12 feet; minimum rod size, 3/8 inch.
 4. NPS 4: Maximum span, 14 feet; minimum rod size, 1/2 inch.
- E. Support multifloor vertical runs at least at each floor.

3.6 FIELD QUALITY CONTROL

- A. Perform tests and inspections and prepare test reports.
- B. Tests and Inspections:
1. Comply with ASME B31.5, Chapter VI.
 2. Test refrigerant piping, specialties, and receivers. Isolate compressor, condenser, evaporator, and safety devices from test pressure if they are not rated above the test pressure.
 3. Test high- and low-pressure side piping of each system separately at not less than the pressures indicated in Part 1 "Performance Requirements" Article.
 - a. Fill system with nitrogen to the required test pressure.
 - b. System shall maintain test pressure at the manifold gage throughout duration of test.
 - c. Test joints and fittings with electronic leak detector or by brushing a small amount of soap and glycerin solution over joints.
 - d. Remake leaking joints using new materials, and retest until satisfactory results are achieved.

3.7 SYSTEM CHARGING

- A. Charge system using the following procedures:
1. Install core in filter dryers after leak test but before evacuation.
 2. Evacuate entire refrigerant system with a vacuum pump to 500 micrometers. If vacuum holds for 12 hours, system is ready for charging.
 3. Break vacuum with refrigerant gas, allowing pressure to build up to 2 psig.
 4. Charge system with a new filter-dryer core in charging line.

3.8 ADJUSTING

- A. Adjust thermostatic expansion valve to obtain proper evaporator superheat.
- B. Adjust high- and low-pressure switch settings to avoid short cycling in response to fluctuating suction pressure.
- C. Adjust set-point temperature of air-conditioning or chilled-water controllers to the system design temperature.
- D. Perform the following adjustments before operating the refrigeration system, according to manufacturer's written instructions:
 - 1. Open shutoff valves in condenser water circuit.
 - 2. Verify that compressor oil level is correct.
 - 3. Open compressor suction and discharge valves.
 - 4. Open refrigerant valves except bypass valves that are used for other purposes.
 - 5. Check open compressor-motor alignment and verify lubrication for motors and bearings.
- E. Replace core of replaceable filter dryer after system has been adjusted and after design flow rates and pressures are established.

END OF SECTION 232300

SECTION 233113 - METAL DUCTS

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

- A. Drawings and general provisions of the Contract, including General and Supplementary Conditions and Division 01 Specification Sections, apply to this Section.

1.2 SUMMARY

- A. Section Includes:
1. Single-wall rectangular ducts and fittings.
 2. Single-wall round and flat-oval ducts and fittings.
 3. Sheet metal materials.
 4. Sealants and gaskets.
 5. Hangers and supports.
- B. Related Sections:
1. Section 230593 "Testing, Adjusting, and Balancing for HVAC" for testing, adjusting, and balancing requirements for metal ducts.
 2. Section 233300 "Air Duct Accessories" for dampers, sound-control devices, duct-mounting access doors and panels, turning vanes, and flexible ducts.

1.3 PERFORMANCE REQUIREMENTS

- A. Airstream Surfaces: Surfaces in contact with the airstream shall comply with requirements in ASHRAE 62.1.
- B. All ductwork in the pool and spectator area shall be constructed of aluminum.

1.4 ACTION SUBMITTALS

- A. Product Data: For each type of the following products:
1. Sealants and gaskets.
 2. ~~Seismic-restraint devices.~~
- B. Shop Drawings:
1. Fabrication, assembly, and installation, including plans, elevations, sections, components, and attachments to other work.
 2. Factory- and shop-fabricated ducts and fittings.
 3. Duct layout indicating sizes, configuration, liner material, and static-pressure classes.
 4. Elevation of top of ducts.
 5. Fittings.
 6. Reinforcement and spacing.
 7. Seam and joint construction.
 8. Equipment installation based on equipment being used on Project.
 9. Locations for duct accessories, including dampers, turning vanes, and access doors and panels.
 10. Hangers and supports, including methods for duct and building attachment, seismic restraints, and vibration isolation.
- C. Delegated-Design Submittal:
1. Design Calculations: Calculations, including analysis data signed and sealed by the qualified professional engineer responsible for their preparation for seismic restraints.

1.5 INFORMATIONAL SUBMITTALS

- A. Coordination Drawings: Plans, drawn to scale, on which the following items are shown and coordinated with each other, using input from installers of the items involved:
 - 1. Duct installation in congested spaces, indicating coordination with general construction, building components, and other building services. Indicate proposed changes to duct layout.
 - 2. Suspended ceiling components.
 - 3. Structural members to which duct will be attached.
 - 4. Size and location of initial access modules for acoustical tile.
 - 5. Penetrations of smoke barriers and fire-rated construction.
 - 6. Items penetrating finished ceiling including the following:
 - a. Lighting fixtures.
 - b. Air outlets and inlets.
 - c. Speakers.
 - d. Sprinklers.
 - e. Access panels.
 - f. Perimeter moldings.
- B. Welding certificates.
- C. Field quality-control reports.

1.6 QUALITY ASSURANCE

- A. Welding Qualifications: Qualify procedures and personnel according to the following:
 - 1. AWS D1.1/D1.1M, "Structural Welding Code - Steel," for hangers and supports.
 - 2. AWS D1.2/D1.2M, "Structural Welding Code - Aluminum," for aluminum supports.
 - 3. AWS D9.1M/D9.1, "Sheet Metal Welding Code," for duct joint and seam welding.
- B. ASHRAE Compliance: Applicable requirements in ASHRAE 62.1, Section 5 - "Systems and Equipment" and Section 7 - "Construction and System Start-up."
- C. ASHRAE/IESNA Compliance: Applicable requirements in ASHRAE/IESNA 90.1, Section 6.4.4 - "HVAC System Construction and Insulation."

PART 2 - PRODUCTS

2.1 SINGLE-WALL RECTANGULAR DUCTS AND FITTINGS

- A. General Fabrication Requirements: Comply with SMACNA's "HVAC Duct Construction Standards - Metal and Flexible" based on indicated static-pressure class unless otherwise indicated.
- B. Transverse Joints: Select joint types and fabricate according to SMACNA's "HVAC Duct Construction Standards - Metal and Flexible," Figure 2-1, "Rectangular Duct/Transverse Joints," for static-pressure class, applicable sealing requirements, materials involved, duct-support intervals, and other provisions in SMACNA's "HVAC Duct Construction Standards - Metal and Flexible."
- C. Longitudinal Seams: Select seam types and fabricate according to SMACNA's "HVAC Duct Construction Standards - Metal and Flexible," Figure 2-2, "Rectangular Duct/Longitudinal Seams," for static-pressure class, applicable sealing requirements, materials involved, duct-support intervals, and other provisions in SMACNA's "HVAC Duct Construction Standards - Metal and Flexible."

- D. Elbows, Transitions, Offsets, Branch Connections, and Other Duct Construction: Select types and fabricate according to SMACNA's "HVAC Duct Construction Standards - Metal and Flexible," Chapter 4, "Fittings and Other Construction," for static-pressure class, applicable sealing requirements, materials involved, duct-support intervals, and other provisions in SMACNA's "HVAC Duct Construction Standards - Metal and Flexible."

2.2 SINGLE-WALL ROUND AND FLAT-OVAL DUCTS AND FITTINGS

- A. General Fabrication Requirements: Comply with SMACNA's "HVAC Duct Construction Standards - Metal and Flexible," Chapter 3, "Round, Oval, and Flexible Duct," based on indicated static-pressure class unless otherwise indicated.
1. Manufacturers: Subject to compliance with requirements, provide products by one of the following:
 - a. Lindab Inc.
 - b. McGill AirFlow LLC.
 - c. SEMCO Incorporated.
 - d. Sheet Metal Connectors, Inc.
 - e. Spiral Manufacturing Co., Inc.
- B. Flat-Oval Ducts: Indicated dimensions are the duct width (major dimension) and diameter of the round sides connecting the flat portions of the duct (minor dimension).
- C. Transverse Joints: Select joint types and fabricate according to SMACNA's "HVAC Duct Construction Standards - Metal and Flexible," Figure 3-1, "Round Duct Transverse Joints," for static-pressure class, applicable sealing requirements, materials involved, duct-support intervals, and other provisions in SMACNA's "HVAC Duct Construction Standards - Metal and Flexible."
1. Transverse Joints in Ducts Larger Than 60 Inches in Diameter: Flanged.
- D. Longitudinal Seams: Select seam types and fabricate according to SMACNA's "HVAC Duct Construction Standards - Metal and Flexible," Figure 3-2, "Round Duct Longitudinal Seams," for static-pressure class, applicable sealing requirements, materials involved, duct-support intervals, and other provisions in SMACNA's "HVAC Duct Construction Standards - Metal and Flexible."
1. Fabricate round ducts larger than 90 inches in diameter with butt-welded longitudinal seams.
 2. Fabricate flat-oval ducts larger than 72 inches in width (major dimension) with butt-welded longitudinal seams.
- E. Tees and Laterals: Select types and fabricate according to SMACNA's "HVAC Duct Construction Standards - Metal and Flexible," Figure 3-5, "90 Degree Tees and Laterals," and Figure 3-6, "Conical Tees," for static-pressure class, applicable sealing requirements, materials involved, duct-support intervals, and other provisions in SMACNA's "HVAC Duct Construction Standards - Metal and Flexible."

2.3 SHEET METAL MATERIALS

- A. General Material Requirements: Comply with SMACNA's "HVAC Duct Construction Standards - Metal and Flexible" for acceptable materials, material thicknesses, and duct construction methods unless otherwise indicated. Sheet metal materials shall be free of pitting, seam marks, roller marks, stains, discolorations, and other imperfections.
- B. Galvanized Sheet Steel: Comply with ASTM A 653/A 653M.
1. Galvanized Coating Designation: G90.
 2. Finishes for Surfaces Exposed to View: Mill phosphatized.

- C. Aluminum Sheets: Comply with ASTM B 209 Alloy 3003, H14 temper; with mill finish for concealed ducts, and standard, one-side bright finish for duct surfaces exposed to view.
- D. Reinforcement Shapes and Plates: ASTM A 36/A 36M, steel plates, shapes, and bars; black and galvanized.
 - 1. Where black- and galvanized-steel shapes and plates are used to reinforce aluminum ducts, isolate the different metals with butyl rubber, neoprene, or EPDM gasket materials.
- E. Tie Rods: Galvanized steel, 1/4-inch minimum diameter for lengths 36 inches or less; 3/8-inch minimum diameter for lengths longer than 36 inches.

2.4 SEALANT AND GASKETS

- A. General Sealant and Gasket Requirements: Surface-burning characteristics for sealants and gaskets shall be a maximum flame-spread index of 25 and a maximum smoke-developed index of 50 when tested according to UL 723; certified by an NRTL.
- B. Water-Based Joint and Seam Sealant:
 - 1. Application Method: Brush on.
 - 2. Solids Content: Minimum 65 percent.
 - 3. Shore A Hardness: Minimum 20.
 - 4. Water resistant.
 - 5. Mold and mildew resistant.
 - 6. VOC: Maximum 75 g/L (less water).
 - 7. Maximum Static-Pressure Class: 10-inch wg, positive and negative.
 - 8. Service: Indoor or outdoor.
 - 9. Substrate: Compatible with galvanized sheet steel (both PVC coated and bare), stainless steel, or aluminum sheets.
- C. Solvent-Based Joint and Seam Sealant:
 - 1. Application Method: Brush on.
 - 2. Base: Synthetic rubber resin.
 - 3. Solvent: Toluene and heptane.
 - 4. Solids Content: Minimum 60 percent.
 - 5. Shore A Hardness: Minimum 60.
 - 6. Water resistant.
 - 7. Mold and mildew resistant.
 - 8. For indoor applications, sealant shall have a VOC content of 250 g/L or less when calculated according to 40 CFR 59, Subpart D (EPA Method 24).
 - 9. VOC: Maximum 395 g/L.
 - 10. Sealant shall comply with the testing and product requirements of the California Department of Health Services' "Standard Practice for the Testing of Volatile Organic Emissions from Various Sources Using Small-Scale Environmental Chambers."
 - 11. Maximum Static-Pressure Class: 10-inch wg, positive or negative.
 - 12. Service: Indoor or outdoor.
 - 13. Substrate: Compatible with galvanized sheet steel (both PVC coated and bare), stainless steel, or aluminum sheets.
- D. Flanged Joint Sealant: Comply with ASTM C 920.
 - 1. General: Single-component, acid-curing, silicone, elastomeric.
 - 2. Type: S.
 - 3. Grade: NS.
 - 4. Class: 25.
 - 5. Use: O.

6. For indoor applications, sealant shall have a VOC content of 250 g/L or less when calculated according to 40 CFR 59, Subpart D (EPA Method 24).
 7. Sealant shall comply with the testing and product requirements of the California Department of Health Services' "Standard Practice for the Testing of Volatile Organic Emissions from Various Sources Using Small-Scale Environmental Chambers."
- E. Flange Gaskets: Butyl rubber, neoprene, or EPDM polymer with polyisobutylene plasticizer.
- F. Round Duct Joint O-Ring Seals:
1. Seal shall provide maximum leakage class of 3 cfm/100 sq. ft. at 1-inch wg and shall be rated for 10-inch wg static-pressure class, positive or negative.
 2. EPDM O-ring to seal in concave bead in coupling or fitting spigot.
 3. Double-lipped, EPDM O-ring seal, mechanically fastened to factory-fabricated couplings and fitting spigots.

2.5 HANGERS AND SUPPORTS

- A. Hanger Rods for Noncorrosive Environments: Cadmium-plated steel rods and nuts.
- B. Hanger Rods for Corrosive Environments: Electrogalvanized, all-thread rods or galvanized rods with threads painted with zinc-chromate primer after installation.
- C. Strap and Rod Sizes: Comply with SMACNA's "HVAC Duct Construction Standards - Metal and Flexible," Table 5-1, "Rectangular Duct Hangers Minimum Size," and Table 5-2, "Minimum Hanger Sizes for Round Duct."
- D. Steel Cables for Galvanized-Steel Ducts: Galvanized steel complying with ASTM A 603.
- E. Steel Cables for Stainless-Steel Ducts: Stainless steel complying with ASTM A 492.
- F. Steel Cable End Connections: Cadmium-plated steel assemblies with brackets, swivel, and bolts designed for duct hanger service; with an automatic-locking and clamping device.
- G. Duct Attachments: Sheet metal screws, blind rivets, or self-tapping metal screws; compatible with duct materials.
- H. Trapeze and Riser Supports:
1. Supports for Galvanized-Steel Ducts: Galvanized-steel shapes and plates.
 2. Supports for Stainless-Steel Ducts: Stainless-steel shapes and plates.
 3. Supports for Aluminum Ducts: Aluminum or galvanized steel coated with zinc chromate.

PART 3 - EXECUTION

3.1 DUCT INSTALLATION

- A. Drawing plans, schematics, and diagrams indicate general location and arrangement of duct system. Indicated duct locations, configurations, and arrangements were used to size ducts and calculate friction loss for air-handling equipment sizing and for other design considerations. Install duct systems as indicated unless deviations to layout are approved on Shop Drawings and Coordination Drawings.
- B. Install ducts according to SMACNA's "HVAC Duct Construction Standards - Metal and Flexible" unless otherwise indicated.
- C. Install round and flat-oval ducts in maximum practical lengths.
- D. Install ducts with fewest possible joints.

- E. Install factory- or shop-fabricated fittings for changes in direction, size, and shape and for branch connections.
- F. Unless otherwise indicated, install ducts vertically and horizontally, and parallel and perpendicular to building lines.
- G. Install ducts close to walls, overhead construction, columns, and other structural and permanent enclosure elements of building.
- H. Install ducts with a clearance of 1 inch, plus allowance for insulation thickness.
- I. Route ducts to avoid passing through transformer vaults and electrical equipment rooms and enclosures.
- J. Where ducts pass through non-fire-rated interior partitions and exterior walls and are exposed to view, cover the opening between the partition and duct or duct insulation with sheet metal flanges of same metal thickness as the duct. Overlap openings on four sides by at least 1-1/2 inches.
- K. Where ducts pass through fire-rated interior partitions and exterior walls, install fire dampers. Comply with requirements in Section 233300 "Air Duct Accessories" for fire and smoke dampers.
- L. Protect duct interiors from moisture, construction debris and dust, and other foreign materials. Comply with SMACNA's "IAQ Guidelines for Occupied Buildings Under Construction," Appendix G, "Duct Cleanliness for New Construction Guidelines."

3.2 INSTALLATION OF EXPOSED DUCTWORK

- A. Protect ducts exposed in finished spaces from being dented, scratched, or damaged.
- B. Trim duct sealants flush with metal. Create a smooth and uniform exposed bead. Do not use two-part tape sealing system.
- C. Grind welds to provide smooth surface free of burrs, sharp edges, and weld splatter. When welding stainless steel with a No. 3 or 4 finish, grind the welds flush, polish the exposed welds, and treat the welds to remove discoloration caused by welding.
- D. Maintain consistency, symmetry, and uniformity in the arrangement and fabrication of fittings, hangers and supports, duct accessories, and air outlets.
- E. Repair or replace damaged sections and finished work that does not comply with these requirements.

3.3 DUCT SEALING

- A. Seal ducts for duct static-pressure, seal classes, and leakage classes specified in "Duct Schedule" Article according to SMACNA's "HVAC Duct Construction Standards - Metal and Flexible."

3.4 HANGER AND SUPPORT INSTALLATION

- A. Comply with SMACNA's "HVAC Duct Construction Standards - Metal and Flexible," Chapter 5, "Hangers and Supports."
- B. Building Attachments: Concrete inserts, powder-actuated fasteners, or structural-steel fasteners appropriate for construction materials to which hangers are being attached.
 - 1. Where practical, install concrete inserts before placing concrete.
 - 2. Install powder-actuated concrete fasteners after concrete is placed and completely cured.
 - 3. Use powder-actuated concrete fasteners for standard-weight aggregate concretes or for slabs more than 4 inches thick.

4. Do not use powder-actuated concrete fasteners for lightweight-aggregate concretes or for slabs less than 4 inches thick.
5. Do not use powder-actuated concrete fasteners for seismic restraints.
- C. Hanger Spacing: Comply with SMACNA's "HVAC Duct Construction Standards - Metal and Flexible," Table 5-1, "Rectangular Duct Hangers Minimum Size," and Table 5-2, "Minimum Hanger Sizes for Round Duct," for maximum hanger spacing; install hangers and supports within 24 inches of each elbow and within 48 inches of each branch intersection.
- D. Hangers Exposed to View: Threaded rod and angle or channel supports.
- E. Support vertical ducts with steel angles or channel secured to the sides of the duct with welds, bolts, sheet metal screws, or blind rivets; support at each floor and at a maximum intervals of 16 feet.
- F. Install upper attachments to structures. Select and size upper attachments with pull-out, tension, and shear capacities appropriate for supported loads and building materials where used.

3.5 CONNECTIONS

- A. Make connections to equipment with flexible connectors complying with Section 233300 "Air Duct Accessories."
- B. Comply with SMACNA's "HVAC Duct Construction Standards - Metal and Flexible" for branch, outlet and inlet, and terminal unit connections.

3.6 PAINTING

- A. Paint interior of metal ducts that are visible through registers and grilles and that do not have duct liner. Apply one coat of flat, black, latex paint over a compatible galvanized-steel primer. Paint materials and application requirements are specified in Section 099113 "Exterior Painting" and Section 099123 "Interior Painting."

3.7 FIELD QUALITY CONTROL

- A. Perform tests and inspections.
- B. Leakage Tests:
 1. Comply with SMACNA's "HVAC Air Duct Leakage Test Manual." Submit a test report for each test.
 2. Test the following systems:
 - a. Ducts with a Pressure Class of 2-Inch wg or Higher: Test representative duct sections, selected by Engineer from sections installed, totaling no less than 50 percent of total installed duct area for each designated pressure class.
 3. Disassemble, reassemble, and seal segments of systems to accommodate leakage testing and for compliance with test requirements.
 4. Test for leaks before applying external insulation.
 5. Conduct tests at static pressures equal to maximum design pressure of system or section being tested. If static-pressure classes are not indicated, test system at maximum system design pressure. Do not pressurize systems above maximum design operating pressure.
 6. Give seven days' advance notice for testing.
- C. Duct system will be considered defective if it does not pass tests and inspections.
- D. Prepare test and inspection reports.

3.8 START UP

- A. Air Balance: Comply with requirements in Section 230593 "Testing, Adjusting, and Balancing for HVAC."

3.9 DUCT SCHEDULE

- A. Fabricate ducts with galvanized sheet steel except as otherwise indicated and as follows:
1. Underground Ducts: Concrete-encased, stainless steel.
- B. Supply Ducts:
1. Ducts Connected to Fan Coil Units and Terminal Units:
 - a. Pressure Class: Positive 2-inch wg
 - b. Minimum SMACNA Seal Class: C.
 - c. SMACNA Leakage Class for Rectangular: 12.
 - d. SMACNA Leakage Class for Round and Flat Oval: 12.
 2. Ducts Connected to Constant-Volume Air-Handling Units:
 - a. Pressure Class: Positive 3-inch wg
 - b. Minimum SMACNA Seal Class: B.
 - c. SMACNA Leakage Class for Rectangular: 6.
 - d. SMACNA Leakage Class for Round and Flat Oval: 6.
- C. Return Ducts:
1. Ducts Connected to Fan Coil Units, Furnaces, Heat Pumps, and Terminal Units:
 - a. Pressure Class: Positive or negative 2-inch wg
 - b. Minimum SMACNA Seal Class: C.
 - c. SMACNA Leakage Class for Rectangular: 12.
 - d. SMACNA Leakage Class for Round and Flat Oval: 12.
 2. Ducts Connected to Air-Handling Units:
 - a. Pressure Class: Positive or negative 2-inch wg.
 - b. Minimum SMACNA Seal Class: B.
 - c. SMACNA Leakage Class for Rectangular: 12.
 - d. SMACNA Leakage Class for Round and Flat Oval: 12.
- D. Exhaust Ducts:
1. Ducts Connected to Fans Exhausting (ASHRAE 62.1, Class 1 and 2) Air:
 - a. Pressure Class: Negative 2-inch wg.
 - b. Minimum SMACNA Seal Class: C if negative pressure, and A if positive pressure.
 - c. SMACNA Leakage Class for Rectangular: 12.
 - d. SMACNA Leakage Class for Round and Flat Oval: 12.
 2. Ducts Connected to Air-Handling Units:
 - a. Pressure Class: Positive or negative 2-inch wg.
 - b. Minimum SMACNA Seal Class: B if negative pressure, and A if positive pressure.
 - c. SMACNA Leakage Class for Rectangular: 12.
 - d. SMACNA Leakage Class for Round and Flat Oval: 12.
- E. Outdoor-Air (Not Filtered, Heated, or Cooled) Ducts:
1. Ducts Connected to Fan Coil Units, Furnaces, Heat Pumps, and Terminal Units:
 - a. Pressure Class: Positive or negative 1-inch wg.
 - b. Minimum SMACNA Seal Class: C.
 - c. SMACNA Leakage Class for Rectangular: 12.
 - d. SMACNA Leakage Class for Round and Flat Oval: 12.

2. Ducts Connected to Air-Handling Units:
 - a. Pressure Class: Positive or negative 2-inch wg.
 - b. Minimum SMACNA Seal Class: B.
 - c. SMACNA Leakage Class for Rectangular: 12.
 - d. SMACNA Leakage Class for Round and Flat Oval: 12.
- F. Intermediate Reinforcement:
 1. Galvanized-Steel Ducts: Galvanized steel or carbon steel coated with zinc-chromate primer.
 2. Stainless-Steel Ducts:
 - a. Exposed to Airstream: Match duct material.
 - b. Not Exposed to Airstream: Match duct material.
 3. Aluminum Ducts: Aluminum or galvanized sheet steel coated with zinc chromate.
- G. Branch Configuration:
 1. Rectangular Duct: Comply with SMACNA's "HVAC Duct Construction Standards - Metal and Flexible," Figure 4-6, "Branch Connection."
 - a. Rectangular Main to Rectangular Branch: 45-degree entry.
 - b. Rectangular Main to Round Branch: Spin in.
 2. Round and Flat Oval: Comply with SMACNA's "HVAC Duct Construction Standards - Metal and Flexible," Figure 3-5, "90 Degree Tees and Laterals," and Figure 3-6, "Conical Tees." Saddle taps are permitted in existing duct.
 - a. Velocity 1000 fpm or Lower: 90-degree tap.
 - b. Velocity 1000 to 1500 fpm: Conical tap.
 - c. Velocity 1500 fpm or Higher: 45-degree lateral.

END OF SECTION 233113

THIS PAGE INTENTIONALLY LEFT BLANK

SECTION 233300 - AIR DUCT ACCESSORIES

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

- A. Drawings and general provisions of the Contract, including General and Supplementary Conditions and Division 01 Specification Sections, apply to this Section.

1.2 SUMMARY

- A. Section Includes:
 - 1. Manual volume dampers.
 - 2. Control dampers.
 - 3. Turning vanes.
 - 4. Duct-mounted access doors.
 - 5. Flexible connectors.
 - 6. Flexible ducts.
 - 7. Duct accessory hardware.

1.3 ACTION SUBMITTALS

- A. Product Data: For each type of product.

1.4 INFORMATIONAL SUBMITTALS

- A. Coordination Drawings: Reflected ceiling plans, drawn to scale, on which ceiling-mounted access panels and access doors required for access to duct accessories are shown and coordinated with each other, using input from Installers of the items involved.
- B. Source quality-control reports.

1.5 CLOSEOUT SUBMITTALS

- A. Operation and Maintenance Data: For air duct accessories to include in operation and maintenance manuals.

1.6 MAINTENANCE MATERIAL SUBMITTALS

- A. Furnish extra materials that match products installed and that are packaged with protective covering for storage and identified with labels describing contents.
 - 1. Fusible Links: Furnish quantity equal to 10 percent of amount installed.

PART 2 - PRODUCTS

2.1 ASSEMBLY DESCRIPTION

- A. Comply with NFPA 90A, "Installation of Air Conditioning and Ventilating Systems," and with NFPA 90B, "Installation of Warm Air Heating and Air Conditioning Systems."
- B. Comply with SMACNA's "HVAC Duct Construction Standards - Metal and Flexible" for acceptable materials, material thicknesses, and duct construction methods unless otherwise indicated. Sheet metal materials shall be free of pitting, seam marks, roller marks, stains, discolorations, and other imperfections.

2.2 MATERIALS

- A. Galvanized Sheet Steel: Comply with ASTM A 653/A 653M.
 - 1. Galvanized Coating Designation: G60.
 - 2. Exposed-Surface Finish: Mill phosphatized.
- B. Stainless-Steel Sheets: Comply with ASTM A 480/A 480M, Type 304, and having a No. 2 finish for concealed ducts and for exposed ducts.
- C. Aluminum Sheets: Comply with ASTM B 209, Alloy 3003, Temper H14; with mill finish for concealed ducts and standard, 1-side bright finish for exposed ducts.
- D. Extruded Aluminum: Comply with ASTM B 221, Alloy 6063, Temper T6.
- E. Reinforcement Shapes and Plates: Galvanized-steel reinforcement where installed on galvanized sheet metal ducts; compatible materials for aluminum and stainless-steel ducts.
- F. Tie Rods: Galvanized steel, 1/4-inch minimum diameter for lengths 36 inches or less; 3/8-inch minimum diameter for lengths longer than 36 inches.

2.3 MANUAL VOLUME DAMPERS

- A. Standard, Steel, Manual Volume Dampers:
 - 1. Manufacturers: Subject to compliance with requirements, provide products by one of the following:
 - a. Air Balance Inc.; a division of Mestek, Inc.
 - b. American Warming and Ventilating; a division of Mestek, Inc.
 - c. Flexmaster U.S.A., Inc.
 - d. McGill AirFlow LLC.
 - e. Nailor Industries Inc.
 - f. Pottorff.
 - g. Ruskin Company.
 - h. Trox USA Inc.
 - i. Vent Products Company, Inc.
 - 2. Standard leakage rating.
 - 3. Suitable for horizontal or vertical applications.
 - 4. Frames:
 - a. Frame: Hat-shaped, 0.094-inch- thick, galvanized sheet steel.
 - b. Mitered and welded corners.
 - c. Flanges for attaching to walls and flangeless frames for installing in ducts.
 - 5. Blades:
 - a. Multiple or single blade.
 - b. Parallel- or opposed-blade design.
 - c. Stiffen damper blades for stability.
 - d. Galvanized-steel, 0.064 inch thick.
 - 6. Blade Axles: Galvanized steel.
 - 7. Bearings:
 - a. Stainless-steel sleeve.
 - b. Dampers in ducts with pressure classes of 3-inch wg or less shall have axles full length of damper blades and bearings at both ends of operating shaft.
 - 8. Tie Bars and Brackets: Galvanized steel.
- B. Standard, Aluminum, Manual Volume Dampers:
 - 1. Manufacturers: Subject to compliance with requirements, provide products by one of the following:

- a. Air Balance Inc.; a division of Mestek, Inc.
 - b. American Warming and Ventilating; a division of Mestek, Inc.
 - c. McGill AirFlow LLC.
 - d. Nailor Industries Inc.
 - e. Pottorff.
 - f. Ruskin Company.
 - g. Trox USA Inc.
 - h. Vent Products Company, Inc.
 2. Standard leakage rating.
 3. Suitable for horizontal or vertical applications.
 4. Frames: Hat-shaped, 0.10-inch- thick, aluminum sheet channels; frames with flanges for attaching to walls and flangeless frames for installing in ducts.
 5. Blades:
 - a. Multiple or single blade.
 - b. Parallel- or opposed-blade design.
 - c. Stiffen damper blades for stability.
 - d. Roll-Formed Aluminum Blades: 0.10-inch- thick aluminum sheet.
 - e. Extruded-Aluminum Blades: 0.050-inch- thick extruded aluminum.
 6. Blade Axles: Stainless steel.
 7. Bearings:
 - a. Stainless-steel sleeve.
 - b. Dampers in ducts with pressure classes of 3-inch wg or less shall have axles full length of damper blades and bearings at both ends of operating shaft.
 8. Tie Bars and Brackets: Aluminum.
- C. Low-Leakage, Steel, Manual Volume Dampers:
1. Manufacturers: Subject to compliance with requirements, provide products by one of the following:
 - a. Air Balance Inc.; a division of Mestek, Inc.
 - b. American Warming and Ventilating; a division of Mestek, Inc.
 - c. McGill AirFlow LLC.
 - d. Nailor Industries Inc.
 - e. Pottorff.
 - f. Ruskin Company.
 - g. Trox USA Inc.
 - h. Vent Products Company, Inc.
 2. Comply with AMCA 500-D testing for damper rating.
 3. Low-leakage rating and bearing AMCA's Certified Ratings Seal for both air performance and air leakage.
 4. Suitable for horizontal or vertical applications.
 5. Frames:
 - a. Hat shaped.
 - b. 0.094-inch- thick, galvanized sheet steel.
 - c. Mitered and welded corners.
 - d. Flanges for attaching to walls and flangeless frames for installing in ducts.
 6. Blades:
 - a. Multiple or single blade.
 - b. Parallel- or opposed-blade design.
 - c. Stiffen damper blades for stability.
 - d. Galvanized, roll-formed steel, 0.064 inch thick.
 7. Blade Axles: Galvanized steel.

8. Bearings:
 - a. Oil-impregnated stainless-steel sleeve.
 - b. Dampers in ducts with pressure classes of 3-inch wg or less shall have axles full length of damper blades and bearings at both ends of operating shaft.
 9. Blade Seals: Neoprene.
 10. Jamb Seals: Cambered stainless steel.
 11. Tie Bars and Brackets: Galvanized steel.
 12. Accessories:
 - a. Include locking device to hold single-blade dampers in a fixed position without vibration.
- D. Low-Leakage, Aluminum, Manual Volume Dampers:
1. Manufacturers: Subject to compliance with requirements, provide products by one of the following:
 - a. Air Balance Inc.; a division of Mestek, Inc.
 - b. American Warming and Ventilating; a division of Mestek, Inc.
 - c. McGill AirFlow LLC.
 - d. Nailor Industries Inc.
 - e. Pottorff.
 - f. Ruskin Company.
 - g. Trox USA Inc.
 - h. Vent Products Company, Inc.
 2. Comply with AMCA 500-D testing for damper rating.
 3. Low-leakage rating and bearing AMCA's Certified Ratings Seal for both air performance and air leakage.
 4. Suitable for horizontal or vertical applications.
 5. Frames: Hat-shaped, 0.10-inch- thick, aluminum sheet channels; frames with flanges for attaching to walls and flangeless frames for installing in ducts.
 6. Blades:
 - a. Multiple or single blade.
 - b. Parallel- or opposed-blade design.
 - c. Roll-Formed Aluminum Blades: 0.10-inch- thick aluminum sheet.
 - d. Extruded-Aluminum Blades: 0.050-inch- thick extruded aluminum.
 7. Blade Axles: Stainless steel.
 8. Bearings:
 - a. Oil-impregnated stainless-steel sleeve.
 - b. Dampers in ducts with pressure classes of 3-inch wg or less shall have axles full length of damper blades and bearings at both ends of operating shaft.
 9. Blade Seals: Neoprene.
 10. Jamb Seals: Cambered stainless steel.
 11. Tie Bars and Brackets: Aluminum.
 12. Accessories:
 - a. Include locking device to hold single-blade dampers in a fixed position without vibration.
- E. Jackshaft:
1. Size: 0.5-inch diameter.
 2. Material: Galvanized-steel pipe rotating within pipe-bearing assembly mounted on supports at each mullion and at each end of multiple-damper assemblies.
 3. Length and Number of Mountings: As required to connect linkage of each damper in multiple-damper assembly.

- F. Damper Hardware:
1. Zinc-plated, die-cast core with dial and handle made of 3/32-inch- thick zinc-plated steel, and a 3/4-inch hexagon locking nut.
 2. Include center hole to suit damper operating-rod size.
 3. Include elevated platform for insulated duct mounting.

2.4 CONTROL DAMPERS

- A. Manufacturers: Subject to compliance with requirements, provide products by one of the following:
1. American Warming and Ventilating; a division of Mestek, Inc.
 2. Arrow United Industries; a division of Mestek, Inc.
 3. Cesco Products; a division of Mestek, Inc.
 4. Greenheck Fan Corporation.
 5. Lloyd Industries, Inc.
 6. McGill AirFlow LLC.
 7. Metal Form Manufacturing, Inc.
 8. Nailor Industries Inc.
 9. NCA Manufacturing, Inc.
 10. Pottorff.
 11. Ruskin Company.
 12. Vent Products Company, Inc.
 13. Young Regulator Company.
- B. Low-leakage rating and bearing AMCA's Certified Ratings Seal for both air performance and air leakage.
- C. Frames:
1. Hat shaped.
 2. 0.094-inch- thick, galvanized sheet steel.
 3. Mitered and welded corners.
- D. Blades:
1. Multiple blade with maximum blade width of 8 inches.
 2. Parallel- and opposed-blade design.
 3. Galvanized-steel.
 4. 0.064 inch thick single skin.
 5. Blade Edging: Closed-cell neoprene.
 6. Blade Edging: Inflatable seal blade edging, or replaceable rubber seals.
- E. Blade Axles: 1/2-inch- diameter; galvanized steel; blade-linkage hardware of zinc-plated steel and brass; ends sealed against blade bearings.
1. Operating Temperature Range: From minus 40 to plus 200 deg F.
- F. Bearings:
1. Stainless-steel sleeve.
 2. Dampers in ducts with pressure classes of 3-inch wg or less shall have axles full length of damper blades and bearings at both ends of operating shaft.
 3. Thrust bearings at each end of every blade.

2.5 TURNING VANES

- A. Manufacturers: Subject to compliance with requirements, provide products by one of the following:

1. Ductmate Industries, Inc.
 2. Duro Dyne Inc.
 3. Elgen Manufacturing.
 4. METALAIRE, Inc.
 5. SEMCO Incorporated.
 6. Ward Industries, Inc.; a division of Hart & Cooley, Inc.
- B. Manufactured Turning Vanes for Metal Ducts: Curved blades of galvanized sheet steel; support with bars perpendicular to blades set; set into vane runners suitable for duct mounting.
1. Acoustic Turning Vanes: Fabricate airfoil-shaped aluminum extrusions with perforated faces and fibrous-glass fill.
- C. Manufactured Turning Vanes for Nonmetal Ducts: Fabricate curved blades of resin-bonded fiberglass with acrylic polymer coating; support with bars perpendicular to blades set; set into vane runners suitable for duct mounting.
- D. General Requirements: Comply with SMACNA's "HVAC Duct Construction Standards - Metal and Flexible"; Figures 4-3, "Vanes and Vane Runners," and 4-4, "Vane Support in Elbows."
- E. Vane Construction: Double wall.
- F. Vane Construction: Single wall for ducts up to 48 inches wide and double wall for larger dimensions.

2.6 DUCT-MOUNTED ACCESS DOORS

- A. Manufacturers: Subject to compliance with requirements, provide products by one of the following:
1. American Warming and Ventilating; a division of Mestek, Inc.
 2. Cesco Products; a division of Mestek, Inc.
 3. Ductmate Industries, Inc.
 4. Elgen Manufacturing.
 5. Flexmaster U.S.A., Inc.
 6. Greenheck Fan Corporation.
 7. McGill AirFlow LLC.
 8. Nailor Industries Inc.
 9. Pottorff.
 10. Ventfabrics, Inc.
 11. Ward Industries, Inc.; a division of Hart & Cooley, Inc.
- B. Duct-Mounted Access Doors: Fabricate access panels according to SMACNA's "HVAC Duct Construction Standards - Metal and Flexible"; Figures 7-2, "Duct Access Doors and Panels," and 7-3, "Access Doors - Round Duct."
1. Door:
 - a. Double wall, rectangular.
 - b. Galvanized sheet metal with insulation fill and thickness as indicated for duct pressure class.
 - c. Vision panel.
 - d. Hinges and Latches: 1-by-1-inch butt or piano hinge and cam latches.
 - e. Fabricate doors airtight and suitable for duct pressure class.
 2. Frame: Galvanized sheet steel, with bend-over tabs and foam gaskets.
 3. Number of Hinges and Locks:
 - a. Access Doors Less Than 12 Inches Square: No hinges and two sash locks.
 - b. Access Doors up to 18 Inches Square: Continuous and two sash locks.

- c. Access Doors up to 24 by 48 Inches: Three hinges and two compression latches.
- d. Access Doors Larger Than 24 by 48 Inches: Four hinges and two compression latches with outside and inside handles.

2.7 FLEXIBLE CONNECTORS

- A. Manufacturers: Subject to compliance with requirements, provide products by one of the following:
 - 1. Ductmate Industries, Inc.
 - 2. Duro Dyne Inc.
 - 3. Elgen Manufacturing.
 - 4. Ventfabrics, Inc.
 - 5. Ward Industries, Inc.; a division of Hart & Cooley, Inc.
- B. Materials: Flame-retardant or noncombustible fabrics.
- C. Coatings and Adhesives: Comply with UL 181, Class 1.
- D. Metal-Edged Connectors: Factory fabricated with a fabric strip 3-1/2 inches wide attached to two strips of 2-3/4-inch- wide, 0.028-inch- thick, galvanized sheet steel or 0.032-inch- thick aluminum sheets. Provide metal compatible with connected ducts.
- E. Indoor System, Flexible Connector Fabric: Glass fabric double coated with neoprene.
 - 1. Minimum Weight: 26 oz./sq. yd..
 - 2. Tensile Strength: 480 lbf/inch in the warp and 360 lbf/inch in the filling.
 - 3. Service Temperature: Minus 40 to plus 200 deg F.
- F. Outdoor System, Flexible Connector Fabric: Glass fabric double coated with weatherproof, synthetic rubber resistant to UV rays and ozone.
 - 1. Minimum Weight: 24 oz./sq. yd..
 - 2. Tensile Strength: 530 lbf/inch in the warp and 440 lbf/inch in the filling.
 - 3. Service Temperature: Minus 50 to plus 250 deg F.
- G. Thrust Limits: Combination coil spring and elastomeric insert with spring and insert in compression, and with a load stop. Include rod and angle-iron brackets for attaching to fan discharge and duct.
 - 1. Frame: Steel, fabricated for connection to threaded rods and to allow for a maximum of 30 degrees of angular rod misalignment without binding or reducing isolation efficiency.
 - 2. Outdoor Spring Diameter: Not less than 80 percent of the compressed height of the spring at rated load.
 - 3. Minimum Additional Travel: 50 percent of the required deflection at rated load.
 - 4. Lateral Stiffness: More than 80 percent of rated vertical stiffness.
 - 5. Overload Capacity: Support 200 percent of rated load, fully compressed, without deformation or failure.
 - 6. Elastomeric Element: Molded, oil-resistant rubber or neoprene.
 - 7. Coil Spring: Factory set and field adjustable for a maximum of 1/4-inch movement at start and stop.

2.8 FLEXIBLE DUCTS

- A. Manufacturers: Subject to compliance with requirements, provide products by one of the following:
 - 1. Flexmaster U.S.A., Inc.
 - 2. McGill AirFlow LLC.
 - 3. Ward Industries, Inc.; a division of Hart & Cooley, Inc.

- B. Insulated, Flexible Duct: UL 181, Class 1, black polymer film supported by helically wound, spring-steel wire; fibrous-glass insulation; polyethylene vapor-barrier film.
 - 1. Pressure Rating: 4-inch wg positive and 0.5-inch wg negative.
 - 2. Maximum Air Velocity: 4000 fpm.
 - 3. Temperature Range: Minus 20 to plus 175 deg F.
 - 4. Insulation R-Value: Comply with ASHRAE/IESNA 90.1.
- C. Flexible Duct Connectors:
 - 1. Clamps: Stainless-steel band with cadmium-plated hex screw to tighten band with a worm-gear action or Nylon strap in sizes 3 through 18 inches, to suit duct size.
 - 2. Non-Clamp Connectors: Adhesive.

2.9 DUCT ACCESSORY HARDWARE

- A. Instrument Test Holes: Cast iron or cast aluminum to suit duct material, including screw cap and gasket. Size to allow insertion of pitot tube and other testing instruments and of length to suit duct-insulation thickness.
- B. Adhesives: High strength, quick setting, neoprene based, waterproof, and resistant to gasoline and grease.

PART 3 - EXECUTION

3.1 INSTALLATION

- A. Install duct accessories according to applicable details in SMACNA's "HVAC Duct Construction Standards - Metal and Flexible" for metal ducts and in NAIMA AH116, "Fibrous Glass Duct Construction Standards," for fibrous-glass ducts.
- B. Install duct accessories of materials suited to duct materials; use galvanized-steel accessories in galvanized-steel and fibrous-glass ducts, stainless-steel accessories in stainless-steel ducts, and aluminum accessories in aluminum ducts.
- C. Install backdraft dampers at inlet of exhaust fans or exhaust ducts as close as possible to exhaust fan unless otherwise indicated.
- D. Install volume dampers at points on supply, return, and exhaust systems where branches extend from larger ducts. Where dampers are installed in ducts having duct liner, install dampers with hat channels of same depth as liner, and terminate liner with nosing at hat channel.
 - 1. Install steel volume dampers in steel ducts.
 - 2. Install aluminum volume dampers in aluminum ducts.
- E. Set dampers to fully open position before testing, adjusting, and balancing.
- F. Install test holes at fan inlets and outlets and elsewhere as indicated.
- G. Install duct access doors on sides of ducts to allow for inspecting, adjusting, and maintaining accessories and equipment at the following locations:
 - 1. On both sides of duct coils.
 - 2. Upstream from duct filters.
 - 3. At outdoor-air intakes and mixed-air plenums.
 - 4. At drain pans and seals.
 - 5. Downstream from, control dampers, backdraft dampers, and equipment.
 - 6. At each change in direction and at maximum 50-foot spacing.
 - 7. Upstream or downstream from duct silencers.
 - 8. Control devices requiring inspection.

- 9. Elsewhere as indicated.
- H. Install access doors with swing against duct static pressure.
- I. Access Door Sizes:
 - 1. One-Hand or Inspection Access: 8 by 5 inches.
 - 2. Two-Hand Access: 12 by 6 inches.
 - 3. Head and Hand Access: 18 by 10 inches.
 - 4. Head and Shoulders Access: 21 by 14 inches.
- J. Label access doors according to Section 230553 "Identification for HVAC Piping and Equipment" to indicate the purpose of access door.
- K. Install flexible connectors to connect ducts to equipment.
- L. For fans developing static pressures of 5-inch wg and more, cover flexible connectors with loaded vinyl sheet held in place with metal straps.
- M. Connect terminal units to supply ducts directly or with maximum 12-inch lengths of flexible duct. Do not use flexible ducts to change directions.
- N. Connect diffusers or light troffer boots to ducts directly or with maximum 60-inch lengths of flexible duct clamped or strapped in place.
- O. Connect flexible ducts to metal ducts with adhesive and draw bands.
- P. Install duct test holes where required for testing and balancing purposes.
- Q. Install thrust limits at centerline of thrust, symmetrical on both sides of equipment. Attach thrust limits at centerline of thrust and adjust to a maximum of 1/4-inch movement during start and stop of fans.

3.2 FIELD QUALITY CONTROL

- A. Tests and Inspections:
 - 1. Operate dampers to verify full range of movement.
 - 2. Inspect locations of access doors and verify that purpose of access door can be performed.
 - 3. Operate fire, smoke, and combination fire and smoke dampers to verify full range of movement and verify that proper heat-response device is installed.
 - 4. Inspect turning vanes for proper and secure installation.
 - 5. Operate remote damper operators to verify full range of movement of operator and damper.

END OF SECTION 233300

THIS PAGE LEFT INTENTIONALLY BLANK

SECTION 233713 - DIFFUSERS, REGISTERS, AND GRILLES

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

- A. Drawings and general provisions of the Contract, including General and Supplementary Conditions and Division 01 Specification Sections, apply to this Section.

1.2 SUMMARY

- A. Section Includes:
1. Rectangular and square ceiling diffusers.
 2. Fixed face grilles.
 3. Drum Diffuser.

1.3 ACTION SUBMITTALS

- A. Product Data: For each type of product indicated, include the following:
1. Data Sheet: Indicate materials of construction, finish, and mounting details; and performance data including throw and drop, static-pressure drop, and noise ratings.
 2. Diffuser, Register, and Grille Schedule: Indicate drawing designation, room location, quantity, model number, size, and accessories furnished.
- B. Samples for Initial Selection: For diffusers, registers, and grilles with factory-applied color finishes.
- C. Samples for Verification: For diffusers, registers, and grilles, in manufacturer's standard sizes to verify color selected.

1.4 INFORMATIONAL SUBMITTALS

- A. Coordination Drawings: Reflected ceiling plans, drawn to scale, on which the following items are shown and coordinated with each other, using input from Installers of the items involved:
1. Ceiling suspension assembly members.
 2. Method of attaching hangers to building structure.
 3. Size and location of initial access modules for acoustical tile.
 4. Ceiling-mounted items including lighting fixtures, diffusers, grilles, speakers, sprinklers, access panels, and special moldings.
 5. Duct access panels.
- B. Source quality-control reports.

PART 2 - PRODUCTS

2.1 CEILING DIFFUSERS

- A. Rectangular and Square Ceiling Diffusers:
1. Basis-of-Design Product: Subject to compliance with requirements, provide product indicated on Drawings or comparable product by one of the following:
 - a. Krueger.
 - b. Nailor Industries Inc.
 - c. Price Industries. – Basis of design
 - d. Titus.

2.2 REGISTERS AND GRILLES

- A. Fixed Face Grille And Drum Diffuser:
1. Basis-of-Design Product: Subject to compliance with requirements, provide product indicated on Drawings or comparable product by one of the following:
 - a. Krueger.
 - b. Nailor Industries Inc.
 - c. Price Industries. – Basis of design
 - d. Titus.

2.3 SOURCE QUALITY CONTROL

- A. Verification of Performance: Rate diffusers, registers, and grilles according to ASHRAE 70, "Method of Testing for Rating the Performance of Air Outlets and Inlets."

PART 3 - EXECUTION

3.1 EXAMINATION

- A. Examine areas where diffusers, registers, and grilles are to be installed for compliance with requirements for installation tolerances and other conditions affecting performance of equipment.
- B. Proceed with installation only after unsatisfactory conditions have been corrected.

3.2 INSTALLATION

- A. Install diffusers, registers, and grilles level and plumb.
- B. Ceiling-Mounted Outlets and Inlets: Drawings indicate general arrangement of ducts, fittings, and accessories. Air outlet and inlet locations have been indicated to achieve design requirements for air volume, noise criteria, airflow pattern, throw, and pressure drop. Make final locations where indicated, as much as practical. For units installed in lay-in ceiling panels, locate units in the center of panel. Where architectural features or other items conflict with installation, notify Architect for a determination of final location.
- C. Install diffusers, registers, and grilles with airtight connections to ducts and to allow service and maintenance of dampers, air extractors, and fire dampers.

3.3 ADJUSTING

- A. After installation, adjust diffusers, registers, and grilles to air patterns indicated, or as directed, before starting air balancing.

END OF SECTION 233713

SECTION 235100 - BREECHINGS, CHIMNEYS, AND STACKS

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

- A. Drawings and general provisions of the Contract, including General and Supplementary Conditions and Division 01 Specification Sections, apply to this Section.

1.2 SUMMARY

- A. This Section includes the following:
 - 1. Listed, refractory-lined **breechings and** stacks.
 - 2. Field-fabricated metal breechings.
- B. Related Sections include the following:
 - 1. Division 23 Section "Draft Control Devices" for induced-draft and mechanical fans and for motorized and barometric dampers.

1.3 SUBMITTALS

- A. Product Data: For the following:
 - 1. Chimney liners.
 - 2. Type B and BW vents.
 - 3. Type L vents.
 - 4. Special gas vents.
 - 5. Building-heating-appliance chimneys.
 - 6. Refractory-lined metal breechings and chimneys.
 - 7. Guy wires and connectors.
- B. Shop Drawings: For vents, breechings, chimneys, and stacks. Include plans, elevations, sections, details, and attachments to other work.
 - 1. Detail equipment assemblies and indicate dimensions, weights, loads, required clearances, methods of field assembly, components, hangers and seismic restraints, and location and size of each field connection.
 - 2. .
- C. Welding certificates.
- D. Warranty: Special warranty specified in this Section.

1.4 QUALITY ASSURANCE

- A. Source Limitations: Obtain listed system components through one source from a single manufacturer.
- B. Welding: Qualify procedures and personnel according to AWS D1.1/D1.1M, "Structural Welding Code--Steel," for hangers and supports and AWS D9.1/D9.1M, "Sheet Metal Welding Code," for shop and field welding of joints and seams in vents, breechings, and stacks.
- C. Certified Sizing Calculations: Manufacturer shall certify venting system sizing calculations.

1.5 COORDINATION.

- A. Coordinate size and location of concrete bases. Cast anchor-bolt inserts into bases. Concrete, reinforcement, and formwork requirements are specified in Division 03.

1.6 WARRANTY

- A. Special Warranty: Manufacturer's standard form in which manufacturer agrees to repair or replace components of venting system that fail in materials or workmanship within specified warranty period. Failures include, but are not limited to, structural failures caused by expansion and contraction.
 - 1. Warranty Period: 15 years from date of Substantial Completion.

PART 2 - PRODUCTS

2.1 FIELD-FABRICATED METAL BREECHINGS AND CHIMNEYS

- A. Fabricate freestanding chimneys according to SMACNA's "Guide for Steel Stack Design and Construction."
- B. Fabricate chimneys and vent connectors from galvanized steel, complying with NFPA 211 for minimum metal thickness.
 - 1. Equal to or Less Than 6 Inches in Diameter: 0.019 inch.
 - 2. Up to 10 Inches in Diameter: 0.024 inch.
 - 3. Up to 16 Inches in Diameter: 0.029 inch.
 - 4. Larger Than Above: 0.056 inch.
- C. Fabricate cleanout doors from compatible material, same thickness as breeching, bolted and gasketed.

2.2 GUYING AND BRACING MATERIALS

- A. Cable: Three galvanized, stranded wires of the following thickness:

1. Minimum Size: 1/4 inch in diameter.
 2. For ID Sizes 4 to 15 Inches: 5/16 inch.
 3. For ID Sizes 18 to 24 Inches: 3/8 inch.
 4. For ID Sizes 27 to 30 Inches: 7/16 inch.
 5. For ID Sizes 33 to 36 Inches: 1/2 inch.
 6. For ID Sizes 39 to 48 Inches: 9/16 inch.
 7. For ID Sizes 51 to 60 Inches: 5/8 inch.
- B. Pipe: Two galvanized steel, NPS 1-1/4.
- C. Angle Iron: Two galvanized steel, 2 by 2 by 0.25 inch.

PART 3 - EXECUTION

3.1 EXAMINATION

- A. Examine areas and conditions for compliance with requirements for installation tolerances and other conditions affecting performance of work.
1. Proceed with installation only after unsatisfactory conditions have been corrected.

3.2 APPLICATION

- A. Listed Building-Heating-Appliance Chimneys: Dual-fuel boilers, oven vents, water heaters, and exhaust for engines. Fireplaces and other solid-fuel-burning appliances.
- B. Listed, Refractory-Lined Metal Breechings and Chimneys: Freestanding dual-fuel boiler vents, oven vents, water heaters, exhaust for engines, fireplaces, and other solid-fuel-burning appliances.
- C. Field-Fabricated Metal Breechings and Chimneys: Dual-fuel boilers, oven vents, water heaters, exhaust for engines, fireplaces, and other solid-fuel-burning appliances.
- D. Field-Fabricated Metal Breechings and Chimneys: Steel pipe for use with engine exhaust.

3.3 INSTALLATION OF LISTED VENTS AND CHIMNEYS

- A. Locate to comply with minimum clearances from combustibles and minimum termination heights according to product listing or NFPA 211, whichever is most stringent.
- B. Seal between sections of positive-pressure vents and grease exhaust ducts according to manufacturer's written installation instructions, using sealants recommended by manufacturer.
- C. Support vents at intervals recommended by manufacturer to support weight of vents and all accessories, without exceeding appliance loading.
- D. Slope breechings down in direction of appliance, with condensate drain connection at lowest point piped to nearest drain.

- E. Lap joints in direction of flow.
- F. Connect base section to foundation using anchor lugs of size and number recommended by manufacturer.
- G. Join sections with acid-resistant joint cement to provide continuous joint and smooth interior finish.
- H. Erect stacks plumb to finished tolerance of no more than 1 inch (25 mm) out of plumb from top to bottom.

3.4 INSTALLATION OF UNLISTED, FIELD-FABRICATED BREECHINGS AND CHIMNEYS

- A. Suspend breechings and chimneys independent of their appliance connections.
- B. Align breechings at connections, with smooth internal surface and a maximum 1/8-inch (3-mm) misalignment tolerance.
- C. Slope breechings down in direction of appliance, with condensate drain connection at lowest point piped to nearest drain.
- D. Lap joints in direction of flow.
- E. Support breechings and chimneys from building structure with bolts, concrete inserts, steel expansion anchors, welded studs, C-clamps, or beam clamps according to manufacturer's written instructions.

3.5 CLEANING

- A. After completing system installation, including outlet fittings and devices, inspect exposed finish. Remove burrs, dirt, and construction debris and repair damaged finishes.
- B. Clean breechings internally, during and after installation, to remove dust and debris. Clean external surfaces to remove welding slag and mill film. Grind welds smooth and apply touchup finish to match factory or shop finish.
- C. Provide temporary closures at ends of breechings, chimneys, and stacks that are not completed or connected to equipment.

END OF SECTION 235100

SECTION 235223 - CAST-IRON BOILERS

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

- A. Drawings and general provisions of the Contract, including General and Supplementary Conditions and Division 1 Specification Sections, apply to this Section.
- B. The requirements of Section 230000, "Basic Mechanical Requirements" apply to work defined by this Section.
- C. The requirements of Section 230500, "Basic Mechanical Materials and Methods" apply to work defined by the Section.

1.2 SUMMARY

- A. This Section includes packaged, factory-fabricated and field-assembled, combination gas- and oil-fired, cast-iron boilers, trim, and accessories for generating hot water

1.3 SUBMITTALS

- A. Product Data: Include performance data, operating characteristics, furnished specialties, and accessories.
- B. Shop Drawings: For boilers, boiler trim, and accessories. Include plans, elevations, sections, details, and attachments to other Work.
 - 1. For installed products indicated to comply with design loads, include structural analysis data signed and sealed by the qualified professional engineer responsible for their preparation.
 - 2. Design Calculations: Calculate requirements for selecting vibration isolators and seismic restraints and for designing vibration isolation bases.
 - 3. Vibration Isolation Base Details: Detail fabrication including anchorages and attachments to structure and to supported equipment. Include auxiliary motor slides and rails, and base weights.
 - 4. Wiring Diagrams: Detail power, signal, and control wiring.
- C. Manufacturer Seismic Qualification Certification: Submit certification that cast-iron boiler, accessories, and components will withstand seismic forces defined in Division 23 Section "Mechanical Vibration and Seismic Controls" when anchored to a concrete base. Include the following:
 - 1. Basis for Certification: Indicate whether withstand certification is based on actual test of assembled components or on calculation.

- a. The term "withstand" means "the unit will remain in place without separation of any parts from the device when subjected to the seismic forces specified."
 - b. The term "withstand" means "the unit will remain in place without separation of any parts from the device when subjected to the seismic forces specified and the unit will be fully operational after the seismic event."
- 2. Dimensioned Outline Drawings of Equipment Unit: Identify center of gravity and locate and describe mounting and anchorage provisions.
- 3. Detailed description of equipment anchorage devices on which the certification is based and their installation requirements.
- D. Source quality-control test reports.
- E. Startup service reports.
- F. Operation and Maintenance Data: For cast-iron boilers to include in emergency, operation, and maintenance manuals.
- G. Warranties: Special warranties specified in this Section.

1.4 QUALITY ASSURANCE

- A. Product Options: Drawings indicate size, profiles, and dimensional requirements of cast-iron boilers and are based on the specific system indicated. Refer to Division 1 Section "Product Requirements."
- B. Electrical Components, Devices, and Accessories: Listed and labeled as defined in NFPA 70, Article 100, by a testing agency acceptable to authorities having jurisdiction, and marked for intended use.
- C. ASME Compliance: Fabricate and label cast-iron boilers to comply with ASME Boiler and Pressure Vessel Code: Section VIII, Division 1.
- D. ASHRAE/IESNA 90.1 Compliance: Boilers shall have minimum efficiency according to "Gas and Oil Fired Boilers - Minimum Efficiency Requirements."
- E. DOE Compliance: Minimum efficiency shall comply with 10 CFR 430, Subpart B, Appendix N, "Uniform Test Method for Measuring the Energy Consumption of Furnaces and Boilers."
- F. I=B=R Compliance: Cast-iron boilers shall be tested and rated according to HI's "Testing and Rating Standard for Heating Boilers," with I=B=R emblem on a nameplate affixed to boiler.
- G. UL Compliance: Test cast-iron boilers to comply with UL 726, "Oil-Fired Boiler Assemblies."
- H. UL Compliance: Test cast-iron boilers to comply with UL 795, "Commercial-Industrial Gas Heating Equipment."

1.5 COORDINATION

- A. Coordinate size and location of concrete bases. Cast anchor-bolt inserts into bases. Concrete, reinforcement, and formwork requirements are specified in Division 3.

1.6 WARRANTY

- A. Special Warranty: Manufacturer's standard form in which manufacturer agrees to repair or replace controls and heat exchangers of cast-iron boilers that fail in materials or workmanship within specified warranty period.
- B. Warranty Period for Controls: two years from date of Substantial Completion.
- C. Warranty Period for Heat Exchangers: 10 years from date of Substantial Completion.

PART 2 - PRODUCTS

2.1 MANUFACTURERS

- A. Manufacturers: Subject to compliance with requirements, provide products by one of the following:
 - 1. Buderus Hydronic Systems.
 - 2. Smith Cast Iron Boilers.
 - 3. Viessmann Manufacturing Co. (US) Inc.
 - 4. Weil-McLain; a United Dominion Company.

2.2 PACKAGED CAST-IRON BOILERS

- A. Description: Factory-fabricated [and -assembled] [, -assembled, and -tested] cast-iron boiler with cast-iron sections sealed pressure-tight,[set on an insulated steel base,] and held together with tie rods; including insulated jacket and flue-gas vent connection.
- B. Description: Factory-fabricated [and -tested and field-assembled] [and field-assembled] cast-iron boiler with cast-iron sections sealed pressure-tight,[set on an insulated steel base,] and held together with tie rods; including insulated jacket and flue-gas vent connection. Ship cast-iron sections disassembled with all materials and equipment for field assembly.
- C. Maximum Pressure Rating: Water, 50 psig.
- D. Fabricate base and attachment to pressure vessel with reinforcement strong enough to resist boiler movement during a seismic event when boiler base is anchored to building structure.

2.3 COMPONENTS

- A. Cast-Iron Section Design:

1. Configuration: Wet base.
 2. Number of Passes: Single.
 3. Sectional Joints: High-temperature sealant to seal flue-gas passages not in contact with heating medium, tapered cast-iron push nipples, and held together with tie rods.
 4. Drain and blowdown tappings.
 5. Return injection tube to equalize water flow to all sections.
 6. Crown inspection tappings with brass plugs.
 7. Built-in air separator.
- B. Combustion Chamber: Equipped flame observation ports, front and back. Seal flue-gas passages between cast-iron sections with fiber rope and high-temperature sealant.
1. Combustion Chamber Access: Refractory lined, hinged, front.
- C. Casing:
1. Jacket: galvanized sheet metal, with snap-in or interlocking closures and baked-enamel protective finish.
 2. Insulation: Minimum 2-inch thick fiberglass insulation surrounding the heat exchanger.
 3. Combustion Chamber Access: Refractory lined, hinged, front.
 4. Access: For cleaning between cast-iron sections.
 5. Draft Hood: Flue canopy and top flue connection shall be constructed of aluminized steel containing adjustable outlet damper assembly.
 6. Insulated base constructed of aluminized steel to permit boiler to be installed on combustible floor.
 7. Mounting Frame: Steel rails to mount assembled boiler package on concrete base.
 8. Seismic Fabrication Requirements: Fabricate mounting base and attachment to boiler, accessories, and components with reinforcement strong enough to withstand seismic forces defined in Division 23 Section "Vibration and Seismic Controls for HVAC Piping and Equipment" when mounting base is anchored to building structure.
 9. Control Cabinet: Sheet metal casing shall cover all controls, gas train, and burner.

2.4 COMBINATION GAS AND OIL BURNER

- A. Burner: Welded construction with multivane, stainless-steel, flame-retention diffuser for fuel oil and natural gas.
- B. Blower: Forward-curved, centrifugal fan integral to burner, directly driven by motor; with adjustable, dual-blade damper assembly and locking quadrant to set air-fuel ratio.
1. Motors: Comply with requirements specified in Division 23 Section "Common Motor Requirements for HVAC Equipment."
 - a. Motor Sizes: Minimum size as indicated. If not indicated, large enough so driven load will not require motor to operate in service factor range above 1.0.
- C. Oil Supply: Control devices and modulating control sequence shall comply with requirements in ASME CSD-1.

1. Oil Pump: Two-stage, gear-type oil pump integral to and directly driven by blower] shall be capable of producing 300-psig discharge pressure and 15-inch Hg vacuum.
2. Oil Piping Specialties:
 - a. Suction-line, manual, gate valve.
 - b. Removable-mesh oil strainer.
 - c. 0- to 30-inch Hg vacuum; 0- to 30-psig vacuum-pressure gage.
 - d. 0- to 300-psig oil-nozzle pressure gage.
 - e. Nozzle-line, solenoid-safety-shutoff oil valve.
- D. Gas Train: Control devices and modulating control sequence shall comply with requirements in ASME CSD-1.
- E. Gas Pilot: Intermittent-electric-spark pilot ignition with 100 percent main-valve and pilot-safety shutoff with electronic supervision of burner flame.
- F. Oil Pilot: Intermittent-electric-spark pilot ignition with 100 percent main-valve and pilot-safety shutoff solenoid with [cadmium sulfide] [ultraviolet scanner] flame-safety control.
- G. Flue-Gas Recirculation: Burner connections shall be equipped for recirculating flue gas.
 1. Maximum Oxides of Nitrogen: 20 ppm.

2.5 HOT-WATER BOILER TRIM

- A. Include devices sized to comply with ANSI B31.9, "Building Services Piping."
- B. Aquastat Controllers: Operating , firing rate, and high limit.
- C. Safety Relief Valve: ASME rated. 45 psig.
- D. Altitude and Temperature Gage: Minimum 3-1/2-inch- diameter, combination water-pressure and -temperature gage. Gages shall have operating-pressure and -temperature ranges so normal operating range is at approximately 50 percent of full range.
- E. Boiler Air Vent: Automatic.
- F. Drain Valve: Minimum NPS 3/4 hose-end gate valve.
- G. Tankless Heater: Carbon-steel header with copper-tube heat exchanger, mounted in an upper port of cast-iron sections and sealed with fiber gasket.
 1. Tappings NPS 2 and Smaller: Threaded ends according to ASME B1.20.1 for pipe threads.
 2. Tappings NPS 2-1/2 and Larger: Flanged ends according to ASME B16.5 for steel and stainless-steel flanges and according to ASME B16.24 for copper and copper-alloy flanges.

2.6 BURNER OPERATING CONTROLS

- A. Description: To maintain safe operating conditions, burner safety controls limit the operation of burner.
 - 1. High Cutoff: Automatic reset stops burner if operating conditions rise above maximum boiler design temperature.
 - 2. Low-Water Cutoff Switch: Float and electronic probe shall prevent burner operation on low water. Cutoff switch shall be manual-reset type.
 - 3. Blocked Vent Safety Switch: Manual-reset switch factory mounted on draft diverter.
 - 4. Rollout Safety Switch: Factory mounted on boiler combustion chamber.
 - 5. Alarm Bell: Factory mounted on control panel with silence switch; shall sound alarm for above conditions.

2.7 BOILER OPERATING CONTROLS

- A. Refer to Division 23, Section 230900 "HVAC Instrumentation and Controls."
- B. Boiler operating controls shall include the following devices and features:
 - 1. Control Transformer: 115 V.
 - 2. Motorized Vent Damper: Interlocked with burner to open before burner is operating. If damper fails to open, stop burner operation.
 - 3. Operating Pressure Control: Factory wired and mounted to cycle burner.
 - 4. Low-Water Cutoff and Pump Control: Cycle feedwater pump(s) for makeup water control.
 - 5. Sequence of Operation: Electric, factory-fabricated, and field-installed panel to control burner firing rate to maintain a constant steam pressure. Maintain pressure set point plus or minus 10 percent.
 - 6. Sequence of Operation: Electric, factory-fabricated, and field-installed panel to control burner firing rate to maintain space temperature in response to thermostat with heat anticipator located in heated space.
 - 7. Sequence of Operation: Electric, factory-fabricated, and field-installed panel to control burner firing rate to reset supply-water temperature inversely with outside-air temperature. At 0 deg F > outside-air temperature, set supply-water temperature at 180 deg F ; at 60 deg F outside-air temperature, set supply-water temperature at 140 deg F.
 - a. Include automatic, alternating-firing sequence for multiple boilers.
- C. Building Management System Interface: Factory-installed hardware and software to enable building management system to monitor and control hot-water set point and display boiler status and alarms.

2.8 VENTING KITS

- A. Vent Damper: Motorized, 24-V ac, UL listed for use with standing pilot or intermittent ignition on atmospheric burner boiler equipped with draft hood. Interlock with burner.

- B. Kit: ASTM A 959, Type 29-4C, stainless-steel vent terminal, passage thimble, indoor wall plate, vent adapter, condensate trap, and sealant.
- C. Combustion-Air Intake: Stainless-steel, vent terminal with screen, inlet air coupling, and sealant.
- D. Chimney and Type B Vent Adapter: Vent adapter and sealant.

2.9 SOURCE QUALITY CONTROL

- A. Test and inspect factory-assembled boilers, before shipping, according to ASME Boiler and Pressure Vessel Code: Section IV.
- B. Burner and Hydrostatic Test: Factory adjust burner to eliminate excess oxygen, carbon dioxide, oxides of nitrogen, and carbon monoxide in flue gas and to achieve combustion efficiency; perform hydrostatic test.
- C. Allow Owner access to source quality-control testing of cast-iron boilers. Notify Architect 14 days in advance of testing.

PART 3 - EXECUTION

3.1 EXAMINATION

- A. Before boiler installation, examine roughing-in for concrete equipment bases, anchor-bolt sizes and locations, and piping and electrical connections to verify actual locations, sizes, and other conditions affecting boiler performance, maintenance, and operations.
 - 1. Final boiler locations indicated on Drawings are approximate. Determine exact locations before roughing-in for piping and electrical connections.
- B. Examine mechanical spaces for suitable conditions where boilers will be installed. Proceed with installation only after unsatisfactory conditions have been corrected.

3.2 BOILER INSTALLATION

- A. Install boilers level on concrete base. Concrete base is specified in Division 23 Section "Basic Mechanical Materials and Methods," and concrete materials and installation requirements are specified in Division 3.
- B. Concrete Bases: Anchor boilers to concrete base.
 - 1. Install dowel rods to connect concrete base to concrete floor. Unless otherwise indicated, install dowel rods on 18-inch centers around full perimeter of base.
 - 2. For supported equipment, install epoxy-coated anchor bolts that extend through concrete base and anchor into structural concrete floor.

3. Place and secure anchorage devices. Use setting drawings, templates, diagrams, instructions, and directions furnished with items to be embedded.
 4. Install anchor bolts to elevations required for proper attachment to supported equipment.
 5. Cast-in-place concrete materials and placement requirements are specified in Division 3.
- C. Vibration Isolation: Rubber pads with a minimum static deflection of [0.25 inch] <Insert deflection>. Vibration isolation devices and installation requirements are specified in Division 23 Section "Mechanical Vibration and Seismic Controls."
- D. Install gas-fired boilers according to NFPA 54.
- E. Install oil-fired boilers according to NFPA 31.
- F. Assemble boiler sections in sequence and seal between each section.
- G. Assemble and install boiler trim.
- H. Install electrical devices furnished with boiler but not specified to be factory mounted.

3.3 CONNECTIONS

- A. Piping installation requirements are specified in other Division 23 Sections. Drawings indicate general arrangement of piping, fittings, and specialties.
- B. Connect gas piping full size to boiler gas-train inlet with union.
- C. Connect oil piping full size to burner inlet with shutoff valve and union.
- D. Connect hot-water piping to supply- and return-boiler tapings with shutoff valve and union or flange at each connection.
- E. Connect steam and condensate piping to supply-, return-, and blowdown-boiler tapings with shutoff valve and union or flange at each connection.
- F. Install piping from safety relief valves to nearest floor drain.
- G. Install piping from safety valves to drip-pan elbow and to nearest floor drain.
- H. Connect breeching full size to boiler outlet.
- I. Install flue-gas recirculation duct from vent to burner. Refer to Division 23 Section "Breechings, Chimneys, and Stacks" for recirculation duct materials.
- J. Install piping adjacent to boiler to allow service and maintenance.
- K. Ground equipment according to Division 26 Section "Grounding and Bonding."
- L. Connect wiring according to Division 26 Section "Conductors and Cables."

- M. Tighten electrical connectors and terminals according to manufacturer's published torque-tightening values. If manufacturer's torque values are not indicated, use those specified in UL 486A and UL 486B.

3.4 STARTUP SERVICE

- A. Engage a factory-authorized service representative to test, inspect, and adjust boiler components and equipment installation and to perform startup service.
- B. Perform installation and startup checks according to manufacturer's written instructions.
- C. Leak Test: Hydrostatic test. Repair leaks and retest until no leaks exist.
- D. Operational Test: Start units to confirm proper motor rotation and unit operation. Adjust air-fuel ratio and combustion.
- E. Test and adjust controls and safeties. Replace damaged and malfunctioning controls and equipment.
- F. Burner Test: Adjust burner to eliminate excess oxygen, carbon dioxide, oxides of nitrogen, and carbon monoxide in flue gas and to achieve combustion efficiency.
- G. Adjust initial temperature set points.
- H. Set field-adjustable switches and circuit-breaker trip ranges as indicated.
- I. Occupancy Adjustments: When requested within 12 months of date of Substantial Completion, provide on-site assistance in adjusting system to suit actual occupied conditions. Provide up to two visits to site outside normal occupancy hours for this purpose, without additional cost.
- J. Prepare written report that documents testing procedures and results.

3.5 DEMONSTRATION

- A. Engage a factory-authorized service representative to train Owner's maintenance personnel to adjust, operate, and maintain cast-iron boilers. Refer to Division 1 Section "[Closeout Procedures] [Demonstration and Training]."

END OF SECTION 235223

THIS PAGE LEFT INTENTIONALLY BLANK

SECTION 235700 - HEAT EXCHANGERS FOR HVAC

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

- A. Drawings and general provisions of the Contract, including General and Supplementary Conditions and Division 01 Specification Sections, apply to this Section.

1.2 SUMMARY

- A. Section includes shell-and-tube heat exchangers.

1.3 DEFINITIONS

- A. TEMA: Tubular Exchanger Manufacturers Association.

1.4 ACTION SUBMITTALS

- A. Product Data: For each type of product.
 - 1. Include rated capacities, operating characteristics, and furnished specialties and accessories.
- B. Shop Drawings: Signed and sealed by a qualified professional engineer. Detail equipment assemblies and indicate dimensions, weights, loads, required clearances, method of field assembly, components, and location and size of each field connection.
 - 1. Design Calculations: Calculate requirements for selecting seismic restraints and for designing bases.
 - 2. Base Details: Detail fabrication including anchorages and attachments to structure and to supported equipment.

1.5 INFORMATIONAL SUBMITTALS

- A. Coordination Drawings: Equipment room, drawn to scale, on which the following items are shown and coordinated with each other, using input from installers of the items involved:
 - 1. Tube-removal space.
 - 2. Structural members to which heat exchangers will be attached.
- B. Seismic Qualification Certificates: For heat exchanger, accessories, and components, from manufacturer.
 - 1. Basis for Certification: Indicate whether withstand certification is based on actual test of assembled components or on calculation.
 - 2. Dimensioned Outline Drawings of Heat Exchanger: Identify center of gravity and locate and describe mounting and anchorage provisions.
 - 3. Detailed description of heat exchanger anchorage devices on which certification is based and their installation requirements.
- C. Product Certificates: For each type of shell-and-tube heat exchanger. Documentation that shell-and-tube heat exchangers comply with "TEMA Standards."
- D. Source quality-control reports.
- E. Field quality-control reports.
- F. Sample Warranty: For manufacturer's warranty.

1.6 CLOSEOUT SUBMITTALS

- A. Operation and Maintenance Data: For heat exchangers to include in emergency, operation, and maintenance manuals.

1.7 WARRANTY

- A. Special Warranty: Manufacturer's standard form in which manufacturer agrees to repair or replace components of domestic-water heat exchangers that fail in materials or workmanship within specified warranty period.
 - 1. Failures include, but are not limited to, the following:
 - a. Structural failures including heat exchanger, storage tank, and supports.
 - b. Faulty operation of controls.
 - c. Deterioration of metals, metal finishes, and other materials beyond normal use.
 - 2. Warranty Periods: From date of Substantial Completion.
 - a. Shell-and-Tube Heat Exchangers:
 - 1) Tube Coil: One year.
 - 2) Other Components: One year.

PART 2 - PRODUCTS

2.1 PERFORMANCE REQUIREMENTS

- A. Delegated Design: Engage a qualified professional engineer, as defined in Section 014000 "Quality Requirements," to design seismic restraints for heat exchangers.
- B. Seismic Performance: Heat exchangers shall withstand the effects of earthquake motions determined according to ASCE/SEI 7.
 - 1. The term "withstand" means "the unit will remain in place without separation of any parts when subjected to the seismic forces specified and the unit will be fully operational after the seismic event."

2.2 SHELL-AND-TUBE HEAT EXCHANGERS

- A. Manufacturers: Subject to compliance with requirements, provide products by one of the following:
 - 1. API Heat Transfer Inc.
 - 2. Armstrong Pumps, Inc.
 - 3. ITT Corporation; Bell & Gossett.
 - 4. TACO Incorporated.
 - 5. Thrush Company, Inc.
- B. Description: Packaged assembly of tank, heat-exchanger coils, and specialties.
- C. Construction:
 - 1. Fabricate and label heat exchangers to comply with ASME Boiler and Pressure Vessel Code, Section VIII, "Pressure Vessels," Division 1.
 - 2. Fabricate and label shell-and-tube heat exchangers to comply with "TEMA Standards."
- D. Configuration: U-tube with removable bundle.
- E. Shell Materials: Steel.
- F. Head:
 - 1. Materials: Cast iron.
 - 2. Flanged and bolted to shell.

- G. Tube:
 - 1. Seamless copper tubes.
 - 2. Tube diameter is determined by manufacturer based on service.
- H. Tubesheet Materials: Steel.
- I. Baffles: Steel.
- J. Piping Connections: Factory fabricated of materials compatible with heat-exchanger shell. Attachappings to shell before testing and labeling.
 - 1. NPS 2 (DN 50) and Smaller: Threaded ends according to ASME B1.20.1.
 - 2. NPS 2-1/2 (DN 65) and Larger: Flanged ends according to ASME B16.5 for steel and stainless-steel flanges and according to ASME B16.24 for copper and copper-alloy flanges.
- K. Support Saddles:
 - 1. Fabricated of material similar to shell.
 - 2. Fabricate foot mount with provision for anchoring to support.
 - 3. Fabricate attachment of saddle supports to pressure vessel with reinforcement strong enough to resist heat-exchanger movement during seismic event when heat-exchanger saddles are anchored to building structure.

2.3 ACCESSORIES

- A. Hangers and Supports:
 - 1. Custom, steel supports and cradles for mounting on structural steel.
 - 2. Field-fabricated steel supports and cradles to ensure both horizontal and vertical support of heat exchanger. Comply with requirements in Section 230529 "Hangers and Supports for HVAC Piping and Equipment."
- B. Pressure Relief Valves: Cast iron, ASME rated and stamped.

2.4 SOURCE QUALITY CONTROL

- A. Factory Tests: Test and inspect heat exchangers according to ASME Boiler and Pressure Vessel Code, Section VIII, "Pressure Vessels," Division 1. Affix ASME label.
- B. Hydrostatically test heat exchangers to minimum of one and one-half times pressure rating before shipment.
- C. Heat exchangers will be considered defective if they do not pass tests and inspections.
- D. Prepare test and inspection reports.

PART 3 - EXECUTION

3.1 EXAMINATION

- A. Examine areas for compliance with requirements for installation tolerances and for structural rigidity, strength, anchors, and other conditions affecting performance of heat exchangers.
- B. Examine roughing-in for heat-exchanger piping to verify actual locations of piping connections before equipment installation.
- C. Proceed with installation only after unsatisfactory conditions have been corrected.

3.2 SHELL-AND-TUBE HEAT-EXCHANGER INSTALLATION

- A. Equipment Mounting:
 - 1. Comply with requirements for vibration isolation and seismic control devices specified in Section 230548 "Vibration and Seismic Controls for HVAC."
- B. Install heat exchangers on saddle supports.
- C. Heat-Exchanger Supports: Use factory-fabricated steel cradles and supports specifically designed for each heat exchanger.

3.3 CONNECTIONS

- A. Comply with requirements for piping specified in other Section 232113 "Hydronic Piping" and Section 232116 Hydronic Piping Specialties." Drawings indicate general arrangement of piping, fittings, and specialties.
- B. Maintain manufacturer's recommended clearances for tube removal, service, and maintenance.
- C. Install piping adjacent to heat exchangers to allow space for service and maintenance of heat exchangers. Arrange piping for easy removal of heat exchangers.
- D. Install shutoff valves at heat-exchanger inlet and outlet connections.
- E. Install relief valves on heat-exchanger heated-fluid connection and install pipe relief valves, full size of valve connection, to floor drain.
- F. Install hose end valve to drain shell.
- G. Install thermometer on heat-exchanger and inlet and outlet piping and install thermometer on heating-fluid inlet and outlet piping. Comply with requirements for thermometers specified in Section 230519 "Meters and Gages for HVAC Piping."
- H. Install pressure gages on heat-exchanger and heating-fluid piping. Comply with requirements for pressure gages specified in Section 230519 "Meters and Gages for HVAC Piping."

3.4 FIELD QUALITY CONTROL

- A. Perform the following tests and inspections:
 - 1. Leak Test: After installation, charge system and test for leaks. Repair leaks and retest until no leaks exist.
 - 2. Test and adjust controls and safeties. Replace damaged and malfunctioning controls and equipment.
- B. Heat exchanger will be considered defective if it does not pass tests and inspections.
- C. Prepare test and inspection reports.

3.5 CLEANING

- A. After completing system installation, including outlet fitting and devices, inspect exposed finish. Remove burrs, dirt, and construction debris and repair damaged finishes.

3.6 DEMONSTRATION

- A. Train Owner's maintenance personnel to adjust, operate, and maintain heat exchangers.

END OF SECTION 235700

SECTION 237200 AIR-TO-AIR ENERGY RECOVERY UNITS

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

- A. Drawings and general provisions of the Contract, including General and Supplementary Conditions and Division 1 Specification Sections, apply to this Section.
- B. The requirements of Section 230000, "Basic Mechanical Requirements" apply to work defined by this Section.
- C. The requirements of Section 230500, "Basic Mechanical Materials and Methods" apply to work defined by the Section.

1.2 SUMMARY

- A. This Section includes the following:
 - 1. Heat wheels.
 - 2. Heat-pipe heat exchangers.
 - 3. Fixed-plate heat exchangers.
 - 4. Packaged energy recovery units.
- B. Related Sections include the following:
 - 1. Division 23, "HVAC Instrumentation and Controls" for control wiring and control devices connected to energy recovery units.

1.3 SUBMITTALS

- A. Product Data: Include rated capacities, furnished specialties, and accessories.
 - 1. Provide detailed calculations documenting the heat recovery meets or exceeds the quantities specified or scheduled for each temperature and load condition identified.
- B. Shop Drawings: Signed and sealed by a qualified professional engineer.
 - 1. Include plans, elevations, sections, details, and attachments to other Work. For installed products indicated to comply with design loads, include structural analysis data.
 - 2. Design Calculations: Calculate requirements for selecting vibration isolators and seismic restraints and for designing vibration isolation bases.
 - 3. Vibration Isolation Base Details: Detail fabrication including anchorages and attachments to structure and to supported equipment. Include auxiliary motor slides and rails, and base weights.
 - 4. Wiring Diagrams: Power, signal, and control wiring.

- C. Coordination Drawings: Plans, elevations, and other details, drawn to scale, on which the following items are shown and coordinated with each other, using input from Installers of the items involved:
 - 1. Suspended ceiling components.
 - 2. Structural members to which equipment or suspension systems will be attached.
- D. Detailed description of equipment anchorage devices on which the certification is based and their installation requirements
- E. Field quality-control test reports.

1.4 QUALITY ASSURANCE

- A. Source Limitations: Obtain air-to-air energy recovery units through one source from a single manufacturer.
- B. Product Options: Drawings indicate size, profiles, and dimensional requirements of air-to-air energy recovery units and are based on the specific system indicated. Refer to Division 1 Section "Product Requirements."
 - 1. Do not modify intended aesthetic effects, as judged solely by Architect, except with Architect's approval. If modifications are proposed, submit comprehensive explanatory data to Architect for review.
- C. Electrical Components, Devices, and Accessories: Listed and labeled as defined in NFPA 70, by a testing agency acceptable to authorities having jurisdiction, and marked for intended use.
- D. ARI Compliance:
 - 1. Capacity ratings for air-to-air energy recovery equipment shall comply with ARI 1060, "Performance Rating of Air-to-Air Heat Exchangers for Energy Recovery Ventilation Equipment."
 - 2. Capacity ratings for air coils shall comply with ARI 410, "Forced-Circulation Air-Cooling and Air-Heating Coils."
- E. ASHRAE Compliance:
 - 1. Applicable requirements in ASHRAE 62.1-2004, Section 5 - "Systems and Equipment" and Section 7 - "Construction and Startup."
 - 2. Capacity ratings for air-to-air energy recovery equipment shall comply with ASHRAE 84, "Method of Testing Air-to-Air Heat Exchangers."
- F. NRCA Compliance: Roof curbs for roof-mounted equipment shall be constructed according to recommendations of NRCA.
- G. UL Compliance:
 - 1. Packaged heat recovery ventilators shall comply with requirements in UL 1812, "Ducted Heat Recovery Ventilators"; or UL 1815, "Nonducted Heat Recovery Ventilators."

2. Electric coils shall comply with requirements in UL 1995, "Heating and Cooling Equipment."

1.5 COORDINATION

- A. Coordinate size and location of concrete bases. Cast anchor-bolt inserts into bases. Concrete, reinforcement, and formwork requirements are specified in Division 3.
- B. Coordinate installation of roof curbs, equipment supports, and roof penetrations. These items are specified in Division 7 Section "Roof Accessories."

1.6 WARRANTY

- A. Special Warranty: Manufacturer's standard form in which manufacturer agrees to repair or replace components of air-to-air energy recovery equipment that fail in materials or workmanship within specified warranty period.
 1. Warranty Period for Packaged Energy Recovery Units: Two years.
 2. Warranty Period for Fixed-Plate Total Heat Exchangers: 5 years.

1.7 EXTRA MATERIALS

- A. Furnish extra materials described below that match products installed and that are packaged with protective covering for storage and identified with labels describing contents.
 1. Filters: Furnish one set of each type of filter specified.
 2. Fan Belts: Furnish one set of belts for each belt-driven fan in energy recovery units.
 3. Wheel Belts: Furnish one set of belts for each heat wheel.

PART 2 - PRODUCTS

2.1 MANUFACTURERS

- A. Available Manufacturers: Subject to compliance with requirements, manufacturers offering products that may be incorporated into the Work include, but are not limited to, the following:
- B. Manufacturers: Subject to compliance with requirements, provide products by one of the following:
 1. Heat wheels:
 - a. Advanced Thermal Technologies.
 - b. American Energy Exchange, Inc.
 - c. Munters; Cargocaire Division.
 - d. SEMCO Incorporated.
 - e. Trane; American Standard Companies, Inc.
 - f. U.S. Rotors, Inc.

2. Fixed-plate sensible heat exchangers:
 - a. American Energy Exchange, Inc.
 - b. Conservation Energy Systems.
 - c. Des Champs Technologies.
 - d. Exothermics Inc.
 - e. Mitsubishi Electric (Canada).
 - f. Nutech Brands Inc.
 - g. UAS, Inc.; a CLARCOR company.
3. Packaged energy recovery units:
 - a. Advanced Thermal Technologies.
 - b. American Energy Exchange, Inc.
 - c. Applied Air; Mestek Technology, Inc.
 - d. Carnes.
 - e. Conservation Energy Systems.
 - f. Des Champs Technologies.
 - g. Engineered Air.
 - h. Gaylord Industries, Inc.
 - i. Gouvernaire.
 - j. Greenheck Fan Corporation.
 - k. Munters; Cargocaire Division.
 - l. SEMCO Incorporated.
 - m. Trane; American Standard Companies, Inc.
 - n. Venmar CES Inc.
 - o. Wing, L. J.; Mestek Technology, Inc.

2.2 HEAT WHEELS

- A. Casing: Steel with manufacturer's standard paint coating. Include the following:
 1. Integral purge section.
 2. Casing seals on periphery of rotor, on duct divider, and on purge section.
 3. Support rotor on grease-lubricated ball bearings with extended grease fittings. Mount horizontal wheels on tapered roller bearing.
- B. Rotor: Corrugated aluminum segmented wheel strengthened with radial spokes with nontoxic, noncorrosive silica-gel desiccant coating. Construct media for passing maximum 800 micrometer solids and maximum 0.04 percent cross contamination by volume of exhaust air. Drive rotor with belt around outside of rotor.
- C. Drive: Fractional horsepower motor and gear reducer, with speed changed by variable frequency controller and self-adjusting multilink belt around outside of rotor.
 1. Comply with NEMA designation, temperature rating, service factor, enclosure type, and efficiency requirements for motors specified in Division 23 Section "Common Motor Requirements for HVAC Equipment."
 2. Motor Sizes: Minimum size as indicated. If not indicated, large enough so driven load will not require motor to operate in service factor range above 1.0.

- D. Controls: Starting relay, factory mounted and wired, and manual motor starter for field wiring.
- E. Controls: Panel factory mounted and wired to motor, with airstream thermostat and adjustable variable-frequency controller for field wiring; with pilot-light indication of rotor rotation and provisions for setting maximum and minimum speed.
- F. Rotation Detection: Electronic control module, electromagnetic sensor, and iron shuttle factory wired and mounted, with alarm bell for field wiring and mounting.

2.3 FIXED-PLATE SENSIBLE HEAT EXCHANGERS

- A. Casing: Aluminum with duct collars.
 - 1. Insulation: 1-inch- thick, foil-faced glass fiber.
 - 2. Drain Pan: Same material as casing, with drain connections on exhaust and supply side.
 - a. Comply with requirements in ASHRAE 62.1-2004
- B. Plates: Construct with plates evenly spaced and sealed and arranged for counter airflow.
 - 1. Plate Material: Embossed aluminum.
 - 2. Plate Coating: Epoxy.
- C. Bypass: Construct bypass plenum within casing, with gasketed face-and-bypass dampers having operating rods extended outside casing.
- D. Water Wash: Automatic system, with spray manifold to individual spray tubes or traversing type with stainless-steel-screw operating mechanism and electric motor drive; activated by time clock.
- E. Accessories:
 - 1. Flexible Duct: UL 181, Class 1 insulated.
 - 2. Humidistat: Wall mounted, adjustable.
 - 3. Weather hoods (wall caps) with 1/4-inch bird screen and insulated flexible duct termination.
 - 4. Sound muffler.
 - 5. 2-kW, electric duct heater with remote thermostat.

PART 3 - EXECUTION

3.1 INSTALLATION

- A. Install heat wheels so supply and exhaust airstreams flow in opposite directions and rotation is from exhaust side to purge section to supply side.
 - 1. Install access doors in both supply and exhaust ducts, both upstream and downstream, for access to wheel surfaces, drive motor, and seals.
 - 2. Install removable panels or access doors between supply and exhaust ducts on building side for bypass during startup.

3. Access doors and panels are specified in Division 23 Section "Duct Accessories."
- B. Install fixed-plate heat exchangers so supply and exhaust airstreams flow in opposite directions.
 1. Install duct access doors in both supply and exhaust ducts, both upstream and downstream, for access to heat exchanger. Access doors and panels are specified in Division 23 Section "Duct Accessories."
- C. Install floor-mounted units on 4-inch- high concrete base[designed to withstand, without damage to equipment, seismic force required by code].
- D. Equipment Mounting: Install air-to-air energy recovery equipment on concrete bases.
 1. Install dowel rods to connect concrete base to concrete floor. Unless otherwise indicated, install dowel rods on 18-inch centers around the full perimeter of concrete base.
 2. For supported equipment, install epoxy-coated anchor bolts that extend through concrete base and anchor into structural concrete floor.
 3. Place and secure anchorage devices. Use setting drawings, templates, diagrams, instructions, and directions furnished with items to be embedded.
- E. Roof Curb: Install on roof structure or concrete base, level and secure, according to The NRCA "Roofing and Waterproofing Manual - Volume 4: Construction Details - Low-Slope Roofing," Illustration "Raised Curb Detail for Rooftop Air Handling Units and Ducts. Install air-to-air energy recovery equipment on curbs and coordinate roof penetrations and flashing with roof construction specified in Division 07 Section "Roof Accessories." Secure air-to-air energy recovery equipment to upper curb rail, and secure curb base to roof framing or concrete base with anchor bolts.
- F. Support suspended units from structure; use threaded steel rods
- G. Install units with clearances for service and maintenance.
- H. Install new filters at completion of equipment installation and before testing, adjusting, and balancing.
- I. Pipe drains from units and drain pans to nearest floor drain; use ASTM B 88, Type L, drawn-temper copper water tubing with soldered joints, same size as condensate drain connection.
 1. Requirements for Low-Emitting Materials:
 - a. Use PVC solvent cement that has a VOC content of 510 g/L or less when calculated according to 40 CFR 59, Subpart D (EPA Method 24).
 - b. Use adhesive primer that has a VOC content of 550 g/L or less when calculated according to 40 CFR 59, Subpart D (EPA Method 24)

3.2 CONNECTIONS

- A. Comply with requirements for piping specified in Division 23 Section "Hydronic Piping." Drawings indicate general arrangement of piping, fittings, and specialties.

- B. Install piping adjacent to machine to allow service and maintenance.
- C. Connect piping to units mounted on vibration isolators with flexible connectors.
- D. Connect cooling condensate drain pans with air seal trap at connection to drain pan and install cleanouts at changes in pipe direction.
- E. Hot Water Piping: Comply with applicable requirements in Division 23 Section "Hydronic Piping." Install shutoff valve and union or flange at each coil supply connection. Install balancing valve and union or flange at each coil return connection.
- F. Refrigerant Piping: Comply with applicable requirements in Division 23 Section "Refrigerant Piping."
- G. Comply with requirements for ductwork specified in Division 23 Section "Metal Ducts."
- H. Electrical Connections: Comply with applicable requirements in Division 26 Sections.
- I. Install electrical devices furnished with units but not factory mounted.
- J. Duct and fan installation requirements are specified in other Division 23 Sections. Drawings indicate general arrangement of ducts, fittings, and specialties.
- K. Ground equipment according to Division 26 Section "Grounding and Bonding."

3.3 FIELD QUALITY CONTROL

- A. Manufacturer's Field Service: Engage a factory-authorized service representative to inspect field-assembled components and equipment installation, including piping and electrical connections. Report results in writing.
 - 1. Operational Test: After electrical circuitry has been energized, start units to confirm proper motor rotation and unit operation.
 - 2. Adjust seals and purge.
 - 3. Test and adjust controls and safeties. Replace damaged and malfunctioning controls and equipment.
 - 4. Set initial temperature and humidity set points.
 - 5. Set field-adjustable switches and circuit-breaker trip ranges as indicated.
- B. Remove malfunctioning units, replace with new units, and retest as specified above.

3.4 DEMONSTRATION

- A. Engage a factory-authorized service representative to train Owner's maintenance personnel to adjust, operate, and maintain units. Refer to Division 1 Section "Closeout Procedures."

END OF SECTION 237200

THIS PAGE LEFT INTENTIONALLY BLANK

SECTION 237413 ROOFTOP AIR CONDITIONERS

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

- A. Drawings and general provisions of the Contract, including General and Supplementary Conditions and Division 1 Specification Sections, apply to this Section.
- B. The requirements of Section 230000, "Basic Mechanical Requirements" apply to work defined by this Section.
- C. The requirements of Section 230500, "Basic Mechanical Materials and Methods" apply to work defined by the Section.

1.2 SUMMARY

- A. This Section includes the following rooftop air conditioners:
 - 1. Cooling-only units 7-1/2 to 20 tons.

1.3 DEFINITIONS

- A. DDC: Direct-digital controls.

1.4 SUBMITTALS

- A. Product Data: Include manufacturer's technical data for each model indicated, including rated capacities, dimensions, required clearances, characteristics, furnished specialties, and accessories.
- B. Shop Drawings: Detail equipment assemblies and indicate dimensions, weights, loads, required clearances, method of field assembly, components, and location and size of each field connection. Prepare the following by or under the supervision of a qualified professional engineer:
 - 1. Design Calculations: Calculate requirements for selecting vibration isolators and for designing vibration isolation bases.
 - 2. Detail mounting, securing, and flashing of roof curb to roof structure. Indicate coordinating requirements with roof membrane system.
 - 3. Wiring Diagrams: Power, signal, and control wiring.
- C. Manufacturer Seismic Qualification Certification: Submit certification that rooftop air conditioners, accessories, and components will withstand seismic forces defined in Division 23 Section "Mechanical Vibration and Seismic Controls." Include the following:

1. Basis for Certification: Indicate whether withstand certification is based on actual test of assembled components or on calculation.
 - a. The term "withstand" means "the unit will remain in place without separation of any parts from the device when subjected to the seismic forces specified."
 - b. The term "withstand" means "the unit will remain in place without separation of any parts from the device when subjected to the seismic forces specified and the unit will be fully operational after the seismic event."
2. Dimensioned Outline Drawings of Equipment Unit: Identify center of gravity and locate and describe mounting and anchorage provisions.
3. Detailed description of equipment anchorage devices on which the certification is based and their installation requirements.

D. Field quality-control test reports.

E. Operation and Maintenance Data: For rooftop air conditioners to include in emergency, operation, and maintenance manuals.

F. Warranties: Special warranties specified in this Section.

1.5 QUALITY ASSURANCE

- A. Product Options: Drawings indicate size, profiles, and dimensional requirements of rooftop air conditioners and are based on the specific system indicated. Refer to Division 1 Section "Product Requirements."
- B. Electrical Components, Devices, and Accessories: Listed and labeled as defined in NFPA 70, by a testing agency acceptable to authorities having jurisdiction, and marked for intended use.
- C. Fabricate and label refrigeration system to comply with ASHRAE 15, "Safety Code for Mechanical Refrigeration."
- D. ASHRAE Compliance:
 1. Comply with ASHRAE 15 for refrigeration system safety.
 2. Comply with ASHRAE 33 for methods of testing cooling and heating coils.
 3. Comply with applicable requirements in ASHRAE 62.1, Section 5 - "Systems and Equipment" and Section 7 - "Construction and Startup."
- E. ASHRAE/IESNA 90.1 Compliance: Applicable requirements in ASHRAE/IESNA 90.1, Section 6 - "Heating, Ventilating, and Air-Conditioning."
- F. NFPA Compliance: Comply with NFPA 90A and NFPA 90B.
- G. UL Compliance: Comply with UL 1995.
- H. Comply with NFPA 54 for gas-fired furnace section.
- I. ARI Certification: Units shall be ARI certified and listed.

J. ARI Compliance:

1. Comply with ARI 210/240 and ARI 340/360 for testing and rating energy efficiencies for RTUs.
2. Comply with ARI 270 for testing and rating sound performance for RTUs.

1.6 COORDINATION

- A. Coordinate size and location of concrete bases. Cast anchor-bolt inserts into bases. Concrete, reinforcement, and formwork requirements are specified in Division 3.
- B. Coordinate installation of roof curbs, equipment supports, and roof penetrations. These items are specified in Division 7 Section "Roof Accessories."
- C. Coordinate size, location, and installation of rooftop air-conditioner manufacturer's roof curbs and equipment supports with roof installer.
 1. Coordinate installation of restrained vibration isolation roof-curb rails.

1.7 WARRANTY

- A. Special Warranty: Manufacturer's standard form in which manufacturer agrees to replace components of rooftop air conditioners that fail in materials or workmanship within specified warranty period.
 1. Warranty Period for Compressors: Manufacturer's standard, but not less than five years from date of Substantial Completion.
 2. Warranty Period for Heat Exchangers: Manufacturer's standard, but not less than five years from date of Substantial Completion.
 3. Warranty Period for Solid-State Ignition Modules: Manufacturer's standard, but not less than three> years from date of Substantial Completion.
 4. Warranty Period for Control Boards: Manufacturer's standard, but not less than three years from date of Substantial Completion.
 5. Warranty Period for Variable-Speed Fan Motors: Manufacturer's standard, but not less than three> years from date of Substantial Completion.
 6. Warranty Period for Electronic Thermostats: Manufacturer's standard, but not less than three years from date of Substantial Completion.

PART 2 - PRODUCTS

2.1 MANUFACTURERS

- A. Available Manufacturers: Subject to compliance with requirements, manufacturers offering products that may be incorporated into the Work include, but are not limited to, the following:

B. Manufacturers: Subject to compliance with requirements, provide products by one of the following:

1. Rooftop Air Conditioners 7-1/2 Tons to 20 Tons (26 to 70 kW):

- a. AAON, Inc.
- b. Carrier Corporation.
- c. Lennox Industries Inc.
- d. Mammoth Inc.
- e. McQuay International.
- f. Trane; American Standard Companies, Inc.
- g. YORK International Corporation.

2. Rooftop Air Conditioners – Larger than 20 Tons (70 kW):

- a. AAON, Inc.
- b. Carrier Corporation.
- c. Engineered Air.
- d. Governair.
- e. Lennox Industries Inc.
- f. Mammoth Inc.
- g. McQuay International.
- h. Season-4, Inc.
- i. Trane; American Standard Companies, Inc.
- j. YORK International Corporation.
- k. <Insert manufacturer's name.>

2.2 ROOFTOP AIR CONDITIONERS 7-1/2 TO 20 TONS

- A. Description: Factory assembled and tested; designed for exterior installation; consisting of compressor, indoor and outside refrigerant coils, indoor fan and outside coil fan, refrigeration and temperature controls, filters, and dampers.
- B. Casing: Galvanized-steel construction with enamel paint finish, removable panels or access doors with neoprene gaskets for inspection and access to internal parts, minimum 1/2-inch thick thermal insulation, knockouts for electrical and piping connections, exterior condensate drain connection, and lifting lugs.
- C. Indoor Fan: Forward curved, centrifugal, belt driven with adjustable motor sheaves, grease-lubricated ball bearings, and motor.
- D. Outside Coil Fan: Propeller type, directly driven by permanently lubricated motor.
- E. Refrigerant Coils: Aluminum-plate fin and seamless copper tube in steel casing with equalizing-type vertical distributor.[Provide phenolic epoxy corrosion-protection coating to both coils.]
- F. Compressor(s): Number as scheduled hermetic reciprocating compressors with integral vibration isolators, internal overcurrent and overtemperature protection, internal pressure relief .

G. Refrigeration System:

1. Compressor(s).
2. Outside coil and fan.
3. Indoor coil and fan.
4. Four-way reversing valve and suction line accumulator.
5. Check valves.
6. Expansion valves with replaceable thermostatic elements.
7. Refrigerant dryers.
8. High-pressure switches.
9. Low-pressure switches.
10. Thermostats for coil freeze-up protection during low-ambient temperature operation or loss of air.
11. Independent refrigerant circuits.
12. Brass service valves installed in discharge and liquid lines.
13. Charge of refrigerant.
14. Hot-Gas Bypass: Factory-installed valve.
15. Timed Off Control: Automatic-reset control shuts compressor off after five minutes.

H. Filters: 2-inch- thick, fiberglass, pleated, MERV 14, throwaway filters in filter rack.

I. Outside-Air Damper: Linked damper blades, for 0 to 25 percent outside air, with [fully modulating, spring-return damper motor and hood.

J. Economizer: Return- and outside-air dampers with neoprene seals, outside-air filter, and hood.

1. Damper Motor: Fully modulating spring return with adjustable minimum position.
2. Control: Electronic-control system uses mixed-air temperature and selects between outside-air and return-air enthalpy to adjust mixing dampers.
3. Relief Damper: Gravity actuated with bird screen and hood.

K. Power Connection: Provide for single connection of power to unit with unit-mounted disconnect switch accessible from outside unit and control-circuit transformer with built-in circuit breaker.

L. Unit Controls: Solid-state control board and components contain at least the following features:

1. Indoor fan on/off delay.
2. Default control to ensure proper operation after power interruption.
3. Service relay output.
4. Unit diagnostics and diagnostic code storage.
5. Field-adjustable control parameters.
6. Defrost control.
7. Dehumidification control with dehumidistat.
8. Economizer control.
9. Electric heat staging.
10. Gas valve delay between first- and second-stage firing.
11. Indoor-air quality control with carbon dioxide sensor.
12. Low-ambient control, allowing operation down to 0 deg F.
13. Minimum run time.
14. Night setback mode.

15. Return-air temperature limit.
 16. Low-refrigerant pressure control.
 17. Digital display of outside temperature, supply-air temperature, return-air temperature, economizer damper position, indoor-air quality, and control parameters.
- M. DDC Temperature Control: Install stand-alone control module providing link between unit controls and DDC temperature-control system. Control module shall be compatible with temperature-control system specified in Division 23 Section "HVAC Instrumentation and Controls."
- N. Thermostat: Programmable, electronic; with heating setback and cooling setup with seven-day programming; and the following:
1. Touch sensitive keyboard.
 2. Automatic switching.
 3. Deg F readout.
 4. LED indicators.
 5. Hour/day programming.
 6. Manual override capability.
 7. Time and operational mode readout.
 8. Status indicator.
 9. Battery backup.
 10. Sub-base with manual system switch (on-heat-auto-cool) and fan switch (auto-on).
 11. Fan-proving switch to lock out unit if fan fails.
 12. Dirty-filter switch.
- O. Optional Accessories:
1. Cold-Weather Kit: Electric heater maintains temperature in gas burner compartment.
 2. Service Outlets: Two, 115-V, ground-fault, circuit-interrupter type.
 3. PVC condensate drain trap.
 4. Dirty-filter switch.
 5. [Step-down] [Flush] diffuser with aluminum grilles, insulated diffuser box with flanges, and interior transition.
 6. Vertical vent extension.
- P. Roof Curb: Steel with corrosion-protection coating, gasketing, and factory-installed wood nailer; complying with NRCA standards; minimum height of 14 inches.
- Q. Horizontal Discharge Roof Curb: Steel with corrosion-protection coating, insulation, gasketing, and factory-installed wood nailer, and configured to convert from downflow to horizontal airflow; complying with NRCA standards; minimum height of 30 inches.

PART 3 - EXECUTION

3.1 INSTALLATION

- A. Install units level and plumb, maintaining manufacturer's recommended clearances.[Install according to ARI Guideline B.]

- B. Curb Support: Install roof curb on roof structure, level and secure, according to NRCA's "Low-Slope Membrane Roofing Construction Details Manual," Illustration "Raised Curb Detail for Rooftop Air Handling Units and Ducts." Install and secure rooftop air conditioners on curbs and coordinate roof penetrations and flashing with roof construction.
- C. Unit Support: Install unit level on structural curbs. Coordinate wall penetrations and flashing with wall construction.
- D. Isolation Curb Support: Install units on isolation curbs according to NRCA's "Low-Slope Membrane Roofing Construction Details Manual," Illustration "Raised Curb Detail for Rooftop Air Handling Units and Ducts."

3.2 CONNECTIONS

- A. Piping installation requirements are specified in other Division 23 Sections. Drawings indicate general arrangement of piping, fittings, and specialties.
- B. Duct installation requirements are specified in other Division 23 Sections. Drawings indicate the general arrangement of ducts. The following are specific connection requirements:
 - 1. Install ducts to termination in roof curb.
 - 2. Remove roof decking only as required for passage of ducts. Do not cut out decking under entire roof curb.
 - 3. Connect supply ducts to rooftop unit with flexible duct connectors specified in Division 23 Section "Duct Accessories."
 - 4. Terminate return-air duct through roof structure and insulate space between roof and bottom of unit with 2-inch-thick, acoustic duct liner.
 - 5. Install normal-weight, 3000 psi, compressive strength (28-day) concrete mix inside roof curb, 4 inches thick. Concrete, formwork, and reinforcement are specified in Division 3.
- C. Electrical System Connections: Comply with applicable requirements in Division 26 Sections for power wiring, switches, and motor controls.
- D. Ground equipment according to Division 26 Section "Grounding and Bonding."
- E. Tighten electrical connectors and terminals according to manufacturer's published torque-tightening values. If manufacturer's torque values are not indicated, use those specified in UL 486A and UL 486B.

3.3 FIELD QUALITY CONTROL

- A. Manufacturer's Field Service: Engage a factory-authorized service representative to inspect, test, and adjust field-assembled components and equipment installation, including connections, and to assist in field testing. Report results in writing.
- B. Perform the following field quality-control tests and inspections and prepare test reports:

1. After installing rooftop air conditioners and after electrical circuitry has been energized, test units for compliance with requirements.
 2. Inspect for and remove shipping bolts, blocks, and tie-down straps.
 3. Operational Test: After electrical circuitry has been energized, start units to confirm proper motor rotation and unit operation.
 4. Test and adjust controls and safeties. Replace damaged and malfunctioning controls and equipment.
- C. Remove malfunctioning units, replace with new units, and retest as specified above.

3.4 STARTUP SERVICE

- A. Engage a factory-authorized service representative to perform startup service.
- B. Complete installation and startup checks according to manufacturer's written instructions and do the following:
1. Inspect for visible damage to unit casing.
 2. Inspect for visible damage to furnace combustion chamber.
 3. Inspect for visible damage to compressor, air-cooled outside coil, and fans.
 4. Inspect internal insulation.
 5. Verify that labels are clearly visible.
 6. Verify that clearances have been provided for servicing.
 7. Verify that controls are connected and operable.
 8. Verify that filters are installed.
 9. Clean outside coil and inspect for construction debris.
 10. Clean furnace flue and inspect for construction debris.
 11. Connect and purge gas line.
 12. Adjust vibration isolators.
 13. Inspect operation of barometric dampers.
 14. Lubricate bearings on fan.
 15. Inspect fan-wheel rotation for movement in correct direction without vibration and binding.
 16. Adjust fan belts to proper alignment and tension.
 17. Start unit according to manufacturer's written instructions.
 - a. Start refrigeration system in summer only.
 - b. Complete startup sheets and attach copy with Contractor's startup report.
 18. Inspect and record performance of interlocks and protective devices; verify sequences.
 19. Operate unit for an initial period as recommended or required by manufacturer.
 20. Perform the following operations for both minimum and maximum firing and adjust burner for peak efficiency. Adjust pilot to stable flame.
 - a. Measure gas pressure on manifold.
 - b. Measure combustion-air temperature at inlet to combustion chamber.
 - c. Measure flue-gas temperature at furnace discharge.
 - d. Perform flue-gas analysis. Measure and record flue-gas carbon dioxide and oxygen concentration.

- e. Measure supply-air temperature and volume when burner is at maximum firing rate and when burner is off. Calculate useful heat to supply air.
- 21. Calibrate thermostats.
- 22. Adjust and inspect high-temperature limits.
- 23. Inspect outside-air dampers for proper stroke and interlock with return-air dampers.
- 24. Start refrigeration system and measure and record the following:
 - a. Coil leaving-air, dry- and wet-bulb temperatures.
 - b. Coil entering-air, dry- and wet-bulb temperatures.
 - c. Outside-air, dry-bulb temperature.
 - d. Outside-air-coil, discharge-air, dry-bulb temperature.
- 25. Inspect controls for correct sequencing of heating, mixing dampers, refrigeration, and normal and emergency shutdown.
- 26. Measure and record the following minimum and maximum airflows. Plot fan volumes on fan curve.
 - a. Supply-air volume.
 - b. Return-air volume.
 - c. Relief-air volume.
 - d. Outside-air intake volume.
- 27. Simulate maximum cooling demand and inspect the following:
 - a. Compressor refrigerant suction and hot-gas pressures.
 - b. Short circuiting of air through outside coil or from outside coil to outside-air intake.
- 28. Verify operation of remote panel, including pilot-light operation and failure modes. Inspect the following:
 - a. High-limit heat exchanger.
 - b. Warm-up for morning cycle.
 - c. Freezestat operation.
 - d. Economizer to limited outside-air changeover.
 - e. Alarms.
- 29. After startup and performance testing, change filters, vacuum heat exchanger and cooling and outside coils, lubricate bearings, adjust belt tension, and inspect operation of power vents.

3.5 ADJUSTING

- A. Adjust initial temperature and humidity set points.
- B. Set field-adjustable switches and circuit-breaker trip ranges as indicated.

- C. Occupancy Adjustments: When requested within 12 months of date of Substantial Completion, provide on-site assistance in adjusting system to suit actual occupied conditions. Provide up to two visits to site outside normal occupancy hours for this purpose, without additional cost.

3.6 DEMONSTRATION

- A. Engage a factory-authorized service representative to train Owner's maintenance personnel to adjust, operate, and maintain rooftop air conditioners. Refer to Division 1 Section "Closeout Procedures."

END OF SECTION 237413

SECTION 237440 – NATATORIUM DEHUMIDIFICATION AIR HANDLING UNITS

PART 1 - General

1.1 SCOPE

Furnish and install, where indicated, a factory-assembled, fully-enclosed, split environmental control system with energy recovery feature(s) designed for natatorium environment control.

Features shall include:

- A. Dehumidification by means of a direct expansion evaporator coil.
- B. Space heating by means of a hot water heating coil.
- C. Cooling mode with heat rejection to a packaged outdoor air-cooled condenser.
- D. Packaged minimum exhaust fan and purge fan with economizer mode.
- E. Integral minimum outdoor air connection.
- F. Integral purge outdoor air connection with economizer mode.
- G. Heat recovery by means of a glycol run-around loop between the minimum exhaust and minimum outdoor air streams.

1.2 QUALITY AND SAFETY ASSURANCE

- A. The system shall be ETL listed.
- B. The system shall be completely assembled, wired, piped, and test-run at the factory prior to shipping. All controls shall be factory adjusted to satisfy the design conditions. A factory test report shall be available, upon request.
- C. Wherever possible, the system shall have a mechanical vestibule where the electrical panel, compressor(s), pool water heat exchanger(s), receiver(s) and most of the refrigeration controls are out of the process air stream.
- D. Warranty: The entire system shall have a 24-month limited parts warranty from the factory ship date.
 - 1. A 1-year labor warranty shall be provided by the manufacturer when the system is connected to the factory via an Internet monitoring system from the date of initial commissioning.
 - 2. The compressor(s) shall have a 5-year warranty from the factory ship date
 - 3. The internal airside heat exchanger coils shall have a 10-year warranty from the factory ship date.
- E. When connected to a network with Internet access, the system shall have remote service capability with the ability for field service technicians to receive service and trouble alerts by e-mail and make parameter adjustments via a browser interface on any Internet-capable device.

PART 2 - Product

2.1 MANUFACTURERS

- A. Subject to compliance with project requirements, natatorium dehumidification units shall be provided by one of the following manufacturers.
 - 1. Dectron (Basis of Design)
 - 2. Desert Aire

3. Innovent
4. Seresco

2.2 GENERAL

The natatorium control system shall include:

- A. Mechanical process dehumidification.
- B. Outdoor cabinet configuration.
- C. Split system with unit mounted outdoor air-cooled condenser for AC heat rejection.
- D. Coaxial condensing heat exchanger(s) for pool water heating using reclaimed compressor waste heat.
- E. Hot water heating coils in the space.
- F. Air filtration via MERV-8 2-inch pleated panel filters for return and outdoor air.
- G. Minimum outdoor air hood.
- H. Purge and economizer modes.
- I. Minimum exhaust and purge exhaust fan(s) with economizer mode.
- J. A service vestibule where the compressor, refrigeration specialties, control valves and all electronics are outside of process air stream.

2.3 SEQUENCE OF OPERATION

The system shall be designed and sized to maintain the specified space conditions:

- A. System Startup:
 1. Power is turned on or the system is restarted.
 2. After a short initial delay to allow the sensors to stabilize, the blower starts and operates continuously.
 3. Based on sensor feedback, the system shall begin or resume operation based on the sequence below.
- B. Airside Configuration:
 1. The system continuously delivers the specified supply air volume to the natatorium.
 2. The minimum exhaust air volume is set to meet the engineer's schedule.
 3. The minimum outdoor air volume is set to meet the engineer's schedule.
- C. Dehumidification Mode:
 1. The return air relative humidity is above the humidity setpoint.
 2. The compressor enters the Compressor Start sequence.
 3. Initially, 100% of compressor hot gas discharge will be diverted to condense at the air reheat coil. The supply air temperature will be higher than the return air temperature.
 4. If the system cannot maintain the relative humidity below setpoint, the second compressor circuit will start.
 5. Compressor waste heat is rejected into a glycol fluid loop which feeds the reheat coils and the air conditioning air-cooled heat exchanger in parallel.
 6. The reheat coils are fully modulating (0-100%). The reheat output will modulate to maintain the space temperature at set point year-round.
- D. Air Conditioning Mode:
 1. The return air temperature is above the room temperature setpoint.
 2. The compressor starts, if not already operating in Dehumidification Mode.

3. Excess compressor hot gas is diverted to the outdoor air-cooled condenser for up to 100% heat rejection at summer design ambient conditions.
 4. Excess compressor hot gas is diverted to a fluid-cooled heat exchanger. Up to 100% of compressor heat is rejected into the glycol fluid loop which is pumped outdoors to an outdoor air-cooled heat exchanger for 100% heat rejection at summer design ambient conditions.
 5. 100% of compressor heat is rejected at the outdoor air-cooled heat exchanger on a summer design day. On off-peak days, the air reheat output will modulate to maintain the space temperature at the set point.
 6. If the system cannot maintain the return air temperature setpoint, the second compressor will start.
- E. Space Heating Mode:
1. The return air temperature is below the room temperature setpoint.
 2. The microprocessor space heating output signal (0-10 volts) is sent to the heating coil controller. The signal output will regulate based on the return air temperature.
- F. Purge Mode:
1. This mode is manually triggered by an operator when super-chlorinating the pool. It can be triggered at the unit-mounted or optional remote operator panel(s), through the online Vision 2.0 interface or by the BACnet controller.
 2. Purge Mode has an adjustable timed duration after which the system automatically resumes normal operation.
 3. Once triggered by the operator:
 - a. The compressor(s), if operating, pump down and cycle off.
 - b. A signal from the microprocessor sets the exhaust fan(s) to their maximum CFM.
 - c. The unit-mounted outdoor air dampers open fully and the return air dampers close.
 - d. The system stays in 100% outdoor air ventilation mode.
 - e. After the timed period expires, all dampers and fans return to normal operating settings and the system resumes normal operation.
 - f. During Purge Mode, the system will control heating based on supply air temperature.
- G. Economizer Cooling Mode:
1. The return air temperature is above the room temperature setpoint.
 2. The microprocessor will compare the temperature of the outside air with the cooling setpoint.
 3. When outside air is deemed suitable by the microprocessor, it will be used as the first stage of sensible cooling.
 4. The system will switch over to using the compressor(s) if outside air conditions cannot satisfy the space cooling demand.
- H. Economizer Dehumidification Mode:
1. The return air relative humidity is above humidity setpoint.
 2. The microprocessor will compare the moisture content of the outside air to the dehumidification setpoint.
 3. When the outside air is deemed suitable by the microprocessor, it will be used as the first stage of dehumidification.
 4. The system will switch over to using the compressor(s) if outside air conditions cannot satisfy the space humidity demand.
- I. Freeze Protection:
1. The supply air temperature falls below the freezestat setpoint or the optional freezestat sensor indicates a freezestat condition.
 2. Exhaust fan(s) are stopped and outdoor air damper(s) are fully closed.

3. When the freezestat alarm is tripped, it must be manually cleared by the operator.

2.4 CABINET

- A. The system shall be designed and configured for indoor installation with a 2" double-walled cabinet including painted inner liner.
 1. Infill panels and doors shall be constructed with 18 gauge G90 galvanized steel exterior and 18 gauge mil aluminum finish interior suitable for chlorine and pool chemical resistance.
 2. The structural base frame shall be 3/16" steel channel base with 12-gauge steel cross bracing.
- B. Cabinet Construction: All cabinet 16, 20 and 24 gauge sheet metal shall be galvanized G90 steel or GalvalumeTM alloy with mill-applied zinc phosphate primer followed by an exterior grade white silicone modified polyester top coat. The sheet metal is engineered to form a cabinet with maximum strength and rigidity. All seams shall be caulked with silicone to prevent air and water leakage or infiltration.
 1. Base Rails: The cabinet shall have a base frame comprised of 2 layers of 10 gauge mill galvanized G90 steel. Lifting lugs shall be provided on the base frame for rigging the system.
 2. The cabinet walls shall be of double-wall construction using 20 gauge pre-painted steel with a fully painted inner metal liner and 2 inches of fiberglass insulation.
 3. The cabinet floor shall be of 2-inch double-wall construction using 20-gauge pre-painted steel engineered with structural bends for maximum rigidity, mechanically fastened to the base frame.
 4. The cabinet roof shall be 20-gauge pre-painted steel, 2-inch double wall engineered with structural bending for maximum rigidity and be mechanically fastened to the base walls of the unit.
 5. The cabinets shall be mechanically assembled with stainless steel 5/32" sealed blind rivets. Where bolts are required bright zinc plated bolts shall be used.
 6. Access doors shall be supported on multiple hinges, held shut by compression latches for quick access. Doors shall be provided for entrance to all sections housing components requiring routine maintenance. Full height access doors shall have "hold back" latches to prevent door closure during the performance of service procedures.
 7. Access doors shall be mounted on multiple combination hinge/latch mechanisms which swing either direction 180 degrees and lifts off. Doors shall be provided for entrance to all sections housing components requiring routine maintenance. Doors shall be secured with minimum two tool-operated latches and sealed against the frame with rubber gasket material.
- C. Outdoor Air Intake:
 1. Purge /Economizer and Minimum Outdoor Air Hoods.
- D. Insulation: The unit shall be insulated per the following standards:
 1. All exterior cabinet sections shall be insulated with two (2) inch thick fiberglass inside the double walled cabinet.
 2. Fire resistant rating to conform to NFPA Standard 90A and 90B.
 3. Sound attenuation coefficient shall not be less than 1.02 at a frequency of 1,000 Hz as per ASTM Standard C423.
 4. Thermal conductivity shall not exceed 0.26 Btu/in-h-sqft-F at 75 °F.
- E. Cabinet configuration shall include:
 1. A filter rack with separate access doors shall be provided for the return air and minimum outdoor air streams.

2. Unit shall be equipped with a second outdoor air intake assembly with motorized 2 position extruded aluminum, Insulated, silicone side-sealed damper for Purge and Economizer operation.
3. Unit shall be equipped with duct collars to admit the minimum outdoor air as scheduled. The outdoor air intake assembly shall have a built in air filter rack with separate access door, manual air balancing device and motorized 2 position extruded aluminum, Insulated, silicone side-sealed damper operated by 24-hour time clock.
4. Mechanical vestibule: The unit shall have the compressor, receiver, solenoid valves and the electrical panel in a separate compartment out of the processed air stream. All components shall be serviceable while the unit is in operation without disturbing the airflow.
5. Electrical panel: The unit shall have a built-in electrical control panel in a separate compartment in order not to disturb the airflow within the dehumidifier during electrical servicing. All electrical components shall be mounted on a 16 gauge galvanized sub-panel.

2.5 FILTERS

Wherever possible, air filters shall be standard sized, replaceable, off-the-shelf filters including:

- A. Return Air: 2-Inch MERV 8, 30% pleated filters with rust-free non-metallic structure on a slide in rack.
 1. Supply Air: 2-inch MERV 8, 30% pleated filters with rust-free non-metallic structure on face loading rack.
- B. Outside Air: 2-Inch MERV 8, 30% pleated filters with rust-free non-metallic structure.
 1. Outside Air: Washable, aluminum media type with aluminum U-channel frame wrapped around the perimeter of crimped layers of aluminum media. The frame is designed with drain holes to ensure removal of excess water.

2.6 COILS

- A. Evaporator/dehumidifier coils shall be designed for maximum moisture removal capacity.
 1. Coils shall be fully dipped and coated with a polyester/enamel coating for maximum corrosion protection. Coating shall comply with ASTM B117/D1654 and ASTM D2126 for corrosion resistance against common acids, salt and gases.
 2. Coil shall have galvanized casing and end plates.
 3. Aluminum fin and copper tubes mechanically bonded to assure high heat transfer.
- B. Air reheat condenser coils shall be sized for variable heat transfer into the air with a capacity of 100% of the compressors total required heat of rejection.
 1. Coils shall be fully dipped and coated with a polyester/enamel coating for maximum corrosion protection. Coating shall comply with ASTM B117/D1654 and ASTM D2126 for corrosion resistance against common acids, salt and gases .
 2. Coil shall have galvanized casing and end plates.
 3. Aluminum fin and copper tube joints mechanically bonded to assure high heat transfer.
- C. Coils shall have an 8-year warranty extension for a total of 10 years coverage.

2.7 DRAIN PANS

Each evaporator coil shall be provided with a positive draining, compound-sloped, baked powder paint coated aluminum drain pan with fully-welded corners to ensure zero water retention.

2.8 BLOWERS AND BLOWER MOTORS

- A. Supply blowers:

1. The supply blower shall be an impeller plenum fan complete with backward curved, three-dimensional, profiled blades made of a high-performance composite material directly driven via a direct current (DC) electronic commuted (EC) motor. The blower and motor shall be completely corrosion resistant and be maintenance free. The EC-Motor shall be of zero-slippage design with continuously variable speed control when connected to the systems controller.
2. The EC motor shall have maintenance-free electronic circuitry, a rotor with permanent magnets, and an integral controller to provide the windings with electrical current so that, the motor rotates continuously and quietly.
3. The fan assembly shall be suitable for a maximum temperature of 60°C.
4. The fan shall be statically and dynamically balanced on precision electronic balancers.
5. The direct driven supply air blower wheel shall be a single width/single inlet airfoil plenum type, secured a machined, ground and polished solid steel shaft. The wheel shall be G90 galvanized steel with baked powder paint coating. The shaft shall be coated with a rust inhibitor.
6. The complete blower assembly shall be statically and dynamically balanced on precision electronic balancers.
7. The blower assembly shall be mounted on a 1" deflection spring isolated rack.
8. The fan inlets shall be equipped with accidental contact protection screen.
9. Motor(s) shall be Premium efficiency painted cast iron construction TEFC, NEMA MG1-PART 31 Inverter Duty 15:1 Constant Torque Severe Duty with a service factor 1.25. Motors shall be 6 Pole 1200 RPM synchronous speed with HOA switch with motor safeties against overloading at 60 Hz operation directly on mains. Motors shall have double lip seals on both ends with re-greasable bearings 254T frame and larger with Polyurea grease.
10. The motor shall be provided with a low motor noise and high starting torque VFD for air balancing purposes. The VFD shall have a drive efficiency of 96 to 98% with displacement power factor of 0.98, output maximum frequency of 400 Hz with torque boost. The VFD shall have protective features including: torque limit, heat sink over-temperature, current-limiting DC bus fuse, electronic motor overload with phase-to-phase and ground fault short circuit protection; current limit, over/under torque protection, over/under voltage protection, short circuit current rating of 30kA rms symmetrical and 100kA rms symmetrical.

2.9 EXHAUST BLOWERS

1. The packaged exhaust blower (EF1) shall be sized to maintain the negative pressure requirement in the space during normal operation and its operation tied to the systems occupancy scheduler.
2. The blower shall be impeller plenum fan complete with backward curved, three-dimensional, profiled blades made of high performance composite material. The blower shall be completely corrosion resistant and be maintenance free a direct drive via a direct current (DC) electronic commuted (EC) motor. The EC-Motor shall have zero slippage design and have continuously variable speed control when connected to the units controller.
3. The fan assembly shall be balanced in Class G 6.3 acc DIN ISO 1940, dynamic on two levels.
4. The fan assembly shall be suitable for ambient temperatures of -40°C to max. +70°C.
5. Thermal contacts installed in the windings compliant with THCL 155.
6. Drive motor in external rotor principle, sealed in protection class IP54 with moisture protection impregnation of the windings, topical protection.
7. High corrosion resistance design with high quality and reliability .
8. The exhaust fan shall be controlled from an end switch on the power open of the exhaust air damper.

B. Purge blowers:

CPL

1. The ventilation/economizer/purge exhaust blower (PEA) shall be unit mounted and sized to provide full exhaust from the space when operating with EF1.
2. The blower shall be impeller plenum fan complete with backward curved, three-dimensional, profiled blades made of high performance composite material. The blower shall be completely corrosion resistant and be maintenance free a direct drive via a direct current (DC) electronic commuted (EC) motor. The EC-Motor shall have zero slippage design and have continuously variable speed control when connected to the unit's controller.
3. The fan assembly shall be balanced in Class G 6.3 acc DIN ISO 1940, dynamic on two levels.
4. The fan assembly shall be suitable for ambient temperatures of -40°C to max. +70°C.
5. Thermal contacts installed in the windings compliant with THCL 155.
6. Drive motor in external rotor principle, sealed in protection class IP54 with moisture protection impregnation of the windings, topical protection.
7. High corrosion resistance design with high quality and reliability.
8. The exhaust fan shall be controlled from an end switch on the power open and spring return outside air damper.

2.10 DAMPERS

Internal dampers shall be made from extruded anodized aluminum with a parallel blade configuration and neoprene double-seal tips to minimize leakage. Damper blades shall be mounted on steel rods which rotate on nylon bushings. All damper hardware shall be corrosion resistant.

- A. The system shall be provided with normally closed outside air and exhaust air dampers equipped with spring-return actuators. The dampers adjust between 0% to 100% open position.
- B. The outdoor air and exhaust air dampers shall be of opposed blade configuration. Dampers shall have 0.750-inch insulated blades made from extruded anodized aluminum with neoprene double-seal tips to minimize leakage. Damper leakage shall be less than 1% of maximum flow at 4-inch water column differential. Damper blades shall be mounted on steel rods which rotate on nylon bushings. All damper hardware shall be corrosion resistant.

2.11 COMPRESSORS

- A. Hermetic, scroll action compressor, suction gas cooled, suitable for refrigerant R-410A.
- B. The compressor(s) shall be equipped with an internal solid-state thermal protection sensor.
- C. Access: Service access valves for convenient servicing.
- D. The compressor(s) shall be mounted on rubber-in-shear isolators to limit the transmission of noise and vibration.
- E. The compressor(s) shall be equipped with removable crankcase heater(s) for liquid migration protection.
- F. The compressor(s) shall be located outside the conditioned air stream in the systems service vestibule.
- G. Compressors shall have a 3-year warranty extension for a total of 5 years coverage.
- H. The compressor manufacturer must have a wholesale outlet for replacement parts in the nearest major city.

2.12 REFRIGERATION CIRCUIT

- A. The system shall consist of two refrigeration circuits for dehumidification and sensible cooling. No site refrigeration work shall be required.
- B. Each refrigeration circuit shall have pressure transducers monitoring the refrigerant discharge (high) and suction (low) pressures. The refrigeration circuit shall be accessible for diagnostics, adjustment and servicing without the need for service manifold gauges.
- C. All refrigeration circuits shall have solenoid control valves, check valves, a liquid line filter-drier, liquid and moisture indicator, thermostatic expansion valve and a pump down solenoid valve.
- D. The system shall have an externally adjustable balanced port design mechanical thermostatic expansion valve. The valve shall have a removable power head.
- E. Tamper proof, hermetically sealed non-adjustable high and low pressure switches and refrigeration service valves shall be installed using Schrader type valves. Refrigeration service valves shall be located outside of the airstream.
- F. The receiver shall have two refrigerant level (maximum and minimum) indicating sight glasses.
- G. The suction line shall be fully insulated with 0.500-inch closed cell insulation.

2.13 CONTROL PANEL

- A. Power block terminals shall be provided.
- B. The system shall include a factory-installed fused disconnect.
- C. Shall be mounted inside the service vestibule outside of the process air stream.
- D. Blower motors shall be protected with thermal trip overloads.
- E. The system shall have a voltage monitor with phase protection.
- F. Available dry contacts shall include:
 - 1. Alarm
 - 2. Blower interlock
 - 3. Stage 1 & 2 heating
 - 4. Outdoor air damper control
 - 5. Remote exhaust fan #1
 - 6. Remote exhaust fan #2
 - 7. Outdoor-air cooled equipment
 - 8. System on
 - 9. Auxiliary pool heater #1
 - 10. Heat recovery
- G. Terminals shall be provided to send 24-volt power to the outdoor air cooled condenser or fluid cooler fan contactor.
- H. All wiring shall be installed in accordance with UL or CSA safety electrical code regulations and shall be in accordance with the NFPA. All components used in the system shall be UL or CSA listed.
- I. Wiring diagrams shall be located near the electrical panel(s) on the system. These diagrams shall provide color-coding and wire numbering for easy troubleshooting. All wires shall be contained in a wire duct.
- J. The compressor(s) shall have a time delay on start to prevent short cycling.
- K. The following parameters shall be available to interface with the BMS.
 - 1. Sensor Inputs:

- a. Return Air Humidity
- b. Return Air Temperature
- c. Refrigerant High Side Pressure
- d. Refrigerant Low Side Pressure
- e. Evaporator Temperature
- f. Supply Air Temperature
- g. Suction Temperature
- h. Outdoor Air Temperature
- i. Outdoor Air Humidity
- j. Pool Water In Temperature
- k. Pool Water Out Temperature
- l. Discharge Temperature
- m. Superheat Temperature
- 2. Setpoints:
 - a. Room Air Humidity Setpoint
 - b. Room Air Temperature Setpoint
 - c. Pool Temperature Setpoint
 - d. Heat Recovery Setpoint
 - e. Minimum OA Damper Setpoint
- 3. Outputs:
 - a. Modulating Heat Signal
 - b. Head Pressure Control Signal
 - c. Outdoor Air Damper Signal
 - d. Exhaust Fan Signal
- 4. Control Status:
 - a. Supply Blower Status
 - b. Compressor(s) Status
 - c. Reheat Status
 - d. Heating Status
 - e. Exhaust Fan Status
 - f. Heat Rejection Pump Status

2.14 AUXILIARY AIR HEATING

The packaged heating coil shall be sized to meet the scheduled heating capacity and have the following characteristics:

- A. Modulating (0-10V) auxiliary air heat control by means of a factory mounted and wired control valve.
- B. Auxiliary air heating coil tubes, fins, headers, casing and end-plates shall be fully protected by a polyester/enamel coating for maximum corrosion protection. The protective coating shall comply with ASTM B117/D1654 and ASTM D2126 for corrosion resistance against common acids, salts and gases.
- C. Coil casing and end-plates shall be made of galvanized steel.
- D. Fin and tube joints shall be mechanically bonded to ensure high heat transfer.
- E. Fins shall be made of aluminum.
- F. Tubes shall be made of copper.

2.15 AIR CONDITIONING

- A. Air-cooled air conditioning via outdoor condenser.

- B. The system shall be equipped with an air conditioning mode where excess compressor heat is rejected to an outdoor air-cooled condenser. The outdoor air-cooled condenser shall be capable of rejecting 100% of the compressor heat rejection with an air-on temperature at summer design conditions. The outdoor condenser shall be equipped with 24VAC controls, including a contactor for the fan motor.
- C. The system shall be provided with a dry contact rated for 5A at 24VAC to operate the remote outdoor condenser controls.
- D. Each refrigeration circuit shall include refrigerant valves, a receiver with pressure relief valve set to 650 psig, a pressure control valve and a pressure differential valve, and two manual shutoff valves to isolate the outdoor condenser.
- E. Coils shall be tested at 600 PSIG and mounted vertically for complete surface utilization. Coils shall be counter flow with a minimum of 10 degrees of liquid sub-cooling and have adequate capacity to dissipate the total heat rejection of the system at design conditions. Condensers shall have guards to protect the coils from vandalism and weather-related damage.
- F. The fan(s) shall be direct driven axial fan(s) made of high-strength composite material in which the motor and controller are integrated. The fan includes FE2owlet blades combined with guide vanes and an EC commutated direct-current external rotor motor to provide maximum efficiency and the quietest performance. The EC motor shall have maintenance-free electronic circuitry, a rotor with permanent magnets and an integral controller to provide the windings with electrical current so that the motor rotates continuously and quietly. The fan has an aerodynamically-optimized, sickle-blade profile, patterned with serrated trailing edge and winglets on the blade outer edge for energy.
 - 1. The fan assembly shall be balanced in Class G 6.3 acc DIN ISO 1940, dynamic on two levels.
 - 2. The fan assembly shall be suitable for ambient temperatures of -40°C to max. +70°C.
 - 3. Thermal contacts installed in the windings compliant with THCL 155.
 - 4. Drive motor in external rotor principle, sealed in protection class IP54 with moisture protection impregnation of the windings, topical protection.
 - 5. High corrosion resistance design with high quality and reliability.

2.16 FACTORY PERFORMANCE TESTING

- A. The system shall be thoroughly tested under factory test conditions. A copy of the original test report shall be available to the engineer upon request.
- B. Microprocessor controls shall be factory adjusted and pre-set to the design conditions during testing.

PART 3 - Execution

3.1 PRODUCT DELIVERY, ACCEPTANCE, STORAGE AND HANDLING

- A. Perform a thorough physical inspection of the system upon delivery from the shipment carrier.
- B. Identify and immediately report any physical damage to manufacturer.
- C. If the system is to be stored prior to installation, store in a clean, dry place protected from weather, dirt, fumes, water, construction and physical damage.
- D. Handle the system carefully during installation to prevent damage.
- E. Damaged systems or components shall not be installed. Contact the manufacturer for RMA instructions.

- F. Comply with the manufacturer's rigging and installation instructions for unloading the system and moving it into position.

3.2 CONNECTIONS

- A. Where installing piping adjacent to the system, allow space for service and maintenance.
- B. Duct connections: drawings indicate the general arrangements of the ducts. Connect the system to ducts with flexible duct connectors. Comply with code requirements for flexible duct connectors.
- C. Electrical connections: comply with code requirements for power wiring, switches and motor controls in electrical sections.

3.3 INSTALLATION

- A. The agency responsible for start-up should work in accordance with the specifications and in accordance with the manufacturer's instructions and only by workers experienced in this type of work.

3.4 START UP

- A. Engage a factory-authorized service representative to perform startup service and assist with unit assembly.
- B. Detailed instructions for startup as provided by the manufacturer must be followed.
- C. Installing contractor must contact the manufacturer prior to start up to confirm start up procedures.
- D. Remote Internet access and control must be initiated and confirmed by the factory prior to start up for extended labor warranty to be in effect.

END OF SECTION 237440

THIS PAGE LEFT INTENTIONALLY BLANK

SECTION 238126 - SPLIT-SYSTEM AIR-CONDITIONING UNITS

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

- A. Drawings and general provisions of the Contract, including General and Supplementary Conditions and Division 1 Specification Sections, apply to this Section.
- B. The requirements of Section 230000, "Basic Mechanical Requirements" apply to work defined by this Section.

1.2 SUMMARY

- A. This Section includes split-system air-conditioning and heat pump units consisting of separate evaporator-fan and compressor-condenser components. Units are designed for exposed or concealed mounting, and may be connected to ducts.

1.3 SUBMITTALS

- A. Product Data: Include rated capacities, furnished specialties, and accessories for each type of product indicated. Include performance data in terms of capacities, outlet velocities, static pressures, sound power characteristics, motor requirements, and electrical characteristics.
- B. Shop Drawings: Diagram power, signal, and control wiring.
- C. Samples for Initial Selection: For units with factory-applied color finishes.
- D. Field quality-control test reports.
- E. Operation and Maintenance Data: For split-system air-conditioning units to include in emergency, operation, and maintenance manuals.
- F. Warranty: Special warranty specified in this Section.

1.4 QUALITY ASSURANCE

- A. Product Options: Drawings indicate size, profiles, and dimensional requirements of split-system units and are based on the specific system indicated. Refer to Division 1 Section "Product Requirements."
- B. Electrical Components, Devices, and Accessories: Listed and labeled as defined in NFPA 70, Article 100, by a testing agency acceptable to authorities having jurisdiction, and marked for intended use.
- C. ASHRAE Compliance:

1. Fabricate and label refrigeration system to comply with ASHRAE 15, "Safety Standard for Refrigeration Systems."
2. ASHRAE Compliance: Applicable requirements in ASHRAE 62.1-2004, Section 4 - "Outdoor Air Quality," Section 5 - "Systems and Equipment," Section 6 - "Procedures," and Section 7 - "Construction and System Start-Up."

D. ASHRAE/IESNA Compliance: Applicable requirements in ASHRAE/IESNA 90.1.

1.5 COORDINATION

- A. Coordinate size and location of concrete bases for units. Cast anchor-bolt inserts into bases. Concrete, reinforcement, and formwork are specified in Division 3 Section "Cast-in-Place Concrete."
- B. Coordinate size, location, and connection details with roof curbs, equipment supports, and roof penetrations specified in Division 7 Section "Roof Accessories."

1.6 WARRANTY

- A. Special Warranty: Manufacturer's standard form in which manufacturer agrees to repair or replace components of split-system air-conditioning units that fail in materials or workmanship within specified warranty period.
 1. Warranty Period: Five years from date of Substantial Completion.

1.7 EXTRA MATERIALS

- A. Furnish extra materials described below that match products installed and that are packaged with protective covering for storage and identified with labels describing contents.
 1. Filters: One set of filters for each unit.
 2. Fan Belts: One set of belts for each unit.

PART 2 - PRODUCTS

2.1 MANUFACTURERS

- A. Available Manufacturers: Subject to compliance with requirements, manufacturers offering products that may be incorporated into the Work include, but are not limited to, the following:
- B. Manufacturers: Subject to compliance with requirements, provide products by one of the following:
 1. Carrier Corporation; Home Comfort and HVAC Building & Industrial Systems.
 2. Evcon Industries, Inc.
 3. First Operations LP.
 4. Friedrich Air Conditioning Company.

5. Koldwave, Inc.; a Mestek company.
6. Lennox International Inc.
7. Mitsubishi Electric & Electronics USA, Inc.; HVAC Advanced Products Division.
8. Mitsubishi Electric Sales Canada Inc.
9. Mitsubishi Heavy Industries America, Inc.
10. SANYO North America Corporation; SANYO Fisher Company.
11. Tadiran Electronic Industries Inc.; Appliance Division.
12. Trane; a business of American Standard companies.
13. YORK; a Johnson Controls company.

2.2 CONCEALED EVAPORATOR-FAN COMPONENTS

- A. Chassis: Galvanized steel with flanged edges, removable panels for servicing, and insulation on back of panel.
 1. Insulation: Faced, glass-fiber duct liner.
- B. Refrigerant Coil: Copper tube, with mechanically bonded aluminum fins, complying with ARI 210/240, and with thermal-expansion valve.
- C. Fan: Forward-curved, double-width wheel of galvanized steel; directly connected to motor.
- D. Comply with requirements in Division 23, Section 230500
- E. Basic Mechanical Materials and Methods, "Motors for Mechanical Equipment."
 1. Special Motor Features: Multitapped, multispeed with internal thermal protection and permanent lubrication.
- F. Disposable Filters: 1 inch thick, in fiberboard frames.
- G. Wiring Terminations: Connect motor to chassis wiring with plug connection.
- H. Airstream Surfaces: Surfaces in contact with the airstream shall comply with requirements in ASHRAE 62.1-2004.
- I. Filters: Permanent, cleanable
- J. Condensate Drain Pans:
 - a. Fabricated with two percent slope in at least two planes to collect condensate from cooling coils (including coil piping connections, coil headers, and return bends) and humidifiers, and to direct water toward drain connection.
 - 1) Length: Extend drain pan downstream from leaving face to comply with ASHRAE 62.1-2004>.
 - 2) Depth: A minimum of 2 inches deep.
 - b. Single-wall, galvanized-steel sheet.

- c. Double-wall, galvanized-steel sheet with space between walls filled with foam insulation and moisture-tight seal.
- d. Drain Connection: Located at lowest point of pan and sized to prevent overflow. Terminate with threaded nipple on [one end] [both ends] of pan.
 - 1) Minimum Connection Size: NPS 1.
- e. Pan-Top Surface Coating: Asphaltic waterproofing compound.
- f. Units with stacked coils shall have an intermediate drain pan to collect condensate from top coil

2.3 WALL-MOUNTING, EVAPORATOR-FAN COMPONENTS

- A. Cabinet: Enameled steel with removable panels on front and ends in color selected by Architect, and discharge drain pans with drain connection.
- B. Refrigerant Coil: Copper tube, with mechanically bonded aluminum fins, complying with ARI 210/240, and with thermal-expansion valve.
- C. Electric Coil: Helical, nickel-chrome, resistance-wire heating elements with refractory ceramic support bushings; automatic-reset thermal cutout; built-in magnetic contactors; manual-reset thermal cutout; airflow proving device; and one-time fuses in terminal box for overcurrent protection.
- D. Water Coil: Copper tube, with mechanically bonded aluminum fins spaced no closer than 0.1 inch; leak tested to 300 psig underwater; with a two-position control valve.
- E. Fan: Direct drive, centrifugal fan.
 - 1. Fan Motors:
 - a. Comply with NEMA designation, temperature rating, service factor, enclosure type, and efficiency requirements specified in Division 23 Section "Common Motor Requirements for HVAC Equipment."
 - b. Multitapped, multispeed with internal thermal protection and permanent lubrication.
 - c. Enclosure Type: Totally enclosed, fan cooled.
 - d. NEMA Premium (TM) efficient motors as defined in NEMA MG 1.
 - e. Controllers, Electrical Devices, and Wiring: Comply with requirements for electrical devices and connections specified in Division 26 Sections.
 - f. Mount unit-mounted disconnect switches on exterior of unit.
- F. Filters: Permanent, cleanable.
 - 1. General Requirements for Air Filtration Section:
 - a. Comply with NFPA 90A.
 - b. Minimum Arrestance: According to ASHRAE 52.1 and MERV according to ASHRAE 52.2.

- c. Filter-Holding Frames: Arranged for flat or angular orientation, with access doors on both sides of unit. Filters shall be removable from one side or lifted out from access plenum

- G. Airstream Surfaces: Surfaces in contact with the airstream shall comply with requirements in ASHRAE 62.1-2004.

2.4 CEILING-MOUNTING, EVAPORATOR-FAN COMPONENTS

- A. Cabinet: Enameled steel with removable panels on front and ends in color selected by Architect, and discharge drain pans with drain connection. Insulation, Faced, glass-fiber duct liner.
- B. Refrigerant Coil: Copper tube, with mechanically bonded aluminum fins, complying with ARI 210/240, and with thermal-expansion valve.
- C. Electric Coil: Helical, nickel-chrome, resistance-wire heating elements with refractory ceramic support bushings; automatic-reset thermal cutout; built-in magnetic contactors; manual-reset thermal cutout; airflow proving device; and one-time fuses in terminal box for overcurrent protection.
- D. Fan: Direct drive, centrifugal fan, with power-induced outside air, and integral condensate pump.
- E. Comply with requirements in Division 23, Section 230500 Basic Mechanical Materials and Methods, "Motors for Mechanical Equipment."
 - 1. Special Motor Features: Multitapped, multispeed with internal thermal protection and permanent lubrication.
- F. Airstream Surfaces: Surfaces in contact with the airstream shall comply with requirements in ASHRAE 62.1.
- G. Filters: Permanent, cleanable. 1 inch thick, in fiberboard frames.

2.5 AIR-COOLED, COMPRESSOR-CONDENSER COMPONENTS

- A. Casing: Steel, finished with baked enamel in color selected by Architect, with removable panels for access to controls, weep holes for water drainage, and mounting holes in base. Provide brass service valves, fittings, and gage ports on exterior of casing.
- B. Compressor: Hermetically sealed with crankcase heater and mounted on vibration isolation. Compressor motor shall have thermal- and current-sensitive overload devices, start capacitor, relay, and contactor.
 - 1. Compressor Type: Reciprocating.
 - 2. Two-speed compressor motor with manual-reset high-pressure switch and automatic-reset low-pressure switch.
 - 3. Refrigerant Charge: R-410A>.

- C. Refrigerant Coil: Copper tube, with mechanically bonded aluminum fins, complying with ARI 210/240, and with liquid subcooler.
- D. Heat Pump Components: Reversing valve and low-temperature air cut-off thermostat.
- E. Fan: Aluminum-propeller type, directly connected to motor.
- F. Motor: Permanently lubricated, with integral thermal-overload protection.
- G. Low Ambient Kit: Permits operation down to 45 deg F.
- H. Mounting Base: Polyethylene.

2.6 ACCESSORIES

- A. Control equipment and sequence of operation are specified in Division 23 Sections "HVAC Instrumentation and Controls" and "Sequence of Operation."
- B. Thermostat: Low voltage with sub-base to control compressor and evaporator fan.
- C. Thermostat: Wireless infrared functioning to remotely control compressor and evaporator fan, with the following features:
 - 1. Compressor time delay.
 - 2. 24-hour time control of system stop and start.
 - 3. Liquid-crystal display indicating temperature, set-point temperature, time setting, operating mode, and fan speed.
 - 4. Fan-speed selection, including auto setting.
- D. Automatic-reset timer to prevent rapid cycling of compressor.
- E. Refrigerant Line Kits: Soft-annealed copper suction and liquid lines factory cleaned, dried, pressurized, and sealed; factory-insulated suction line with flared fittings at both ends.
- F. Drain Hose: For condensate.
- G. Additional Monitoring:
 - 1. Monitor constant and variable motor loads.
 - 2. Monitor variable-frequency-drive operation.
 - 3. Monitor economizer cycle.
 - 4. Monitor cooling load.
 - 5. Monitor air distribution static pressure and ventilation air volumes.

PART 3 - EXECUTION

3.1 INSTALLATION

- A. Install units level and plumb.

- B. Install evaporator-fan components using manufacturer's standard mounting devices securely fastened to building structure.
- C. Install ground-mounting, compressor-condenser components on 4-inch- thick, reinforced concrete base; 4 inches larger on each side than unit. Concrete, reinforcement, and formwork are specified in Division 3 Section "Cast-in-Place Concrete." Coordinate anchor installation with concrete base.
- D. Install ground-mounting, compressor-condenser components on polyethylene mounting base.
- E. Install roof-mounting compressor-condenser components on equipment supports specified in Division 7 Section "Roof Accessories." Anchor units to supports with removable, cadmium-plated fasteners.
- F. Install seismic restraints.
- G. Install compressor-condenser components on restrained, spring isolators with a minimum static deflection of 1 inch. Refer to Division 23 Section "Mechanical Vibration Controls and Seismic Restraints."
- H. Install and connect precharged refrigerant tubing to component's quick-connect fittings. Install tubing to allow access to unit.

3.2 CONNECTIONS

- A. Piping installation requirements are specified in other Division 23 Sections. Drawings indicate general arrangement of piping, fittings, and specialties.
 - 1. Water Coil Connections: Comply with requirements in Division 23 Section "Hydronic Piping." Connect to supply and return coil with shutoff-duty valve and union or flange on the supply connection and with throttling-duty valve and union or flange on the return connection.
 - 2. Remote Water-Cooled Condenser Connections: Comply with requirements in Division 23 Section "Hydronic Piping." Connect to supply and return with shutoff-duty valve and union or flange on the supply connection and with throttling-duty valve and union or flange on the return connection.
 - 3. Steam Coil Connections: Comply with requirements in Division 23 Section "Steam and Condensate Piping." Connect to steam piping with shutoff valve and union or flange; for condensate piping, starting from the coil connection, connect with union or flange, strainer, trap, and shutoff valve.
- B. Install piping adjacent to unit to allow service and maintenance.
- C. Duct Connections: Duct installation requirements are specified in Division 23 Section "Metal Ducts." Drawings indicate the general arrangement of ducts. Connect supply and return ducts to split-system air-conditioning units with flexible duct connectors. Flexible duct connectors are specified in Division 23 Section "Duct Accessories."
- D. Ground equipment according to Division 26 Section "Grounding and Bonding."

- E. Electrical Connections: Comply with requirements in Division 26 Sections for power wiring, switches, and motor controls.

3.3 FIELD QUALITY CONTROL

- A. Manufacturer's Field Service: Engage a factory-authorized service representative to inspect, test, and adjust field-assembled components and equipment installation, including connections, and to assist in field testing. Report results in writing.
- B. Perform the following field tests and inspections and prepare test reports:
 - 1. Leak Test: After installation, charge system and test for leaks. Repair leaks and retest until no leaks exist.
 - 2. Operational Test: After electrical circuitry has been energized, start units to confirm proper motor rotation and unit operation.
 - 3. Test and adjust controls and safeties. Replace damaged and malfunctioning controls and equipment.
- C. Remove and replace malfunctioning units and retest as specified above.
- D. Prepare test and inspection reports.

3.4 STARTUP SERVICE

- A. Engage a factory-authorized service representative to perform startup service.
 - 1. Complete installation and startup checks according to manufacturer's written instructions.

3.5 DEMONSTRATION

- A. Engage a factory-authorized service representative to train Owner's maintenance personnel to adjust, operate, and maintain units. Refer to Division 1 Section "Closeout Procedures."

END OF SECTION 238126

SECTION 238216 - AIR COILS

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

- A. Drawings and general provisions of the Contract, including General and Supplementary Conditions and Division 1 Specification Sections, apply to this Section.
- B. The requirements of Section 230000, "Basic Mechanical Requirements" apply to work defined by this Section.
- C. The requirements of Section 230500, "Basic Mechanical Materials and Methods" apply to work defined by the Section.

1.2 SUMMARY

- A. This Section includes the following:
 - 1. Hot-water coils
 - 2. Refrigerant coils.
 - 3. Electric coils.
- B. Related Sections include the following:
 - 1. Division 23 "Control Systems Equipment" for coil temperature-control valve requirements.

1.3 SUBMITTALS

- A. Product Data: Include rated capacities of selected models; pressure drop; shipping, installed, and operating weights; installation instructions; and startup instructions for each type of product indicated.
- B. Shop Drawings: Detail equipment assemblies and indicate dimensions, weights, loads, required clearances, method of field assembly, components, and location and size of each field connection.
 - 1. Wiring Diagrams: Detail wiring for power, signal, and control systems and differentiate between manufacturer-installed and field-installed wiring.
- C. Coordination Drawings: Reflected ceiling plans drawn to scale and coordinating coil location and ceiling-mounted access panels.
- D. Field quality-control test reports.
- E. Maintenance Data: For air coils to include in maintenance manuals specified in Division 1.

1.4 QUALITY ASSURANCE

- A. Electrical Components, Devices, and Accessories: Listed and labeled as defined in NFPA 70, Article 100, by a testing agency acceptable to authorities having jurisdiction, and marked for intended use.
- B. ASHRAE Compliance:
 - 1. Comply with ASHRAE 15 for refrigeration system safety.
 - 2. Comply with ASHRAE 33 for methods of testing cooling and heating coils.
 - 3. Comply with applicable requirements in ASHRAE 62.1, Section 5 - "Systems and Equipment" and Section 7 - "Construction and Startup."
- C. Comply with ARI 410, "Standard for Forced-Circulation Air-Cooling and Air-Heating Coils," for components, construction, and rating.
 - 1. Certify coils to ARI 410, "Standard for Forced-Circulation Air-Cooling and Air-Heating Coils."

PART 2 - PRODUCTS

2.1 MANUFACTURERS

- A. Available Manufacturers: Subject to compliance with requirements, manufacturers offering products that may be incorporated into the Work include, but are not limited to, the following:
- B. Manufacturers: Subject to compliance with requirements, provide products by one of the following:
 - 1. **Water Coils:**
 - a. **Aerofin Corporation.**
 - b. **Carrier Corporation.**
 - c. **Coil Company, LLC.**
 - d. **Dunham-Bush, Inc.**
 - e. **Heatcraft Refrigeration Products LLC; Heat Transfer Division.**
 - f. **Super Radiator Coils.**
 - g. **Trane.**
 - h. **USA Coil & Air.**
 - 2. **Refrigerant Coils:**
 - a. **Aerofin Corporation.**
 - b. **Carrier Corporation.**
 - c. **Coil Company, LLC.**
 - d. **Dunham-Bush, Inc.**
 - e. **Heatcraft Refrigeration Products LLC; Heat Transfer Division.**
 - f. **Lennox Industries Inc.**
 - g. **Super Radiator Coils.**

- h. **Trane.**
- i. **USA Coil & Air.**

2.2 HOT-WATER COILS

- A. Description: **Continuous circuit coil fabricated to ARI 410.**
- B. Dampers: Arrangement of coil segments with face-and-bypass dampers and downstream damper.
 - 1. Arrangement: **Horizontal coils.**
 - 2. Dampers: Extruded-aluminum blades with full-length drive rod.
- C. Piping Connections: **Threaded, on same end.**
- D. Tubes: Copper, complying with **ASTM B 75.**
 - 1. Tube Diameter: **0.625 inch.**
- E. Tubes: Red brass, complying with **ASTM B 111.**
 - 1. Tube Diameter: **0.625 inch**
 - 2. Minimum Tube Thickness: **0.020 inch.**
- F. Tubes: Stainless steel, **0.625-inch** diameter.
- G. Tubes: Carbon steel, **0.75-inch** diameter.
- H. Fins: **Aluminum** with fin spacing **0.125 inch.**
- I. Fin and Tube Joint: **Mechanical bond.**
- J. Frames: Galvanized-steel channel frame, **0.052 inch.**
- K. Frames: ASTM A 666, Type **304** stainless steel, minimum **0.0625 inch** thick for **slip-in** mounting.
- L. Ratings: Design tested and rated according to ASHRAE 33 and ARI 410.
 - 1. Working Pressure Ratings: **200 psig, 325 deg F.**
- M. Source Quality Control: Test to **300 psig**, and to **200 psig** underwater.

2.3 REFRIGERANT COILS

- A. Description: Coil designed for use with R-22 refrigerant, fabricated to ARI 410, connected with **soldered** fittings.
- B. Capacity Reduction: **Circuit for face control.**

- C. Tubes: ASTM B 743 Copper.
 - 1. Tube Diameter: **0.625 inch**.
- D. Tubes: Red brass, complying with **ASTM B 111**.
 - 1. Tube Diameter: **0.625 inch**.
 - 2. Minimum Tube Thickness: **0.020 inch**.
- E. Tubes: Stainless steel, **0.625-inch** diameter.
- F. Tubes: Carbon steel, **0.75-inch** diameter.
- G. Fins: **Aluminum** with fin spacing **0.125 inch**.
- H. Fin and Tube Joint: **Mechanical bond**.
- I. Suction and Distributor: **ASTM B 88, Type L** Seamless copper tube with brazed joints.
- J. Frames: Galvanized-steel channel frame, **0.052 inch**.
- K. Frames: ASTM A 666, Stainless steel, **0.0625 inch**.
- L. Ratings: Design tested and rated according to ASHRAE 33 and ARI 410.
 - 1. Working Pressure Rating: **300 psig**.
- M. Source Quality Control: Test to **450 psig**, and to **300 psig** underwater.

2.4 ELECTRIC COILS

- A. Electrical Heating Coils, Controls, and Accessories: Listed and labeled as defined in NFPA 70, Article 100, by a testing agency acceptable to authorities having jurisdiction, and marked for intended use.
- B. Coil Assembly: Comply with UL 1995..
- C. Casing Assembly: **Slip-in** type with galvanized-steel frame.
- D. Heating Elements: Coiled resistance wire of 80 percent nickel and 20 percent chromium; surrounded by compacted magnesium-oxide powder in tubular-steel sheath; with spiral-wound, copper-plated, steel fins continuously brazed to sheath.
- E. Heating Elements: Open-coil resistance wire of 80 percent nickel and 20 percent chromium, supported and insulated by floating ceramic bushings recessed into casing openings, fastened to supporting brackets, and mounted in galvanized-steel frame.
- F. Control Panel: **Remote mounted** with disconnecting means and overcurrent protection. Include the following controls:
 - 1. Magnetic contactor.

2. Mercury contactor.
 3. Solid-state stepless pulse controller.
 4. Toggle switches; one per step.
 5. Step controller.
 6. Time-delay relay.
 7. Pilot lights; one per step.
 8. Airflow proving switch.
- G. Thermostats: Wall-mounted thermostats, with temperature range from 50 to 90 deg F, and 2.5 deg F throttling range.

PART 3 - EXECUTION

3.1 EXAMINATION

- A. Examine ducts, plenums, and units to receive air coils for compliance with requirements for installation tolerances and other conditions affecting coil performance.
- B. Examine roughing-in for piping systems to verify actual locations of piping connections before coil installation.
- C. Proceed with installation only after unsatisfactory conditions have been corrected.

3.2 INSTALLATION

- A. Install coils level and plumb.
- B. Install coils in metal ducts and casings constructed according to SMACNA's "HVAC Duct Construction Standards, Metal and Flexible."
- C. Install **galvanized-steel** drain pan under each chilled-water coil.
 1. Construct drain pans to comply with ASHRAE 62.
 2. Construct drain pans to extend beyond coil length and width and to connect to condensate trap and drainage.
 3. Extend drain pan 5 inches upstream from coil face.
 4. Extend drain pan 10 inches downstream from **coil face**.
 5. Extend drain pan under coil headers and exposed supply piping.
- D. Install moisture eliminators for chilled-water and refrigerant coils.
- E. Straighten bent fins on air coils.
- F. Clean coils using materials and methods recommended in writing by manufacturers, and clean inside of casings and enclosures to remove dust and debris.

3.3 CONNECTIONS

- A. Piping installation requirements are specified in other Division 23 Sections. Drawings indicate general arrangement of piping, fittings, and specialties.
- B. Install piping adjacent to coils to allow service and maintenance.
- C. Unless otherwise indicated, connect piping with unions and shutoff valves to allow coils to be disconnected without draining piping. Refer to piping system Sections for specific valve and specialty arrangements.
- D. Ground equipment.
 - 1. Tighten electrical connectors and terminals according to manufacturer's published torque-tightening values. If manufacturer's torque values are not indicated, use those specified in UL 486A and UL 486B.

3.4 ADJUSTING

- A. Adjust initial temperature and humidity set points.
- B. Set field-adjustable switches and circuit-breaker trip ranges as indicated.
- C. Straighten bent fins on each air coil.

3.5 FIELD QUALITY CONTROL

- A. Perform the following field tests and inspections and prepare test reports:
 - 1. Operational Test: After electrical circuitry has been energized, operate electric coils to confirm proper unit operation.
 - 2. Test and adjust controls and safeties. Replace damaged and malfunctioning controls and equipment.

3.6 CLEANING

- A. After completing system installation, including outlet fitting and devices, inspect exposed finish. Remove burrs, dirt, and construction debris and repair damaged finishes.
- B. Clean coils using materials and methods recommended in writing by manufacturers, and clean inside of casings and enclosures to remove dust and debris.

END OF SECTION 238216

SECTION 238223 - UNIT VENTILATORS

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

- A. Drawings and general provisions of the Contract, including General and Supplementary Conditions and Division 01 Specification Sections, apply to this Section.

1.2 SUMMARY

- A. Section includes unit ventilators and accessories with the following heating and cooling features:
 - 1. Hydronic heating coil.
 - 2. Direct-expansion refrigerant cooling coil.

1.3 ACTION SUBMITTALS

- A. Product Data: For each type of product
 - 1. Include rated capacities, operating characteristics, and furnished specialties and accessories for each unit type and configuration.
- B. Shop Drawings:
 - 1. Include plans, elevations, sections, and details.
 - 2. Include details of equipment assemblies. Indicate dimensions, weights, loads, required clearances, method of field assembly, components, and location and size of each field connection.
 - 3. Detail anchorages and attachments to structure and to supported equipment.
 - 4. Include diagrams for power, signal, and control wiring.

1.4 INFORMATIONAL SUBMITTALS

- A. Coordination Drawings: Reflected ceiling plans, drawn to scale, on which the following items are shown and coordinated with each other, based on input from installers of the items involved:
 - 1. Suspended ceiling components.
 - 2. Structural members to which equipment will be attached.
 - 3. Method of attaching hangers to building structure.
 - 4. Size and location of initial access modules for acoustical tile.
 - 5. Size and location of access panels in hard ceilings to provide access to concealed units.
 - 6. Items penetrating finished ceiling, including the following:
 - a. Lighting fixtures.
 - b. Air outlets and inlets.
 - c. Speakers.
 - d. Sprinklers.
 - e. Access panels.
 - 7. Perimeter moldings.
- B. Field quality-control reports.
- C. Sample Warranty: For special warranty.

1.5 CLOSEOUT SUBMITTALS

- A. Operation and Maintenance Data: For unit ventilators to include in emergency, operation, and maintenance manuals.

1. In addition to items specified in Section 017823 "Operation and Maintenance Data," include the following:
 - a. Maintenance schedules and repair part lists for motors, coils, integral controls, and filters.
- 1.6 MAINTENANCE MATERIAL SUBMITTALS
 - A. Furnish extra materials that match products installed and that are packaged with protective covering for storage and identified with labels describing contents.
 1. Unit Ventilator Filters: Furnish 2 spare filters for each filter installed.
- 1.7 QUALITY ASSURANCE
 - A. Comply with NFPA 70.
 - B. ASHRAE Compliance: Applicable requirements in ASHRAE 62.1, Section 5 - "Systems and Equipment" and Section 7 - "Construction and Startup."
 - C. ASHRAE/IES 90.1 Compliance: Applicable requirements in ASHRAE/IES 90.1, Section 6 - "Heating, Ventilating, and Air-Conditioning."
- 1.8 COORDINATION
 - A. Coordinate layout and installation of unit ventilators and suspension system components with other construction that penetrates or is supported by ceilings, including light fixtures, HVAC equipment, fire-suppression-system components, and partition assemblies.
 - B. Coordinate size and location of wall sleeves for outdoor-air intake.
- 1.9 WARRANTY
 - A. Special Warranty: Manufacturer agrees to repair or replace components of condensing units that fail in materials or workmanship within specified warranty period.
 1. Failures include, but are not limited to, the following:
 - a. Compressor failure.
 - b. Condenser coil leak.
 2. Warranty Period: Five years from date of Substantial Completion.

PART 2 - PRODUCTS

- 2.1 SYSTEM DESCRIPTION
 - A. Electrical Components, Devices, and Accessories: Listed and labeled as defined in NFPA 70, by a qualified testing agency, and marked for intended location and application.
 - B. Factory-packaged and -tested units rated according to AHRI 840, ASHRAE 33, and UL 1995.
- 2.2 MANUFACTURERS
 - A. Manufacturers: Subject to compliance with requirements, provide products by one of the following:
 1. Carrier Corporation.
 2. McQuay International.
 3. Magic Aire.
 4. Trane.

2.3 MANUFACTURED UNITS

- A. Description: Unit ventilators consisting of finished cabinet, filter, cooling coil, drain pan, supply-air fan and motor in draw-through configuration, and hydronic cooling coil.

2.4 CABINETS

- A. Insulation: Minimum 1/2-inch-thick, coated glass fiber complying with ASTM C 1071 and attached with adhesive complying with ASTM C 916.
1. Surface-Burning Characteristics: Insulation and adhesive shall have a combined maximum flame-spread index of 25 and smoke-developed index of 50 when tested according to ASTM E 84 by a qualified testing agency.
 2. Airstream Surfaces: Surfaces in contact with the airstream shall comply with requirements in ASHRAE 62.1.
- B. Main and Auxiliary Drain Pans: Insulated galvanized steel with plastic liner, formed as required by ASHRAE 62.1. Heating-only units shall also be provided with drain pans for future installation of a cooling coil.
- C. Cabinet end pockets shall be a minimum of 12 inches wide to facilitate piping and service. If the standard end pocket is less than 12 inches wide an extended cabinet unit shall be provided.
- D. Cabinet Frame and Access Panels: Welded-steel frame with removable panels fastened with hex-head tamperproof fasteners and key-operated control and valve access doors.
1. Steel components exposed to moisture shall be hot-dip galvanized after fabrication.
 2. Ceiling-mounted units:
 - a. Ceiling units shall be constructed with two hinged bottom panels for ease of maintenance. Access to filters, controls and piping shall be easily available through the two bottom panels. Retainer chains shall be factory installed to prevent sudden release of bottom panels
- E. Cabinet Finish: Electrostatically painted with an oven-baked thermosetting urethane powder finish, color as selected by Architect.
- F. Indoor-Supply-Air Grille: Steel linear bar welded in-place as an integral part of the unit structure.
- G. Return-Air Inlet: Front toe space.
- H. End Panels: Matching material and finish of unit ventilator.
- I. Outdoor-Air Wall Box (Floor-mounted units): Minimum 0.1265-inch-thick, aluminum, rain-resistant louver and box with integral eliminators and bird screen.
1. Louver Configuration: Vertical, rain-resistant louver.
 2. Louver Material: Aluminum.
 3. Bird Screen: 1/2-inch mesh screen on interior side of louver.
 4. Decorative Grille: On outside of intake.
 5. Finish: Anodized aluminum.
- J. Floor-mounted units shall have an integral pipe tunnel for convenient installation of through-piping.

2.5 COILS

- A. Test and rate unit ventilator coils according to ASHRAE 33.
- B. Hydronic Coils: Copper tube, with mechanically bonded aluminum fins spaced no closer than 0.1 inch, rated for a minimum working pressure of 200 psig and a maximum entering-water temperature of 220 deg F. Include manual air vent and drain valve.

- C. Indoor Refrigerant Coils: Copper tube, with mechanically bonded aluminum fins spaced no closer than 0.1 inch, and brazed joints at fittings. Comply with AHRI 210/240, and leak test to minimum 450 psig for a minimum 300-psig working pressure. Include thermal expansion valve.

2.6 INDOOR FAN

- A. Fan and Motor Board: Removable.
1. Fan: Forward curved, double width, double inlet, centrifugal; directly connected to motor. Thermoplastic or painted-steel wheels, and aluminum, painted-steel, or galvanized-steel fan scrolls, with offset aerodynamic blades.
 2. Fan Shaft and Bearings: 1-1/4" dia. hollow-steel shaft with permanently lubricated, resiliently mounted bearings.
 3. Motor: Permanently lubricated, multispeed, resiliently mounted on motor board. Comply with requirements in Section 230513 "Common Motor Requirements for HVAC Equipment." Motor speed shall be controlled by factory mounted multi-tap transformer through a High-Medium-Low-Off switch. Motors shall be 115/60/1 NEMA permanent split capacitor (PSC), plug-in type designed specifically for unit ventilator operation. Motors shall be located out of the airstream and have an internal thermal overload device (auto reset). Fan motors and controls shall have each hot line protected by factory installed cartridge type fuse(s). Motors shall have sleeve type bearings and require oiling no more than once annually. Units shall have shaft bearing located out of the air stream. Bearings in the airstream are not acceptable
 4. Wiring Termination: Connect motor to chassis wiring with plug connection.
 5. The fan and motor assembly shall be rated at low or medium speed to meet the design criteria.
 6. For Ceiling-mounted units, provide high-static fan motor.

2.7 FILTERS

- A. Filter shall be one-piece design located to provide filtration of the outdoor air/return air mixture to assure even dust loading and balanced airflow in lieu of separate filters for outdoor air and return, and shall be factory furnished initially installed in all units.

2.8 DAMPERS

- A. Outside and Room Air Dampers: The room air damper shall be constructed of aluminum using metal-forming techniques to resist twisting and shall be counterbalanced against backpressure. Outdoor air damper shall be two-piece double-wall construction with 1/2" thick, 1.5 lbs. density fiberglass insulation encapsulated between welded 20 ga. galvanized steel blades for rigidity and to inhibit corrosion, and have additional insulation on the exterior surfaces of the damper blade and on the ends of the outdoor air chamber. Provide with factory-mounted electric actuator.
- B. Dampers shall be fitted with mohair seals along all sealing edges. Dampers shall use turned-metal principle on long closing ends with no metal-to-metal contact. No plastic or rubber gaskets shall be acceptable. Damper bearings shall be made of nylon or other material which does not require lubrication.
- C. Face and Bypass Dampers: Galvanized-steel damper blades with edge and end seals and nylon bearings; with factory-mounted electric actuator.
- D. Comply with ASHRAE/IES 90.1.

2.9 ACCESSORIES

- A. Subbase: Sheet metal floor-mounting base with leveling screws and black enamel finish.
- B. Insulated false back with gasket seals on wall and outdoor-air plenum.
 - 1. Insulation: Minimum 1/2-inch- thick, coated glass fiber complying with ASTM C 1071 and attached with adhesive complying with ASTM C 916.
 - a. Surface-Burning Characteristics: Insulation and adhesive shall have a combined maximum flame-spread index of 25 and smoke-developed index of 50 when tested according to ASTM E 84 by a qualified testing agency.
 - b. Airstream Surfaces: Surfaces in contact with the airstream shall comply with requirements in ASHRAE 62.1.
- C. Return-air plenum, 6 inches thick, designed to take return air from top inlet grilles in cabinets on both sides of unit ventilator with gasket seals on wall and outdoor-air plenum extension.
- D. Duct flanges for supply-, return-, and outdoor-air connections.

2.10 INTEGRAL COOLING CHASSIS

- A. Description: Assembly mounted within unit ventilator, factory assembled and tested; consisting of compressors, condenser coils, fans, motors, and refrigerant receivers; removable for maintenance, with plug and receptacle connections for control and power wiring. Construct, test, and rate condensing units according to AHRI 210/240 and ASHRAE 15.
- B. Casing: Galvanized steel with removable panels for access to controls and refrigerant piping.
- C. Exterior Louver: Extruded aluminum.
- D. Compressor: Hermetic, scroll type; internally isolated for vibration with factory-installed safety devices as follows:
 - 1. Antirecycle timer.
 - 2. High-pressure cutout.
 - 3. Low-pressure cutout or loss-of-charge switch.
 - 4. Internal thermal-overload protection.
 - 5. Current- and voltage-sensitive safety devices.
- E. Energy Efficiency: Equal to or greater than prescribed by ASHRAE/IES 90.1, "Energy Standard for Buildings except Low-Rise Residential Buildings."
- F. Refrigerant Piping Materials:
 - 1. Drawn-Temper Copper Tube: ASTM B 88, Type L.
 - 2. Annealed-Temper Copper Tube: ASTM B 88, Type L.
 - 3. Wrought-Copper Fittings: ASME B16.22.
- G. Refrigerant: R-410A.
- H. Low ambient controls to permit operation down to 45 deg F.
- I. Crankcase heater.
- J. Charging and service fittings.
- K. Filter dryer.
- L. Air-to-Air Heat Pump: Pilot-operated, sliding-type reversing valve with replaceable magnetic coil, and controls for air-to-air heat pump operation with supplemental heat.
- M. Condenser: Copper-tube, aluminum-fin coil, with liquid subcooler.

- N. Direct-Driven Condenser Fan: Forward curved, double width, centrifugal; thermoplastic or painted-steel wheels and galvanized-steel fan scrolls.
1. Motor: Comply with requirements in Section 230513 "Common Motor Requirements for HVAC Equipment."
- 2.11 BASIC UNIT CONTROLS
- A. Control devices and operational sequences are specified in Section 230900 "Instrumentation and Control for HVAC" and Section 230993 "Sequence of Operations for HVAC Controls."
- B. Basic Unit Controls:
1. Control voltage transformer.
 2. Wall-mounting thermostat with the following features.
 - a. Heat-cool-off switch.
 - b. Fan on-auto switch.
 - c. Fan-speed switch.
 - d. Automatic changeover.
 - e. Adjustable deadband.
 - f. Concealed set point.
 - g. Concealed indication.
 - h. Degree F indication.
 3. Wall-mounting temperature sensor.
 4. Unoccupied-period-override push button.
 5. Data entry and access port.
 - a. Input data includes room temperature, and humidity set points and occupied and unoccupied periods.
 - b. Output data includes room temperature and humidity, supply-air temperature, entering-water temperature, operating mode, and status.
- C. DDC Terminal Controller:
1. Safety Controls Operation: Freezestat shall stop fan and close outdoor-air damper if air less than 38 deg F enters coils.
 2. Scheduled Operation: Occupied and unoccupied periods on seven-day clock with a minimum of four programmable periods per day.
 3. Unoccupied-Period-Override Operation: Two hours.
 4. Hydronic Cooling-Coil Operation:
 - a. Occupied Periods: [Open] [Modulate] control valve to provide cooling if room temperature exceeds thermostat set point.
 - b. Unoccupied Periods: Close control valve.
 5. Refrigerant-Coil Operation:
 - a. Occupied Periods: Start compressor to maintain room temperature.
 - b. Unoccupied Periods: Stop compressor cooling.
 6. Outdoor-Air Damper Operation: Open to 25 percent fixed minimum intake during occupied periods, and close during unoccupied periods.
 7. Outdoor-Air Damper Operation: Open to 25 percent fixed minimum intake, and maximum 100 percent of the fan capacity to comply with ASHRAE Cycle II during occupied periods, and close during unoccupied periods. Microprocessor controller shall permit air-side economizer operation when outdoor air is less than 60 deg F
 8. Face-and-Bypass Damper Operation: Position damper to face of coils until room temperature equals thermostat set point; bypass after room-temperature set point is achieved.

9. HGBP: Open HGBP solenoid valve to maintain minimum suction pressure at compressor.
 10. Controller shall have volatile-memory backup.
- D. Building Automation System (BAS) Interface Requirements:
1. Interface relay for scheduled operation.
 2. Interface relay to provide indication of fault at the central workstation.
 3. Provide BACnet interface for central BAS workstation for the following functions:
 - a. Adjust set points.
 - b. Unit ventilator start, stop, and operating status.
 - c. Data inquiry to include outdoor-air damper position, supply- and room-air temperature.
 - d. Occupied and unoccupied schedules.
- E. Electrical Connection: Factory wire motors and controls for a single electrical connection.

PART 3 - EXECUTION

3.1 EXAMINATION

- A. Examine areas, with Installer present, to receive unit ventilators for compliance with requirements for installation tolerances and other conditions affecting performance of the Work.
- B. Examine roughing-in for piping and electrical connections to verify actual locations before unit ventilator installation.
- C. Proceed with installation only after unsatisfactory conditions have been corrected.

3.2 INSTALLATION

- A. Install unit ventilators to comply with NFPA 90A.
- B. Suspend horizontal unit ventilators from structure with threaded steel rods and minimum 0.25-inch static-deflection, elastomeric vibration isolation hanger. Vibration isolators are specified in Section 230548 "Vibration and Seismic Controls for HVAC Piping and Equipment."

3.3 CONNECTIONS

- A. Piping installation requirements are specified in other Sections. Drawings indicate general arrangement of piping, fittings, and specialties. Specific connection requirements are as follows:
 1. Install piping adjacent to machine to allow service and maintenance.
 2. Connect condensate drain to indirect waste.
- B. Install refrigerant piping as required by Section 232300 "Refrigerant Piping," and add refrigerant as required to compensate for length of piping.
- C. Connect supply-air and return-air ducts to unit ventilators with flexible duct connectors specified in Section 233300 "Air Duct Accessories." Comply with safety requirements in UL 1995 for duct connections.
- D. Ground equipment according to Section 260526 "Grounding and Bonding for Electrical Systems."
- E. Connect wiring according to Section 260519 "Low-Voltage Electrical Power Conductors and Cables."

3.4 FIELD QUALITY CONTROL

- A. Manufacturer's Field Service: Engage a factory-authorized service representative to test and inspect components, assemblies, and equipment installations, including connections.
- B. Perform the following tests and inspections:
 - 1. Operational Test: After electrical circuitry has been energized, start units to confirm proper motor rotation and unit operation.
 - 2. Operate electric heating elements through each stage to verify proper operation and electrical connections.
 - 3. Test and adjust controls and safety devices. Replace damaged and malfunctioning controls and equipment.
 - 4. Record temperatures entering and leaving energy recovery wheel when outdoor-air temperature is a minimum of 15 deg F higher, or 20 deg F lower, than room temperature.
- C. Remove and replace malfunctioning units and retest as specified above.
- D. Prepare test and inspection reports.

3.5 ADJUSTING

- A. Adjust initial temperature and humidity set points.

3.6 DEMONSTRATION

- A. Train Owner's maintenance personnel to adjust, operate, and maintain unit ventilators.

END OF SECTION 238223

SECTION 238236 - FINNED-TUBE RADIATION HEATERS

PART 1 - GENERAL

1.1 SUMMARY

- A. Section includes hydronic finned-tube radiation heaters.

1.2 ACTION SUBMITTALS

- A. Product Data: For each type of product.
1. Include rated capacities, operating characteristics, furnished specialties and accessories.
- B. Shop Drawings:
1. Include plans, elevations, sections and details.
 2. Include details of equipment assemblies. Indicate dimensions, weights, loads, required clearances, method of field assembly, components, and location and size of each field connection.
 3. Include details and dimensions of custom-fabricated enclosures.
 4. Indicate location and size of each field connection.
 5. Indicate location and arrangement of piping valves and specialties.
 6. Indicate location and arrangement of controls.
 7. Include enclosure joints, corner pieces, access doors, and other accessories.
- C. Provide color samples for verification.

1.3 INFORMATIONAL SUBMITTALS

- A. Coordination Drawings: Floor plans and other details, drawn to scale, on which the following items are shown and coordinated with each other, using input from installers of the items involved:
1. Coordination with unit ventilator cabinetry.
 2. Structural members, including wall construction, to which finned-tube radiation heaters will be attached.
 3. Method of attaching finned-tube radiation heaters to building structure.
 4. Penetrations of fire-rated wall and floor assemblies.

PART 2 - PRODUCTS

2.1 HOT-WATER FINNED-TUBE RADIATION HEATERS

- A. Manufacturer: Subject to compliance with requirements, provide products by one of the following:
1. Sterling HVAC Products (Basis of Design)
 2. Rittling
 3. Runtal Radiator
 4. Vulcan Radiator
- B. Performance Ratings: Rate finned-tube radiation heaters according to Hydronics Institute's "I=B=R Testing and Rating Standard for Finned-Tube (Commercial) Radiation."
- C. Heating Elements: Copper tubing mechanically expanded into flanged collars of evenly spaced aluminum fins resting on element supports. One end of tube shall be belled.
- D. Element Supports: Ball-bearing cradle type to permit longitudinal movement on enclosure brackets.

- E. Front Panel: Minimum 16-gauge steel.
- F. Wall-Mounted Back Panel: Minimum 20-gauge steel, full height, with full-length channel support for front panel without exposed fasteners.
- G. Support Brackets: Locate at maximum 36-inch spacing to support front panel and element.

PART 3 - EXECUTION

3.1 EXAMINATION

- A. Examine areas to receive finned-tube radiation heaters for compliance with requirements for installation tolerances and other conditions affecting performance of the Work.
- B. Examine roughing-in for hydronic-piping connections to verify actual locations before installation of finned-tube radiation heaters.
- C. Proceed with installation only after unsatisfactory conditions have been corrected.

3.2 FINNED-TUBE RADIATION HEATER INSTALLATION

- A. Install units level and plumb.
- B. Install access doors for access to valves.
- C. Install valves within reach of access door provided in enclosure.
- D. Install air-seal gasket between wall and recessed flanges or front cover of fully recessed unit.

3.3 CONNECTIONS

- A. Provide piping valves and accessories per detail and controls drawings.
- B. Install piping adjacent to finned-tube radiation heaters to allow service and maintenance.

3.4 FIELD QUALITY CONTROL

- A. Perform the following field tests and inspections:
 - 1. Leak Test: After installation, charge system and test for leaks. Repair leaks and retest until no leaks exist.
 - 2. Test and adjust controls and safeties. Replace damaged and malfunctioning controls and equipment.
- B. Units will be considered defective if they do not pass tests and inspections.

END OF SECTION 238236

SECTION 238239 - CABINET UNIT HEATERS

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

- A. Drawings and general provisions of the Contract, including General and Supplementary Conditions and Division 1 Specification Sections, apply to this Section.
- B. The requirements of Section 230000, "Basic Mechanical Requirements" apply to work defined by this Section.
- C. The requirements of Section 230500, "Basic Mechanical Materials and Methods" apply to work defined by the Section.

1.2 SUMMARY

- A. This Section includes cabinet unit heaters.

1.3 DEFINITIONS

- A. BAS: Building automation system.
- B. CWP: Cold working pressure.
- C. PTFE: Polytetrafluoroethylene plastic.
- D. TFE: Tetrafluoroethylene plastic

1.4 SUBMITTALS

- A. Product Data: Include specialties and accessories for each unit type and configuration.
- B. Shop Drawings: Submit the following for each unit type and configuration:
 - 1. Plans, elevations, sections, and details.
 - 2. Details of anchorages and attachments to structure and to supported equipment.
 - 3. Power, signal, and control wiring diagrams. Differentiate between manufacturer-installed and field-installed wiring.
 - 4. Equipment schedules to include rated capacities; shipping, installed, and operating weights; furnished specialties; and accessories.
- C. Coordination Drawings: Reflected ceiling plans drawn to scale and coordinating penetrations and ceiling-mounted items. Show the following:
 - 1. Ceiling suspension assembly members.
 - 2. Method of attaching hangers to building structure.
 - 3. Size and location of initial access modules for acoustical tile.
 - 4. Size and location of access panels in hard ceilings to provide access to concealed units.

5. Ceiling-mounted items including lighting fixtures, diffusers, grilles, speakers, sprinklers, access panels, and special moldings.
- D. Manufacturer Seismic Qualification Certification: Submit certification that cabinet unit heaters, accessories, and components will withstand seismic forces defined in Section 230548 "Vibration and Seismic Controls for HVAC Piping and Equipment." Include the following:
 1. Basis for Certification: Indicate whether withstand certification is based on actual test of assembled components or on calculation.
 - a. The term "withstand" means "the unit will remain in place without separation of any parts from the device when subjected to the seismic forces specified."
 - b. The term "withstand" means "the unit will remain in place without separation of any parts from the device when subjected to the seismic forces specified and the unit will be fully operational after the seismic event."
 2. Dimensioned Outline Drawings of Equipment Unit: Identify center of gravity and locate and describe mounting and anchorage provisions.
 3. Detailed description of equipment anchorage devices on which the certification is based and their installation requirements.
- E. Samples for Initial Selection: Manufacturer's color charts showing the full range of colors available for units with factory-applied color finishes.
- F. Field Test Reports: Written reports of tests specified in Part 3 of this Section.
- G. Maintenance Data: For cabinet unit heaters to include in maintenance manuals specified in Division 1. Include the following:
 1. Maintenance schedules and repair parts lists for motors, coils, integral controls, and filters.

1.5 QUALITY ASSURANCE

- A. Electrical Components, Devices, and Accessories: Listed and labeled as defined in NFPA 70, Article 100, by a testing agency acceptable to authorities having jurisdiction, and marked for intended use.
- B. ASHRAE Compliance: Applicable requirements in ASHRAE 62.1, Section 5 - "Systems and Equipment" and Section 7 - "Construction and Startup."
- C. ASHRAE/IESNA 90.1 Compliance: Applicable requirements in ASHRAE/IESNA 90.1, Section 6 - "Heating, Ventilating, and Air-Conditioning."

1.6 COORDINATION

- A. Coordinate layout and installation of cabinet unit heaters and suspension system components with other construction that penetrates ceilings or is supported by them, including light fixtures, HVAC equipment, fire-suppression-system components, and partition assemblies.

1.7 EXTRA MATERIALS

- A. Furnish extra materials described below that match products installed and that are packaged with protective covering for storage and identified with labels describing contents.
 - 1. Cabinet Unit Heater Filters: Furnish <Insert number> spare filter[s] for each filter installed.

PART 2 - PRODUCTS

2.1 MANUFACTURERS

- A. Available Manufacturers: Subject to compliance with requirements, manufacturers offering products that may be incorporated into the Work include, but are not limited to, the following:
- B. Manufacturers: Subject to compliance with requirements, provide products by one of the following:
 - 1. Airtherm; a Mestek Company.
 - 2. Carrier Corporation.
 - 3. Dunham-Bush, Inc.
 - 4. Engineered Air Ltd.
 - 5. International Environmental Corporation.
 - 6. McQuay International.
 - 7. Rosemex Products.
 - 8. Trane.
 - 9. USA Coil & Air.

2.2 CABINET UNIT HEATERS

- A. Description: An assembly including filter, chassis, coil, fan, and motor in blow-through configuration with heating coil.
 - 1. Comply with UL 2021.
- B. Cabinet: For one or more of the following configurations:
 - 1. Surface, wall mounting.
 - a. Air Inlet: Front grille or open bottom as indicated.
 - b. Air Outlet: Front grille.
 - 2. Surface, ceiling mounting.
 - a. Air Inlet: Bottom grille.
 - b. Air Outlet: Front grille.
 - 3. Semirecessed, wall-mounting front grilles for air inlet and outlet.
 - 4. Semirecessed, ceiling-mounting front grilles for air inlet and outlet.

5. Recessed, wall-mounting front grilles for air inlet and outlet.
6. Recessed, ceiling-mounting front grilles for air inlet and outlet.

2.3 MATERIALS

- A. Chassis: Galvanized steel, with flanged edges and unit-leveling bolts.
- B. Coil Section Insulation: 1-inch duct liner complying with ASTM C 1071 and attached with adhesive complying with ASTM C 916.
 1. Fire-Hazard Classification: Duct liner and adhesive shall have a maximum flame-spread rating of 25 and smoke-developed rating of 50 when tested according to ASTM E 84.
- C. Cabinet: Galvanized steel, with removable panels fastened with tamperproof fasteners and key-operated access door.
- D. Cabinet Finish: Bonderize, phosphatize, and flow-coat with baked-on with manufacturer's standard paint, in color selected by Architect, applied to factory-assembled and -tested cabinet unit heater before shipping.

2.4 COILS

- A. Hot-Water Coil: Copper tube, with mechanically bonded aluminum fins spaced no closer than 0.1 inch and with manual air vent. Coils shall be rated for a minimum working pressure of 300 psig and a maximum entering water temperature of 275 deg F, with manual air vent.
 1. Coil Section Insulation: ASTM C 1071; surfaces exposed to airstream shall be aluminum-foil facing to prevent erosion of glass fibers.
 2. Thickness: 1 inch.
 3. Thermal Conductivity (k-Value): 0.26 Btu x in./h x sq. ft. at 75 deg F mean temperature.
 4. Fire-Hazard Classification: Maximum flame-spread index of 25 and smoke-developed index of 50 when tested according to ASTM E 84.
 5. Adhesive: Comply with ASTM C 916 and with NFPA 90A or NFPA 90B.
 6. Airstream Surfaces: Surfaces in contact with the airstream shall comply with requirements in ASHRAE 62.1.

2.5 FAN

- A. Centrifugal, with forward-curved, double-width wheels and fan scrolls made of galvanized steel or thermoplastic material; directly connected to motor.

2.6 FAN MOTORS

- A. Multispeed motor with integral thermal-overload protection and resilient mounts. Connect motor to chassis wiring with plug connection.

2.7 ACCESSORIES

- A. Aluminum wall boxes with integral eliminators and insect screen.
- B. Steel subbase, height as indicated.
- C. Plastic motor-oiler tubes extending to beneath top discharge grille.
- D. Steel recessing flanges for recessing cabinet unit heaters into ceiling or wall.
- E. Filters: 1-inch- thick, glass-fiber media in fiberboard frame.
 - 1. Minimum arrestance according to ASHRAE 52.1 and a minimum efficiency reporting value (MERV) according to ASHRAE 52.2
 - 2. Washable Foam: 70 percent arrestance and 3 MERV.
 - 3. Glass Fiber Treated with Adhesive: 80 percent arrestance and 5 MERV.
 - 4. Pleated: 90 percent arrestance and 7 MERV
- F. Dampers: Steel damper blade(s) with polyurethane stop across entire blade length and having factory-mounted electric operators for proportioning amounts of outside air and return air.

2.8 CONTROLS

- A. Control Devices: Unit-mounted fan-speed switch and wall-mounting thermostat.

2.9 SOURCE QUALITY CONTROL

- A. Test cabinet unit heater coils according to ASHRAE 33.

PART 3 - EXECUTION

3.1 EXAMINATION

- A. Examine areas to receive cabinet unit heaters for compliance with requirements for installation tolerances and other conditions affecting performance.
- B. Examine roughing-in for piping and electrical connections to verify actual locations before cabinet unit heater installation.
- C. Proceed with installation only after unsatisfactory conditions have been corrected.

3.2 INSTALLATION

- A. Install cabinet unit heaters level and plumb.
- B. Install cabinet unit heaters to comply with NFPA 90A.

- C. Suspend cabinet unit heaters from structure with rubber-in-shear vibration isolators (rubber hangers). Vibration isolators are specified in Division 23 Section "Mechanical Vibration Controls and Seismic Restraints."
- D. Install wall-mounting thermostats and switch controls in electrical outlet boxes at heights to match lighting controls.
- E. Install new filters in each fan-coil unit within two weeks of Substantial Completion.

3.3 CONNECTIONS

- A. Piping installation requirements are specified in other Division 23 Sections. Drawings indicate general arrangement of piping, fittings, and specialties.
- B. Unless otherwise indicated, install shutoff valve and union or flange at each connection.
- C. Install piping adjacent to machine to allow service and maintenance.
- D. Comply with safety requirements in UL 1995.
- E. Ground equipment.
- F. Tighten electrical connectors and terminals according to manufacturer's published torque-tightening values. If manufacturer's torque values are not indicated, use those specified in UL 486A and UL 486B.

3.4 FIELD QUALITY CONTROL

- A. Manufacturer's Field Service: Engage a factory-authorized service representative to inspect, test, and adjust field-assembled components and equipment installation, including connection , and to assist in field testing. Report results in writing.
- B. Testing: Perform the following field quality-control testing and report results in writing:
 - 1. After electrical circuitry has been energized, start units to confirm proper motor rotation and unit operation.
 - 2. Operate electric heating elements through each stage to verify proper operation and electrical connections.
 - 3. Test and adjust controls and safeties.
- C. Repair or replace malfunctioning units. Retest as specified above after repairs or replacements are made.

3.5 ADJUSTING

- A. Adjust initial temperature set points.

- B. Occupancy Adjustments: When requested within 12 months of date of Substantial Completion, provide on-site assistance in adjusting system to suit actual occupied conditions. Provide up to two visits to Project during other-than-normal occupancy hours for this purpose.

3.6 CLEANING

- A. After installing units, inspect unit cabinet for damage to finish. Remove paint splatters and other spots, dirt, and debris. Repair damaged finish to match original finish.
- B. After installing units, clean cabinet unit heaters internally according to manufacturer's written instructions.
- C. Install new filters in each cabinet unit heater within two weeks after Substantial Completion.

3.7 DEMONSTRATION

- A. Engage a factory-authorized service representative to train Owner's maintenance personnel to adjust, operate, and maintain cabinet unit heaters.
 - 1. Train Owner's maintenance personnel on procedures and schedules for starting and stopping, troubleshooting, servicing, and maintaining equipment.
 - 2. Review data in maintenance manuals. Refer to Division 1 Section "Closeout Procedures."
 - 3. Review data in maintenance manuals. Refer to Division 1 Section "Operation and Maintenance Data."
 - 4. Schedule training with Owner, through Architect, with at least seven days' advance notice.

END OF SECTION 238239

THIS PAGE LEFT BLANK INTENTIONALLY

SECTION 260000 – GENERAL PROVISIONS FOR ELECTRICAL WORK

PART 1 - GENERAL

1.1 SCOPE OF WORK

- A. The work included in this Contract is shown on the drawings and described in these specifications. It consists of furnishing all labor, material, services, supervision and connection of all systems shown and/or specified including the requirements of:
- | | | | | |
|----|----------|----|---|-----------------------------------|
| 1. | DIVISION | 0 | - | BIDDING AND CONTRACT REQUIREMENTS |
| 2. | DIVISION | 1 | - | GENERAL REQUIREMENTS |
| 3. | DIVISION | 26 | - | ELECTRICAL |
| 4. | DIVISION | 27 | - | COMMUNICATIONS |
| 5. | DIVISION | 28 | - | ELECTRONIC SAFETY AND SECURITY |
- B. Contractor is responsible to review and understand all drawings and all work of all trades to ensure a complete and thorough project.
- C. Provide all labor, tools, materials, equipment, coordination, and plans necessary for installation and proper operation of the electrical systems.
- D. Contract drawings and specifications are complementary and must be so used to ascertain all requirements of the work.

1.2 DEFINITIONS

- A. Provide, furnish, install, and furnish and install shall have the same meaning. That is, the Contractor shall purchase, transport to the site and install all required components of the work unless specifically stated otherwise in the contract documents.
- B. Wiring pertains to raceway, fittings, conductors, terminations, hangers, supports, etc. as required to form a complete system.

1.3 DRAWINGS AND SPECIFICATIONS

- A. The plans are diagrammatic and indicate only the sizes and general arrangement of conduit, devices, and equipment; exact locations of all elements shall be determined as work progresses, in cooperation with the work of other trades. It is not intended to show every item of work or minor piece of equipment, but every item shall be furnished and installed without additional remuneration as necessary to complete the system in accordance with the best practice of the trade.
- B. As previously stated, the exact locations of electrical devices and equipment is diagrammatic. The owner may request for any devices or equipment to be installed at different locations than what is indicated on the drawings in a specific area or room. It is the responsibility of the Electrical Contractor to coordinate the locations of devices in all areas prior to installation.

1.4 APPLICABLE STANDARDS

- A. All equipment shall bear the UL label.
- B. The latest edition of the following minimum standards shall apply wherever applicable:
- | | | |
|----|-----|--------------------------------|
| 1. | ASA | American Standards Association |
|----|-----|--------------------------------|

2. ASTM American Society for Testing Materials
3. ETL Electrical Testing Laboratories, Inc.
4. IEEE Institute of Electrical and Electronic Engineers
5. IPCEA Insulated Power Cable for Engineers Association
6. OSHA Occupational Safety and Health Act
7. NEC National Electric Code
8. NEMA National Electrical Manufacturers Association
9. NESC National Electrical Safety Code
10. NFPA National Fire Protection Association
11. UL Underwriters Laboratories, Inc.
12. Power company standards and regulations.
13. Local and state codes.

- C. In the event there are conflicts between specifications and standards, standards shall govern unless specifications are in excess of standards.

1.5 PERMITS AND INSPECTIONS

- A. Permits: The Contractor shall apply for and pay the cost for any local permits necessary for the work of this contract.
- B. Inspections: The Contractor shall be responsible for obtaining inspection of and the certificate by a 3rd party inspection agency for the entire electrical system. Turn over certificate of inspection to the architect.
- C. The undertaking of periodic inspections by the Owner or Engineer shall not be construed as supervision of actual construction. The Owner or Engineer is not responsible for providing a safe place of work for the Contractor, Contractor's employees, suppliers or subcontractors for access, visits, use, work, travel or occupancy by any person.

1.6 CODES AND REGULATIONS

- A. Comply with all applicable rules and regulations of the municipal laws and ordinances and latest revisions thereof. All work shall be done in full conformity with the requirements of all authorities having jurisdiction. Modifications required by the above authorities will be made without additional charges to the Owner. Where alterations to and/or deviations from the Contract Documents are required by the authorities, report the requirements to the Engineer and secure approval before work is started.
- B. Furnish and file with the proper authorities, all drawings required by them in connection with the work. Obtain all permits, licenses, and inspections and pay all legal and proper fees and charges in this connection.
- C. Should any work shown or specified be of lighter or smaller material than Code requires, same shall be executed in strict accordance with the regulations.
- D. Heavier or larger size material than Code requires shall be furnished and installed, if required by the Plans and Specifications.
- E. This Contractor shall have the electrical work inspected from time to time by authorized inspectors and shall pay all expense incurred by same. At the completion of the work, the Contractor shall furnish a Certificate of Approval, in triplicate, indicating full approval of the work furnished and installed in this Contract from the local authority having jurisdiction.

- F. Equipment and components parts thereof shall bear manufacturer's name-plate, giving manufacturer's name, size, type and model number or serial number, electrical characteristic to facilitate maintenance and replacements. Name plates of distributors or contractors are not acceptable.
- G. Engineer will have privilege of stopping any work or use of any material that in his opinion is not being properly installed and each Contractor shall remove all materials delivered, or work erected, which does not comply with Contract Drawings and Specifications, and replace with proper materials, or correct such work as directed by the Engineer, at no additional cost to Owner.
- H. If equipment or materials are installed before proper approvals have been obtained, each Contractor shall be liable for their removal and replacement including work of other trades affected by such work, at no additional cost to Owner, if such items do not meet intent of the Drawings and Specifications.

1.7 RECORD DRAWINGS

- A. The Electrical Contractor shall keep an accurate location record of all underground and concealed piping, and of all changes from the original design. He is required to furnish this information to the Engineer prior to his application for final payment.
 - 1. Submit prior to final acceptance inspection, one complete marked-up set of reproducible engineering design drawings.
 - a. Fully illustrate all revisions made by all crafts in course of work.
 - b. Include all field changes, adjustments, variances, substitutions and deletions, including all Change Orders.
 - c. Exact location of raceways, equipment and devices.
 - d. Exact size and location of underground and under floor raceways, grounding conductors and duct banks.
 - 2. These drawings shall be for record purposes for Owner's use and are not considered shop drawings.
- B. At completion of the project, all changes and deviations from the Contract Documents shall be recorded by the Contractor.
- C. Four (4) corrected sets of all operating and maintenance instructions and complete parts lists bound in hard covers shall be furnished to the Owner.

1.8 CLEANING CONDUIT AND EQUIPMENT

- A. Conduit and electrical equipment shall be thoroughly cleaned of dirt, cuttings, and other foreign substances.

1.9 VIBRATION ISOLATION

- A. Vibration isolators shall prevent, as far as practicable, transmission of vibration, noise or hum to any part of building.
- B. Wiring and other electrical connections to equipment mounted on vibration isolators; made flexible with minimum 180 degree loop of "greenfield" in order to avoid restraining equipment and short circuiting vibration isolator.

1.10 BALANCED LOAD

- A. It is intended that design and features of the work as indicated will provide balanced load on the feeders and main service. Contractor shall provide material and installation to provide this balance load insofar as possible.
- B. Contractor shall take current and voltage measurements at all panels of at least 1/2 hour. Reconnections of loads shall be made when deemed necessary by the Engineers.

1.11 JOB CONDITIONS

- A. Examine site related work and surfaces before starting work of any Section. Failure to do so shall in no way relieve the Contractor of the responsibility to properly install the new work.
 - 1. Report to the Engineer, in writing, conditions, which will prevent proper provision of this work ten (10) days prior to bid date, in time for an addendum to be issued.
 - 2. Beginning work of any Section without reporting unsuitable conditions to the Engineer constitutes acceptance of conditions by the Contractor.
 - 3. Perform any required removal, repair or replacement of this work caused by unsuitable conditions at no additional cost to Owner.
 - 4. The Contractor is responsible for performing routine maintenance and cleaning of any existing equipment where he is making connections to new work and to the building where his work adds debris.
- B. Connections to existing work:
 - 1. Install new work and connect to existing work with minimum interference to existing facilities.
 - 2. Provide temporary shutdowns of existing services only with written consent of Owner at no additional charges and at time not to interfere with normal operation of existing facilities.
 - 3. Maintain continuous operation of existing facilities as required with necessary temporary connections between new and existing work.
 - 4. Do not interrupt alarm and emergency systems.
 - 5. Connect new work to existing work in neat and acceptable manner.
 - 6. Restore existing disturbed work to original condition including maintenance of wiring and continuity as required. Replace damaged or rusted conduit to which new equipment is being installed and connected.
- C. Removal and relocation of existing work.
 - 1. Disconnect, remove or relocate electrical material, equipment and other work noted and required by removal or changes in existing construction.
 - 2. Provide new material and equipment required for relocated equipment.
 - 3. Disconnect load and line end of conductors feeding existing equipment.
 - 4. Remove conductors from existing raceways to be rewired.
 - 5. Remove conductors and cap outlets on raceways to be abandoned.
 - 6. Dispose of removed raceways and wire.
 - 7. Dispose of removed electrical equipment as directed by Owner. The Owner shall provide a list of equipment of the Contractor of equipment to be delivered to the Owner.

1.12 SPECIAL TOOLS AND LOOSE ITEMS

- A. Furnish to Owner at completion of work:
 - 1. One set of any special tools required to operate, adjust, dismantle or repair equipment furnished under any section of this Division.

2. "Special Tools": Those not normally found in possession of maintenance personnel.
3. Keys
4. Redundant components and spare parts.

B. Deliver items to Owner and obtain receipt prior to approval of final payment.

1.13 REVIEW OF CONSTRUCTION

- A. Work may be reviewed at any time by representative of the Engineer.
- B. Advise Architect and Engineer that work is ready for review at following times:
1. Prior to backfilling buried work.
 2. Prior to concealment of work in walls and above ceilings.
 3. When all requirements of contract have been completed.
- C. Neither backfill nor conceal work without Engineer's consent.

1.14 SHOP DRAWING SUBMITTALS

- A. Submit required shop drawings, samples and product information in accordance with Division 1, requirements and as required in the various sections of these specifications.
- B. Submittals shall show evidence of checking by the Contractor for accuracy. Product information (catalog sheets) shall indicate complete catalog number, color, accessories, etc., as well as, name of manufacturer and local distributor or manufacturer's representative.
- C. Submit for review detailed coordination drawings 3/8" or larger scale plans for all major electrical equipment and any areas of conflicts by drafting location of equipment, lighting fixtures, cable trays and conduits larger than 1-1/2" trade size. Contractor shall refer to Division 1 for preparing coordination drawings.
- D. Incomplete submittals will be rejected.
- E. Additionally, the Contractor will submit data on the following:
1. All electrical equipment including all panelboards and switching devices (disconnects, switches, occupancy sensors, etc.).
 2. Fire stop seals used for wall penetrations.
 3. Any proposed variation in specified wiring plans and circuitry.
 4. All special items and panels, made or constructed specifically for this project, including wiring diagrams, component layout and component data or materials list.
 5. All settings of installed equipment, such as overcurrent protection, overload settings, temperature settings, time settings, etc. This includes equipment provided by other contractors or subcontractors and connected and tested by this Contractor.
- F. All submittals of NON-SPECIFIED equipment and components will be reviewed. It is the submitting Contractor's responsibility to prove compliance and not the Architect/Engineer to prove non-compliance. The submitting Contractor will be charged the prevailing wage of the reviewing Engineer for all submittals requiring over one (1) hour to review that were not originally specified.

1.15 OPERATING INSTRUCTIONS

- A. It shall be the Contractor's responsibility to ensure that the Owner's representative is given adequate instruction on the operation of all equipment prior to final payment.

1.16 TEMPORARY POWER

- A. The Contractor shall provide all temporary power to all trades for all construction locations of this contract. This will include but not be limited to temporary lighting and power outlets.

PART 2 - PRODUCTS

2.1 MATERIALS

- A. All materials and equipment shall be new and as specified or of equal or better quality.
- B. Basic hardware and miscellaneous items shall meet existing trade standards of quality and shall carry UL or FM listings where applicable.
- C. All equipment supplied shall be the standard equipment of the manufacturer.
- D. Multiple items such as panelboards, wiring devices, switches, breakers, raceways, etc., shall be from the same manufacturer.
- E. Drawings and specifications are based on specific manufacturer's equipment. Therefore, the Contractor shall assume all responsibility, cost and coordination involved in making any necessary revisions to apply another manufacturer's equipment, even though it may be approved as an "equal" item by the Engineer.

PART 3 - EXECUTION

3.1 COORDINATION OF WORK

- A. All work shall be executed in accordance with recognized standards of workmanship. All work shall be installed in a neat and orderly manner.
- B. The Contractor shall exchange information with other Contractors and the Owner in order to insure orderly progress of the work.
- C. The Contractor must contact the Owner's representative and schedule all work ten (10) days prior to start.
- D. The Contractor shall check for possible interference before installing any items. If any work is installed, and later develops interference with other features of the design, the Contractor will be responsible to make such changes to eliminate the interference.

3.2 CEILING REMOVAL

- A. Existing ceilings which must be removed for the installation of new work or demolition of existing conditions shall be done by the Contractor. No ceiling shall be removed without prior approval of the Owner. Ceilings which must be removed shall be restored to their original condition as soon as practical and prior to final payment.
- B. The removed tile of lay-in type ceilings shall be stored either in the ceiling space or at a designated space in the building. No tiles shall be stored in the occupied space.
- C. The Contractor shall take all necessary precautions to prevent damage to the existing ceilings. All damaged ceilings shall be replaced with new ceiling construction to match the existing and to the Owner's satisfaction.

3.3 COMMON REQUIREMENTS FOR ELECTRICAL INSTALLATION

- A. Comply with NECA 1.
- B. Measure indicated mounting heights to bottom of unit for suspended items and to center of unit for wall-mounting items.
- C. Headroom Maintenance: If mounting heights or other location criteria are not indicated, arrange and install components and equipment to provide maximum possible headroom consistent with these requirements.
- D. Equipment: Install to facilitate service, maintenance, and repair or replacement of components of both electrical equipment and other nearby installations. Connect in such a way as to facilitate future disconnecting with minimum interference with other items in the vicinity.
- E. Right of Way: Give to piping systems installed at a required slope.

3.4 FIRESTOPPING

- A. Apply firestopping to penetrations of fire-rated floor and wall assemblies for electrical installations to restore original fire-resistance rating of assembly. Firestopping materials and installation requirements are specified in Division 7 Section "Through-Penetration Firestop Systems."

END OF SECTION 260000

THIS PAGE INTENTIONALLY LEFT BLANK

SECTION 260513 - MEDIUM-VOLTAGE CABLES

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

- A. Drawings and general provisions of the Contract, including General and Supplementary Conditions and Division 01 Specification Sections, apply to this Section.

1.2 SUMMARY

- A. This Section includes cables and related splices, terminations, and accessories for medium-voltage electrical distribution systems.

1.3 DEFINITIONS

- A. NETA ATS: Acceptance Testing Specification.

1.4 ACTION SUBMITTALS

- A. Product Data: For each type of cable indicated. Include splices and terminations for cables and cable accessories.
- B. Samples: 16-inch lengths of each type of cable indicated.

1.5 INFORMATIONAL SUBMITTALS

- A. Qualification Data: For Installer and testing agency.
- B. Material Certificates: For each cable and accessory type, signed by manufacturers.
- C. Source quality-control test reports.
- D. Field quality-control test reports.

1.6 QUALITY ASSURANCE

- A. Installer: Engage a cable splicer, trained and certified by splice material manufacturer, to install, splice, and terminate medium-voltage cable.
- B. Testing Agency Qualifications: An independent agency, with the experience and capability to conduct the testing indicated, that is a member company of the InterNational Electrical Testing Association or is a nationally recognized testing laboratory (NRTL) as defined by OSHA in 29 CFR 1910.7, and that is acceptable to authorities having jurisdiction.
 - 1. Testing Agency's Field Supervisor: Person currently certified by the InterNational Electrical Testing Association or the National Institute for Certification in Engineering Technologies to supervise on-site testing specified in Part 3.
- C. Source Limitations: Obtain cables and accessories through one source from a single manufacturer.
- D. Electrical Components, Devices, and Accessories: Listed and labeled as defined in NFPA 70, Article 100, by a testing agency acceptable to authorities having jurisdiction, and marked for intended use.
- E. Comply with IEEE C2 and NFPA 70.

1.7 PROJECT CONDITIONS

- A. Interruption of Existing Electric Service: Do not interrupt electric service to facilities occupied by Owner or others unless permitted under the following conditions and then only after arranging to provide temporary electric service according to requirements indicated:
1. Notify Owner no fewer than ten days in advance of proposed interruption of electric service.
 2. Do not proceed with interruption of electric service without Owner's written permission.

PART 2 - PRODUCTS

2.1 MANUFACTURERS

- A. Available Manufacturers: Subject to compliance with requirements, manufacturers offering products that may be incorporated into the Work include, but are not limited to, the following:
- B. Manufacturers: Subject to compliance with requirements, provide products by one of the following:
1. Cables:
 - a. King wire
 - b. American Insulated Wire Corp.; a Leviton Company.
 - c. General Cable Technologies Corporation.
 - d. Kerite Co. (The); Hubbell Incorporated.
 - e. Okonite Company (The).
 - f. Pirelli Cables & Systems NA.
 - g. Rome Cable Corporation.
 - h. Southwire Company.
 2. Cable Splicing and Terminating Products and Accessories:
 - a. Engineered Products Company.
 - b. G&W Electric Company.
 - c. MPHusky.
 - d. Raychem Corp.; Telephone Energy and Industrial Division; Tyco International Ltd.
 - e. RTE Components; Cooper Power Systems, Inc.
 - f. Scott Fetzer Co. (The); Adalet.
 - g. Thomas & Betts Corporation.
 - h. Thomas & Betts Corporation/Elastimold.
 - i. 3M; Electrical Products Division.

2.2 CABLES

- A. Cable Type: MV90.
- B. Comply with UL 1072, AEIC CS 8[, ICEA S-93-639, and ICEA S-97-682] [, ICEA S-94-649].
- C. Conductor: Copper.
- D. Conductor Stranding: Compressed Concentric lay, Class B.
- E. Strand Filling: Conductor interstices are filled with impermeable compound.
- F. Conductor Insulation: Crosslinked polyethylene.
- G. Neutral conductor: Copper Concentric.
- H. Conductor Insulation: Ethylene-propylene rubber. (EPR)

1. Voltage Rating: 15 kV.
2. Insulation Thickness: (90mill) 133 percent insulation level.
- I. Shielding: Copper tape, helically applied over semiconducting insulation shield.
- J. Shielding and Jacket: Corrugated copper drain wires embedded in extruded, chlorinated, polyethylene jacket.
- K. Cable Armor: Interlocked aluminum applied over cable.
- L. Cable Jacket: Sunlight-resistant PVC.
- M. Cable: Suitable for direct burial, overhead and underground ducts/conduit.

2.3 SPLICE KITS

- A. Connectors and Splice Kits: Comply with IEEE 404; type as recommended by cable or splicing kit manufacturer for the application.
- B. Splicing Products: As recommended, in writing, by splicing kit manufacturer for specific sizes, ratings, and configurations of cable conductors. Include all components required for complete splice, with detailed instructions.
 1. Combination tape and cold-shrink-rubber sleeve kit with re-jacketing by cast-epoxy-resin encasement or other waterproof, abrasion-resistant material.
 2. Heat-shrink splicing kit of uniform, cross-section, polymeric construction with outer heat-shrink jacket.
 3. Premolded, cold-shrink-rubber, in-line splicing kit.
 4. Premolded EPDM splicing body kit with cable joint sealed by interference fit of mating parts and cable.

2.4 SOLID TERMINATIONS

- A. Multiconductor Cable Sheath Seals: Type recommended by seal manufacturer for type of cable and installation conditions, including orientation.
 1. Compound-filled, cast-metal body, metal-clad cable terminator for metal-clad cable with external plastic jacket.
 2. Cold-shrink sheath seal kit with preformed sleeve openings sized for cable and insulated conductors.
 3. Heat-shrink sheath seal kit with phase- and ground-conductor re-jacketing tubes, cable-end sealing boot, and sealing plugs for unused ground-wire openings in boot.
 4. Cast-epoxy-resin sheath seal kit with wraparound mold and packaged, two-part, epoxy-resin casting material.
- B. Shielded-Cable Terminations: Comply with the following classes of IEEE 48. Insulation class is equivalent to that of cable. Include shield ground strap for shielded cable terminations.
 1. Class 1 Terminations: Modular type, furnished as a kit, with stress-relief tube; multiple, molded-silicone rubber, insulator modules; shield ground strap; and compression-type connector.
 2. Class 1 Terminations: Heat-shrink type with heat-shrink inner stress control and outer nontracking tubes; multiple, molded, nontracking skirt modules; and compression-type connector.
 3. Class 1 Terminations: Modular type, furnished as a kit, with stress-relief shield terminator; multiple-wet-process, porcelain, insulator modules; shield ground strap; and compression-type connector.
 4. Class 1 Terminations, Indoors: Kit with stress-relief tube, nontracking insulator tube, shield ground strap, compression-type connector, and end seal.

5. Class 2 Terminations, Indoors: Kit with stress-relief tube, nontracking insulator tube, shield ground strap, and compression-type connector. Include silicone-rubber tape, cold-shrink-rubber sleeve, or heat-shrink plastic-sleeve moisture seal for end of insulation whether or not supplied with kits.
6. Class 3 Terminations: Kit with stress cone and compression-type connector.
- C. Nonshielded-Cable Terminations: Kit with compression-type connector. Include silicone-rubber tape, cold-shrink-rubber sleeve, or heat-shrink plastic-sleeve moisture seal for end of insulation whether or not supplied with kits.

2.5 SEPARABLE INSULATED CONNECTORS

- A. Description: Modular system, complying with IEEE 386, with disconnecting, single-pole, cable terminators and with matching, stationary, plug-in, dead-front terminals designed for cable voltage and for sealing against moisture.
- B. Terminations at Distribution Points: Modular type, consisting of terminators installed on cables and modular, dead-front, terminal junctions for interconnecting cables.
- C. Load-Break Cable Terminators: Elbow-type units with 200-A load make/break and continuous-current rating; coordinated with insulation diameter, conductor size, and material of cable being terminated. Include test point on terminator body that is capacitance coupled.
- D. Dead-Break Cable Terminators: Elbow-type unit with 600-A continuous-current rating; designed for de-energized disconnecting and connecting; coordinated with insulation diameter, conductor size, and material of cable being terminated. Include test point on terminator body that is capacitance coupled.
- E. Dead-Front Terminal Junctions: Modular bracket-mounted groups of dead-front stationary terminals that mate and match with above cable terminators. Two-, three-, or four-terminal units as indicated, with fully rated, insulated, watertight conductor connection between terminals and complete with grounding lug, manufacturer's standard accessory stands, stainless-steel mounting brackets, and attaching hardware.
 1. Protective Cap: Insulating, electrostatic-shielding, water-sealing cap with drain wire.
 2. Portable Feed-Through Accessory: Two-terminal, dead-front junction arranged for removable mounting on accessory stand of stationary terminal junction.
 3. Grounding Kit: Jumpered elbows, portable feed-through accessory units, protective caps, test rods suitable for concurrently grounding three phases of feeders and carrying case.
 4. Standoff Insulator: Portable, single dead-front terminal for removable mounting on accessory stand of stationary terminal junction. Insulators suitable for fully insulated isolation of energized cable-elbow terminator.
- F. Test-Point Fault Indicators: Applicable current-trip ratings and arranged for installation in test points of load-break separable connectors, and complete with self-resetting indicators capable of being installed with shotgun hot stick and tested with test tool.
- G. Tool Set: Shotgun hot stick with energized terminal indicator, fault-indicator test tool, and carrying case.

2.6 ARC-PROOFING MATERIALS

- A. Tape for First Course on Metal Objects: 10-mil- thick, corrosion-protective, moisture-resistant, PVC pipe-wrapping tape.

- B. Arc-Proofing Tape: Fireproof tape, flexible, conformable, intumescent to 0.3-inch-thick, compatible with cable jacket.
- C. Glass-Cloth Tape: Pressure-sensitive adhesive type, 1/2 inch wide.

2.7 SOURCE QUALITY CONTROL

- A. Test and inspect cables according to ICEA S-97-682 before shipping.
- B. Test strand-filled cables for water-penetration resistance according to ICEA T-31-610, using a test pressure of 5 psig.

PART 3 - EXECUTION

3.1 INSTALLATION

- A. Install cables according to IEEE 576.
- B. Pull Conductors: Do not exceed manufacturer's recommended maximum pulling tensions and sidewall pressure values.
 - 1. Where necessary, use manufacturer-approved pulling compound or lubricant that will not deteriorate conductor or insulation.
 - 2. Use pulling means, including fish tape, cable, rope, and basket-weave cable grips that will not damage cables and raceways. Do not use rope hitches for pulling attachment to cable.
- C. Install exposed cables parallel and perpendicular to surfaces of exposed structural members and follow surface contours where possible.
- D. Support cables according to Section 260529 "Hangers and Supports for Electrical Systems."
- E. Install direct-buried cables on leveled and tamped bed of 3-inch- thick, clean sand. Separate cables crossing other cables or piping by a minimum of 4 inches of tamped earth. Install permanent markers at ends of cable runs, changes in direction, and buried splices.
- F. Install "buried-cable" warning tape 12 inches above cables.
- G. In manholes, handholes, pull boxes, junction boxes, and cable vaults, train cables around walls by the longest route from entry to exit and support cables at intervals adequate to prevent sag.
- H. Install cable splices at pull points and elsewhere as indicated; use standard kits.
- I. Install terminations at ends of conductors and seal multiconductor cable ends with standard kits.
- J. Install separable insulated-connector components as follows:
 - 1. Protective Cap: At each terminal junction, with one on each terminal to which no feeder is indicated to be connected.
 - 2. Portable Feed-Through Accessory: Three.
 - 3. Standoff Insulator: Three.
- K. Arc Proofing: Unless otherwise indicated, arc proof medium-voltage cable at locations not protected by conduit, cable tray, direct burial, or termination materials. In addition to arc-proofing tape manufacturer's written instructions, apply arc proofing as follows:
 - 1. Clean cable sheath.
 - 2. Wrap metallic cable components with 10-mil pipe-wrapping tape.
 - 3. Smooth surface contours with electrical insulation putty.
 - 4. Apply arc-proofing tape in one half-lapped layer with coated side toward cable.

- 5. Band arc-proofing tape with 1-inch- wide bands of half-lapped, adhesive, glass-cloth tape 2 inches o.c.
- L. Seal around cables passing through fire-rated elements according to Section 078413 "Penetration Firestopping."
- M. Install fault indicators on each phase where indicated.
- N. Ground shields of shielded cable at terminations, splices, and separable insulated connectors. Ground metal bodies of terminators, splices, cable and separable insulated-connector fittings, and hardware.
- O. Identify cables according to Section 260553 "Identification for Electrical Systems."

3.2 FIELD QUALITY CONTROL

- A. Testing: Owner will engage a qualified testing and inspecting agency to perform field tests and inspections and prepare test reports.
- B. Testing: Engage a qualified testing and inspecting agency to perform the following field tests and inspections and prepare test reports:
- C. Perform the following field tests and inspections and prepare test reports:
 - 1. Perform each visual and mechanical inspection and electrical test stated in NETA ATS. Certify compliance with test parameters.
 - 2. Contractor is responsible for performing of high potential dielectric strength (HIPOT) testing of conductors prior to energizing of cables.
 - 3. After installing medium-voltage cables and before electrical circuitry has been energized, test for compliance with requirements.
- D. Remove and replace malfunctioning units and retest as specified above.

END OF SECTION 260513

SECTION 260519 – LOW-VOLTAGE CONDUCTORS AND CABLES

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

- A. Drawings and general provisions of the Contract, including General and Supplementary Conditions and Division 1 Specification Sections, apply to this Section.

1.2 SUMMARY

- A. This Section includes building wires and cables and associated connectors, splices, and terminations for wiring systems rated 600 V and less.

1.3 SUBMITTALS

- A. Field Test Reports: Indicate and interpret test results for compliance with performance requirements.

1.4 QUALITY ASSURANCE

- A. Testing Agency Qualifications: In addition to requirements specified in Division 1, an independent testing agency shall meet OSHA criteria for accreditation of testing laboratories, Title 29, Part 1907; or shall be a full-member company of the InterNational Electrical Testing Association.
 - 1. Testing Agency's Field Supervisor: Person currently certified by the InterNational Electrical Testing Association or the National Institute for Certification in Engineering Technologies, to supervise on-site testing specified in Part 3.
- B. Listing and Labeling: Provide wires and cables specified in this Section that are listed and labeled.
 - 1. The Terms "Listed" and "Labeled": As defined in NFPA 70, Article 100.
 - 2. Listing and Labeling Agency Qualifications: A "Nationally Recognized Testing Laboratory" as defined in OSHA Regulation 1910.7.
- C. Comply with NFPA 70.

1.5 DELIVERY, STORAGE, AND HANDLING

- A. Deliver wires and cables according to NEMA WC 26.

1.6 COORDINATION

- A. Coordinate layout and installation of cables with other installations.
- B. Revise locations and elevations from those indicated, as required to suit field conditions and as approved by Architect.

PART 2 - PRODUCTS

2.1 MANUFACTURERS

- A. Manufacturers: Subject to compliance with requirements, provide products by one of the following:
 - 1. Wires and Cables:

- a. Okonite
- b. American Insulated Wire Corp.; Leviton Manufacturing Co.
- c. BICC Brand-Rex Company.
- d. Southwire Company.
- 2. Connectors for Wires and Cables:
 - a. General Signal; O-Z/Gedney Unit.
 - b. Square D Co.; Anderson.
 - c. 3M Company; Electrical Products Division.

2.2 BUILDING WIRES AND CABLES

- A. UL-listed building wires and cables with conductor material, insulation type, cable construction, and rating as specified in Part 3 "Wire and Insulation Applications" Article.
- B. Rubber Insulation Material: Comply with NEMA WC 3.
- C. Thermoplastic Insulation Material: Comply with NEMA WC 5.
- D. Cross-Linked Polyethylene Insulation Material: Comply with NEMA WC 7.
- E. Ethylene Propylene Rubber Insulation Material: Comply with NEMA WC 8.
- F. Conductor Material: Copper.
- G. Stranded conductors.

2.3 CONNECTORS AND SPLICES

- A. UL-listed, factory-fabricated wiring connectors of size, ampacity rating, material, type, and class for application and service indicated. Comply with Project's installation requirements and as specified in Part 3 "Wire and Insulation Applications" Article.

PART 3 - EXECUTION

3.1 EXAMINATION

- A. Examine raceways and building finishes to receive wires and cables for compliance with requirements for installation tolerances and other conditions affecting performance of wires and cables. Do not proceed with installation until unsatisfactory conditions have been corrected.

3.2 WIRE AND INSULATION APPLICATIONS

- A. Feeders: Type THHN/THWN, in raceway.
- B. Branch Circuits: Type THHN/THWN, in raceway.
- C. Fire Alarm Circuits: Power-limited, fire-protective, signaling circuit cable.
- D. Class 1 Control Circuits: Type THHN/THWN, in raceway.
- E. Class 2 Control Circuits: Type THHN/THWN, in raceway.

3.3 INSTALLATION

- A. Install wires and cables as indicated, according to manufacturer's written instructions and NECA's "Standard of Installation."
- B. Remove existing wires from raceway before pulling in new wires and cables.

- C. Pull Conductors: Use manufacturer-approved pulling compound or lubricant where necessary; compound used must not deteriorate conductor or insulation. Do not exceed manufacturer's recommended maximum pulling tensions and sidewall pressure values.
- D. Use pulling means, including fish tape, cable, rope, and basket-weave wire/cable grips, that will not damage cables or raceway.
- E. Install exposed cables, parallel and perpendicular to surfaces of exposed structural members, and follow surface contours where possible.
- F. Support cables according to Division 26 Section "General Provisions for Electrical Work."
- G. Seal around cables penetrating fire-rated elements according to Division 7 Section "Penetration Firestopping."
- H. Identify wires and cables according to Division 26 Section "Electrical Identification."

3.4 CONNECTIONS

- A. Conductor Splices: Keep to minimum.
- B. Install splices and tapes that possess equivalent or better mechanical strength and insulation ratings than conductors being spliced.
- C. Use splice and tap connectors compatible with conductor material.
- D. Wiring at Outlets: Install conductor at each outlet, with at least 12 inches of slack.
- E. Connect outlets and components to wiring and to ground as indicated and instructed by manufacturer.
- F. Tighten electrical connectors and terminals according to manufacturer's published torque-tightening values. If manufacturer's torque values are not indicated, use those specified in UL 486A and UL 486B.

3.5 FIELD QUALITY CONTROL

- A. Testing: On installation of wires and cables and before electrical circuitry has been energized, demonstrate product capability and compliance with requirements.
 - 1. Procedures: Perform each visual and mechanical inspection and electrical test stated in NETA ATS, Section 7.3.1. Certify compliance with test parameters.
- B. Correct malfunctioning conductors and cables at Project site, where possible, and retest to demonstrate compliance; otherwise, remove and replace with new units and retest.

END OF SECTION 260519

THIS PAGE INTENTIONALLY LEFT BLANK

SECTION 260526 - GROUNDING AND BONDING

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

- A. Drawings and general provisions of the Contract, including General and Supplementary Conditions and Division 1 Specification Sections, apply to this Section.

1.2 SUMMARY

- A. This Section includes grounding of electrical systems and equipment. Grounding requirements specified in this Section may be supplemented by special requirements of systems described in other Sections.

1.3 SUBMITTALS

- A. Product Data: For each type of product indicated.
- B. Product Data: For the following:
 - 1. Ground rods.
 - 2. Chemical rods.
- C. Qualification Data: For firms and persons specified in "Quality Assurance" Article.
- D. Field Test Reports: Submit written test reports to include the following:
 - 1. Test procedures used.
 - 2. Test results that comply with requirements.
 - 3. Results of failed tests and corrective action taken to achieve test results that comply with requirements.

1.4 QUALITY ASSURANCE

- A. Testing Agency Qualifications: Testing agency as defined by OSHA in 29 CFR 1910.7 or a member company of the InterNational Electrical Testing Association and that is acceptable to authorities having jurisdiction.
 - 1. Testing Agency's Field Supervisor: Person currently certified by the InterNational Electrical Testing Association to supervise on-site testing specified in Part 3.
- B. Electrical Components, Devices, and Accessories: Listed and labeled as defined in NFPA 70, Article 100, by a testing agency acceptable to authorities having jurisdiction, and marked for intended use.
 - 1. Comply with UL 467.
- C. Comply with NFPA 70; for overhead-line construction and medium-voltage underground construction, comply with IEEE C2.
- D. Comply with NFPA 780 and UL 96 when interconnecting with lightning protection system.

PART 2 - PRODUCTS

2.1 MANUFACTURERS

- A. Manufacturers: Subject to compliance with requirements, provide products by one of the following:
1. Grounding Conductors, Cables, Connectors, and Rods:
 - a. Copperweld Corp.
 - b. Erico Inc.; Electrical Products Group.
 - c. Framatome Connectors/Burndy Electrical.
 - d. O-Z/Gedney Co.; a business of the EGS Electrical Group.
 - e. Thomas & Betts, Electrical.

2.2 GROUNDING CONDUCTORS

- A. For insulated conductors, comply with Division 26 Section "Low Voltage Conductors and Cables."
- B. Material: Copper.
- C. Equipment Grounding Conductors: Insulated with green-colored insulation.
- D. Isolated Ground Conductors: Insulated with green-colored insulation with yellow stripe. On feeders with isolated ground, use colored tape, alternating bands of green and yellow tape to provide a minimum of three bands of green and two bands of yellow.
- E. Grounding Electrode Conductors: Stranded cable.
- F. Underground Conductors: Bare, tinned, stranded, unless otherwise indicated.
- G. Bare Copper Conductors: Comply with the following:
1. Solid Conductors: ASTM B 3.
 2. Assembly of Stranded Conductors: ASTM B 8.
 3. Tinned Conductors: ASTM B 33.
- H. Copper Bonding Conductors: As follows:
1. Bonding Cable: 28 kcmil, 14 strands of No. 17 AWG copper conductor, 1/4 inch in diameter.
 2. Bonding Conductor: No. 4 or No. 6 AWG, stranded copper conductor.
 3. Bonding Jumper: Bare copper tape, braided bare copper conductors, terminated with copper ferrules; 1-5/8 inches wide and 1/16 inch thick.
- I. Ground Conductor and Conductor Protector for Wood Poles: As follows:
1. No. 4 AWG minimum, soft-drawn copper conductor.
- J. Grounding Bus: Bare, annealed copper bars of rectangular cross section, with insulators.

2.3 CONNECTOR PRODUCTS

- A. Comply with IEEE 837 and UL 467; listed for use for specific types, sizes, and combinations of conductors and connected items.
- B. Bolted Connectors: Bolted-pressure-type connectors, or compression type.
- C. Welded Connectors: Exothermic-welded type, in kit form, and selected per manufacturer's written instructions.

2.4 GROUNDING ELECTRODES

- A. Ground Rods: Sectional type; copper-clad steel.
 - 1. Size: $\frac{3}{4}$ " diameter by 120 inches in length.

PART 3 - EXECUTION

3.1 APPLICATION

- A. Use only copper conductors for both insulated and bare grounding conductors in direct contact with earth, concrete, masonry, crushed stone, and similar materials.
- B. In raceways, use insulated equipment grounding conductors.
- C. Exothermic-Welded Connections: Use for connections to structural steel and for underground connections, except those at test wells.
- D. Equipment Grounding Conductor Terminations: Use bolted pressure clamps.
- E. Underground Grounding Conductors: Use tinned-copper conductor, No. 2/0 AWG minimum. Bury at least 24 inches below grade or bury 12 inches above duct bank when installed as part of the duct bank.

3.2 EQUIPMENT GROUNDING CONDUCTORS

- A. Comply with NFPA 70, Article 250, for types, sizes, and quantities of equipment grounding conductors, unless specific types, larger sizes, or more conductors than required by NFPA 70 are indicated.
- B. Install equipment grounding conductors in all feeders and circuits.
- C. Install insulated equipment grounding conductor with circuit conductors for the following items, in addition to those required by NEC:
 - 1. Feeders and branch circuits.
 - 2. Lighting circuits.
 - 3. Receptacle circuits.
 - 4. Single-phase motor and appliance branch circuits.
 - 5. Three-phase motor and appliance branch circuits.
 - 6. Flexible raceway runs.
- D. Computer Outlet Circuits: Install insulated equipment grounding conductor in branch-circuit runs from computer-area power panels or power-distribution units.
- E. Isolated Grounding Receptacle Circuits: Install an insulated equipment grounding conductor connected to the receptacle grounding terminal. Isolate grounding conductor from raceway and from panelboard grounding terminals. Terminate at equipment grounding conductor terminal of the applicable derived system or service, unless otherwise indicated.
- F. Nonmetallic Raceways: Install an equipment grounding conductor in nonmetallic raceways unless they are designated for telephone or data cables.
- G. Air-Duct Equipment Circuits: Install an equipment grounding conductor to duct-mounted electrical devices operating at 120 V and more, including air cleaners and heaters. Bond conductor to each unit and to air duct.
- H. Water Heater, Heat-Tracing, and Antifrost Heating Cables: Install a separate equipment grounding conductor to each electric water heater, heat-tracing, and antifrost heating cable. Bond conductor to heater units, piping, connected equipment, and components.

- I. Signal and Communication Systems: For telephone, alarm, voice and data, and other communication systems, provide No. 4 AWG minimum insulated grounding conductor in raceway from grounding electrode system to each service location, terminal cabinet, wiring closet, and central equipment location.
 - 1. Service and Central Equipment Locations and Wiring Closets: Terminate grounding conductor on a 1/4-by-2-by-12-inch grounding bus.
 - 2. Terminal Cabinets: Terminate grounding conductor on cabinet grounding terminal.
- J. Metal Poles Supporting Outdoor Lighting Fixtures: Provide a grounding electrode in addition to installing a separate equipment grounding conductor with supply branch-circuit conductors.
- K. Common Ground Bonding with Lightning Protection System: Bond electrical power system ground directly to lightning protection system grounding conductor at closest point to electrical service grounding electrode. Use bonding conductor sized same as system grounding electrode conductor and install in conduit.
- L. Equipment enclosures: Bond electrical equipment enclosures to electrical equipment system ground ring. Use bonding conductor sized same as system grounding electrode conductor.

3.3 INSTALLATION

- A. Ground Rods: Install at least three rods spaced at least one-rod length from each other and located at least the same distance from other grounding electrodes.
 - 1. Drive ground rods until tops are 2 inches below finished floor or final grade, unless otherwise indicated.
 - 2. Interconnect ground rods with grounding electrode conductors. Use exothermic welds, except at test wells and as otherwise indicated. Make connections without exposing steel or damaging copper coating.
- B. Grounding Conductors: Route along shortest and straightest paths possible, unless otherwise indicated. Avoid obstructing access or placing conductors where they may be subjected to strain, impact, or damage.
- C. Bonding Straps and Jumpers: Install so vibration by equipment mounted on vibration isolation hangers and supports is not transmitted to rigidly mounted equipment. Use exothermic-welded connectors for outdoor locations, unless a disconnect-type connection is required; then, use a bolted clamp. Bond straps directly to the basic structure taking care not to penetrate any adjacent parts. Install straps only in locations accessible for maintenance.
- D. Metal Water Service Pipe: Provide insulated copper grounding conductors, in conduit, from building's main service equipment, or grounding bus, to main metal water service entrances to building. Connect grounding conductors to main metal water service pipes by grounding clamp connectors. Where a dielectric main water fitting is installed, connect grounding conductor to street side of fitting. Bond metal grounding conductor conduit or sleeve to conductor at each end.
- E. Water Meter Piping: Use braided-type bonding jumpers to electrically bypass water meters. Connect to pipe with grounding clamp connectors.
- F. Bond interior metal piping systems and metal air ducts to equipment grounding conductors of associated pumps, fans, blowers, electric heaters, and air cleaners. Use braided-type bonding straps.

3.4 CONNECTIONS

- A. General: Make connections so galvanic action or electrolysis possibility is minimized. Select connectors, connection hardware, conductors, and connection methods so metals in direct contact will be galvanically compatible.
 - 1. Use electroplated or hot-tin-coated materials to ensure high conductivity and to make contact points closer to order of galvanic series.
 - 2. Make connections with clean, bare metal at points of contact.
 - 3. Make aluminum-to-steel connections with stainless-steel separators and mechanical clamps.
 - 4. Make aluminum-to-galvanized steel connections with tin-plated copper jumpers and mechanical clamps.
 - 5. Coat and seal connections having dissimilar metals with inert material to prevent future penetration of moisture to contact surfaces.
- B. Exothermic-Welded Connections: Comply with manufacturer's written instructions. Welds that are puffed up or that show convex surfaces indicating improper cleaning are not acceptable.
- C. Equipment Grounding Conductor Terminations: For No. 8 AWG and larger, use pressure-type grounding lugs. No. 10 AWG and smaller grounding conductors may be terminated with winged pressure-type connectors.
- D. Noncontact Metal Raceway Terminations: If metallic raceways terminate at metal housings without mechanical and electrical connection to housing, terminate each conduit with a grounding bushing. Connect grounding bushings with a bare grounding conductor to grounding bus or terminal in housing. Bond electrically noncontinuous conduits at entrances and exits with grounding bushings and bare grounding conductors, unless otherwise indicated.
- E. Tighten screws and bolts for grounding and bonding connectors and terminals according to manufacturer's published torque-tightening values. If manufacturer's torque values are not indicated, use those specified in UL 486A and UL 486B.
- F. Compression-Type Connections: Use hydraulic compression tools to provide correct circumferential pressure for compression connectors. Use tools and dies recommended by connector manufacturer. Provide embossing die code or other standard method to make a visible indication that a connector has been adequately compressed on grounding conductor.
- G. Moisture Protection: If insulated grounding conductors are connected to ground rods or grounding buses, insulate entire area of connection and seal against moisture penetration of insulation and cable.

3.5 UNDERGROUND DISTRIBUTION SYSTEM GROUNDING

- A. Duct Banks: Install a grounding conductor with at least 50 percent ampacity of the largest phase conductor in the duct bank.
- B. Manholes and Handholes: Install a driven ground rod close to wall and set rod depth so 4 inches will extend above finished floor. If necessary, install ground rod before manhole is placed and provide a No. 1/0 AWG bare, tinned-copper conductor from ground rod into manhole through a waterproof sleeve in manhole wall. Protect ground rods passing through concrete floor with a double wrapping of pressure-sensitive tape or heat-shrunk insulating sleeve from 2 inches above to 6 inches below concrete. Seal floor opening with waterproof, nonshrink grout.
- C. Connections to Manhole Components: Connect exposed-metal parts, such as inserts, cable racks, pulling irons, ladders, and cable shields within each manhole or handhole, to ground rod or

grounding conductor. Make connections with No. 4 AWG minimum, stranded, hard-drawn copper conductor. Train conductors' level or plumb around corners and fasten to manhole walls. Connect to cable armor and cable shields as recommended by manufacturer of splicing and termination kits.

- D. Pad-Mounted Transformers and/or Switches: Provide service transformer ground grid as shown on associated electrical drawings. Ground pad-mounted equipment and noncurrent-carrying metal items associated with transformers or substations by connecting them to underground cable and grounding electrodes. Use tinned-copper conductors for counterpoise and for taps to equipment ground pad.

3.6 FIELD QUALITY CONTROL

- A. Testing: Perform the following field quality-control testing:
1. After installing grounding system but before permanent electrical circuitry has been energized, test for compliance with requirements.
 2. Test completed grounding system at each location where a maximum ground-resistance level is specified and at service disconnect enclosure grounding terminal. Measure ground resistance not less than two full days after the last trace of precipitation, and without the soil being moistened by any means other than natural drainage or seepage and without chemical treatment or other artificial means of reducing natural ground resistance. Perform tests, by the fall-of-potential method according to IEEE 81.
 - a. Equipment Rated 500 kVA and Less: 10 ohms.
 - b. Equipment Rated 500 to 1000 kVA: 5 ohms.
 - c. Equipment Rated More Than 1000 kVA: 3 ohms.
 - d. Substations and Pad-Mounted Switching Equipment: 5 ohms.
 - e. Manhole Grounds: 10 ohms.
 3. Excessive Ground Resistance: If resistance to ground exceeds specified values, notify Architect promptly and include recommendations to reduce ground resistance.

3.7 GRADING AND PLANTING

- A. Restore surface features, including vegetation, at areas disturbed by Work of this Section. Reestablish original grades, unless otherwise indicated. If sod has been removed, replace it as soon as possible after backfilling is completed. Restore areas disturbed by trenching, storing of dirt, cable laying, and other activities to their original condition. Include application of topsoil, fertilizer, lime, seed, sod, sprig, and mulch. Comply with Division 32 Section "Turfs and Grasses." Maintain restored surfaces. Restore disturbed paving as indicated.

END OF SECTION 260526

SECTION 260529 - HANGERS AND SUPPORTS FOR ELECTRICAL SYSTEMS

PART 1 - GENERAL

1.1 SUMMARY

- A. This Section includes the following:
 - 1. Hangers and supports for electrical equipment and systems.
 - 2. Construction requirements for concrete bases.

1.2 DEFINITIONS

- A. EMT: Electrical metallic tubing.
- B. IMC: Intermediate metal conduit.
- C. RMC: Rigid metal conduit.

1.3 PERFORMANCE REQUIREMENTS

- A. Design supports for multiple raceways capable of supporting combined weight of supported systems and its contents.
- B. Design equipment supports capable of supporting combined operating weight of supported equipment and connected systems and components.
- C. Rated Strength: Adequate in tension, shear, and pullout force to resist maximum loads calculated or imposed for this Project, with a minimum structural safety factor of five times the applied force.

1.4 QUALITY ASSURANCE

- A. Welding: Qualify procedures and personnel according to AWS D1.1/D1.1M, "Structural Welding Code - Steel."
- B. Comply with NFPA 70.

1.5 COORDINATION

- A. Coordinate size and location of concrete bases. Cast anchor-bolt inserts into bases. Concrete, reinforcement, and formwork requirements are specified in Division 3.
- B. Coordinate installation of roof curbs, equipment supports, and roof penetrations

PART 2 - PRODUCTS

2.1 SUPPORT, ANCHORAGE, AND ATTACHMENT COMPONENTS

- A. Steel Slotted Support Systems: Comply with MFMA-4, factory-fabricated components for field assembly.
 - 1. Manufacturers: Subject to compliance with requirements, provide products by one of the following:
 - a. Allied Tube & Conduit.
 - b. Cooper B-Line, Inc.; a division of Cooper Industries.
 - c. ERICO International Corporation.
 - d. Thomas & Betts Corporation.

- e. Unistrut; Tyco International, Ltd.
 - f. Wesanco, Inc.
- 2. Metallic Coatings: Hot-dip galvanized after fabrication and applied according to MFMA-4.
- 3. Channel Dimensions: Selected for applicable load criteria.
- B. Raceway and Cable Supports: As described in NECA 1 and NECA 101.
- C. Conduit and Cable Support Devices: Steel hangers, clamps, and associated fittings, designed for types and sizes of raceway or cable to be supported.
- D. Support for Conductors in Vertical Conduit: Factory-fabricated assembly consisting of threaded body and insulating wedging plug or plugs for non-armored electrical conductors or cables in riser conduits. Plugs shall have number, size, and shape of conductor gripping pieces as required to suit individual conductors or cables supported. Body shall be malleable iron.
- E. Structural Steel for Fabricated Supports and Restraints: ASTM A 36/A 36M, steel plates, shapes, and bars; black and galvanized.
- F. Mounting, Anchoring, and Attachment Components: Items for fastening electrical items or their supports to building surfaces include the following:
 - 1. Powder-Actuated Fasteners: Threaded-steel stud, for use in hardened portland cement concrete, steel, or wood, with tension, shear, and pullout capacities appropriate for supported loads and building materials where used.
 - a. Manufacturers: Subject to compliance with requirements, provide products by one of the following:
 - 1) Hilti Inc.
 - 2) ITW Ramset/Red Head; a division of Illinois Tool Works, Inc.
 - 3) MKT Fastening, LLC.
 - 4) Simpson Strong-Tie Co., Inc.; Masterset Fastening Systems Unit.
 - 2. Mechanical-Expansion Anchors: Insert-wedge-type, zinc-coated steel, for use in hardened portland cement concrete with tension, shear, and pullout capacities appropriate for supported loads and building materials in which used.
 - a. Manufacturers: Subject to compliance with requirements, provide products by one of the following:
 - 1) Cooper B-Line, Inc.; a division of Cooper Industries.
 - 2) Hilti Inc.
 - 3) ITW Ramset/Red Head; a division of Illinois Tool Works, Inc.
 - 4) MKT Fastening, LLC.
 - 3. Concrete Inserts: Steel or malleable-iron, slotted support system units similar to MSS Type 18; complying with MFMA-4 or MSS SP-58.
 - 4. Clamps for Attachment to Steel Structural Elements: MSS SP-58, type suitable for attached structural element.
 - 5. Through Bolts: Structural type, hex head, and high strength. Comply with ASTM A 325.
 - 6. Toggle Bolts: All-steel springhead type.
 - 7. Hanger Rods: Threaded steel.

2.2 FABRICATED METAL EQUIPMENT SUPPORT ASSEMBLIES

- A. Description: Welded or bolted, structural-steel shapes, shop or field fabricated to fit dimensions of supported equipment.

PART 3 - EXECUTION

3.1 APPLICATION

- A. Comply with NECA 1 and NECA 101 for application of hangers and supports for electrical equipment and systems except if requirements in this Section are stricter.
- B. Maximum Support Spacing and Minimum Hanger Rod Size for Raceway: Space supports for EMT, IMC, and RMC as required by NFPA 70. Minimum rod size shall be 1/4 inch in diameter.
- C. Multiple Raceways or Cables: Install trapeze-type supports fabricated with steel slotted support system, sized so capacity can be increased by at least 25 percent in future without exceeding specified design load limits.
 - 1. Secure raceways and cables to these supports with two-bolt conduit clamps.

3.2 SUPPORT INSTALLATION

- A. Comply with NECA 1 and NECA 101 for installation requirements except as specified in this Article.
- B. Raceway Support Methods: In addition to methods described in NECA 1, EMT, IMC, and RMC may be supported by openings through structure members, as permitted in NFPA 70.
- C. Strength of Support Assemblies: Where not indicated, select sizes of components so strength will be adequate to carry present and future static loads within specified loading limits. Minimum static design load used for strength determination shall be weight of supported components plus 200 lb.
- D. Mounting and Anchorage of Surface-Mounted Equipment and Components: Anchor and fasten electrical items and their supports to building structural elements by the following methods unless otherwise indicated by code:
 - 1. To Wood: Fasten with lag screws or through bolts.
 - 2. To New Concrete: Bolt to concrete inserts.
 - 3. To Masonry: Approved toggle-type bolts on hollow masonry units and expansion anchor fasteners on solid masonry units.
 - 4. To Existing Concrete: Expansion anchor fasteners.
 - 5. Instead of expansion anchors, powder-actuated driven threaded studs provided with lock washers and nuts may be used in existing standard-weight concrete 4 inches thick or greater. Do not use for anchorage to lightweight-aggregate concrete or for slabs less than 4 inches thick.
 - 6. To Steel: Beam clamps (MSS Type 19, 21, 23, 25, or 27) complying with MSS SP-69.
 - 7. To Light Steel: Sheet metal screws.
 - 8. Items Mounted on Hollow Walls and Nonstructural Building Surfaces: Mount cabinets, panelboards, disconnect switches, control enclosures, pull and junction boxes, transformers, and other devices on slotted-channel racks attached to substrate.
- E. Drill holes for expansion anchors in concrete at locations and to depths that avoid reinforcing bars.

3.3 INSTALLATION OF FABRICATED METAL SUPPORTS

- A. Cut, fit, and place miscellaneous metal supports accurately in location, alignment, and elevation to support and anchor electrical materials and equipment.
- B. Field Welding: Comply with AWS D1.1/D1.1M.

3.4 CONCRETE BASES

- A. Construct concrete bases of dimensions indicated but not less than 4 inches larger in both directions than supported unit, and so anchors will be a minimum of 10 bolt diameters from edge of the base.
- B. Use 3000-psi, 28-day compressive-strength concrete. Concrete materials, reinforcement, and placement requirements are specified in Division 3 Section "Cast-in-Place Concrete."
- C. Anchor equipment to concrete base.
 - 1. Place and secure anchorage devices. Use supported equipment manufacturer's setting drawings, templates, diagrams, instructions, and directions furnished with items to be embedded.
 - 2. Install anchor bolts to elevations required for proper attachment to supported equipment.
 - 3. Install anchor bolts according to anchor-bolt manufacturer's written instructions.

3.5 PAINTING

- A. Touchup: Clean field welds and abraded areas of shop paint. Paint exposed areas immediately after erecting hangers and supports. Use same materials as used for shop painting. Comply with SSPC-PA 1 requirements for touching up field-painted surfaces.
 - 1. Apply paint by brush or spray to provide minimum dry film thickness of 2.0 mils.
- B. Touchup: Comply with requirements in Division 9 painting Sections for cleaning and touchup painting of field welds, bolted connections, and abraded areas of shop paint on miscellaneous metal.
- C. Galvanized Surfaces: Clean welds, bolted connections, and abraded areas and apply galvanizing-repair paint to comply with ASTM A 780.

END OF SECTION 26 0529

SECTION 260533 - RACEWAYS AND BOXES

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

- A. Drawings and general provisions of the Contract, including General and Supplementary Conditions and Division 1 Specification Sections, apply to this Section.

1.2 SUMMARY

- A. This Section includes raceways, fittings, connectors and couplings, boxes, enclosures, and cabinets for electrical wiring.
1. Raceways include the following:
 - a. RMC.
 - b. IMC.
 - c. PVC externally coated, rigid steel conduits.
 - d. PVC externally coated, IMC.
 - e. EMT.
 - f. FMC.
 - g. LFMC.
 - h. LFNC.
 - i. RNC.
 - j. ENT.
 - k. Wireways.
 - l. Surface raceways.
 - m. Type MC cable
 2. Boxes, enclosures, and cabinets include the following:
 - a. Device boxes.
 - b. Floor boxes.
 - c. Outlet boxes.
 - d. Pull and junction boxes.
 - e. Cabinets and hinged-cover enclosures.

1.3 DEFINITIONS

- A. EMT: Electrical metallic tubing.
- B. ENT: Electrical nonmetallic tubing.
- C. FMC: Flexible metal conduit.
- D. IMC: Intermediate metal conduit.
- E. LFMC: Liquidtight flexible metal conduit.
- F. LFNC: Liquidtight flexible nonmetallic conduit.
- G. RMC: Rigid metal conduit.
- H. RNC: Rigid nonmetallic conduit.

1.4 SUBMITTALS

- A. Product Data: For surface raceways, wireways and fittings, hinged-cover enclosures, and cabinets.
- B. Shop Drawings: Include layout drawings showing components and wiring for nonstandard boxes, enclosures, and cabinets.

1.5 QUALITY ASSURANCE

- A. Listing and Labeling: Provide raceways and boxes specified in this Section that are listed and labeled.
 - 1. The Terms "Listed" and "Labeled": As defined in NFPA 70, Article 100.
 - 2. Listing and Labeling Agency Qualifications: A "Nationally Recognized Testing Laboratory" as defined in OSHA Regulation 1910.7.
- B. Comply with NECA's "Standard of Installation."
- C. Comply with NFPA 70.

1.6 COORDINATION

- A. Coordinate layout and installation of raceways and boxes with other construction elements to ensure adequate headroom, working clearance, and access.

PART 2 - PRODUCTS

2.1 MANUFACTURERS

- A. Manufacturers: Subject to compliance with requirements, provide products by one of the following:
 - 1. Metal Conduit and Tubing:
 - a. Alflec Corp.
 - b. Anamet, Inc.; Anaconda Metal Hose.
 - c. Carol Cable Co., Inc.
 - d. Cole-Flex Corp.
 - e. Electri-Flex Co.
 - f. Flexcon, Inc.; Coleman Cable Systems, Inc.
 - g. Grinnell Co.; Allied Tube and Conduit Div.
 - 2. Nonmetallic Conduit and Tubing:
 - a. Anamet, Inc.; Anaconda Metal Hose.
 - b. Arnco Corp.
 - c. Cantex Industries; Harsco Corp.
 - d. Certainteed Corp.; Pipe & Plastics Group.
 - e. Cole-Flex Corp.
 - f. Condux International; Electrical Products.
 - g. Electri-Flex Co.
 - h. Hubbell, Inc.; Raco, Inc.
 - i. Lamson & Sessions; Carlon Electrical Products.
 - j. R&G Sloan Manufacturing Co., Inc.
 - k. Thomas & Betts Corp.
 - 3. Conduit Bodies and Fittings:

- a. American Electric; Construction Materials Group.
 - b. Crouse-Hinds; Div. of Cooper Industries.
 - c. Emerson Electric Co.; Appleton Electric Co.
 - d. Hubbell, Inc.; Killark Electric Manufacturing Co.
 - e. Lamson & Sessions; Carlon Electrical Products.
 - f. O-Z/Gedney; Unit of General Signal.
4. Metal Wireways:
- a. Hoffman Engineering Co.
 - b. Keystone/Rees, Inc.
 - c. Square D Co.
5. Nonmetallic Wireways:
- a. Hoffman Engineering Co.
 - b. Lamson & Sessions; Carlon Electrical Products.
6. Surface Metal Raceways:
- a. American Electric; Construction Materials Group.
 - b. Butler Manufacturing Co.; Walker Division.
 - c. Wiremold Co. (The); Electrical Sales Division.
7. Surface Nonmetallic Raceways:
- a. Butler Manufacturing Co.; Walker Division.
 - b. Hubbell, Inc.; Wiring Device Division.
 - c. Lamson & Sessions; Carlon Electrical Products.
 - d. Panduit Corp.
 - e. United Telecom; Premier Telecom Products, Inc.
 - f. Wiremold Co. (The); Electrical Sales Division.
8. Boxes, Enclosures, and Cabinets:
- a. American Electric; FL Industries.
 - b. Butler Manufacturing Co.; Walker Division.
 - c. Crouse-Hinds; Div. of Cooper Industries.
 - d. Electric Panelboard Co., Inc.
 - e. Hoffman Engineering Co.; Federal-Hoffman, Inc.
 - f. Hubbell Inc.; Killark Electric Manufacturing Co.
 - g. Hubbell Inc.; Raco, Inc.
 - h. Lamson & Sessions; Carlon Electrical Products.
 - i. O-Z/Gedney; Unit of General Signal.
 - j. Parker Electrical Manufacturing Co.
 - k. Robroy Industries, Inc.; Electrical Division.
 - l. Thomas & Betts Corp.
 - m. Woodhead Industries, Inc.; Daniel Woodhead Co.

2.2 METAL CONDUIT AND TUBING

- A. Rigid Steel Conduit: ANSI C80.1.
- B. Rigid Aluminum Conduit: ANSI C80.5.
- C. IMC: ANSI C80.6.
- D. Plastic-Coated Steel Conduit and Fittings: NEMA RN 1.

- E. Plastic-Coated IMC and Fittings: NEMA RN 1.
- F. EMT and Fittings: ANSI C80.3.
 - 1. Fittings: Set-screw or compression type.
- G. FMC: Aluminum.
- H. FMC: Zinc-coated steel.
- I. LFMC: Flexible steel conduit with PVC jacket.
- J. Fittings: NEMA FB 1; compatible with conduit/tubing materials.

2.3 NONMETALLIC CONDUIT AND TUBING

- A. ENT: NEMA TC 13.
- B. RNC: NEMA TC 2, Schedule 40 or 80 PVC.
- C. ENT and RNC Fittings: NEMA TC 3; match to conduit or conduit/tubing type and material.
- D. LFNC: UL 1660.

2.4 METAL WIREWAYS

- A. Material: Sheet metal sized and shaped as indicated.
- B. Fittings and Accessories: Include couplings, offsets, elbows, expansion joints, adapters, hold-down straps, end caps, and other fittings to match and mate with wireways as required for complete system.
- C. Select features, unless otherwise indicated, as required to complete wiring system and to comply with NFPA 70.
- D. Wireway Covers: As indicated
- E. Wireway Covers: Hinged type.
- F. Wireway Covers: Screw-cover type.
- G. Wireway Covers: Flanged-and-gasketed type.
- H. Finish: Manufacturer's standard enamel finish.

2.5 NONMETALLIC WIREWAYS

- A. Description: Fiberglass polyester, extruded and fabricated to size and shape indicated, with no holes or knockouts. Cover is gasketed with oil-resistant gasket material and fastened with captivated screws treated for corrosion resistance. Connections are flanged, with stainless-steel screws and oil-resistant gaskets.
- B. Description: PVC plastic, extruded and fabricated to size and shape indicated, with snap-on cover and mechanically coupled connections using plastic fasteners.
- C. Fittings and Accessories: Include couplings, offsets, elbows, expansion joints, adapters, hold-down straps, end caps, and other fittings to match and mate with wireways as required for complete system.
- D. Select features, unless otherwise indicated, as required to complete wiring system and to comply with NFPA 70.

2.6 NON-METALLIC SURFACE RACEWAY

- A. Wiremold 5400 two-piece surface non-metallic raceway or approved equivalent. Electrical Contractor is responsible for providing and installing all surface mounted raceway as indicated on associated electrical drawings. Raceway system shall include but not be limited to items listed below. Contractor is responsible for providing a complete operational surface raceway system where indicated on associated electrical drawings.
1. Provide divider plate for separation of communications and power wiring.
 2. Size: 1-11/16" x 5-1/4"W
 3. Provide two section Base No. 5400TB and cover No. 5400C as required.
 4. Install where indicated on the associated electrical drawings with devices as noted.
 5. Install where ceilings are inaccessible.
 6. Raceway color shall be ivory. Color of receptacles and connectors shall match raceway.
 7. Provide all necessary parts including, but not limited to, the following:
 - a. Wire Clip No. 5400TWC
 - b. Cover Clip No. 5406A
 - c. Flat Elbow No. 5411
 - d. End Cap No. 5410
 - e. Internal Elbow No. 5417
 - f. External Elbow No. 5418
 - g. Device Bracket and Faceplate No. 5407
 - h. Duplex Faceplate No. 5507D

2.7 CONNECTORS AND COUPLINGS

- A. Locknuts: Appleton Electric Co. BL-50 Series, Gould Inc. Efcor 151 Series, Midwest Electric Mfg. Corp. 10 Series, OZ/Gedney Co. 1-50S Series, Racor Inc. 1002 Series, or Thomas & Betts Corp. 141 Series.
- B. Grounding Wedge: Thomas & Betts Corp. 3650 Series
- C. Couplings (For Rigid and IMC Conduit): Standard threaded couplings as furnished by conduit manufacturer.
- D. Three Piece Conduit Coupling (For Rigid and IMC Conduit): Gould Inc. Efcor 165 Series, Midwest Electric Mfg. Corp. 190 Series, OZ/Gedney Co. 4-50 Series, Racor Inc. 1502 Series, or Thomas & Betts Corp. 675 Series
- E. Set Screw Type: Appleton Electric Co., Gould Inc. Efcor, Midwest Electric Mfg. Corp., Racor Inc., Tomic Electric, or Thomas & Betts Corp.
- F. Flexible Steel Conduit Connectors: Midwest Electric Mfg. Corp. 1708, 1736 Series, OZ/Gedney Co. C-8T, 24-34T, ACV-50T Series, or Thomas & Betts Corp. Nylon insulated Tite-Bite Series.
- G. Sealtite Connectors (For Liquidtight Metal Conduit): Appleton Electric Co. STB Series, Crouse-Hinds Co. LTB Series, Gould Inc Efcor 11-50B Series, Ideal Industries Inc. 75-521 Series, Midwest Electric Mfg. Corp. LTB Series, OZ/Gedney Co. 4Q-50T Series, Racor Inc. 3512 Series, or Thomas & Betts Corp. 5332 Series.

2.8 FLOOR BOXES

- A. Floor Boxes: metallic or nonmetallic, shallow, rectangular box.
- B. Four compartment with wiring dividers for power and communication wiring.
- C. Provide with mud cap for protection during concrete pour of floor slab.
- D. Provide with internal duplex receptacle brackets and communication brackets.
- E. Provide with brushed metal cover - finish to be determined by architect at submittal time. Cover to have capability to remain closed with cables exiting box.
- F. Legrand RFB2 Series.

2.9 OUTLET AND DEVICE BOXES

- A. Sheet Metal Boxes: NEMA OS 1.
- B. Cast-Metal Boxes: NEMA FB 1, Type FD, cast box with gasketed cover.

2.10 PULL AND JUNCTION BOXES

- A. Small Sheet Metal Boxes: NEMA OS 1.
- B. Cast-Metal Boxes: NEMA FB 1, cast aluminum with gasketed cover.

2.11 ENCLOSURES AND CABINETS

- A. Hinged-Cover Enclosures: NEMA 250, Type 1, with continuous hinge cover and flush latch.
 - 1. Metal Enclosures: Steel, finished inside and out with manufacturer's standard enamel.
 - 2. Nonmetallic Enclosures: Plastic, finished inside with radio-frequency-resistant paint.
- B. Cabinets: NEMA 250, Type 1, galvanized steel box with removable interior panel and removable front, finished inside and out with manufacturer's standard enamel. Hinged door in front cover with flush latch and concealed hinge. Key latch to match panelboards. Include metal barriers to separate wiring of different systems and voltage, and include accessory feet where required for freestanding equipment.

PART 3 - EXECUTION

3.1 EXAMINATION

- A. Examine surfaces to receive raceways, boxes, enclosures, and cabinets for compliance with installation tolerances and other conditions affecting performance of raceway installation. Do not proceed with installation until unsatisfactory conditions have been corrected.

3.2 WIRING METHODS

- A. Outdoors: Use the following wiring methods:
 - 1. Exposed: Rigid steel.
 - 2. Concealed: Rigid steel.
 - 3. Underground, Single Run: RNC.
 - 4. Underground, Grouped: RNC.

5. Connection to Vibrating Equipment (Including Transformers and Hydraulic, Pneumatic, Electric Solenoid, or Motor-Driven Equipment): LFMC.
 6. Boxes and Enclosures: NEMA 250, Type 3R or Type 4.
- B. Indoors: Use the following wiring methods:
1. Exposed: EMT. Non-metallic and metallic surface raceways as shown on associated electrical drawings.
 2. Concealed: EMT
 3. Concealed in slab on grade: RNC (transition to 90 degree rigid steel elbow prior to exiting floor slab on grade)
 4. Connection to Vibrating Equipment (Including Transformers and Hydraulic, Pneumatic, Electric Solenoid, or Motor-Driven Equipment): FMC; except in wet or damp locations, use LFMC.
 5. Damp or Wet Locations: Rigid steel conduit.
 6. Boxes and Enclosures: NEMA 250, Type 1, except as follows:
 - a. Damp or Wet Locations: NEMA 250, Type 4, stainless steel.

3.3 INSTALLATION

- A. Install raceways, boxes, enclosures, and cabinets as indicated, according to manufacturer's written instructions.
- B. Minimum Raceway Size: 3/4-inch trade size. Unless otherwise noted
- C. Conceal conduit and EMT, unless otherwise indicated, within finished walls, ceilings, and floors.
- D. Keep raceways at least 6 inches away from parallel runs of flues and steam or hot-water pipes. Install horizontal raceway runs above water and steam piping.
- E. Install raceways level and square and at proper elevations. Provide adequate headroom.
- F. Complete raceway installation before starting conductor installation.
- G. Support raceways as specified in Division 16 Section "Basic Electrical Materials and Methods."
- H. Use temporary closures to prevent foreign matter from entering raceways.
- I. Protect stub-ups from damage where conduits rise through floor slabs. Arrange so curved portion of bends is not visible above the finished slab.
- J. Make bends and offsets so ID is not reduced. Keep legs of bends in the same plane and straight legs of offsets parallel, unless otherwise indicated.
- K. Use raceway fittings compatible with raceways and suitable for use and location. For intermediate steel conduit, use threaded rigid steel conduit fittings, unless otherwise indicated.
- L. Run concealed raceways, with a minimum of bends, in the shortest practical distance considering the type of building construction and obstructions, unless otherwise indicated.
- M. Raceways Embedded in Slabs: Install in middle third of slab thickness where practical, and leave at least 1-inch concrete cover.
 1. Secure raceways to reinforcing rods to prevent sagging or shifting during concrete placement.
 2. Space raceways laterally to prevent voids in concrete.
 3. Run conduit larger than 1-inch trade size parallel to or at right angles to main reinforcement. Where at right angles to reinforcement, place conduit close to slab support.

4. Transition from nonmetallic tubing to Schedule rigid steel conduit before rising above floor.
- N. Install exposed raceways parallel to or at right angles to nearby surfaces or structural members and follow the surface contours as much as practical.
 1. Run parallel or banked raceways together, on common supports where practical.
 2. Make bends in parallel or banked runs from same centerline to make bends parallel. Use factory elbows only where elbows can be installed parallel; otherwise, provide field bends for parallel raceways.
- O. Join raceways with fittings designed and approved for the purpose and make joints tight.
 1. Make raceway terminations tight. Use bonding bushings or wedges at connections subject to vibration. Use bonding jumpers where joints cannot be made tight.
 2. Use insulating bushings to protect conductors.
- P. Terminations: Where raceways are terminated with locknuts and bushings, align raceways to enter squarely and install locknuts with dished part against the box. Where terminations are not secure with 1 locknut, use 2 locknuts: 1 inside and 1 outside the box.
- Q. Where raceways are terminated with threaded hubs, screw raceways or fittings tightly into the hub so the end bears against the wire protection shoulder. Where chase nipples are used, align raceways so the coupling is square to the box and tighten the chase nipple so no threads are exposed.
- R. Install pull wires in empty raceways. Use No. 14 AWG zinc-coated steel or monofilament plastic line with not less than 200-lb tensile strength. Leave at least 12 inches of slack at each end of the pull wire.
- S. Telephone and Signal System Raceways, 2-Inch Trade Size and Smaller: In addition to the above requirements, install raceways in maximum lengths of 150 feet and with a maximum of two 90-degree bends or equivalent. Separate lengths with pull or junction boxes where necessary to comply with these requirements.
- T. Install raceway sealing fittings according to manufacturer's written instructions. Locate fittings at suitable, approved, and accessible locations and fill them with UL-listed sealing compound. For concealed raceways, install each fitting in a flush steel box with a blank cover plate having a finish similar to that of adjacent plates or surfaces. Install raceway sealing fittings at the following points:
 1. Where conduits pass from warm to cold locations, such as the boundaries of refrigerated spaces.
 2. Where otherwise required by NFPA 70.
- U. Stub-up Connections: Extend conduits through concrete floor for connection to freestanding equipment. Install with an adjustable top or coupling threaded inside for plugs set flush with the finished floor. Extend conductors to equipment with rigid steel conduit; FMC may be used 6 inches above the floor. Install screwdriver-operated, threaded flush plugs flush with floor for future equipment connections.
- V. Flexible Connections: Use maximum of 6 feet of flexible conduit for recessed and semirecessed lighting fixtures; for equipment subject to vibration, noise transmission, or movement; and for all motors. Use liquid tight flexible conduit in wet or damp locations. Install separate ground conductor across flexible connections.
- W. Install nonferrous conduit or tubing for circuits operating above 60 Hz. Where aluminum raceways are installed for such circuits and pass through concrete, install in a nonmetallic sleeve.

- X. Do not install aluminum conduits embedded in or in contact with concrete.
- Y. PVC Externally Coated, Rigid Steel Conduits: Use only fittings approved for use with that material. Patch all nicks and scrapes in PVC coating after installing conduits.
- Z. Surface Raceways: Install a separate, green, ground conductor in raceways from junction box supplying the raceways to receptacle or fixture ground terminals.
 - 1. Select each surface raceway outlet box, to which a lighting fixture is attached, of sufficient diameter to provide a seat for the fixture canopy.
 - 2. Where a surface raceway is used to supply a fluorescent lighting fixture having central-stem suspension with a backplate and a canopy (with or without extension ring), no separate outlet box is required.
 - 3. Provide surface metal raceway outlet box, and the backplate and canopy, at the feed-in location of each fluorescent lighting fixture having end-stem suspension.
 - 4. Where a surface metal raceway extension is made from an existing outlet box on which a lighting fixture is installed, no additional surface-mounted outlet box is required. Provide a backplate slightly smaller than the fixture canopy.
- AA. Set floor boxes level and adjust to finished floor surface.
- BB. Install hinged-cover enclosures and cabinets plumb. Support at each corner.

3.4 PROTECTION

- A. Provide final protection and maintain conditions, in a manner acceptable to manufacturer and Installer that ensure coatings, finishes, and cabinets are without damage or deterioration at the time of Substantial Completion.
 - 1. Repair damage to galvanized finishes with zinc-rich paint recommended by manufacturer.
 - 2. Repair damage to PVC or paint finishes with matching touchup coating recommended by manufacturer.

3.5 CLEANING

- A. On completion of installation, including outlet fittings and devices, inspect exposed finish. Remove burrs, dirt, and construction debris and repair damaged finish, including chips, scratches, and abrasions.

END OF SECTION 260533

THIS PAGE INTENTIONALLY LEFT BLANK

SECTION 260543 – UNDERGROUND DUCTS AND RACEWAYS FOR ELECTRICAL SYSTEMS

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

- A. Drawings and general provisions of the Contract, including General and Supplementary Conditions and Division 01 Specification Sections, apply to this Section.

1.2 SUMMARY

- A. Section Includes:
 - 1. Metal conduits and fittings, including GRC and PVC-coated steel conduit.
 - 2. Rigid nonmetallic duct.
 - 3. Duct accessories.
 - 4. Fiberglass handholes and boxes with polymer concrete cover.
 - 5. Fiberglass handholes and boxes.
 - 6. High-density plastic boxes.

1.3 DEFINITIONS

- A. Direct Buried: Duct or a duct bank that is buried in the ground, without any additional casing materials such as concrete.
- B. Duct: A single duct or multiple ducts. Duct may be either installed singly or as component of a duct bank.
- C. Duct Bank:
 - 1. Two or more ducts installed in parallel, with or without additional casing materials.
 - 2. Multiple duct banks.
- D. GRC: Galvanized rigid (steel) conduit.
- E. Trafficways: Locations where vehicular or pedestrian traffic is a normal course of events.

1.4 ACTION SUBMITTALS

- A. Product Data: For each type of product.
 - 1. Include duct-bank materials, including spacers and miscellaneous components.
 - 2. Include duct, conduits, and their accessories, including elbows, end bells, bends, fittings, and solvent cement.
 - 3. Include accessories for handholes and boxes.
 - 4. Include underground-line warning tape.
 - 5. Include warning planks.
- B. Shop Drawings:
 - 1. Factory-Fabricated Handholes and Boxes Other Than Precast Concrete:
 - a. Include dimensioned plans, sections, and elevations, and fabrication and installation details.
 - b. Include duct entry provisions, including locations and duct sizes.
 - c. Include cover design.
 - d. Include grounding details.
 - e. Include dimensioned locations of cable rack inserts, and pulling-in and lifting irons.

1.5 INFORMATIONAL SUBMITTALS

- A. Coordination Drawings: For duct and duct bank. Show duct profiles and coordination with other utilities and underground structures.
 - 1. Include plans and sections, drawn to scale, and show bends and locations of expansion fittings.
 - 2. Drawings shall be signed and sealed by a qualified professional engineer.
- B. Qualification Data: For professional engineer and testing agency responsible for testing nonconcrete handholes and boxes.
- C. Product Certificates: For concrete and steel used in precast concrete handholes, as required by ASTM C 858.
- D. Source quality-control reports.
- E. Field quality-control reports.

1.6 MAINTENANCE MATERIALS SUBMITTALS

- A. Furnish extra materials that match products installed and that are packaged with protective covering for storage and identified with labels describing contents.
- B. Furnish cable-support stanchions, arms, insulators, and associated fasteners in quantities equal to 5 percent of quantity of each item installed.

1.7 QUALITY ASSURANCE

- A. Testing Agency Qualifications: Qualified according to ASTM E 329 for testing indicated.

1.8 FIELD CONDITIONS

- A. Interruption of Existing Electrical Service: Do not interrupt electrical service to facilities occupied by Owner or others unless permitted under the following conditions, and then only after arranging to provide temporary electrical service according to requirements indicated:
 - 1. Notify Owner no fewer than two days in advance of proposed interruption of electrical service.
 - 2. Do not proceed with interruption of electrical service without Owner's written permission.
- B. Ground Water: Assume ground-water level is 36 inches below ground surface unless a higher water table is noted on Drawings.

PART 2 - PRODUCTS**2.1 METAL CONDUIT AND FITTINGS**

- A. GRC: Comply with ANSI C80.1 and UL 6.
- B. Coated Steel Conduit: PVC-coated GRC.
 - 1. Comply with NEMA RN 1.
 - 2. Coating Thickness: 0.040 inch, minimum.
- C. Manufacturers: Subject to compliance with requirements, available manufacturers offering products that may be incorporated into the Work include, but are not limited to the following:
 - 1. Allied Tube & Conduit; a part of Atkore International.
 - 2. Electri-Flex Company.

3. NEC, Inc.
 4. Opti-Com Manufacturing Network, Inc (OMNI).
 5. O-Z/Gedney; a brand of Emerson Industrial Automation.
- D. Listed and labeled as defined in NFPA 70, by a nationally recognized testing laboratory, and marked for intended location and application.

2.2 RIGID NONMETALLIC DUCT

- A. Underground Plastic Utilities Duct: Type EPC-80-PVC and Type EPC-40-PVC RNC, complying with NEMA TC 2 and UL 651, with matching fittings complying with NEMA TC 3 by same manufacturer as duct.
- B. Manufacturers: Subject to compliance with requirements, provide products by one of the following:
1. ARNCO Corp.
 2. CertainTeed Corporation.
 3. Condux International, Inc.
 4. Electri-Flex Company.
 5. Opti-Com Manufacturing Network, Inc (OMNI).
- C. Listed and labeled as defined in NFPA 70, by a nationally recognized testing laboratory, and marked for intended location and application.
- D. Solvents and Adhesives: As recommended by conduit manufacturer.

2.3 DUCT ACCESSORIES

- A. Duct Spacers: Factory-fabricated, rigid, PVC interlocking spacers; sized for type and size of duct with which used and selected to provide minimum duct spacing indicated while supporting duct during concreting or backfilling.
1. Manufacturers: Subject to compliance with requirements, provide products by one of the following:
- a. Allied Tube & Conduit; a part of Atkore International.
 - b. Carlon; a brand of Thomas & Betts Corporation.
 - c. IPEX USA LLC.
 - d. Underground Devices, Inc.
- B. Underground-Line Warning Tape: Comply with requirements for underground-line warning tape specified in Section 260553 "Identification for Electrical Systems."
- C. Concrete Warning Planks: Nominal 12 by 24 by 3 inches in size, manufactured from 6000-psi concrete.
1. Color: Red dye added to concrete during batching.
 2. Mark each plank with "ELECTRIC" in 2-inch-high, 3/8-inch-deep letters.

2.4 FIBERGLASS HANDHOLES AND BOXES WITH POLYMER CONCRETE FRAME AND COVER

- A. Description: Sheet-molded, fiberglass-reinforced, polyester resin enclosure joined to polymer concrete top ring or frame.
- B. Manufacturers: Subject to compliance with requirements, provide products by one of the following:
1. Armorcast Products Company.
 2. Oldcastle Enclosure Solutions.

- 3. Quazite: Hubbell Power Systems, Inc.
- C. Standard: Comply with SCTE 77. Comply with tier requirements in "Underground Enclosure Application" Article.
- D. Color: Green.
- E. Configuration: Units shall be designed for flush burial and have open bottom unless otherwise indicated.
- F. Cover: Weatherproof, secured by tamper-resistant locking devices and having structural load rating consistent with enclosure.
- G. Cover Finish: Nonskid finish shall have a minimum coefficient of friction of 0.50.
- H. Cover Legend: Molded lettering, "ELECTRIC."
- I. Direct-Buried Wiring Entrance Provisions: Knockouts equipped with insulated bushings or end-bell fittings, selected to suit box material, sized for wiring indicated, and arranged for secure, fixed installation in enclosure wall.
- J. Duct Entrance Provisions: Duct-terminating fittings shall mate with entering duct for secure, fixed installation in enclosure wall.
- K. Handholes 12 inches wide by 24 inches long and larger shall have factory-installed inserts for cable racks and pulling-in irons.

2.5 FIBERGLASS HANDHOLES AND BOXES

- A. Description: Molded of fiberglass-reinforced polyester resin, with covers made of polymer concrete.
- B. Manufacturers: Subject to compliance with requirements, provide products by one of the following:
 - 1. Christy Concrete Products.
 - 2. Oldcastle Enclosure Solutions.
 - 3. Quazite: Hubbell Power Systems, Inc.
- C. Standard: Comply with SCTE 77. Comply with tier requirements in "Underground Enclosure Application" Article.
- D. Color: Green.
- E. Configuration: Units shall be designed for flush burial and have open bottom unless otherwise indicated.
- F. Cover: Weatherproof, secured by tamper-resistant locking devices and having structural load rating consistent with enclosure.
- G. Cover Finish: Nonskid finish shall have a minimum coefficient of friction of 0.50.
- H. Cover Legend: Molded lettering, "ELECTRIC."
- I. Direct-Buried Wiring Entrance Provisions: Knockouts equipped with insulated bushings or end-bell fittings, selected to suit box material, sized for wiring indicated, and arranged for secure, fixed installation in enclosure wall.
- J. Duct Entrance Provisions: Duct-terminating fittings shall mate with entering duct for secure, fixed installation in enclosure wall.

- K. Handholes 12 inches wide by 24 inches long and larger shall have factory-installed inserts for cable racks and pulling-in irons.

2.6 HIGH-DENSITY PLASTIC BOXES

- A. Description: Injection molded of HDPE or copolymer-polypropylene. Cover shall be made of polymer concrete.
- B. Manufacturers: Subject to compliance with requirements, provide products by one of the following:
 - 1. Nordic Fiberglass, Inc.
 - 2. Oldcastle Enclosure Solutions.
 - 3. Quazite: Hubbell Power Systems, Inc.
- C. Standard: Comply with SCTE 77. Comply with tier requirements in "Underground Enclosure Application" Article.
- D. Color: Green.
- E. Configuration: Units shall be designed for flush burial and have open bottom unless otherwise indicated.
- F. Cover: Weatherproof, secured by tamper-resistant locking devices and having structural load rating consistent with enclosure.
- G. Cover Finish: Nonskid finish shall have a minimum coefficient of friction of 0.50.
- H. Cover Legend: Molded lettering, "ELECTRIC."
- I. Direct-Buried Wiring Entrance Provisions: Knockouts equipped with insulated bushings or end-bell fittings, selected to suit box material, sized for wiring indicated, and arranged for secure, fixed installation in enclosure wall.
- J. Duct Entrance Provisions: Duct-terminating fittings shall mate with entering duct for secure, fixed installation in enclosure wall.
- K. Handholes 12 inches wide by 24 inches long and larger shall have factory-installed inserts for cable racks and pulling-in irons.

2.7 SOURCE QUALITY CONTROL

- A. Test and inspect precast concrete utility structures according to ASTM C 1037.
- B. Nonconcrete Handhole and Pull-Box Prototype Test: Test prototypes of manholes and boxes for compliance with SCTE 77. Strength tests shall be for specified tier ratings of products supplied.
 - 1. Tests of materials shall be performed by an independent testing agency.
 - 2. Strength tests of complete boxes and covers shall be by an independent testing agency or manufacturer. A qualified registered professional engineer shall certify tests by manufacturer.
 - 3. Testing machine pressure gages shall have current calibration certification, complying with ISO 9000 and ISO 10012, and traceable to NIST standards.

PART 3 - EXECUTION

3.1 PREPARATION

- A. Coordinate layout and installation of duct, duct bank, manholes, handholes, and boxes with final arrangement of other utilities, site grading, and surface features as determined in the field. Notify

Architect if there is a conflict between areas of excavation and existing structures or archaeological sites to remain.

- B. Coordinate elevations of duct and duct-bank entrances into manholes, handholes, and boxes with final locations and profiles of duct and duct banks, as determined by coordination with other utilities, underground obstructions, and surface features. Revise locations and elevations as required to suit field conditions and to ensure that duct and duct bank will drain to manholes and handholes, and as approved by Architect.
- C. Clear and grub vegetation to be removed and protect vegetation to remain according to Section 311000 "Site Clearing." Remove and stockpile topsoil for reapplication according to Section 311000 "Site Clearing."

3.2 UNDERGROUND DUCT APPLICATION

- A. Duct for Electrical Cables More Than 600 V: Type EPC-80-PVC Type EPC-40-PVC RNC, concrete-encased unless otherwise indicated.
- B. Duct for Electrical Feeders 600 V and Less: Type EPC-80-PVC Type EPC-40-PVC RNC, concrete-encased unless otherwise indicated.
- C. Duct for Electrical Feeders 600 V and Less: Type EPC-80-PVC Type EPC-40-PVC RNC, direct-buried unless otherwise indicated.
- D. Duct for Electrical Branch Circuits: Type EPC-80-PVC Type EPC-40-PVC RNC, direct-buried unless otherwise indicated.
- E. Underground Ducts Crossing Paved Paths Walks and Driveways: Type EPC-40 PVC RNC, encased in reinforced concrete.
- F. Stub-ups: Concrete-encased GRC.

3.3 UNDERGROUND ENCLOSURE APPLICATION

- A. Handholes and Boxes for 600 V and Less:
 - 1. Units in Roadways and Other Deliberate Traffic Paths: Precast concrete. AASHTO HB 17, H-10 structural load rating.
 - 2. Units in Driveway, Parking Lot, and Off-Roadway Locations, Subject to Occasional, Nondeliberate Loading by Heavy Vehicles: Fiberglass enclosures with polymer concrete frame and cover, SCTE 77, Tier 15 structural load rating.
 - 3. Units in Sidewalk and Similar Applications with a Safety Factor for Nondeliberate Loading by Vehicles: Heavy-duty fiberglass units with polymer concrete frame and cover, SCTE 77, Tier 8 structural load rating.
 - 4. Units Subject to Light-Duty Pedestrian Traffic Only: High-density plastic, structurally tested according to SCTE 77 with 3000-lbf vertical loading.
 - 5. Cover design load shall not exceed the design load of the handhole or box.

3.4 EARTHWORK

- A. Excavation and Backfill: Comply with Section 312000 "Earth Moving," but do not use heavy-duty, hydraulic-operated, compaction equipment.
- B. Restoration: Replace area after construction vehicle traffic in immediate area is complete.
- C. Restore surface features at areas disturbed by excavation and re-establish original grades unless otherwise indicated. Replace removed sod immediately after backfilling is completed.

- D. Restore areas disturbed by trenching, storing of dirt, cable laying, and other work. Restore vegetation and include necessary topsoiling, fertilizing, liming, seeding, sodding, sprigging, and mulching. Comply with Section 329200 "Turf and Grasses".
- E. Cut and patch existing pavement in the path of underground duct, duct bank, and underground structures according to "Cutting and Patching" Article in Section 017300 "Execution."

3.5 DUCT AND DUCT-BANK INSTALLATION

- A. Where indicated on Drawings, install duct, spacers, and accessories into the duct-bank configuration shown. Duct installation requirements in this Section also apply to duct bank.
- B. Install duct according to NEMA TCB 2.
- C. Slope: Pitch duct a minimum slope of 1:300 down toward manholes and handholes and away from buildings and equipment. Slope duct from a high point between two manholes, to drain in both directions.
- D. Curves and Bends: Use 5-degree angle couplings for small changes in direction. Use manufactured long sweep bends with a minimum radius of 48 inches, both horizontally and vertically, at other locations unless otherwise indicated.
 - 1. Duct shall have maximum of two 90-degree bends or the total of all bends shall be no more 180 degrees between pull points.
- E. Joints: Use solvent-cemented joints in duct and fittings and make watertight according to manufacturer's written instructions. Stagger couplings so those of adjacent duct do not lie in same plane.
- F. Installation Adjacent to High-Temperature Steam Lines: Where duct is installed parallel to underground steam lines, perform calculations showing the duct will not be subject to environmental temperatures above 40 deg C. Where environmental temperatures are calculated to rise above 40 deg C, and anywhere the duct crosses above an underground steam line, install insulation blankets listed for direct burial to isolate the duct bank from the steam line.
- G. End Bell Entrances to Manholes and Concrete and Polymer Concrete Handholes: Use end bells, spaced approximately 10 inches o.c. for 5-inch duct, and vary proportionately for other duct sizes.
 - 1. Begin change from regular spacing to end-bell spacing 10 feet from the end bell, without reducing duct slope and without forming a trap in the line.
 - 2. Expansion and Deflection Fittings: Install an expansion and deflection fitting in each duct in the area of disturbed earth adjacent to manhole or handhole. Install an expansion fitting near the center of all straight line direct-buried duct with calculated expansion of more than 3/4 inch.
 - 3. Grout end bells into structure walls from both sides to provide watertight entrances.
- H. Terminator Entrances to Manholes and Concrete and Polymer Concrete Handholes: Use manufactured, cast-in-place duct terminators, with entrances into structure spaced approximately 6 inches o.c. for 4-inch duct, and vary proportionately for other duct sizes.
 - 1. Begin change from regular spacing to terminator spacing 10 feet from the terminator, without reducing duct line slope and without forming a trap in the line.
 - 2. Expansion and Deflection Fittings: Install an expansion and deflection fitting in each duct in the area of disturbed earth adjacent to manhole or handhole. Install an expansion fitting near the center of all straight-line duct with calculated expansion of more than 3/4 inch.
- I. Building Wall Penetrations: Make a transition from underground duct to GRC at least 10 feet outside the building wall, without reducing duct line slope away from the building and without forming a trap in the line. Use fittings manufactured for RNC-to-GRC transition. Install GRC

penetrations of building walls as specified in Section 260544 "Sleeves and Sleeve Seals for Electrical Raceways and Cabling."

- J. Sealing: Provide temporary closure at terminations of duct with pulled cables. Seal spare duct at terminations. Use sealing compound and plugs to withstand at least 15-psig hydrostatic pressure.
- K. Pulling Cord: Install 200-lbf-test nylon cord in empty ducts.
- L. Concrete-Encased Ducts and Duct Bank:
 - 1. Excavate trench bottom to provide firm and uniform support for duct. Prepare trench bottoms as specified in Section 312000 "Earth Moving" for pipes less than 6 inches in nominal diameter.
 - 2. Width: Excavate trench 12 inches wider than duct on each side.
 - 3. Width: Excavate trench 3 inches wider than duct on each side.
 - 4. Depth: Install so top of duct envelope is at least 24 inches below finished grade in areas not subject to deliberate traffic, and at least 30 inches below finished grade in deliberate traffic paths for vehicles unless otherwise indicated.
 - 5. Support duct on duct spacers coordinated with duct size, duct spacing, and outdoor temperature.
 - 6. Spacer Installation: Place spacers close enough to prevent sagging and deforming of duct, with not less than four spacers per 20 feet of duct. Place spacers within 24 inches of duct ends. Stagger spacers approximately 6 inches between tiers. Secure spacers to earth and to duct to prevent floating during concreting. Tie entire assembly together using fabric straps; do not use tie wires or reinforcing steel that may form conductive or magnetic loops around ducts or duct groups.
 - 7. Minimum Space between Duct: 3 inches between edge of duct and exterior envelope wall, 2 inches between ducts for like services, and 4 inches between power and communications ducts.
 - 8. Elbows: Use manufactured duct elbows for stub-ups, at building entrances, and at changes of direction in duct unless otherwise indicated. Extend encasement throughout length of elbow.
 - 9. Elbows: Use manufactured GRC elbows for stub-ups, at building entrances, and at changes of direction in duct run.
 - a. Couple RNC duct to GRC with adapters designed for this purpose and encase coupling with 3 inches of concrete.
 - b. Stub-ups to Outdoor Equipment: Extend concrete-encased GRC horizontally a minimum of 60 inches from edge of base. Install insulated grounding bushings on terminations at equipment.
 - 1) Stub-ups shall be minimum 4 inches above finished floor and minimum 3 inches from conduit side to edge of slab.
 - c. Stub-ups to Indoor Equipment: Extend concrete-encased GRC horizontally a minimum of 60 inches from edge of wall. Install insulated grounding bushings on terminations at equipment.
 - 1) Stub-ups shall be minimum 4 inches above finished floor and no less than 3 inches from conduit side to edge of slab.
 - 10. Reinforcement: Reinforce concrete-encased duct where crossing disturbed earth and where indicated. Arrange reinforcing rods and ties without forming conductive or magnetic loops around ducts or duct groups.
 - 11. Forms: Use walls of trench to form side walls of duct bank where soil is self-supporting and concrete envelope can be poured without soil inclusions; otherwise, use forms.

12. Concrete Cover: Install a minimum of 3 inches of concrete cover between edge of duct to exterior envelope wall, 2 inches between duct of like services, and 4 inches between power and communications ducts.
 13. Concreting Sequence: Pour each run of envelope between manholes or other terminations in one continuous operation.
 - a. Start at one end and finish at the other, allowing for expansion and contraction of duct as its temperature changes during and after the pour. Use expansion fittings installed according to manufacturer's written instructions or use other specific measures to prevent expansion-contraction damage.
 - b. If more than one pour is necessary, terminate each pour in a vertical plane and install 3/4-inch reinforcing-rod dowels extending a minimum of 18 inches into concrete on both sides of joint near corners of envelope.
 14. Pouring Concrete: Comply with requirements in "Concrete Placement" Article in Section 033000 "Cast-in-Place Concrete." Place concrete carefully during pours to prevent voids under and between duct and at exterior surface of envelope. Do not allow a heavy mass of concrete to fall directly onto ducts. Allow concrete to flow around duct and rise up in middle, uniformly filling all open spaces. Do not use power-driven agitating equipment unless specifically designed for duct-installation application.
- M. Direct-Buried Duct and Duct Bank:
1. Excavate trench bottom to provide firm and uniform support for duct. Comply with requirements in Section 312000 "Earth Moving" for preparation of trench bottoms for pipes less than 6 inches in nominal diameter.
 2. Width: Excavate trench 12 inches wider than duct on each side.
 3. Width: Excavate trench 3 inches wider than duct on each side.
 4. Depth: Install top of duct at least 36 inches below finished grade unless otherwise indicated.
 5. Set elevation of bottom of duct bank below frost line.
 6. Support ducts on duct spacers coordinated with duct size, duct spacing, and outdoor temperature.
 7. Spacer Installation: Place spacers close enough to prevent sagging and deforming of duct, with not less than four spacers per 20 feet of duct. Place spacers within 24 inches of duct ends. Stagger spacers approximately 6 inches between tiers. Secure spacers to earth and to ducts to prevent floating during concreting. Tie entire assembly together using fabric straps; do not use tie wires or reinforcing steel that may form conductive or magnetic loops around ducts or duct groups.
 8. Install duct with a minimum of 3 inches between ducts for like services and 6 inches between power and communications duct.
 9. Elbows: Install manufactured duct elbows for stub-ups, at building entrances, and at changes of direction in duct direction unless otherwise indicated. Encase elbows for stub-up ducts throughout length of elbow.
 10. Install manufactured GRC elbows for stub-ups, at building entrances, and at changes of direction in duct.
 - a. Couple RNC duct to GRC with adapters designed for this purpose, and encase coupling with 3 inches of concrete.
 - b. Stub-ups to Outdoor Equipment: Extend concrete-encased GRC horizontally a minimum of 60 inches from edge of base. Install insulated grounding bushings on terminations at equipment.

- 1) Stub-ups shall be minimum 4 inches above finished floor and minimum 3 inches from conduit side to edge of slab.
 - c. Stub-ups to Indoor Equipment: Extend concrete-encased GRC horizontally a minimum of 60 inches from edge of wall. Install insulated grounding bushings on terminations at equipment.
 - 1) Stub-ups shall be minimum 4 inches above finished floor and no less than 3 inches from conduit side to edge of slab.
 11. After installing first tier of duct, backfill and compact. Start at tie-in point and work toward end of duct run, leaving ducts at end of run free to move with expansion and contraction as temperature changes during this process. Repeat procedure after placing each tier. After placing last tier, hand place backfill to 4 inches over duct and hand tamp. Firmly tamp backfill around ducts to provide maximum supporting strength. Use hand tamper only. After placing controlled backfill over final tier, make final duct connections at end of run and complete backfilling with normal compaction. Comply with requirements in Section 312000 "Earth Moving" for installation of backfill materials.
 - a. Place minimum 3 inches of sand as a bed for duct. Place sand to a minimum of 6 inches above top level of duct.
 - b. Place minimum 6 inches of engineered fill above concrete encasement of duct.
 - N. Warning Planks: Bury warning planks approximately 12 inches above direct-buried duct, placing them 24 inches o.c. Align planks along the width and along the centerline of duct or duct bank. Provide an additional plank for each 12-inch increment of duct-bank width over a nominal 18 inches. Space additional planks 12 inches apart, horizontally.
 - O. Underground-Line Warning Tape: Bury conducting underground line specified in Section 260553 "Identification for Electrical Systems" no less than 12 inches above all concrete-encased duct and duct banks and approximately 12 inches below grade. Align tape parallel to and within 3 inches of centerline of duct bank. Provide an additional warning tape for each 12-inch increment of duct-bank width over a nominal 18 inches. Space additional tapes 12 inches apart, horizontally.
- 3.6 INSTALLATION OF HANDHOLES AND BOXES OTHER THAN PRECAST CONCRETE**
- A. Install handholes and boxes level and plumb and with orientation and depth coordinated with connecting duct, to minimize bends and deflections required for proper entrances. Use box extension if required to match depths of duct, and seal joint between box and extension as recommended by manufacturer.
 - B. Unless otherwise indicated, support units on a level bed of crushed stone or gravel, graded from 1/2-inch sieve to No. 4 sieve and compacted to same density as adjacent undisturbed earth.
 - C. Elevation: In paved areas and trafficways, set cover flush with finished grade. Set covers of other handholes 1 inch above finished grade.
 - D. Install handholes and boxes with bottom below frost line, 36" below grade.
 - E. Install removable hardware, including pulling eyes, cable stanchions, cable arms, and insulators, as required for installation and support of cables and conductors and as indicated. Select arm lengths to be long enough to provide spare space for future cables, but short enough to preserve adequate working clearances in enclosure.
 - F. Field cut openings for duct according to enclosure manufacturer's written instructions. Cut wall of enclosure with a tool designed for material to be cut. Size holes for terminating fittings to be used, and seal around penetrations after fittings are installed.

- G. For enclosures installed in asphalt paving and subject to occasional, nondeliberate, heavy-vehicle loading, form and pour a concrete ring encircling, and in contact with, enclosure and with top surface screeded to top of box cover frame. Bottom of ring shall rest on compacted earth.
1. Concrete: 3000 psi, 28-day strength, complying with Section 033000 "Cast-in-Place Concrete," with a troweled finish.
 2. Dimensions: 10 inches wide by 12 inches deep.

3.7 GROUNDING

- A. Ground underground ducts and utility structures according to Section 260526 "Grounding and Bonding for Electrical Systems."

3.8 FIELD QUALITY CONTROL

- A. Perform the following tests and inspections:
1. Demonstrate capability and compliance with requirements on completion of installation of underground duct, duct bank, and utility structures.
 2. Pull solid aluminum or wood test mandrel through duct to prove joint integrity and adequate bend radii, and test for out-of-round duct. Provide a minimum 12-inch-long mandrel equal to duct size minus 1/4 inch. If obstructions are indicated, remove obstructions and retest.
 3. Test handhole grounding to ensure electrical continuity of grounding and bonding connections. Measure and report ground resistance as specified in Section 260526 "Grounding and Bonding for Electrical Systems."
- B. Correct deficiencies and retest as specified above to demonstrate compliance.
- C. Prepare test and inspection reports.

3.9 CLEANING

- A. Pull leather-washer-type duct cleaner, with graduated washer sizes, through full length of duct until duct cleaner indicates that duct is clear of dirt and debris. Follow with rubber duct swab for final cleaning and to assist in spreading lubricant throughout ducts.
- B. Clean internal surfaces of manholes, including sump.
1. Sweep floor, removing dirt and debris.
 2. Remove foreign material.

END OF SECTION 260543

THIS PAGE INTENTIONALLY LEFT BLANK

SECTION 260544 - SLEEVES & SLEEVE SEALS FOR ELECTRICAL RACEWAYS & CABLING**PART 1 - GENERAL****1.1 RELATED DOCUMENTS**

- A. Drawings and general provisions of the Contract, including General and Supplementary Conditions and Division 01 Specification Sections, apply to this Section.

1.2 SUMMARY

- A. Section Includes:
1. Sleeves for raceway and cable penetration of non-fire-rated construction walls and floors.
 2. Sleeve-seal systems.
 3. Sleeve-seal fittings.
 4. Grout.
 5. Silicone sealants.
- B. Related Requirements:
1. Section 078413 "Penetration Firestopping" for penetration firestopping installed in fire-resistance-rated walls, horizontal assemblies, and smoke barriers, with and without penetrating items.

1.3 ACTION SUBMITTALS

- A. Product Data: For each type of product.

PART 2 - PRODUCTS**2.1 SLEEVES**

- A. Wall Sleeves:
1. Steel Pipe Sleeves: ASTM A 53/A 53M, Type E, Grade B, Schedule 40, zinc coated, plain ends.
 2. Cast-Iron Pipe Sleeves: Cast or fabricated "wall pipe," equivalent to ductile-iron pressure pipe, with plain ends and integral waterstop unless otherwise indicated.
- B. Sleeves for Conduits Penetrating Non-Fire-Rated Gypsum Board Assemblies: Galvanized-steel sheet; 0.0239-inch minimum thickness; round tube closed with welded longitudinal joint, with tabs for screw-fastening the sleeve to the board.
- C. PVC-Pipe Sleeves: ASTM D 1785, Schedule 40.
- D. Molded-PVC Sleeves: With nailing flange for attaching to wooden forms.
- E. Molded-PE or -PP Sleeves: Removable, tapered-cup shaped, and smooth outer surface with nailing flange for attaching to wooden forms.
- F. Sleeves for Rectangular Openings:
1. Material: Galvanized sheet steel.

2. Minimum Metal Thickness:
 - a. For sleeve cross-section rectangle perimeter less than 50 inches and with no side larger than 16 inches, thickness shall be 0.052 inch.
 - b. For sleeve cross-section rectangle perimeter 50 inches or more and one or more sides larger than 16 inches, thickness shall be 0.138 inch.

2.2 SLEEVE-SEAL SYSTEMS

- A. Description: Modular sealing device, designed for field assembly, to fill annular space between sleeve and raceway or cable.
 1. Manufacturers: Subject to compliance with requirements, available manufacturers offering products that may be incorporated into the Work include, but are not limited to, the following:
 - a. Advance Products & Systems, Inc.
 - b. CALPICO, Inc.
 - c. Metraflex Company (The).
 - d. Pipeline Seal and Insulator, Inc.
 - e. Proco Products, Inc.
 2. Sealing Elements: EPDM rubber interlocking links shaped to fit surface of pipe. Include type and number required for pipe material and size of pipe.
 3. Pressure Plates: carbon steel or stainless steel.
 4. Connecting Bolts and Nuts: carbon steel, with corrosion-resistant coating or stainless steel of length required to secure pressure plates to sealing elements.

2.3 SLEEVE-SEAL FITTINGS

- A. Description: Manufactured plastic, sleeve-type, waterstop assembly made for embedding in concrete slab or wall. Unit shall have plastic or rubber waterstop collar with center opening to match piping OD.

2.4 GROUT

- A. Description: Nonshrink; recommended for interior and exterior sealing openings in non-fire-rated walls or floors.
- B. Standard: ASTM C 1107/C 1107M, Grade B, post-hardening and volume-adjusting, dry, hydraulic-cement grout.
- C. Design Mix: 5000-psi 28-day compressive strength.
- D. Packaging: Premixed and factory packaged.

2.5 SILICONE SEALANTS

- A. Silicone Sealants: Single-component, silicone-based, neutral-curing elastomeric sealants of grade indicated below.
 1. Grade: Pourable (self-leveling) formulation for openings in floors and other horizontal surfaces that are not fire rated.
 2. Sealant shall comply with the testing and product requirements of the California Department of Health Services' "Standard Practice for the Testing of Volatile Organic Emissions from Various Sources Using Small-Scale Environmental Chambers."
- B. Silicone Foams: Multicomponent, silicone-based liquid elastomers that, when mixed, expand and cure in place to produce a flexible, nonshrinking foam.

PART 3 - EXECUTION

3.1 SLEEVE INSTALLATION FOR NON-FIRE-RATED ELECTRICAL PENETRATIONS

- A. Comply with NECA 1.
- B. Comply with NEMA VE 2 for cable tray and cable penetrations.
- C. Sleeves for Conduits Penetrating Above-Grade Non-Fire-Rated Concrete and Masonry-Unit Floors and Walls:
 - 1. Interior Penetrations of Non-Fire-Rated Walls and Floors:
 - a. Seal annular space between sleeve and raceway or cable, using joint sealant appropriate for size, depth, and location of joint. Comply with requirements in Section 079200 "Joint Sealants."
 - b. Seal space outside of sleeves with mortar or grout. Pack sealing material solidly between sleeve and wall so no voids remain. Tool exposed surfaces smooth; protect material while curing.
 - 2. Use pipe sleeves unless penetration arrangement requires rectangular sleeved opening.
 - 3. Size pipe sleeves to provide 1/4-inch annular clear space between sleeve and raceway or cable unless sleeve seal is to be installed.
 - 4. Install sleeves for wall penetrations unless core-drilled holes or formed openings are used. Install sleeves during erection of walls. Cut sleeves to length for mounting flush with both surfaces of walls. Deburr after cutting.
 - 5. Install sleeves for floor penetrations. Extend sleeves installed in floors 2 inches above finished floor level. Install sleeves during erection of floors.
- D. Sleeves for Conduits Penetrating Non-Fire-Rated Gypsum Board Assemblies:
 - 1. Use circular metal sleeves unless penetration arrangement requires rectangular sleeved opening.
 - 2. Seal space outside of sleeves with approved joint compound for gypsum board assemblies.
- E. Roof-Penetration Sleeves: Seal penetration of individual raceways and cables with flexible boot-type flashing units applied in coordination with roofing work.
- F. Aboveground, Exterior-Wall Penetrations: Seal penetrations using steel or cast-iron pipe sleeves and mechanical sleeve seals. Select sleeve size to allow for 1-inch annular clear space between pipe and sleeve for installing mechanical sleeve seals.
- G. Underground, Exterior-Wall and Floor Penetrations: Install cast-iron pipe sleeves. Size sleeves to allow for 1-inch annular clear space between raceway or cable and sleeve for installing sleeve-seal system.

3.2 SLEEVE-SEAL-SYSTEM INSTALLATION

- A. Install sleeve-seal systems in sleeves in exterior concrete walls and slabs-on-grade at raceway entries into building.
- B. Install type and number of sealing elements recommended by manufacturer for raceway or cable material and size. Position raceway or cable in center of sleeve. Assemble mechanical sleeve seals and install in annular space between raceway or cable and sleeve. Tighten bolts against pressure plates that cause sealing elements to expand and make watertight seal.

3.3 SLEEVE-SEAL-FITTING INSTALLATION

- A. Install sleeve-seal fittings in new walls and slabs as they are constructed.

- B. Assemble fitting components of length to be flush with both surfaces of concrete slabs and walls. Position waterstop flange to be centered in concrete slab or wall.
- C. Secure nailing flanges to concrete forms.
- D. Using grout, seal the space around outside of sleeve-seal fittings.

END OF SECTION 260544

SECTION 260553 - ELECTRICAL IDENTIFICATION

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

- A. Drawings and general provisions of the Contract, including General and Supplementary Conditions and Division 1 Specification Sections, apply to this Section.

1.2 SUMMARY

- A. This Section includes electrical identification materials and devices required to comply with ANSI C2, NFPA 70, OSHA standards, and authorities having jurisdiction.

1.3 SUBMITTALS

- A. Product Data: For each electrical identification product indicated.
- B. Schedule of Nomenclature: An index of electrical equipment and system components used in identification signs and labels.
- C. Samples: For each type of label and sign to illustrate color, lettering style, and graphic features of identification products.

1.4 QUALITY ASSURANCE

- A. Comply with ANSI C2.
- B. Comply with NFPA 70.
- C. Comply with ANSI A13.1 and NFPA 70 for color-coding.

PART 2 - PRODUCTS

2.1 RACEWAY AND CABLE LABELS

- A. Comply with ANSI A13.1, Table 3, for minimum size of letters for legend and for minimum length of color field for each raceway and cable size.
 - 1. Color: Black letters on orange field.
 - 2. Legend: Indicates voltage and service.
- B. Adhesive Labels: Preprinted, flexible, self-adhesive vinyl with legend overlaminated with a clear, weather- and chemical-resistant coating.
- C. Pretensioned, Wraparound Plastic Sleeves: Flexible, preprinted, color-coded, acrylic band sized to suit the diameter of the line it identifies and arranged to stay in place by pretensioned gripping action when placed in position.
- D. Colored Adhesive Tape: Self-adhesive vinyl tape not less than 3 mils thick by 1 to 2 inches wide.
- E. Underground-Line Warning Tape: Permanent, bright-colored, continuous-printed, vinyl tape.
 - 1. Not less than 6 inches wide by 4 mils thick.
 - 2. Compounded for permanent direct-burial service.
 - 3. Embedded continuous metallic strip or core.
 - 4. Printed legend indicating type of underground line.

- F. Tape Markers: Vinyl or vinyl-cloth, self-adhesive, wraparound type with preprinted numbers and letters.
- G. Aluminum, Wraparound Marker Bands: Bands cut from 0.014-inch- thick aluminum sheet, with stamped or embossed legend, and fitted with slots or ears for permanently securing around wire or cable jacket or around groups of conductors.
- H. Plasticized Card-Stock Tags: Vinyl cloth with preprinted and field-printed legends. Orange background, unless otherwise indicated, with eyelet for fastener.
- I. Aluminum-Faced, Card-Stock Tags: Weather-resistant, 18-point minimum card stock faced on both sides with embossable aluminum sheet, 0.002-inch-thick, laminated with moisture-resistant acrylic adhesive, punched for fasteners, and preprinted with legends to suit each application.
- J. Brass or Aluminum Tags: 2 by 2 by 0.05-inch metal tags with stamped legend, punched for fastener.

2.2 NAMEPLATES AND SIGNS

- A. Safety Signs: Comply with 29 CFR, Chapter XVII, Part 1910.145.
- B. Engraved Plastic Nameplates and Signs: Engraving stock, melamine plastic laminate, minimum 1/16-inch-thick for signs up to 20 sq. in. and 1/8 inch thick for larger sizes.
 - 1. Engraved legend with black letters on white face.
 - 2. Punched or drilled for mechanical fasteners.
- C. Baked-Enamel Signs for Interior Use: Preprinted aluminum signs, punched or drilled for fasteners, with colors, legend, and size required for the application. 1/4-inch grommets in corners for mounting.
- D. Exterior, Metal-Backed, Butyrate Signs: Weather-resistant, nonfading, preprinted, cellulose-acetate butyrate signs with 0.0396-inch galvanized-steel backing; and with colors, legend, and size required for the application. 1/4-inch grommets in corners for mounting.
- E. Fasteners for Nameplates and Signs: Self-tapping, stainless-steel screws or No. 10/32, stainless-steel machine screws with nuts and flat and lock washers.

2.3 MISCELLANEOUS IDENTIFICATION PRODUCTS

- A. Cable Ties: Fungus-inert, self-extinguishing, one-piece, self-locking, Type 6/6 nylon cable ties.
 - 1. Minimum Width: 3/16 inch.
 - 2. Tensile Strength: 50 lb minimum.
 - 3. Temperature Range: Minus 40 to plus 185 deg F.
 - 4. Color: According to color-coding.
- B. Paint: Formulated for the type of surface and intended use.
 - 1. Primer for Galvanized Metal: Single-component acrylic vehicle formulated for galvanized surfaces.
 - 2. Primer for Concrete Masonry Units: Heavy-duty-resin block filler.
 - 3. Primer for Concrete: Clear, alkali-resistant, binder-type sealer.
 - 4. Enamel: Silicone-alkyd or alkyd urethane as recommended by primer manufacturer.

PART 3 - EXECUTION

3.1 INSTALLATION

- A. Identification Materials and Devices: Install at locations for most convenient viewing without interference with operation and maintenance of equipment.
- B. Lettering, Colors, and Graphics: Coordinate names, abbreviations, colors, and other designations with corresponding designations in the Contract Documents or with those required by codes and standards. Use consistent designations throughout Project.
- C. Sequence of Work: If identification is applied to surfaces that require finish, install identification after completing finish work.
- D. Self-Adhesive Identification Products: Clean surfaces before applying.
- E. Circuits with More Than 600 V: Identify raceway and cable with "DANGER--HIGH VOLTAGE" in black letters 2 inches high, stenciled with paint at 10-foot intervals over a continuous, painted orange background. Identify the following:
 - 1. Entire floor area directly above conduits running beneath and within 12 inches of a basement or ground floor that is in contact with earth or is framed above unexcavated space.
 - 2. Wall surfaces directly external to conduits concealed within wall.
 - 3. All accessible surfaces of concrete envelope around conduits in vertical shafts, exposed in the building, or concealed above suspended ceilings.
 - 4. Entire surface of exposed conduits.
- F. Install painted identification according to manufacturer's written instructions and as follows:
 - 1. Clean surfaces of dust, loose material, and oily films before painting.
 - 2. Prime surfaces using type of primer specified for surface.
 - 3. Apply one intermediate and one finish coat of enamel.
- G. Color Banding Raceways and Exposed Cables: Band exposed and accessible raceways of the systems listed below:
 - 1. Bands: Pretensioned, wraparound plastic sleeves; colored adhesive tape; or a combination of both. Make each color band 2 inches wide, completely encircling conduit, and place adjacent bands of two-color markings in contact, side by side.
 - 2. Band Locations: At changes in direction, at penetrations of walls and floors, at 50-foot maximum intervals in straight runs, and at 25-foot maximum intervals in congested areas.
 - 3. Apply the following colors to the systems listed below:
 - a. Fire Alarm System: Red.
 - b. Fire-Suppression Supervisory and Control System: Red and yellow.
 - c. Combined Fire Alarm and Security System: Red and blue.
 - d. Security System: Blue and yellow.
 - e. Mechanical and Electrical Supervisory System: Green and blue.
 - f. Telecommunication System: Green and yellow.
- H. Caution Labels for Indoor Boxes and Enclosures for Power and Lighting: Install pressure-sensitive, self-adhesive labels identifying system voltage with black letters on orange background. Install on exterior of door or cover.
- I. Circuit Identification Labels on Boxes: Install labels externally.
 - 1. Exposed Boxes: Pressure-sensitive, self-adhesive plastic label on cover.
 - 2. Concealed Boxes: Plasticized card-stock tags.

3. Labeling Legend: Permanent, waterproof listing of panel and circuit number or equivalent.
- J. Paths of Underground Electrical Lines: During trench backfilling, for exterior underground power, control, signal, and communication lines, install continuous underground plastic line marker located directly above line at 6 to 8 inches below finished grade. Where width of multiple lines installed in a common trench or concrete envelope does not exceed 16 inches overall, use a single line marker. Install line marker for underground wiring, both direct-buried cables and cables in raceway.
- K. Secondary Service, Feeder, and Branch-Circuit Conductors: Color-code throughout the secondary electrical system.
 1. Color-code 208/120-V system as follows:
 - a. Phase A: Black.
 - b. Phase B: Red.
 - c. Phase C: Blue.
 - d. Neutral: White.
 - e. Ground: Green.
 2. Color-code 480/277-V system as follows:
 - a. Phase A: Yellow.
 - b. Phase B: Brown.
 - c. Phase C: Orange.
 - d. Neutral: White with a colored stripe or gray.
 - e. Ground: Green.
 3. Factory apply color the entire length of conductors, except the following field-applied, color-coding methods may be used instead of factory-coded wire for sizes larger than No. 10 AWG:
 - a. Colored, pressure-sensitive plastic tape in half-lapped turns for a distance of 6 inches from terminal points and in boxes where splices or taps are made. Apply last two turns of tape with no tension to prevent possible unwinding. Use 1-inch-wide tape in colors specified. Adjust tape bands to avoid obscuring cable identification markings.
- L. Power-Circuit Identification: Metal tags or aluminum, wraparound marker bands for cables, feeders, and power circuits in vaults, pull and junction boxes, manholes, and switchboard rooms.
 1. Legend: 1/4-inch- steel letter and number stamping or embossing with legend corresponding to indicated circuit designations.
 2. Tag Fasteners: Nylon cable ties.
 3. Band Fasteners: Integral ears.
- M. Apply identification to conductors as follows:
 1. Conductors to Be Extended in the Future: Indicate source and circuit numbers.
 2. Multiple Power or Lighting Circuits in the Same Enclosure: Identify each conductor with source, voltage, circuit number, and phase. Use color-coding to identify circuits' voltage and phase.
 3. Multiple Control and Communication Circuits in the Same Enclosure: Identify each conductor by its system and circuit designation. Use a consistent system of tags, color-coding, or cable marking tape.

- N. Apply warning, caution, and instruction signs as follows:
1. Warnings, Cautions, and Instructions: Install to ensure safe operation and maintenance of electrical systems and of items to which they connect. Install engraved plastic-laminated instruction signs with approved legend where instructions are needed for system or equipment operation. Install metal-backed butyrate signs for outdoor items.
 2. Emergency Operation: Install engraved laminated signs with white legend on red background with minimum 3/8-inch- high lettering for emergency instructions on power transfer, load shedding, and other emergency operations.
- O. Equipment Identification Labels: Engraved plastic laminate. Install on each unit of equipment, including central or master unit of each system. This includes power, lighting, communication, signal, and alarm systems, unless units are specified with their own self-explanatory identification. Unless otherwise indicated, provide a single line of text with 1/2-inch- high lettering on 1-1/2-inch- high label; where two lines of text are required, use labels 2 inches high. Use white lettering on black field. Apply labels for each unit of the following categories of equipment using mechanical fasteners:
1. Panelboards, electrical cabinets, and enclosures.
 2. Access doors and panels for concealed electrical items.
 3. Electrical switchgear and switchboards.
 4. Electrical substations.
 5. Emergency system boxes and enclosures.
 6. Motor-control centers.
 7. Disconnect switches.
 8. Enclosed circuit breakers.
 9. Motor starters.
 10. Push-button stations.
 11. Power transfer equipment.
 12. Contactors.
 13. Remote-controlled switches.
 14. Dimmers.
 15. Control devices.
 16. Transformers.
 17. Inverters.
 18. Rectifiers.
 19. Frequency converters.
 20. Battery racks.
 21. Power-generating units.
 22. Telephone switching equipment.
 23. Clock/program master equipment.
 24. Call system master station.
 25. TV/audio-monitoring master station.
 26. Fire alarm master station or control panel.
 27. Security-monitoring master station or control panel.

END OF SECTION 260553

THIS PAGE INTENTIONALLY LEFT BLANK

SECTION 260923 – LIGHTING CONTROL DEVICES

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

- A. Drawings and general provisions of the Contract, including General and Supplementary Conditions and Division 01 Specification Sections, apply to this Section.

1.2 SUMMARY

- A. Section Includes:
 - 1. Time switches.
 - 2. Photoelectric switches.
 - 3. Indoor occupancy sensors.
 - 4. Lighting contactors.
- B. Related Requirements:
 - 1. Section 262726 "Wiring Devices" for wall-box dimmers, manual light switches, and color/finish of devices.

1.3 ACTION SUBMITTALS

- A. Product Data: For each type of product.
- B. Shop Drawings: Show installation details for occupancy sensors.
 - 1. Interconnection diagrams showing field-installed wiring.
 - 2. Include diagrams for power, signal, and control wiring.

1.4 CLOSEOUT SUBMITTALS

- A. Operation and Maintenance Data: For each type of lighting control device to include in emergency, operation, and maintenance manuals.

PART 2 - PRODUCTS

2.1 TIME SWITCHES

- A. Manufacturers: Subject to compliance with requirements, available manufacturers offering products that may be incorporated into the Work include, but are not limited to, the following:
 - 1. Intermatic, Inc.
 - 2. Cooper Industries, Inc.
 - 3. Invensys Controls.
 - 4. Leviton Mfg. Company Inc.
 - 5. NSi Industries LLC; TORK Products.
 - 6. Tyco Electronics; ALR Brand.
- B. Electronic Time Switches: Solid state, programmable, with alphanumeric display; complying with UL 917.
 - 1. Listed and labeled as defined in NFPA 70, by a qualified testing agency, and marked for intended location and application.
 - 2. Contact Configuration: As indicated on drawings.
 - 3. Contact Rating: As indicated on drawings.
 - 4. Programs: As indicated on drawings.
 - 5. Switch to include 2 independent outputs for separate circuit programming.

6. Circuitry: Allow connection of a photoelectric relay as substitute for on-off function of a program
7. Astronomic Time: All channels.
8. Automatic daylight savings time changeover.
9. Battery Backup: Not less than seven days reserve, to maintain schedules and time clock.
10. Intermatic ET270 Series.

2.2 OUTDOOR PHOTOELECTRIC SWITCHES

- A. Manufacturers: Subject to compliance with requirements, provide products by one of the following:
1. Cooper Industries, Inc.
 2. Intermatic, Inc.
 3. NSi Industries LLC; TORK Products.
 4. Tyco Electronics; ALR Brand.
 5. Paragon.
- B. Description: Solid state, with SPST or DPST dry contacts rated for 1800-VA tungsten or 1000-VA inductive, to operate connected relay, contactor coils, or microprocessor input; complying with UL 773A.
1. Listed and labeled as defined in NFPA 70, by a qualified testing agency, and marked for intended location and application.
 2. Light-Level Monitoring Range: 1.5 to 10 fc, with an adjustment for turn-on and turn-off levels within that range, and a directional lens in front of the photocell to prevent fixed light sources from causing turn-off.
 3. Time Delay: Fifteen second minimum, to prevent false operation.
 4. Surge Protection: Metal-oxide varistor.
 5. Mounting: Twist lock complies with NEMA C136.10, with base-and-stem mounting or stem-and-swivel mounting accessories as required to direct sensor to the north sky exposure.

2.3 DAYLIGHT-HARVESTING DIMMING CONTROLS

- A. System Description: Sensing daylight and electrical lighting levels, the system adjusts the indoor electrical lighting levels. As daylight increases, the lights are dimmed.
1. Lighting control set point is based on two lighting conditions:
 - a. When no daylight is present (target level).
 - b. When significant daylight is present.
 2. System programming is done with two hand-held, remote-control tools.
 - a. Initial setup tool.
 - b. Tool for occupants to adjust the target levels by increasing the set point up to 25 percent, or by minimizing the electric lighting level.
- B. Ceiling-Mounted Dimming Controls: Solid-state, light-level sensor unit, with integrated or separate power pack, to detect changes in indoor lighting levels that are perceived by the eye.
- C. Electrical Components, Devices, and Accessories:
1. Listed and labeled as defined in NFPA 70, by a qualified testing agency, and marked for intended location and application.
 2. Sensor Output: 0- to 10-V dc to operate luminaires. Sensor is powered by controller unit.
 3. Light-Level Sensor Set-Point Adjustment Range: 20 to 100 fc (120 to 1080 lux).
- D. Power Pack: Dry contacts rated for 20-A load at 120- and 277-V ac. Sensor has 24-V dc, 150-mA, Class 2 power source, as defined by NFPA 70.

1. LED status lights to indicate load status.
 2. Plenum rated.
- E. Power Pack: Digital controller capable of accepting RJ45 inputs with two outputs rated for 20-A load at 120- and 277-V ac. Sensor has 24-V dc Class 2 power source, as defined by NFPA 70.
1. With integral current monitoring
 - a. Compatible with digital addressable lighting interface- Plenum rated.

2.4 INDOOR OCCUPANCY SENSORS

- A. Manufacturers: Subject to compliance with requirements, available manufacturers offering products that may be incorporated into the Work include, but are not limited to, the following:
1. Cooper Industries, Inc.
 2. Lightolier Controls.
 3. Lithonia Lighting; Acuity Lighting Group, Inc.
 4. Lutron Electronics Co., Inc.
 5. Sensor Switch, Inc.
 6. Square D; a brand of Schneider Electric.
 7. Watt Stopper.
- B. General Requirements for Sensors: Wall- or ceiling-mounted, solid-state indoor occupancy sensors with a separate power pack.
1. Listed and labeled as defined in NFPA 70, by a qualified testing agency, and marked for intended location and application.
 2. Operation: Unless otherwise indicated, turn lights on when coverage area is occupied, and turn them off when unoccupied; with a time, delay for turning lights off, adjustable over a minimum range of 1 to 30 minutes.
 3. Sensor Output: Contacts rated to operate the connected relay, complying with UL 773A. Sensor is powered from the power pack.
 4. Power Pack: Dry contacts rated for 20-A ballast load at 120- and 277-V ac, for 13-A tungsten at 120-V ac, and for 1 hp at 120-V ac. Sensor has 24-V dc, 150-mA, Class 2 power source, as defined by NFPA 70.
 5. Mounting:
 - a. Sensor: Suitable for mounting in any position on a standard outlet box.
 - b. Relay: Externally mounted through a 1/2-inch knockout in a standard electrical enclosure.
 - c. Time-Delay and Sensitivity Adjustments: Recessed and concealed behind hinged door.
 6. Indicator: Digital display, to show when motion is detected during testing and normal operation of sensor.
 7. Bypass Switch: Override the "on" function in case of sensor failure.
 8. Automatic Light-Level Sensor: Adjustable from 2 to 200 fc; turn lights off when selected lighting level is present.
 9. Dual Relay Units: Shall have provisions for setting both relays to turn on when occupancy is detected. Units that allow only one relay to default to "on" are not acceptable.
 10. Occupancy sensor to be compatible with all other lighting controls and light fixtures in room. Contractor and lighting supplier to verify coordination prior to submittal and shall be responsible to replace any devices that do not operate as intended.
- C. Dual-Technology Type: Ceiling mounted; detect occupants in coverage area using PIR and ultrasonic detection methods. The particular technology or combination of technologies that control on-off functions is selectable in the field by operating controls on unit.
1. Sensitivity Adjustment: Separate for each sensing technology.

2. Detector Sensitivity: Detect occurrences of 6-inch- minimum movement of any portion of a human body that presents a target of not less than 36 sq. in., and detect a person of average size and weight moving not less than 12 inches in either a horizontal or a vertical manner at an approximate speed of 12 inches/s.
 3. Detection Coverage (Small Room): Detect occupancy anywhere within a circular area of 600 sq. ft. when mounted on a 96-inch- high ceiling.
 4. Detection Coverage (Standard Room): Detect occupancy anywhere within a circular area of 1000 sq. ft. when mounted on a 96-inch- high ceiling.
 5. Detection Coverage (Large Room): Detect occupancy anywhere within a circular area of 2000 sq. ft. when mounted on a 96-inch- high ceiling.
 6. Ceiling sensor to be provided with isolated relay for integration with Building HVAC management system.
- D. Ceiling Mounted Occupancy Sensor with Integral Photocell:
1. Passive Infrared Technology Type.
 2. Extended range (20' radius, 360 degrees), 1500 square-foot coverage pattern.
 3. Auto control photocell prevents lights from coming on if adequate daylight is available.
 4. UL and cUL Listed and labeled.
 5. Sensitivity adjustment 20%-100%
 6. Line Voltage Input.
 7. General Space Sensors Light-Level Monitoring Range: 5 to 200 fc, with an adjustment for turn-on and turn-off levels within that range.
 8. Time Delay: Adjustable from 30 seconds to 30 minutes.
 9. Set-Point Adjustment: Equip with deadband adjustment of 25, 50, and 75 percent above the "on" set point, or provide with separate adjustable "on" and "off" set points.
 10. Walk test indicator light.
 11. Color to be white.
 12. Manufacturer: Hubbell Building Automation, Inc., Model # PIR10P. .

2.5 SWITCHBOX-MOUNTED OCCUPANCY SENSORS

- A. Manufacturers: Subject to compliance with requirements, available manufacturers offering products that may be incorporated into the Work include, but are not limited to, the following:
1. Cooper Industries, Inc.
 2. Leviton Mfg. Company Inc.
 3. Lightolier Controls.
 4. Lithonia Lighting; Acuity Lighting Group, Inc.
 5. Lutron Electronics Co., Inc.
 6. Sensor Switch, Inc.
 7. Square D; a brand of Schneider Electric.
 8. Watt Stopper.
- B. General Requirements for Sensors: Automatic-wall-switch occupancy sensor, suitable for mounting in a single gang switchbox.
- C. Vacancy Sensor with integral 0-10v manual dimming control.
1. Listed and labeled as defined in NFPA 70, by a qualified testing agency, and marked for intended location and application.
 2. Operating Ambient Conditions: Dry interior conditions, 32 to 120 deg F.
 3. Switch Rating: Not less than 800-VA fluorescent at 120 V, 1200-VA fluorescent at 277 V, and 800-W incandescent.
 4. Standard Range: 180-degree field of view, field adjustable from 180 to 40 degrees; with a minimum coverage area of 900 sq. ft.
 5. Sensing Technology: Dual technology (PIR and ultrasonic).
 6. Switch Type: Single-relay or dual-relay, as indicated on drawing.

- a. Dual-Relay Units: Shall have provisions for setting both relays to turn on when occupancy is detected. Units that allow only one relay to default to "on" are not acceptable.
7. Voltage: Match the circuit voltage.
8. Ambient-Light Override: Concealed, field-adjustable, light-level sensor from 10 to 150 fc. The switch prevents the lights from turning on when the light level is higher than the set point of the sensor.
9. Concealed, field-adjustable, "off" time-delay selector at up to 30 minutes.
10. Concealed "off" time-delay selector at 30 seconds, and 5, 10, and 20 minutes.
11. Adaptive Technology: Self-adjusting circuitry detects and memorizes usage patterns of the space and helps eliminate false "off" switching.
12. Color/finish shall match that of other wiring devices in the project.
13. Sensor to be compatible with all other lighting controls and light fixtures in room. Contractor and lighting supplier to verify coordination prior to submittal and shall be responsible to replace any devices that do not operate as intended.

2.6 LIGHTING CONTACTORS

- A. Manufacturers: Subject to compliance with requirements, available manufacturers offering products that may be incorporated into the Work include, but are not limited to, the following:
 1. Allen-Bradley/Rockwell Automation.
 2. ASCO Power Technologies, LP; a division of Emerson Electric Co.
 3. Eaton Corporation.
 4. General Electric Company; GE Consumer & Industrial - Electrical Distribution; Total Lighting Control.
 5. Square D; a brand of Schneider Electric.
- B. Description: Electrically operated and electrically held, combination-type lighting contactors, complying with NEMA ICS 2 and UL 508.
 1. Current Rating for Switching: Listing or rating consistent with type of load served, including tungsten filament, inductive, and high-inrush ballast (ballast with 15 percent or less total harmonic distortion of normal load current).
 2. Fault Current Withstand Rating: Equal to or exceeding the available fault current at the point of installation.
 3. Enclosure: Comply with NEMA 250.
 4. Provide with control and pilot devices as indicated on Drawings, matching the NEMA type specified for the enclosure.

2.7 DIMMER SWITCH

- A. Description: Wall box dimmer switch.
 1. On/Off switch with slider to raise/lower light level.
 2. 0-10v dimming control.
 3. Compatible with associated dimming driver in luminaire.
 4. Finish of decorator switch to be brown.
 5. Wall plate to be satin-finished stainless steel.
 6. Multiple gang face plates to accommodate quantity of switches required.
 7. Provide additional components (power supply, power booster) if required to wire system.
 8. Manufacturers:
 - a. Wattstopper, Inc.
 - b. Lutron
 - c. Hunt Dimming

2.8 CONDUCTORS AND CABLES

- A. Power Wiring to Supply Side of Remote-Control Power Sources: Not smaller than No. 12 AWG. Comply with requirements in Section 260519 "Low-Voltage Conductors and Cables."
- B. Classes 2 and 3 Control Cable: Multiconductor cable with stranded-copper conductors not smaller than No. 18 AWG. Comply with requirements in Section 260519 "Low-Voltage Conductors and Cables."
- C. Class 1 Control Cable: Multiconductor cable with stranded-copper conductors not smaller than No. 14 AWG. Comply with requirements in Section 260519 "Low-Voltage Conductors and Cables."

PART 3 - EXECUTION

3.1 SENSOR INSTALLATION

- A. Coordinate layout and installation of ceiling-mounted devices with other construction that penetrates ceilings or is supported by them, including light fixtures, HVAC equipment, smoke detectors, fire-suppression systems, and partition assemblies.
- B. Install and aim sensors in locations to achieve not less than 90 percent coverage of areas indicated. Do not exceed coverage limits specified in manufacturer's written instructions.

3.2 WIRING INSTALLATION

- A. Wiring Method: Comply with Section 260519 "Low-Voltage Conductors and Cables." Minimum conduit size is 1/2 inch.
- B. Wiring within Enclosures: Comply with NECA 1. Separate power-limited and nonpower-limited conductors according to conductor manufacturer's written instructions.
- C. Size conductors according to lighting control device manufacturer's written instructions unless otherwise indicated.
- D. Splices, Taps, and Terminations: Make connections only on numbered terminal strips in junction, pull, and outlet boxes; terminal cabinets; and equipment enclosures.

3.3 IDENTIFICATION

- A. Identify components and power and control wiring according to Section 260553 "Electrical Identification."

3.4 FIELD QUALITY CONTROL

- A. Perform the following tests and inspections:
 - 1. Operational Test: After installing and sensors, and after electrical circuitry has been energized, start units to confirm proper unit operation.
 - 2. Test and adjust controls and safeties. Replace damaged and malfunctioning controls and equipment.
- B. Lighting control devices will be considered defective if they do not pass tests and inspections.

3.5 ADJUSTING

- A. Occupancy Adjustments: When requested within 12 months from date of Substantial Completion, provide on-site assistance in adjusting sensors to suit actual occupied conditions. Provide up to two visits to Project during other-than-normal occupancy hours for this purpose.

1. For occupancy and motion sensors, verify operation at outer limits of detector range. Set time delay to suit Owner's operations.

3.6 DEMONSTRATION

- A. Train Owner's maintenance personnel to adjust, operate, and maintain lighting control devices.

END OF SECTION 260923

THIS PAGE INTENTIONALLY LEFT BLANK

SECTION 260924 – LOW VOLTAGE LIGHTING CONTROL DEVICES

PART 1 - GENERAL

1.1 SUMMARY

- A. Section Includes:
 - 1. Occupancy, Vacancy and Daylighting Sensor Control
 - 2. Emergency Lighting Control (if applicable)
- B. Related Section
 - 1. Section 265113 – Interior Lighting
- C. Control Intent – Control Intent includes, but is not limited to:
 - 1. Defaults and pre-defined calibration settings for such items as daylighting, occupancy sensor times, sensitivity, fade rates, etc.
 - 2. Wallstation pre-defined control sequences
 - 3. Daylight sensor and switching zones

1.2 REFERENCES

- A. American National Standards Institute/Institute of Electrical and Electronic Engineers (ANSI/IEEE) (and www.ieee.org)
- B. Underwriter Laboratories of Canada (ULC)
- C. International Electrotechnical Commission
- D. International Organization for Standardization (ISO)
- E. National Electrical Manufacturers Association (NEMA)
- F. WD1 (R2005) - General Color Requirements for Wiring Devices.
- G. NEMA WD7 -
- H. Underwriters Laboratories, Inc. (UL)
 - 1. 508 – Industrial Control Equipment.
 - 2. 924 – Emergency Lighting
 - 3. 2043 – Plenum

1.3 SYSTEM DESCRIPTION & OPERATION

- A. The Lighting Control and Automation system as defined under this section covers the following equipment:
 - 1. Room Controller System – Pre-defined solutions to meet typical applications. The NX Network system includes defined equipment shown below
 - 2. Room Controllers – Pre-configured, three relay controllers with 0-10-volt control for ballasts (if applicable) with integral UL924 emergency relay (if applicable), that NX smart devices connect to over the NX communications network
 - 3. Occupancy Sensors – Auto adjusting, MicroSet technology NEMA WD7 compliant occupancy sensors
 - 4. Wallstations – Smart device that is pre-configured, pre-engraved digital pushbutton wallstations, dimmers, and scene switches
 - 5. Daylight Photosensor – Smart device that is a multi-zone open loop daylight sensor with two-way active infrared (IR) communications can provide switching or dimming control for daylight harvesting.

6. NX communication network – Pre-defined lengths of QuickConnect cable (RJ45) for power and data to smart devices.

1.4 LIGHTING CONTROL APPLICATIONS

- A. Minimum lighting control performance required, unless local Energy Code is more stringent.
 1. Occupancy/vacancy requirements – Provide an occupancy/vacancy sensor with Manual On/ Automatic Off or Automatic On/ Automatic Off functionality in all spaces. Manual On vacancy sensors should be used for any enclosed space with a Manual On switch that does not require hands free operation. Spaces with multiple occupants or where line of sight might be obscured ceiling or corner mount sensors and Manual wallstations would be required. Automatic On of lighting via occupancy sensor cannot exceed 30% of lighting. Systems that do that allow the user to select Occupancy or Vacancy mode shall not be acceptable.
 2. Bi-Level switching – Provide multi-level switching and/or variable dimming for maximum energy savings
 3. Daylit Zones – Primary sidelighted or toplighted areas within an enclosed space shall be controlled separately and automatically by a multilevel photocontrol device without the need for programming. Adjustments to the daylight zones must be provided by a simple to use intuitive remote handheld device.
 4. Provide smooth and continuous daylight dimming for areas marked on drawings. Daylighting control system may be designed to dim electric light to the lowest light level.
 5. Provide the ability to adjust the high end and low-end trim of the dimmers to ensure the lighting automatically provides energy saving even when daylighting calls for full illumination.
 6. Provide the ability for the dimmers and the relays to function separately. Systems where the 0-10V dimmers and relays are tied together reduce design capabilities and shall not be acceptable.
 7. Provide the ability to provide occupancy status to a Building Automation System. Occupancy status shall happen automatically and be provided to the BAS without the need of programming any device in the Room Controller System. Systems that require programming for BAS occupancy status shall not be acceptable.
 8. Shall be capable of automatically responding to a Demand Response Signal and adjusting the lighting level, without the need of programming or software. Systems that require software or commissioning to provide Demand Response integration shall not be acceptable.

1.5 PERFORMANCE REQUIREMENTS

- A. The Room Controller system shall be accompanied by: Recessed or Suspended luminaires specified as fluorescent or LED with defined CRI, and lumen output, provided by the same manufacturer as the control systems.
- B. The Room Controller system shall include: The Room Controller NX, Entry and wallstations (up to four), matching color screwless wallplates, Occupancy Sensors (up to two), Daylight Sensor, QuickConnect cable (plenum or non-plenum pre-terminated and defined for package),

1.6 SUBMITTALS

- A. Submittals Package: Submit the shop drawings, and the product data specified below at the same time as a package.
- B. Shop Drawings:

1. Composite wiring and/or schematic diagram of each control circuit as proposed to be installed (standard diagrams will not be accepted).
 2. Scale drawing for each area showing exact location of each sensor, room controller, and digital switch.
- C. Product Data: Catalog sheets, specifications and installation instructions.
- D. Include data for each device which:
1. Indicate best mounting and installation locations for each device, this may be contained within drawings or installation instructions depending upon the project.
- E. Warranties: Standard and special warranty information

1.7 QUALITY ASSURANCE

- A. Manufacturer: Minimum 10 years' experience in manufacture of lighting controls.
- B. Products: All electrical components and devices shall be listed and labeled as defined in NFPA 70, Article 100, by a testing agency and marked for intended use.
- C. Comply with NFPA 70
- D. Source Limitations: Obtain luminaires and control systems from a single manufacturer.

1.8 DELIVERY, STORAGE AND HANDLING

- A. The contractor is responsible for complete installation of the entire system according to strict factory standards and requirements.
- B. Packaging: All components of the lighting control system shall be packaged in a single box as a QuickKit. The catalog number will be marked on package label along with bill of materials.
- C. Storage: Packaging labeling will provide a space for the receiver to clearly mark the room number/location for the lighting controls to be installed.
- D. Handling: Packaging labeling will clearly include an image of the Hubbell defined AutoCAD block for this QuickKit package. The installing contractor can easily match each package to the AutoCAD block on the design floor plans.

1.9 PROJECT CONDITIONS

- A. Do not install equipment until following conditions can be maintained in spaces to receive equipment:
1. Ambient temperature: 32° to 104° F.
 2. Relative humidity: Maximum 90 percent, non-condensing.
- B. Coordinate layout and installation of luminaires and controls with other construction.
- C. Coordinate site commissioning with manufacturer no less than 21 day prior to required date.

1.10 WARRANTY

- A. Manufacturer shall supply a 5-year warranty on all hardware and software. These warranties will be in effect for all installations. Systems that provide special warranties based on installation shall not be acceptable.

1.11 MAINTENANCE

- A. Provide extra materials described below when needed. Products shall match those that are installed. Extra materials should be stored and identified with labels describing contents. Inclusion of extra materials on the bill of materials is not the responsibility of the manufacturer.
- B. Recommended extra materials
 - 1. Occupancy Sensors: Provide 1 of each product type for every 200 installed, to be used for maintenance.
 - 2. Daylight Sensors: Provide 1 of each product type for every 100 installed, to be used for maintenance.
 - 3. Wallstations: Provide 1 of each product type for every 200 installed, to be used for maintenance.
 - 4. Room Controller: Provide 1 of each product type for every 200 installed, to be used for maintenance.
 - 5. QuickConnect Cable: Provide 1 of each product type for every 200 installed, to be used for maintenance.

PART 2 - PRODUCTS

2.1 MANUFACTURERS

- A. Acceptable Manufacturer:
 - 1. Hubbell Controls
 - a. System: Room Controller NX Series
 - b. Or approved Equivalent
 - 2. Basis of design product: Hubbell Controls Room Controller or subject to compliance and prior approval with specified requirements of this section, one of the following:
 - a. Hubbell Controls Room Controller NX Series or equal
- B. Substitutions:
 - 1. All proposed substitutions (clearly delineated as such) must be submitted in writing for approval by the design professional a minimum of 10 working days prior to the bid date and must be made available to all bidders. Proposed substitutes must be accompanied by a review of the specification noting compliance on a line-by-line basis.
 - 2. Any substitutions provided by the contractor shall be reviewed at the contractor's expense by the electrical engineer at a rate.
 - 3. By using pre-approved substitutions, the contractor accepts responsibility and associated costs for all required modifications to circuitry, devices, and wiring. The contractor shall provide complete engineered shop drawings (including power and control wiring) with deviations from the original design highlighted in an alternate color to the engineer for review and approval prior to rough-in.

2.2 WALL OR CEILING MOUNTED OCCUPANCY PERFORMANCE REQUIREMENTS

- A. Sensing mechanism:
 - 1. Dual technology:
 - a. Utilize multiple segmented lens, with internal grooves to eliminate dust and residue build-up.
 - b. Utilize an operating frequency of 32 kHz or 40 kHz that shall be crystal controlled to operate within plus or minus 0.005% tolerance.

- c. Incorporate Doppler shift ultrasonic and passive infrared motion detection technologies. Products that react to noise or ambient sound shall not be considered.
- B. Power failure memory:
 - 1. Controls incorporate non-volatile memory. Should power be interrupted and subsequently restored, settings and parameters saved in protected memory shall not be lost.
- C. Designed and tested to withstand discharges without impairment of performance when subjected to discharges of 15,000 volts per IEC 801-2.
- D. Products tested in identical manner, complaint to NEMA WD 7 -2011 Occupancy Motion Sensors Standards.
- E. Sensor shall have time delays from 8 to 30min.
- F. When specified, sensors shall automatically adjust time delay and sensitivity settings.
- G. All sensors shall provide an LED as a visual means of indication at all times to verify that motion is being detected during both testing and normal operation.
- H. All sensors shall have readily accessible, user adjustable settings for time delay and sensitivity. Settings shall be located on the sensor (not the control unit) and shall be recessed to limit tampering.
- I. Where specified, sensor shall have an internal additional isolated relay with Normally Open, Normally Closed, and Common outputs for use with HVAC control, Data Logging and other control options. Sensors utilizing separate components or specially modified units to achieve this function are not acceptable.

2.3 CEILING MOUNTED SENSORS

- A. Product: NXOS-OMNIDT2
 - 1. Provide all necessary mounting hardware and instructions.
- B. Sensors shall be Class 2 devices.
- C. Connect to Room Controller via Click & Go cable to eliminate wiring errors.
 - 1. NX Room Controller accessory is used to allow any standard Occupancy/ Vacancy Sensor to utilize Click & Go cable connections.
 - 2. Two RJ45 connection ports for connection to Room Controller
 - 3. Occupancy Sensor and Daylight sensor shall be capable of a daisy chain connection to the Room Controller
- D. Device calibration and features
 - 1. Sensitivity – 0-100% in 10% increments
 - 2. Time delay – 1-30, self-adjusts to 8 min based on room occupancy
 - 3. Test mode – Fifteen second time delay
 - 4. Detection technology – PIR, Ultrasonic or Dual Technology activation and/or re-activation.
 - 5. Walk-through mode
 - 6. Dual Technology Sensors utilizes two independent sensor detection circuits simultaneously to ensure optimum performance regardless of location or proximity to walls and structures.
 - 7. Dual Technology Sensors utilize Variable Drive Circuitry (VDC) in cases of over saturation from misapplication, which automatically adjusts the volumetric output

- without reducing detection capability. Systems that reduce detection coverage area shall not be acceptable.
8. Automatically and continually self-adjust ultrasonic frequency to ignore specific frequency continuous noise from airflow to prevent detuning which can lead to inadvertent lights out. Sensors that require detuning shall not be acceptable.
 9. All load parameters including Automatic-On/Manual-ON, blink warning, and daylight enable/disable when daylight sensors are pre-defined with the Room Controller local network.
- E. Device Status LEDs including:
1. PIR Detection
 2. Ultrasonic detection
- F. Occupancy sensor are pre-defined to specific loads within the room without wiring or special tools for maximum energy savings.
- G. Manual override of controlled loads.
- H. Multiple occupancy sensors may be installed in a room by simply daisy chaining them together to the Room Controller via Click & Go cable. No additional configuration will be required
- I. Sensors shall be RoHS compliant.

2.4 ROOM CONTROLLER DIGITAL WALLSTATIONS

- A. Low voltage momentary pushbutton switches in 2, 3, 4, 5 and 6 button configurations; available in white, ivory, grey and black; compatible with wall plates with decorator opening. Wallstations shall include the following features:
1. Removable buttons for field replacement with engraved buttons and/or alternate color buttons ENGRV-*BTNL-*, Button replacement may be completed without removing the switch from the wall.
 2. Intuitive button labeling to match application and load controls.
- B. Two RJ-45 ports for connection to the Room Controller local network.
- C. Multiple digital wallstations may be installed in a room by simply connecting them to the Room Controller local network. No additional configuration will be required to achieve multi-way switching.
- D. Room Controller digital wallstations are delivered with pre-defined functions including, raise, lower, A/V mode, Quiet Time, manual and scene control. No additional configuration is required to provide a fully functional system. Systems that require configuration or load binding and do not deliver maximum energy savings out of the box shall not be acceptable.
- E. Optional custom labeling is available for application or location specific wall station button labels.
- F. Hubbell Controls Wall switch: 4 button – ON/Raise/Lower/Off switch position. Catalog numbers: NXSW – ORLO-WH.

2.5 HANDHELD REMOTE CONTROLS

- A. Battery-operated handheld 10 button configuration for remote daylight sensor configuration. Remote controls shall include the following features:
1. Two-way infrared (IR) transceiver for line of sight communication with the Room Controller daylight sensors within up to 30 feet.
 2. Red communication LED on the daylight sensor confirms button press.

- 3. Inactivity timeout to save battery life.
- B. Three intuitive daylight sensor range push buttons.
- C. Intuitive daylight zone adjustment raise/lower pushbuttons
- D. Hubbell Controls

2.6 ROOM CONTROLLERS

- A. Room Controllers are fully functional out of the box to the connected devices in the space without commissioning or the use of any tools. Room Controllers shall be provided to match the room lighting load and control requirements. The controllers will be simple to install and will include line voltage wiring space and will not require additional electrical junction boxes. The control units will include the following features:
- B. Fully functional room configuration to the most energy-efficient sequence of operation based upon the connected devices in the room.
- C. Simple replacement – Using the automatic configuration capabilities, a Room Controller may be replaced with an off-the-shelf unit without requiring any configuration or setup.
- D. Quick installation features including:
 - 1. Included line voltage space to simplify wiring and eliminate the need for separate junction boxes.
 - 2. Included emergency voltage space to simplify wiring of emergency luminaire connections.
 - 3. Breakouts for direct conduit connection.
 - 4. Line and low voltage sections include conduit connection points. Systems that require special accessories for direct conduit connections may not comply with local building codes and shall not be acceptable.
 - 5. Quick low voltage connections using standard RJ-45 QuickConnect cable
 - 6. Plenum rated
 - 7. Dual voltage (120/277 VAC, 60 Hz)
 - 8. Zero cross circuitry for each load.
 - 9. Three relay configurations
 - 10. Efficient 150 mA switching power supply
 - 11. Six RJ-45 Click & Go local network ports
 - 12. All models support local network connections of wallstations, occupancy-based controls and receptacle controls.
- E. On/Off/Dimming Room Controllers shall include:
 - a. All models support local network connections of wallstations, occupancy-based controls and receptacle controls.
 - b. 2 SPST Switched, 2 0-10V analog outputs dimming controls of compatible ballasts and LED drivers.
- F. Hubbell Controls: NXRC 2RD.

2.7 DAYLIGHT PHOTOSENSORS

- A. Digital daylight sensor includes the following features:
 - 1. An internal photodiode that measures only within the visible spectrum and has a response curve that closely matches the photopic curve.
 - 2. The daylight sensor has three light level ranges: Foot candle Range 3-6,000 fc

3. For dimming daylight harvesting, the daylight sensor shall provide the capability of controlling multiple (up to three) daylight zones immediately upon connection without programming.
 4. Optional digital wallstations to allow occupants to reduce lighting level to increase energy savings and lower lighting levels for a selected period of time or cycle of occupancy.
 5. Infrared (IR) transceiver for daylight sensor range and daylight zone gain adjustments via handheld remote programmer.
 6. Red configuration LED that blinks to indicate data transmission.
 7. One RJ-45 port for connection to Room Controller local network.
 8. An adjustable head and an optional mounting bracket to accommodate multiple mounting methods and building materials. The daylight sensor may be mounted on a ceiling tile, skylight light well, suspended lighting fixture or backbox.
- B. Open loop digital daylight sensor includes the following additional features:
1. An internal photodiode that measures light in a 60-degree angle cutting off the unwanted light from the interior of the room.
 2. Automatically establishes dimming set-points upon power up without any programming. Optional calibration using the wireless IR handheld programmer.
 3. Hubbell Controls: NXDS.

2.8 ROOM CONTROLLER LOCAL NETWORK

- A. The Room Controller local network is a physical connection and communication protocol designed to optimally control a space within a building. Room Controller devices connect to the local network using CAT 5e cables with RJ-45 QuickConnect cables which provide both data and power to room devices. Features of the Room Controller local network include:
1. Click & Go default functionality of occupancy sensors, wallstations, slider station, daylight sensors, receptacle controls, BMS status output and lighting loads to the most energy-efficient sequence of operation based upon the device attached.
 2. Replacement of any device in the network with a standard off the shelf unit without requiring commissioning, configuration or setup.

PART 3 - EXECUTION

3.1 INSTALLATION

- A. The control system shall be installed and fully wired as shown on the plans by the installing contractor. The contractor shall complete all electrical connections to all control circuits.
- B. All low voltage smart devices shall connect using QuickConnect wire provided by Hubbell Controls. When using wire for connections other than the QuickConnect low voltage wire (pre-defined lengths of RJ45 cable), provide detailed point to point wiring diagrams for every termination. Provide wire specifications and wire colors to simplify contactor termination requirements
- C. Install the work of this Section in accordance with manufacturer's printed instructions unless otherwise indicated.
- D. Provide written or computer-generated documentation on the commissioning of the system including room by room description including:
1. Sensor parameters, time delays, sensitivities, and daylighting setpoints.
 2. Sequence of operation, (e.g. manual ON, Auto OFF. etc.)

3. Load Parameters (e.g. blink warning, etc.)

3.2 PRODUCT SUPPORT AND SERVICE

- A. Factory telephone support shall be available at no cost to the owner. Factory assistance shall consist of solving programming or application questions concerning the control equipment

3.3 FACTORY COMMISSIONING .

- A. The system manufacturer shall provide a factory authorized field engineer to the project site after installation has been completed and prior to system energization for the purpose of testing and adjustment of the system for a minimum of 2 full days. Factory field engineer shall test and verify all system functions and ensure proper operation of the system components in accordance with the specifications and on-site conditions. The installing contractor shall notify the system manufacturer in writing that the system is completely wired and ready to be energized and tested 2 weeks prior to scheduling a field engineer for start-up of the system. Should the field engineer arrive on the job site and find the installation incomplete, the installing contractor shall pay the cost of any future visits by the field engineer required to complete the system start-up.
- B. During the start-up procedure, the factory field engineer shall provide programming assistance and guidance to the building operating personnel in order to program the systems for initial operation.
- C. Allow for up to 4 hours of on-site training on the use and maintenance of the lighting control system to be scheduled at the completion of startup and programming of the system.

END OF SECTION 260924

THIS PAGE INTENTIONALLY LEFT BLANK

SECTION 262413 - SWITCHBOARDS

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

- A. Drawings and general provisions of the Contract, including General and Supplementary Conditions and Division 01 Specification Sections, apply to this Section.

1.2 SUMMARY

- A. Section Includes:
1. Service and distribution switchboards rated 600 V and less.
 2. Surge protection devices.
 3. Disconnecting and overcurrent protective devices.
 4. Accessory components and features.
 5. Identification.

1.3 ACTION SUBMITTALS

- A. Product Data: For each switchboard, overcurrent protective device, surge protection device, ground-fault protector, accessory, and component.
1. Include dimensions and manufacturers' technical data on features, performance, electrical characteristics, ratings, accessories, and finishes.
- B. Shop Drawings: For each switchboard and related equipment.
1. Include dimensioned plans, elevations, sections, and details, including required clearances and service space around equipment. Show tabulations of installed devices, equipment features, and ratings.
 2. Detail enclosure types for types other than NEMA 250, Type 1.
 3. Detail bus configuration, current, and voltage ratings.
 4. Detail short-circuit current rating of switchboards and overcurrent protective devices.
 5. Include descriptive documentation of optional barriers specified for electrical insulation and isolation.
 6. Detail utility company's metering provisions with indication of approval by utility company.
 7. Include evidence of NRTL listing for series rating of installed devices.
 8. Detail features, characteristics, ratings, and factory settings of individual overcurrent protective devices and auxiliary components.
 9. Include time-current coordination curves for each type and rating of overcurrent protective device included in switchboards. Submit on translucent log-log graph paper; include selectable ranges for each type of overcurrent protective device.
 10. Include diagram and details of proposed mimic bus.
 11. Include schematic and wiring diagrams for power, signal, and control wiring.
- C. Samples: Representative portion of mimic bus with specified material and finish, for color selection.

1.4 INFORMATIONAL SUBMITTALS

- A. Qualification Data: For Installer.

- B. Seismic Qualification Data: Certificates, for switchboards, overcurrent protective devices, accessories, and components, from manufacturer.
 - 1. Basis for Certification: Indicate whether withstand certification is based on actual test of assembled components or on calculation.
 - 2. Dimensioned Outline Drawings of Equipment Unit: Identify center of gravity and locate and describe mounting and anchorage provisions.
 - 3. Detailed description of equipment anchorage devices on which the certification is based and their installation requirements.
- C. Field Quality-Control Reports:
 - 1. Test procedures used.
 - 2. Test results that comply with requirements.
 - 3. Results of failed tests and corrective action taken to achieve test results that comply with requirements.

1.5 CLOSEOUT SUBMITTALS

- A. Operation and Maintenance Data: For switchboards and components to include in emergency, operation, and maintenance manuals.
 - 1. In addition to items specified in Section 017823 "Operation and Maintenance Data," include the following:
 - a. Routine maintenance requirements for switchboards and all installed components.
 - b. Manufacturer's written instructions for testing and adjusting overcurrent protective devices.
 - c. Time-current coordination curves for each type and rating of overcurrent protective device included in switchboards. Submit on translucent log-log graph paper; include selectable ranges for each type of overcurrent protective device.

1.6 MAINTENANCE MATERIAL SUBMITTALS

- A. Furnish extra materials that match products installed and that are packaged with protective covering for storage and identified with labels describing contents.
 - 1. Potential Transformer Fuses: Equal to 10 percent of quantity installed for each size and type but no fewer than two of each size and type.
 - 2. Control-Power Fuses: Equal to 10 percent of quantity installed for each size and type, but no fewer than two of each size and type.
 - 3. Fuses and Fusible Devices for Fused Circuit Breakers: Equal to 10 percent of quantity installed for each size and type but no fewer than three of each size and type.
 - 4. Fuses for Fused Switches: Equal to 10 percent of quantity installed for each size and type but no fewer than three of each size and type.
 - 5. Fuses for Fused Power-Circuit Devices: Equal to 10 percent of quantity installed for each size and type but no fewer than three of each size and type.
 - 6. Indicating Lights: Equal to 10 percent of quantity installed for each size and type but no less than one of each size and type.

1.7 QUALITY ASSURANCE

- A. Installer Qualifications: An employer of workers qualified as defined in NEMA PB 2.1 and trained in electrical safety as required by NFPA 70E.
- B. Testing Agency Qualifications: Accredited by NETA.
 - 1. Testing Agency's Field Supervisor: Certified by NETA to supervise on-site testing.

1.8 DELIVERY, STORAGE, AND HANDLING

- A. Deliver switchboards in sections or lengths that can be moved past obstructions in delivery path.
- B. Remove loose packing and flammable materials from inside switchboards.
- C. Handle and prepare switchboards for installation according to NECA 400.

1.9 FIELD CONDITIONS

- A. Installation Pathway: Remove and replace access fencing, doors, lift-out panels, and structures to provide pathway for moving switchboards into place.
- B. Environmental Limitations:
 - 1. Do not deliver or install switchboards until spaces are enclosed and weathertight, wet work in spaces is complete and dry, work above switchboards is complete, and HVAC system is operating and maintaining ambient temperature and humidity conditions at occupancy levels during the remainder of the construction period.
 - 2. Rate equipment for continuous operation under the following conditions unless otherwise indicated:
 - a. Ambient Temperature: Not exceeding 104 deg F (40 deg C).
 - b. Altitude: Not exceeding 6600 feet (2000 m).
- C. Unusual Service Conditions: NEMA PB 2, as follows:
 - 1. Ambient temperatures within limits specified.
 - 2. Altitude not exceeding 6600 feet (2000 m).
- D. Interruption of Existing Electric Service: Do not interrupt electric service to facilities occupied by Owner or others unless permitted under the following conditions and then only after arranging to provide temporary electric service according to requirements indicated:
 - 1. Notify Construction Manager and Owner no fewer than ten (10) days in advance of proposed interruption of electric service.
 - 2. Indicate method of providing temporary electric service.
 - 3. Do not proceed with interruption of electric service without Construction Manager's and Owner's written permission.
 - 4. Comply with NFPA 70E.

1.10 COORDINATION

- A. Coordinate layout and installation of switchboards and components with other construction that penetrates walls or is supported by them, including electrical and other types of equipment, raceways, piping, encumbrances to workspace clearance requirements, and adjacent surfaces. Maintain required workspace clearances and required clearances for equipment access doors and panels.
- B. Coordinate sizes and locations of concrete bases with actual equipment provided. Cast anchor-bolt inserts into bases. Concrete, reinforcement, and formwork requirements are specified with concrete.

1.11 WARRANTY

- A. Manufacturer's Warranty: Manufacturer agrees to repair or replace switchboard enclosures, buswork, overcurrent protective devices, accessories, and factory installed interconnection wiring that fail in materials or workmanship within specified warranty period.
 - 1. Warranty Period: Three (3) years from date of Substantial Completion.

- B. Manufacturer's Warranty: Manufacturer's agrees to repair or replace surge protection devices that fail in materials or workmanship within specified warranty period.
1. Warranty Period: Five **(5)** years from date of Substantial Completion.

PART 2 - PRODUCTS

2.1 PERFORMANCE REQUIREMENTS

- A. Seismic Performance: Switchboards shall withstand the effects of earthquake motions determined according to ASCE/SEI 7.
1. Basis for Certification: Indicate whether withstand certification is based on actual test of assembled components or on calculation. Shake-table testing shall comply with ICC-ES AC156.
 2. The term "withstand" means "the unit will remain in place without separation of any parts from the device when subjected to the seismic forces specified."

2.2 SWITCHBOARDS

- A. Manufacturers: Subject to compliance with requirements, provide products by one of the following:
1. Square D; by Schneider Electric.
 2. Eaton
- B. Source Limitations: Obtain switchboards, overcurrent protective devices, components, and accessories from single source from single manufacturer.
- C. Product Selection for Restricted Space: Drawings indicate maximum dimensions for switchboards including clearances between switchboards and adjacent surfaces and other items. Comply with indicated maximum dimensions.
- D. Electrical Components, Devices, and Accessories: Listed and labeled as defined in NFPA 70, by a qualified testing agency, and marked for intended location and application.
- E. Comply with NEMA PB 2.
- F. Comply with NFPA 70.
- G. Comply with UL 891.
- H. Front-Connected, Front-Accessible Switchboards:
1. Main Devices: Fixed, individually mounted.
 2. Branch Devices: Panel mounted.
 3. Sections front and rear aligned.
- I. Front- and Side-Accessible Switchboards:
1. Main Devices: Fixed, individually mounted.
 2. Branch Devices: Panel mounted.
 3. Section Alignment: Front and Rear aligned.
- J. Nominal System Voltage: 208Y/120 V.
- K. Main-Bus Continuous: Ampacity as indicated on associated electrical drawings.
1. Basis for Certification: Indicate whether withstand certification is based on actual test of assembled components or on calculation. Shake-table testing shall comply with ICC-ES AC156.

- a. The term "withstand" means "the unit will remain in place without separation of any parts from the device when subjected to the seismic forces specified."
 - b. The term "withstand" means "the unit will remain in place without separation of any parts from the device when subjected to the seismic forces specified and the unit will be fully operational after the seismic event."
- L. Indoor Enclosures: Steel, NEMA 250, Type 1.
- M. Enclosure Finish for Indoor Units: Factory-applied finish in manufacturer's standard gray finish over a rust-inhibiting primer on treated metal surface.
- N. Barriers: Between adjacent switchboard sections.
- O. Insulation and isolation for main bus of main section and main and vertical buses of feeder sections.
- P. Bus Transition and Incoming Pull Sections: Matched and aligned with basic switchboard.
- Q. Removable, Hinged Rear Doors and Compartment Covers: Secured by standard bolts, for access to rear interior of switchboard.
- R. Hinged Front Panels: Allow access to circuit breaker, metering, accessory, and blank compartments.
- S. Pull Box on Top of Switchboard:
 - 1. Adequate ventilation to maintain temperature in pull box within same limits as switchboard.
 - 2. Set back from front to clear circuit-breaker removal mechanism.
 - 3. Removable covers shall form top, front, and sides. Top covers at rear shall be easily removable for drilling and cutting.
 - 4. Bottom shall be insulating, fire-resistive material with separate holes for cable drops into switchboard.
 - 5. Cable supports shall be arranged to facilitate cabling and adequate to support cables indicated, including those for future installation.
- T. Buses and Connections: Three phase, four wire unless otherwise indicated.
 - 1. Provide phase bus arrangement A, B, C from front to back, top to bottom, and left to right when viewed from the front of the switchboard.
 - 2. Phase- and Neutral-Bus Material: Hard-drawn copper of 98 percent conductivity, silver-plated.
 - 3. Copper feeder circuit-breaker line connections.
 - 4. Load Terminals: Insulated, rigidly braced, runback bus extensions, of same material as through buses, equipped with mechanical connectors for outgoing circuit conductors. Provide load terminals for future circuit-breaker positions at full-ampere rating of circuit-breaker position.
 - 5. Ground Bus: 1/4-by-2-inch- (6-by-50-mm-) hard-drawn copper of 98 percent conductivity, equipped with mechanical connectors for feeder and branch-circuit ground conductors.
 - 6. Main-Phase Buses and Equipment-Ground Buses: Uniform capacity for entire length of switchboard's main and distribution sections. Provide for future extensions from both ends.
 - 7. Disconnect Links:
 - a. Isolate neutral bus from incoming neutral conductors.
 - b. Bond neutral bus to equipment-ground bus for switchboards utilized as service equipment or separately derived systems.

8. Neutral Buses: 100 percent of the ampacity of phase buses unless otherwise indicated, equipped with mechanical connectors for outgoing circuit neutral cables. Brace bus extensions for busway feeder neutral bus.
9. Isolation Barrier Access Provisions: Permit checking of bus-bolt tightness.
- U. Future Devices: Equip compartments with mounting brackets, supports, bus connections, and appurtenances at full rating of circuit-breaker compartment.
- V. Bus-Bar Insulation: Factory-applied, flame-retardant, tape wrapping of individual bus bars or flame-retardant, spray-applied insulation. Minimum insulation temperature rating of 105 deg C.

2.3 SURGE PROTECTION DEVICES

- A. Manufacturers: Subject to compliance with requirements, provide products by one of the following:
 1. Square D; by Schneider Electric.
 2. Eaton
- B. SPDs: Comply with UL 1449, Type 1.
- C. SPDs: Listed and labeled by an NRTL acceptable to authorities having jurisdiction as complying with UL 1449, Type 1.
- D. Features and Accessories:
 1. Integral disconnect switch.
 2. Internal thermal protection that disconnects the SPD before damaging internal suppressor components.
 3. Indicator light display for protection status.
 4. Form-C contacts rated at 5 A and 250-V ac, one normally open and one normally closed, for remote monitoring of protection status. Contacts shall reverse on failure of any surge diversion module or on opening of any current-limiting device. Coordinate with building power monitoring and control system.
 5. Surge counter.
- E. Peak Surge Current Rating: The minimum single-pulse surge current withstand rating per phase shall not be less than 250kA. The peak surge current rating shall be the arithmetic sum of the ratings of the individual MOVs in a given mode.
- F. Protection modes and UL 1449 VPR for grounded wye circuits with 208Y/120 V, three-phase, four-wire circuits shall not exceed the following:
 1. Line to Neutral: 700 V for 208Y/120 V.
 2. Line to Ground: 1200 V for 208Y/120 V
 3. Line to Line: 1000 V for 208Y/120 V.
- G. Nominal Rating: 20 kA.

2.4 DISCONNECTING AND OVERCURRENT PROTECTIVE DEVICES

- A. Molded-Case Circuit Breaker (MCCB): Comply with UL 489, with interrupting capacity to meet available fault currents.
 1. Thermal-Magnetic Circuit Breakers: Inverse time-current element for low-level overloads and instantaneous magnetic trip element for short circuits. Adjustable magnetic trip setting for circuit-breaker frame sizes 250 A and larger.
 2. Electronic trip circuit breakers with rms sensing; field-replaceable rating plug or field-replicable electronic trip; and the following field-adjustable settings:
 - a. Instantaneous trip.

- b. Long- and short-time pickup levels.
- c. Long and short time adjustments.
- d. Ground-fault pickup level, time delay, and I squared t response.

2.5 INSTRUMENTATION

- A. Multifunction Digital-Metering Monitor: Microprocessor-based unit suitable for three- or four-wire systems and with the following features:
 - 1. Switch-selectable digital display of the following values with maximum accuracy tolerances as indicated:
 - a. Phase Currents, Each Phase: Plus or minus 0.5 percent.
 - b. Phase-to-Phase Voltages, Three Phase: Plus or minus 0.5 percent.
 - c. Phase-to-Neutral Voltages, Three Phase: Plus or minus 0.5 percent.
 - d. Megawatts: Plus or minus 1 percent.
 - e. Megavars: Plus or minus 1 percent.
 - f. Power Factor: Plus or minus 1 percent.
 - g. Frequency: Plus or minus 0.1 percent.
 - h. Accumulated Energy, Megawatt Hours: Plus or minus 1 percent; accumulated values unaffected by power outages up to 72 hours.
 - i. Megawatt Demand: Plus or minus 1 percent; demand interval programmable from five to 60 minutes.
 - j. Contact devices to operate remote impulse-totalizing demand meter.
 - 2. Mounting: Display and control unit flush or semiflush mounted in instrument compartment door.

2.6 IDENTIFICATION

- A. Mimic Bus: Entire single-line switchboard bus work, as depicted on factory record drawing, on a photoengraved nameplate.
 - 1. Nameplate: At least 0.032-inch- (0.813-mm-) thick anodized aluminum, located at eye level on front cover of the switchboard incoming service section.
- B. Mimic Bus: Entire single-line switchboard bus work, as depicted on factory record drawing, on an engraved laminated-plastic (Gravoply) nameplate.
 - 1. Nameplate: At least 0.0625-inch- (1.588 mm-) thick laminated plastic (Gravoply), located at eye level on front cover of the switchboard incoming service section.
- C. Mimic Bus: Continuously integrated mimic bus factory applied to front of switchboard. Arrange in single-line diagram format, using symbols and letter designations consistent with final mimic-bus diagram.
- D. Coordinate mimic-bus segments with devices in switchboard sections to which they are applied. Produce a concise visual presentation of principal switchboard components and connections.
- E. Presentation Media: Painted graphics in color contrasting with background color to represent bus and components, complete with lettered designations.
- F. Service Equipment Label: NRTL labeled for use as service equipment for switchboards with one or more service disconnecting and overcurrent protective devices.

PART 3 - EXECUTION

3.1 EXAMINATION

- A. Receive, inspect, handle, and store switchboards according to NECA 400.

1. Lift or move panelboards with spreader bars and manufacturer-supplied lifting straps following manufacturer's instructions.
 2. Use rollers, slings, or other manufacturer-approved methods if lifting straps are not furnished.
 3. Protect from moisture, dust, dirt, and debris during storage and installation.
 4. Install temporary heating during storage per manufacturer's instructions.
- B. Examine switchboards before installation. Reject switchboards that are moisture damaged or physically damaged.
- C. Examine elements and surfaces to receive switchboards for compliance with installation tolerances and other conditions affecting performance of the Work or that affect the performance of the equipment.
- D. Proceed with installation only after unsatisfactory conditions have been corrected.

3.2 INSTALLATION

- A. Install switchboards and accessories according to NECA 400.
- B. Equipment Mounting: Install switchboards on concrete base, 4-inch (100-mm) nominal thickness.
1. Install dowel rods to connect concrete base to concrete floor. Unless otherwise indicated, install dowel rods on 18-inch (450-mm) centers around the full perimeter of concrete base.
 2. For supported equipment, install epoxy-coated anchor bolts that extend through concrete base and anchor into structural concrete floor.
 3. Place and secure anchorage devices. Use setting drawings, templates, diagrams, instructions, and directions furnished with items to be embedded.
 4. Install anchor bolts to elevations required for proper attachment to switchboards.
 5. Anchor switchboard to building structure at the top of the switchboard if required or recommended by the manufacturer.
- C. Temporary Lifting Provisions: Remove temporary lifting eyes, channels, straps and brackets, and temporary blocking of moving parts from switchboard units and components.
- D. Comply with mounting and anchoring requirements specified in Section 260548.16 "Seismic Controls for Electrical Systems."
- E. Operating Instructions: Frame and mount the printed basic operating instructions for switchboards, including control and key interlocking sequences and emergency procedures. Fabricate frame of finished wood or metal and cover instructions with clear acrylic plastic. Mount on front of switchboards.
- F. Install filler plates in unused spaces of panel-mounted sections.
- G. Install overcurrent protective devices, surge protection devices, and instrumentation.
1. Set field-adjustable switches and circuit-breaker trip ranges.
- H. Install spare-fuse cabinet.
- I. Comply with NECA 1.

3.3 CONNECTIONS

- A. Bond conduits entering underneath the switchboard to the equipment ground bus with a bonding conductor sized per NFPA 70.
- B. Support and secure conductors within the switchboard according to NFPA 70.

3.4 IDENTIFICATION

- A. Identify field-installed conductors, interconnecting wiring, and components; provide warning signs complying with requirements for identification specified in Section 260553 "Identification for Electrical Systems."
- B. Switchboard Nameplates: Label each switchboard compartment with a nameplate complying with requirements for identification specified in Section 260553 "Identification for Electrical Systems."
- C. Device Nameplates: Label each disconnecting and overcurrent protective device and each meter and control device mounted in compartment doors with a nameplate complying with requirements for identification specified in Section 260553 "Identification for Electrical Systems."

3.5 FIELD QUALITY CONTROL

- A. Testing Agency: Owner will engage a qualified testing agency to perform tests and inspections.
- B. Testing Agency: Engage a qualified testing agency to perform tests and inspections.
- C. Manufacturer's Field Service: Engage a factory-authorized service representative to test and inspect components, assemblies, and equipment installations, including connections.
- D. Perform tests and inspections with the assistance of a factory-authorized service representative.
- E. Tests and Inspections:
 - 1. Acceptance Testing:
 - a. Test insulation resistance for each switchboard bus, component, connecting supply, feeder, and control circuit. Open control and metering circuits within the switchboard and remove neutral connection to surge protection and other electronic devices prior to insulation test. Reconnect after test.
 - b. Test continuity of each circuit.
 - 2. Test ground-fault protection of equipment for service equipment per NFPA 70.
 - 3. Perform each visual and mechanical inspection and electrical test stated in NETA Acceptance Testing Specification. Certify compliance with test parameters.
 - 4. Correct malfunctioning units on-site where possible, and retest to demonstrate compliance; otherwise, replace with new units and retest.
 - 5. Perform the following infrared scan tests and inspections, and prepare reports:
 - a. Initial Infrared Scanning: After Substantial Completion, but not more than 60 days after Final Acceptance, perform an infrared scan of each switchboard. Remove front and rear panels so joints and connections are accessible to portable scanner.
 - b. Follow-up Infrared Scanning: Perform an additional follow-up infrared scan of each switchboard 11 months after date of Substantial Completion.
 - c. Instruments and Equipment:
 - 1) Use an infrared scanning device designed to measure temperature or to detect significant deviations from normal values. Provide calibration record for device.
 - 6. Test and adjust controls, remote monitoring, and safeties. Replace damaged and malfunctioning controls and equipment.
- F. Switchboard will be considered defective if it does not pass tests and inspections.

- G. Prepare test and inspection reports, including a certified report that identifies switchboards included and that describes scanning results. Include notation of deficiencies detected, remedial action taken, and observations after remedial action.

3.6 ADJUSTING

- A. Adjust moving parts and operable components to function smoothly and lubricate as recommended by manufacturer.
- B. Set field-adjustable circuit-breaker trip ranges as indicated.

3.7 PROTECTION

- A. Temporary Heating: Apply temporary heat, to maintain temperature according to manufacturer's written instructions, until switchboard is ready to be energized and placed into service.

3.8 DEMONSTRATION

- A. Train Owner's maintenance personnel to adjust, operate, and maintain switchboards, overcurrent protective devices, instrumentation, and accessories and to use and reprogram any microprocessor-based trip, monitoring, and communication units.

END OF SECTION 262413

SECTION 262416 - PANELBOARDS

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

- A. Drawings and general provisions of the Contract, including General and Supplementary Conditions and Division 1 Specification Sections, apply to this Section.

1.2 SUMMARY

- A. This Section includes load centers and panelboards, overcurrent protective devices, and associated auxiliary equipment rated 600 V and less for the following types:
 - 1. Lighting and appliance branch-circuit panelboards.
 - 2. Distribution panelboards.

1.3 DEFINITIONS

- A. EMI: Electromagnetic interference.
- B. GFCI: Ground-fault circuit interrupter.
- C. RFI: Radio-frequency interference.
- D. RMS: Root mean square.
- E. SPDT: Single pole, double throw.

1.4 SUBMITTALS

- A. Product Data: For each type of panelboard, overcurrent protective device, TVSS device, accessory, and component indicated. Include dimensions and manufacturers' technical data on features, performance, electrical characteristics, ratings, and finishes.
- B. Shop Drawings: For each panelboard and related equipment.
 - 1. Dimensioned plans, elevations, sections, and details. Show tabulations of installed devices, equipment features, and ratings. Include the following:
 - a. Enclosure types and details for types other than NEMA 250, Type 1.
 - b. Bus configuration, current, and voltage ratings.
 - c. Short-circuit current rating of panelboards and overcurrent protective devices.
 - d. UL listing for series rating of installed devices.
 - e. Features, characteristics, ratings, and factory settings of individual overcurrent protective devices and auxiliary components.
 - 2. Wiring Diagrams: Diagram power, signal, and control wiring and differentiate between manufacturer-installed and field-installed wiring.
- C. Qualification Data: Submit data for testing agencies indicating that they comply with qualifications specified in "Quality Assurance" Article.
- D. Field Test Reports: Submit written test reports and include the following:
 - 1. Test procedures used.
 - 2. Test results that comply with requirements.
 - 3. Results of failed tests and corrective action taken to achieve test results that comply with requirements.
- E. Panelboard Schedules: For installation in panelboards. Submit final versions after load balancing.

- F. Maintenance Data: For panelboards and components to include in maintenance manuals specified in Division 1. In addition to requirements specified in Division 1, include the following:
1. Manufacturer's written instructions for testing and adjusting overcurrent protective devices.
 2. Time-current curves, including selectable ranges for each type of overcurrent protective device.

1.5 QUALITY ASSURANCE

- A. Testing Agency Qualifications: Testing agency that is a member company of the InterNational Electrical Testing Association and that is acceptable to authorities having jurisdiction.
1. Testing Agency's Field Supervisor: Person currently certified by the InterNational Electrical Testing Association or National Institute for Certification in Engineering Technologies to supervise on-site testing specified in Part 3.
- B. Electrical Components, Devices, and Accessories: Listed and labeled as defined in NFPA 70, Article 100, by a testing agency acceptable to authorities having jurisdiction, and marked for intended use.
- C. Comply with NEMA PB 1.
- D. Comply with NFPA 70.

1.6 COORDINATION

- A. Coordinate layout and installation of panelboards and components with other construction that penetrates walls or is supported by them, including electrical and other types of equipment, raceways, piping, and encumbrances to workspace clearance requirements.

1.7 EXTRA MATERIALS

- A. Keys: Six spares of each type of panelboard cabinet lock.

PART 2 - PRODUCTS

2.1 MANUFACTURERS

- A. Manufacturers: Subject to compliance with requirements, provide products by one of the following:
1. Panelboards, Overcurrent Protective Devices, Controllers, Contactors, and Accessories (Panelboard dimensions on associated electrical drawings are based on Square D equipment. Electrical contractor is responsible for layout of equipment if equivalent manufacturer is accepted):
 - a. Square D Co.
 - b. Eaton Corp.; Cutler-Hammer Products.

2.2 FABRICATION AND FEATURES

- A. Enclosures: Flush- and surface-mounted cabinets. NEMA PB 1, Type 1, to meet environmental conditions at installed location.
1. Outdoor Locations: NEMA 250, Type 3R.
 2. Kitchen Areas: NEMA 250, Type 4X, stainless steel.
 3. Other Wet or Damp Indoor Locations: NEMA 250, Type 4.
 4. Hazardous Areas Indicated on Drawings: NEMA 250, Type 7C.

- B. Hinged Front Cover: Entire front trim hinged to box and with standard door within hinged trim cover.
- C. Finish: Manufacturer's standard enamel finish over corrosion-resistant treatment or primer coat.
- D. Directory Card: With transparent protective cover, mounted inside metal frame, inside panelboard door.
- E. Bus: Hard-drawn copper, 98 percent conductivity.
- F. Main and Neutral Lugs: Compression type suitable for use with conductor material.
- G. Equipment Ground Bus: Adequate for feeder and branch-circuit equipment ground conductors; bonded to box.
- H. Future Devices: Mounting brackets, bus connections, and necessary appurtenances required for future installation of devices.
- I. Feed-through Lugs: Compression type suitable for use with conductor material. Locate at opposite end of bus from incoming lugs or main device.

2.3 PANELBOARD SHORT-CIRCUIT RATING

- A. Fully rated to interrupt symmetrical short-circuit current available at terminals. Series rated panelboards will not be accepted.

2.4 LIGHTING AND APPLIANCE BRANCH-CIRCUIT PANELBOARDS

- A. Branch Overcurrent Protective Devices: Plug-in circuit breakers, replaceable without disturbing adjacent units.
- B. Doors: Front mounted with concealed hinges; secured with flush latch with tumbler lock; keyed alike; directory frame
- C. Fronts: piano hinged cold-rolled sheet steel with gray lacquer finish, furnished with concealed latch for securing hinged front to box. Furnish piano hinged front on all panelboards. All flush finished areas shall be provided with the piano hinge attached to the back box with flush flathead screws. Include door.

2.5 DISTRIBUTION PANELBOARDS

- A. Doors: Front mounted, except omit in fused-switch panelboards; secured with vault-type latch with tumbler lock; keyed alike.
- B. Main Overcurrent Protective Devices: Circuit breaker.
- C. Branch overcurrent protective devices shall be one of the following:
- D. For Circuit-Breaker Frame Sizes 125 A and Smaller: Plug-in circuit breakers.
- E. For Circuit-Breaker Frame Sizes Larger Than 125 A: Bolt-on circuit breakers; plug-in circuit breakers where individual positive-locking device requires mechanical release for removal.

2.6 OVERCURRENT PROTECTIVE DEVICES

- A. Molded-Case Circuit Breaker: NEMA AB 1, with interrupting capacity to meet available fault currents.
 - 1. Thermal-Magnetic Circuit Breakers: Inverse time-current element for low-level overloads, and instantaneous magnetic trip element for short circuits. Adjustable magnetic trip setting for circuit-breaker frame sizes 250 A and larger.

2. GFCI Circuit Breakers: Single- and two-pole configurations with 5-mA trip sensitivity.
- B. Molded-Case Circuit-Breaker Features and Accessories. Standard frame sizes, trip ratings, and number of poles.
 1. Lugs: Compression style, suitable for number, size, trip ratings, and material of conductors.
 2. Application Listing: Appropriate for application; Type SWD for switching fluorescent lighting loads; Type HACR for heating, air-conditioning, and refrigerating equipment.
 3. Shunt Trip: 120-V trip coil energized from separate circuit, set to trip at 75 percent of rated voltage.
 4. Undervoltage Trip: Set to operate at 35 to 75 percent of rated voltage with field-adjustable 0.1- to 0.6-second time delay.

2.7 ACCESSORY COMPONENTS AND FEATURES

- A. Accessory Set: Tools and miscellaneous items required for overcurrent protective device test, inspection, maintenance, and operation.
- B. Portable Test Set: To test functions of solid-state trip devices without removal from panelboard.

PART 3 - EXECUTION

3.1 INSTALLATION

- A. Install panelboards and accessories according to NEMA PB 1.1.
- B. Mounting: Plumb and rigid without distortion of box. Mount recessed panelboards with fronts uniformly flush with wall finish.
- C. Circuit Directory: Create a directory to indicate installed circuit loads after balancing panelboard loads. Obtain approval before installing. Use a computer or typewriter to create directory; handwritten directories are not acceptable.
- D. Install filler plates in unused spaces.
- E. Provision for Future Circuits at Flush Panelboards: Stub four 1-inch empty conduits from panelboard into accessible ceiling space or space designated to be ceiling space in the future. Stub four 1-inch empty conduits into raised floor space or below slab not on grade.
- F. Wiring in Panelboard Gutters: Arrange conductors into groups and bundle and wrap with wire ties after completing load balancing.

3.2 IDENTIFICATION

- A. Identify field-installed conductors, interconnecting wiring, and components; provide warning signs as specified in Division 26 Section "Electrical Identification."
- B. Panelboard Nameplates: Label each panelboard with engraved metal or laminated-plastic nameplate mounted with corrosion-resistant screws.

3.3 CONNECTIONS

- A. Install equipment grounding connections for panelboards with ground continuity to main electrical ground bus.

- B. Tighten electrical connectors and terminals according to manufacturer's published torque-tightening values. If manufacturer's torque values are not indicated, use those specified in UL 486A and UL 486B.

3.4 FIELD QUALITY CONTROL

- A. Prepare for acceptance tests as follows:
 - 1. Test insulation resistance for each panelboard bus, component, connecting supply, feeder, and control circuit.
 - 2. Test continuity of each circuit.
- B. Testing: After installing panelboards and after electrical circuitry has been energized, demonstrate product capability and compliance with requirements.
 - 1. Procedures: Perform each visual and mechanical inspection and electrical test indicated in NETA ATS, Section 7.5 for switches and Section 7.6 for molded-case circuit breakers. Certify compliance with test parameters.
 - 2. Correct malfunctioning units on-site, where possible, and retest to demonstrate compliance; otherwise, replace with new units and retest.
- C. Balancing Loads: After Substantial Completion, but not more than 60 days after Final Acceptance, measure load balancing and make circuit changes as follows:
 - 1. Measure as directed during period of normal system loading.
 - 2. Perform load-balancing circuit changes outside normal occupancy/working schedule of the facility and at time directed. Avoid disrupting critical 24-hour services such as fax machines and on-line data-processing, computing, transmitting, and receiving equipment.
 - 3. After circuit changes, recheck loads during normal load period. Record all load readings before and after changes and submit test records.
 - 4. Tolerance: Difference exceeding 20 percent between phase loads, within a panelboard, is not acceptable. Rebalance and recheck as necessary to meet this minimum requirement.

3.5 ADJUSTING

- A. Set field-adjustable circuit-breaker trip ranges.

3.6 CLEANING

- A. On completion of installation, inspect interior and exterior of panelboards. Remove paint splatters and other spots. Vacuum dirt and debris; do not use compressed air to assist in cleaning. Repair exposed surfaces to match original finish.

END OF SECTION 262416

THIS PAGE INTENTIONALLY LEFT BLANK

SECTION 262616 - ENCLOSED SWITCHES AND CIRCUIT BREAKERS

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

- A. Drawings and general provisions of the Contract, including General and Supplementary Conditions and Division 1 Specification Sections, apply to this Section.

1.2 SUMMARY

- A. This Section includes individually mounted enclosed switches and circuit breakers used for the following:
 - 1. Service disconnecting means.
 - 2. Feeder and branch-circuit protection.
 - 3. Motor and equipment disconnecting means.
- B. Related Sections include the following:
 - 1. Division 26 Section "Wiring Devices" for attachment plugs, receptacles, and toggle switches used for disconnecting means.
 - 2. Division 26 Section "Fuses" for fusible devices.

1.3 DEFINITIONS

- A. GFCI: Ground-fault circuit interrupter.
- B. RMS: Root mean square.
- C. SPDT: Single pole, double throw.

1.4 SUBMITTALS

- A. Product Data: For each type of switch, circuit breaker, accessory, and component indicated. Include dimensions and manufacturers' technical data on features, performance, electrical characteristics, ratings, and finishes.
- B. Shop Drawings: For each switch and circuit breaker.
 - 1. Dimensioned plans, elevations, sections, and details, including required clearances and service space around equipment. Show tabulations of installed devices, equipment features, and ratings. Include the following:
 - a. Enclosure types and details for types other than NEMA 250, Type 1.
 - b. Current and voltage ratings.
 - c. Short-circuit current rating.
 - d. UL listing for series rating of installed devices.
 - e. Features, characteristics, ratings, and factory settings of individual overcurrent protective devices and auxiliary components.
 - 2. Wiring Diagrams: Power, signal, and control wiring. Differentiate between manufacturer-installed and field-installed wiring.

- C. Manufacturer Seismic Qualification Certification: Submit certification that enclosed switches and circuit breakers, accessories, and components will withstand seismic forces. Include the following:
 - 1. Basis of Certification: Indicate whether withstand certification is based on actual test of assembled components or on calculation.
 - a. The term "withstand" means "the unit will remain in place without separation of any parts from the device when subjected to the seismic forces specified and the unit will be fully operational after the seismic event."
 - 2. Dimensioned Outline Drawings of Equipment Unit: Identify center of gravity and locate and describe mounting and anchorage provisions.
 - 3. Detailed description of equipment anchorage devices on which the certification is based and their installation requirements.
- D. Qualification Data: Submit data for testing agencies indicating that they comply with qualifications specified in "Quality Assurance" Article.
- E. Field Test Reports: Submit written test reports and include the following:
 - 1. Test procedures used.
 - 2. Test results that comply with requirements.
 - 3. Results of failed tests and corrective action taken to achieve test results that comply with requirements.
- F. Manufacturer's field service report.
- G. Maintenance Data: For enclosed switches and circuit breakers and for components to include in maintenance manuals specified in Division 1. In addition to requirements specified in Division 1, include the following:
 - 1. Routine maintenance requirements for components.
 - 2. Manufacturer's written instructions for testing and adjusting switches and circuit breakers.
 - 3. Time-current curves, including selectable ranges for each type of circuit breaker.

1.5 QUALITY ASSURANCE

- A. Testing Agency Qualifications: Testing agency that is a member company of the InterNational Electrical Testing Association and that is acceptable to authorities having jurisdiction.
 - 1. Testing Agency's Field Supervisor: Person currently certified by the InterNational Electrical Testing Association or National Institute for Certification in Engineering Technologies to supervise on-site testing specified in Part 3.
- B. Electrical Components, Devices, and Accessories: Listed and labeled as defined in NFPA 70, Article 100, by a testing agency acceptable to authorities having jurisdiction, and marked for intended use.
- C. Comply with NEMA AB 1 and NEMA KS 1.
- D. Comply with NFPA 70.
- E. Product Selection for Restricted Space: Drawings indicate maximum dimensions for enclosed switches and circuit breakers, including clearances between enclosures, and adjacent surfaces and other items. Comply with indicated maximum dimensions.

1.6 PROJECT CONDITIONS

- A. Environmental Limitations: Rate equipment for continuous operation under the following conditions, unless otherwise indicated:
1. Ambient Temperature: Not less than minus 22 deg F and not exceeding 104 deg F.
 2. Altitude: Not exceeding 6600 feet.

1.7 COORDINATION

- A. Coordinate layout and installation of switches, circuit breakers, and components with other construction, including conduit, piping, equipment, and adjacent surfaces. Maintain required workspace clearances and required clearances for equipment access doors and panels.
- B. Verify existing panelboard KAIC ratings for installation of new breakers. New breakers to be added to existing panelboards shall be U.L. listed/labeled for use with the existing panelboards. Interrupting rating of new breakers shall match rating of existing associated panelboard.

1.8 EXTRA MATERIALS

- A. Furnish extra materials described below that match products installed and that are packaged with protective covering for storage and identified with labels describing contents.
1. Spares: For the following:
 - a. Control-Power Fuses: 2
 - b. Fuses for Fused Switches: 2
 2. Spare Indicating Lights: Six of each type installed.

PART 2 - PRODUCTS

2.1 MANUFACTURERS

- A. Manufacturers: Subject to compliance with requirements, provide products by one of the following:
1. Square D Co.
 2. Eaton Corp.; Cutler-Hammer Products.

2.2 ENCLOSED SWITCHES

- A. Enclosed, Nonfusible Switch: NEMA KS 1, Type HD, with lockable handle.
- B. Enclosed, Fusible Switch, 800 A and Smaller: NEMA KS 1, Type HD, with clips to accommodate specified fuses, lockable handle with two padlocks, and interlocked with cover in closed position.

2.3 ENCLOSURES

- A. NEMA AB 1 and NEMA KS 1 to meet environmental conditions of installed location.
1. Outdoor Locations: NEMA 250, Type 3R.
 2. Kitchen Areas: NEMA 250, Type 4X, stainless steel.
 3. Other Wet or Damp Indoor Locations: NEMA 250, Type 4.
 4. Hazardous Areas Indicated on Drawings: NEMA 250, Type 7C.

2.4 FACTORY FINISHES

- A. Manufacturer's standard prime-coat finish ready for field painting.

- B. Finish: Manufacturer's standard gray paint applied to factory-assembled and -tested enclosures before shipping.

PART 3 - EXECUTION

3.1 EXAMINATION

- A. Examine elements and surfaces to receive enclosed switches and circuit breakers for compliance with installation tolerances and other conditions affecting performance.
 - 1. Proceed with installation only after unsatisfactory conditions have been corrected.

3.2 INSTALLATION

- A. Temporary Lifting Provisions: Remove temporary lifting eyes, channels, and brackets and temporary blocking of moving parts from enclosures and components.

3.3 IDENTIFICATION

- A. Identify field-installed conductors, interconnecting wiring, and components; provide warning signs as specified in Division 26 Section "Electrical Identification".
- B. Enclosure Nameplates: Label each enclosure with engraved metal or laminated-plastic nameplate mounted with corrosion-resistant screws.

3.4 CONNECTIONS

- A. Install equipment grounding connections for switches and circuit breakers with ground continuity to main electrical ground bus.
- B. Install power wiring. Install wiring between switches and circuit breakers, and control and indication devices.
- C. Tighten electrical connectors and terminals according to manufacturer's published torque-tightening values. If manufacturer's torque values are not indicated, use those specified in UL 486A and UL 486B.

3.5 FIELD QUALITY CONTROL

- A. Prepare for acceptance tests as follows:
 - 1. Test insulation resistance for each enclosed switch, circuit breaker, component, and control circuit.
 - 2. Test continuity of each line- and load-side circuit.
- B. Testing: After installing enclosed switches and circuit breakers and after electrical circuitry has been energized, demonstrate product capability and compliance with requirements.
 - 1. Procedures: Perform each visual and mechanical inspection and electrical test indicated in NETA ATS, Section 7.5 for switches. Certify compliance with test parameters.
 - 2. Correct malfunctioning units on-site, where possible, and retest to demonstrate compliance; otherwise, replace with new units and retest.
- C. Infrared Scanning: After Substantial Completion, but not more than 60 days after Final Acceptance, perform an infrared scan of each enclosed switch and circuit breaker. Open or remove doors or panels so connections are accessible to portable scanner.
 - 1. Follow-up Infrared Scanning: Perform an additional follow-up infrared scan of each unit 11 months after date of Substantial Completion.

2. Instrument: Use an infrared scanning device designed to measure temperature or to detect significant deviations from normal values. Provide calibration record for device.
3. Record of Infrared Scanning: Prepare a certified report that identifies switches and circuit breakers checked and that describes scanning results. Include notation of deficiencies detected, remedial action taken and observations after remedial action.

3.6 CLEANING

- A. On completion of installation, inspect interior and exterior of enclosures. Remove paint splatters and other spots. Vacuum dirt and debris; do not use compressed air to assist in cleaning. Repair exposed surfaces to match original finish.

END OF SECTION 262616

THIS PAGE INTENTIONALLY LEFT BLANK

SECTION 262726 - WIRING DEVICES

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

- A. Drawings and general provisions of the Contract, including General and Supplementary Conditions and Division 01 Specification Sections, apply to this Section.

1.2 SUMMARY

- A. Section Includes:
 - 1. Standard-grade receptacles, 125 V, 20 A.
 - 2. GFCI receptacles, 125 V, 20 A.
 - 3. Twist-locking receptacles.
 - 4. Pendant cord-connector devices.
 - 5. Cord and plug sets.
 - 6. Toggle switches, 120/277 V, 20 A.
 - 7. Occupancy sensors.
 - 8. Wall-box dimmers.
 - 9. Wall plates.
 - 10. Floor service fittings.

1.3 DEFINITIONS

- A. AFCI: Arc-fault circuit interrupter.
- B. BAS: Building automation system.
- C. EMI: Electromagnetic interference.
- D. GFCI: Ground-fault circuit interrupter.
- E. Pigtail: Short lead used to connect a device to a branch-circuit conductor.
- F. RFI: Radio-frequency interference.
- G. SPD: Surge protective device.

1.4 ACTION SUBMITTALS

- A. Product Data: For each type of product.
- B. Shop Drawings: List of legends and description of materials and process used for premarking wall plates.
- C. Samples: One for each type of device and wall plate specified, in each color specified.

1.5 INFORMATIONAL SUBMITTALS

- A. Field quality-control reports.

1.6 CLOSEOUT SUBMITTALS

- A. Operation and Maintenance Data: For wiring devices to include in all manufacturers' packing-label warnings and instruction manuals that include labeling conditions.

1.7 MAINTENANCE MATERIAL SUBMITTALS

- A. Furnish extra materials that match products installed and that are packaged with protective covering for storage and identified with labels describing contents.
 - 1. Floor Service-Outlet Assemblies: One for every 10, but no fewer than one.

PART 2 - PRODUCTS

2.1 GENERAL WIRING-DEVICE REQUIREMENTS

- A. Wiring Devices, Components, and Accessories: Listed and labeled as defined in NFPA 70, by a qualified testing agency, and marked for intended location and use.
- B. Comply with NFPA 70.
- C. RoHS compliant.
- D. Comply with NEMA WD 1.
- E. Devices that are manufactured for use with modular plug-in connectors may be substituted under the following conditions:
 - 1. Connectors shall comply with UL 2459 and shall be made with stranding building wire.
 - 2. Devices shall comply with requirements in this Section.
- F. Devices for Owner-Furnished Equipment:
 - 1. Receptacles: Match plug configurations.
 - 2. Cord and Plug Sets: Match equipment requirements.
- G. Device Color:
 - 1. Wiring Devices Connected to Normal Power System: White unless otherwise indicated or required by NFPA 70 or device listing.
 - 2. Wiring Devices Connected to Essential Electrical System: Red.
- H. Wall Plate Color: For plastic covers, match device color.
- I. Source Limitations: Obtain each type of wiring device and associated wall plate from single source from single manufacturer.

2.2 STANDARD-GRADE RECEPTACLES, 125 V, 20 A

- A. Duplex Receptacles, 125 V, 20 A:
 - 1. Manufacturers: Subject to compliance with requirements, available manufacturers offering products that may be incorporated into the Work include, but are not limited to, the following:
 - a. Eaton (Arrow Hart).
 - b. Hubbell Incorporated; Wiring Device-Kellems.
 - c. Leviton Manufacturing Co., Inc.
 - d. Pass & Seymour/Legrand (Pass & Seymour).
 - 2. Description: Two pole, three wire, and self-grounding.
 - 3. Configuration: NEMA WD 6, Configuration 5-20R.
 - 4. Standards: Comply with UL 498 and FS W-C-596.
- B. Tamper-Resistant Duplex Receptacles, 125 V, 20 A:

1. Manufacturers: Subject to compliance with requirements, available manufacturers offering products that may be incorporated into the Work include, but are not limited to the following:
 - a. Eaton (Arrow Hart).
 - b. Hubbell Incorporated; Wiring Device-Kellems.
 - c. Leviton Manufacturing Co., Inc.
 - d. Pass & Seymour/Legrand (Pass & Seymour).
 2. Description: Two pole, three wire, and self-grounding. Integral shutters that operate only when a plug is inserted in the receptacle.
 3. Configuration: NEMA WD 6, Configuration 5-20R.
 4. Standards: Comply with UL 498 and FS W-C-596.
 5. Marking: Listed and labeled as complying with NFPA 70, "Tamper-Resistant Receptacles" Article.
- C. Weather-Resistant Duplex Receptacle, 125 V, 20 A:
1. Manufacturers: Subject to compliance with requirements, available manufacturers offering products that may be incorporated into the Work include, but are not limited to the following:
 - a. Eaton (Arrow Hart).
 - b. Hubbell Incorporated; Wiring Device-Kellems.
 - c. Leviton Manufacturing Co., Inc.
 - d. Pass & Seymour/Legrand (Pass & Seymour).
 2. Description: Two pole, three wire, and self-grounding. Integral shutters that operate only when a plug is inserted in the receptacle. Square face.
 3. Configuration: NEMA WD 6, Configuration 5-20R.
 4. Standards: Comply with UL 498.
 5. Marking: Listed and labeled as complying with NFPA 70, "Receptacles in Damp or Wet Locations" Article.
- D. Tamper- and Weather-Resistant Duplex Receptacles, 125 V, 20 A:
1. Manufacturers: Subject to compliance with requirements, available manufacturers offering products that may be incorporated into the Work include, but are not limited to the following:
 - a. Eaton (Arrow Hart).
 - b. Hubbell Incorporated; Wiring Device-Kellems.
 - c. Leviton Manufacturing Co., Inc.
 - d. Pass & Seymour/Legrand (Pass & Seymour).
 2. Description: Two pole, three wire, and self-grounding. Integral shutters that operate only when a plug is inserted in the receptacle. Square face.
 3. Configuration: NEMA WD 6, Configuration 5-20R.
 4. Standards: Comply with UL 498.
 5. Marking: Listed and labeled as complying with NFPA 70, "Tamper-Resistant Receptacles" and "Receptacles in Damp or Wet Locations" articles.

2.3 GFCI RECEPTACLES, 125 V, 20 A

- A. Duplex GFCI Receptacles, 125 V, 20 A:
1. Manufacturers: Subject to compliance with requirements, available manufacturers offering products that may be incorporated into the Work include, but are not limited to the following:
 - a. Eaton (Arrow Hart).
 - b. Hubbell Incorporated; Wiring Device-Kellems.

- c. Leviton Manufacturing Co., Inc.
 - d. Pass & Seymour/Legrand (Pass & Seymour).
 - 2. Description: Integral GFCI with "Test" and "Reset" buttons and LED indicator light. Two pole, three wire, and self-grounding.
 - 3. Configuration: NEMA WD 6, Configuration 5-20R.
 - 4. Type: Feed through.
 - 5. Standards: Comply with UL 498, UL 943 Class A, and FS W-C-596.
- B. Tamper-Resistant Duplex GFCI Receptacles, 125 V, 20 A:
 - 1. Manufacturers: Subject to compliance with requirements, available manufacturers offering products that may be incorporated into the Work include, but are not limited to the following:
 - a. Hubbell Incorporated; Wiring Device-Kellems.
 - b. Pass & Seymour/Legrand (Pass & Seymour).
 - 2. Description: Integral GFCI with "Test" and "Reset" buttons and LED indicator light. Two pole, three wire, and self-grounding. Integral shutters that operate only when a plug is inserted in the receptacle.
 - 3. Configuration: NEMA WD 6, Configuration 5-20R.
 - 4. Type: Feed through.
 - 5. Standards: Comply with UL 498, UL 943 Class A, and FS W-C-596.
 - 6. Marking: Listed and labeled as complying with NFPA 70, "Tamper-Resistant Receptacles" Article.
- C. Tamper- and Weather-Resistant, GFCI Duplex Receptacles, 125 V, 20 A:
 - 1. Manufacturers: Subject to compliance with requirements, available manufacturers offering products that may be incorporated into the Work include, but are not limited to the following:
 - a. Eaton (Arrow Hart).
 - b. Hubbell Incorporated; Wiring Device-Kellems.
 - c. Leviton Manufacturing Co., Inc.
 - d. Pass & Seymour/Legrand (Pass & Seymour).
 - 2. Description: Integral GFCI with "Test" and "Reset" buttons and LED indicator light. Two pole, three wire, and self-grounding. Integral shutters that operate only when a plug is inserted in the receptacle. Square face.
 - 3. Configuration: NEMA WD 6, Configuration 5-15R.
 - 4. Type: Feed through.
 - 5. Standards: Comply with UL 498 and UL 943 Class A.
 - 6. Marking: Listed and labeled as complying with NFPA 70, "Tamper-Resistant Receptacles" and "Receptacles in Damp or Wet Locations" articles.

2.4 TWIST-LOCKING RECEPTACLES

- A. Twist-Lock, Single Receptacles, 120 V, 20 A:
 - 1. Manufacturers: Subject to compliance with requirements, available manufacturers offering products that may be incorporated into the Work include, but are not limited to the following:
 - a. Eaton (Arrow Hart).
 - b. Hubbell Incorporated; Wiring Device-Kellems.
 - c. Leviton Manufacturing Co., Inc.
 - d. Pass & Seymour/Legrand (Pass & Seymour).
 - 2. Configuration: NEMA WD 6, Configuration L5-20R.
 - 3. Standards: Comply with UL 498.

- B. Twist-Lock, Single Receptacles, 250 V, 20 A:
 - 1. Manufacturers: Subject to compliance with requirements, available manufacturers offering products that may be incorporated into the Work include, but are not limited to the following:
 - a. Eaton (Arrow Hart).
 - b. Hubbell Premise Wiring.
 - c. Leviton Manufacturing Co., Inc.
 - d. Pass & Seymour/Legrand (Pass & Seymour).
 - 2. Configuration: NEMA WD 6, Configuration L6-20R.
 - 3. Standards: Comply with UL 498.
- C. Twist-Lock, Single Receptacles, 277 V, 20 A:
 - 1. Manufacturers: Subject to compliance with requirements, available manufacturers offering products that may be incorporated into the Work include, but are not limited to the following:
 - a. Eaton (Arrow Hart).
 - b. Hubbell Premise Wiring.
 - c. Leviton Manufacturing Co., Inc.
 - d. Pass & Seymour/Legrand (Pass & Seymour).
 - 2. Configuration: NEMA WD 6, Configuration L7-20R.
 - 3. Standards: Comply with UL 498.

2.5 PENDANT CORD-CONNECTOR DEVICES

- A. Description: Matching, locking-type plug and receptacle body connector, heavy-duty grade.
- B. Manufacturers: Subject to compliance with requirements, available manufacturers offering products that may be incorporated into the Work include, but are not limited to the following:
 - 1. Eaton (Arrow Hart).
 - 2. Hubbell Premise Wiring.
 - 3. Leviton Manufacturing Co., Inc.
 - 4. Pass & Seymour/Legrand (Pass & Seymour).
- C. Configuration: NEMA WD 6, Configurations L5-20P and L5-20R.
- D. Body: Nylon, with screw-open, cable-gripping jaws and provision for attaching external cable grip.
- E. External Cable Grip: Woven wire-mesh type made of high-strength, galvanized-steel wire strand, matched to cable diameter, and with attachment provision designed for corresponding connector.
- F. Standards: Comply with FS W-C-596.

2.6 CORD AND PLUG SETS

- A. Match voltage and current ratings and number of conductors to requirements of equipment being connected.
- B. Cord: Rubber-insulated, stranded-copper conductors, with Type SOW-A jacket; with green-insulated grounding conductor and ampacity of at least 130 percent of the equipment rating.
- C. Plug: Nylon body and integral cable-clamping jaws. Match cord and receptacle type for connection.

2.7 TOGGLE SWITCHES, 120/277 V, 20 A

- A. Single-Pole Switches, 120/277 V, 20 A:

1. Manufacturers: Subject to compliance with requirements, available manufacturers offering products that may be incorporated into the Work include, but are not limited to the following:
 - a. Eaton (Arrow Hart).
 - b. Hubbell Incorporated; Wiring Device-Kellems.
 - c. Leviton Manufacturing Co., Inc.
 - d. Pass & Seymour/Legrand (Pass & Seymour).
 2. Standards: Comply with UL 20 and FS W-S-896.
- B. Two-Pole Switches, 120/277 V, 20 A:
1. Manufacturers: Subject to compliance with requirements, available manufacturers offering products that may be incorporated into the Work include, but are not limited to the following:
 - a. Eaton (Arrow Hart).
 - b. Hubbell Incorporated; Wiring Device-Kellems.
 - c. Leviton Manufacturing Co., Inc.
 - d. Pass & Seymour/Legrand (Pass & Seymour).
 2. Comply with UL 20 and FS W-S-896.
- C. Three-Way Switches, 120/277 V, 20 A:
1. Manufacturers: Subject to compliance with requirements, available manufacturers offering products that may be incorporated into the Work include, but are not limited to the following:
 - a. Eaton (Arrow Hart).
 - b. Hubbell Incorporated; Wiring Device-Kellems.
 - c. Leviton Manufacturing Co., Inc.
 - d. Pass & Seymour/Legrand (Pass & Seymour).
 2. Comply with UL 20 and FS W-S-896.
- D. Four-Way Switches, 120/277 V, 20 A:
1. Manufacturers: Subject to compliance with requirements, available manufacturers offering products that may be incorporated into the Work include, but are not limited to the following:
 - a. Eaton (Arrow Hart).
 - b. Hubbell Incorporated; Wiring Device-Kellems.
 - c. Leviton Manufacturing Co., Inc.
 - d. Pass & Seymour/Legrand (Pass & Seymour).
 2. Standards: Comply with UL 20 and FS W-S-896.
- E. Pilot-Light, Single-Pole Switches: 120/277 V, 20 A:
1. Manufacturers: Subject to compliance with requirements, available manufacturers offering products that may be incorporated into the Work include, but are not limited to the following:
 - a. Eaton (Arrow Hart).
 - b. Hubbell Incorporated; Wiring Device-Kellems.
 - c. Leviton Manufacturing Co., Inc.
 - d. Pass & Seymour/Legrand (Pass & Seymour).
 2. Description: Illuminated when switch is on.
 3. Standards: Comply with UL 20 and FS W-S-896.
- F. Lighted Single-Pole Switches, 120/277 V, 20 A:

1. Manufacturers: Subject to compliance with requirements, available manufacturers offering products that may be incorporated into the Work include, but are not limited to the following:
 - a. Eaton (Arrow Hart).
 - b. Hubbell Premise Wiring.
 - c. Leviton Manufacturing Co., Inc.
 - d. Pass & Seymour/Legrand (Pass & Seymour).
 2. Description: Handle illuminated when switch is off.
 3. Standards: Comply with NEMA WD 1, UL 20, and FS W-S-896.
- G. Key-Operated, Single-Pole Switches, 120/277 V, 20 A:
1. Manufacturers: Subject to compliance with requirements, available manufacturers offering products that may be incorporated into the Work include, but are not limited to the following:
 - a. Eaton (Arrow Hart).
 - b. Hubbell Incorporated; Wiring Device-Kellems.
 - c. Leviton Manufacturing Co., Inc.
 - d. Pass & Seymour/Legrand (Pass & Seymour).
 2. Description: Factory-supplied key in lieu of switch handle.
 3. Standards: Comply with UL 20 and FS W-S-896.
- H. Single-Pole, Double-Throw, Momentary-Contact, Center-off Switches, 120/277 V, 20 A:
1. Manufacturers: Subject to compliance with requirements, available manufacturers offering products that may be incorporated into the Work include, but are not limited to the following:
 - a. Eaton (Arrow Hart).
 - b. Hubbell Incorporated; Wiring Device-Kellems.
 - c. Leviton Manufacturing Co., Inc.
 - d. Pass & Seymour/Legrand (Pass & Seymour).
 2. Description: For use with mechanically held lighting contactors.
 3. Standards: Comply with NEMA WD 1, UL 20, and FS W-S-896.
- I. Key-Operated, Single-Pole, Double-Throw, Momentary-Contact, Center-off Switches, 120/277 V, 20 A:
1. Manufacturers: Subject to compliance with requirements, available manufacturers offering products that may be incorporated into the Work include, but are not limited to the following:
 - a. Eaton (Arrow Hart).
 - b. Hubbell Incorporated; Wiring Device-Kellems.
 - c. Leviton Manufacturing Co., Inc.
 - d. Pass & Seymour/Legrand (Pass & Seymour).
 2. Description: For use with mechanically held lighting contactors, with factory-supplied key in lieu of switch handle.
 3. Standards: Comply with NEMA WD 1, UL 20, and FS W-S-896.

2.8 OCCUPANCY SENSORS

- A. Wall Switch Sensor Light Switch, Dual Technology:
1. Manufacturers: Subject to compliance with requirements, available manufacturers offering products that may be incorporated into the Work include, but are not limited to the following:
 - a. Eaton (Arrow Hart).
 - b. Hubbell Incorporated; Wiring Device-Kellems.

- c. Leviton Manufacturing Co., Inc.
 - d. Pass & Seymour/Legrand (Pass & Seymour).
 2. Description: Switchbox-mounted, combination lighting-control sensor and conventional switch lighting-control unit using dual (ultrasonic and passive infrared) technology.
 3. Standards: Comply with UL 20.
 4. Rated 960 W at 120 V ac for tungsten lighting, 10 A at 120 V ac or 10 A at 277 V ac for fluorescent or LED lighting, and 1/4 hp at 120 V ac.
 5. Adjustable time delay of five minutes.
 6. Able to be locked to Manual-On mode.
 7. Automatic Light-Level Sensor: Adjustable from 2 to 200 fc.
 8. Connections: Provisions for connection to BAS.
 9. Connections: RJ-45 communications outlet.
 10. Connections: Integral wireless networking.
- B. Wall Sensor Light Switch, Passive Infrared:
 1. Manufacturers: Subject to compliance with requirements, available manufacturers offering products that may be incorporated into the Work include, but are not limited to the following:
 - a. Cooper Industries.
 - b. Hubbell Premise Wiring.
 - c. Leviton Manufacturing Co., Inc.
 - d. Pass & Seymour/Legrand (Pass & Seymour).
 2. Description: Switchbox-mounted, combination, lighting-control sensor and conventional switch lighting-control unit using passive infrared technology.
 3. Standards: Comply with UL 20.
 4. Connections: Provisions for connection to BAS.
 5. Connections: Hard wired.
 6. Connections: Wireless.
 7. Rated 960 W at 120 V ac for tungsten lighting, 10 A at 120 V ac or 10 A at 277 V ac for fluorescent or LED lighting, and 1/4 hp at 120 V ac.
 8. Integral relay for connection to BAS.
 9. Adjustable time delay of five minutes.
 10. Able to be locked to Manual-On mode.
 11. Automatic Light-Level Sensor: Adjustable from 2 to 200 fc.
- C. Wall Sensor Light Switch, Ultrasonic:
 1. Manufacturers: Subject to compliance with requirements, available manufacturers offering products that may be incorporated into the Work include, but are not limited to the following:
 - a. Eaton (Arrow Hart).
 - b. Hubbell Incorporated; Wiring Device-Kellems.
 - c. Leviton Manufacturing Co., Inc.
 2. Description: Switchbox-mounted, combination, lighting-control sensor and conventional switch lighting-control unit using ultrasonic technology.
 3. Standards: Comply with UL 20.
 4. Connections: Provisions for connection to BAS.
 5. Connections: RJ-45 communications outlet.
 6. Connections: Integral wireless networking.
 7. Rated 960 W at 120 V ac for tungsten lighting, 10 A at 120 V ac or 10 A at 277 V ac for fluorescent or LED lighting, and 1/4 hp at 120 V ac.
 8. Integral relay for connection to BAS.
 9. Adjustable time delay of five minutes.

10. Able to be locked to Manual-On mode.
11. Automatic Light-Level Sensor: Adjustable from 2 to 200 fc.

2.9 DIMMERS

A. Wall-Box Dimmers:

1. Manufacturers: Subject to compliance with requirements, available manufacturers offering products that may be incorporated into the Work include, but are not limited to the following:
 - a. Eaton (Arrow Hart).
 - b. Hubbell Incorporated; Wiring Device-Kellems.
 - c. Leviton Manufacturing Co., Inc.
 - d. Lutron Electronics Co., Inc.
 - e. Pass & Seymour/Legrand (Pass & Seymour).
2. Description: Modular, full-wave, solid-state dimmer switch with integral, quiet on-off switches, with audible frequency and EMI/RFI suppression filters.
3. Control: Continuously adjustable slider; with single-pole or three-way switching.
4. Standards: Comply with UL 1472.
5. Incandescent Lamp Dimmers: 120 V; control shall follow square-law dimming curve. On-off switch positions shall bypass dimmer module.
 - a. 600 W; dimmers shall require no derating when ganged with other devices. Illuminated when "off."
6. Fluorescent Lamp Dimmer Switches: Modular; compatible with dimmer ballasts; trim potentiometer to adjust low-end dimming; dimmer-ballast combination capable of consistent dimming with low end not greater than 20 percent of full brightness.
7. LED Lamp Dimmer Switches: Modular; compatible with LED lamps; trim potentiometer to adjust low-end dimming; capable of consistent dimming with low end not greater than 20 percent of full brightness.

2.10 WALL PLATES

- A. Single Source: Obtain wall plates from same manufacturer of wiring devices.
- B. Single and combination types shall match corresponding wiring devices.
 1. Plate-Securing Screws: Metal with head color to match plate finish.
 2. Material for Finished Spaces: 0.035-inch-thick, satin-finished, Type 302 stainless steel.
 3. Material for Unfinished Spaces: Galvanized steel.
 4. Material for Damp Locations: Thermoplastic with spring-loaded lift cover, and listed and labeled for use in wet and damp locations.
- C. Wet-Location, Weatherproof Cover Plates: NEMA 250, complying with Type 3R, weather-resistant thermoplastic with lockable cover.
- D. Antimicrobial Cover Plates:
 1. Contact surfaces treated with a coating that kills 99.9 percent of certain common bacteria within two hours when regularly and properly cleaned.
 2. Tarnish resistant.

2.11 FLOOR SERVICE FITTINGS

A. Flush-Type Floor Service Fittings:

1. Manufacturers: Subject to compliance with requirements, available manufacturers offering products that may be incorporated into the Work include, but are not limited to the following:

- a. Eaton (Arrow Hart).
 - b. Hubbell Premise Wiring.
 - c. Thomas & Betts Power Solutions; ABB Group.
 - d. Wiremold / Legrand.
 2. Description: Type: Modular, flush-type, dual-service units suitable for wiring method used, with cover flush with finished floor.
 3. Compartments: Barrier separates power from voice and data communication cabling.
 4. Service Plate and Cover: Rectangular, solid brass with satin finish.
 5. Power Receptacle: NEMA WD 6 Configuration 5-20R, gray finish, unless otherwise indicated.
 6. Data Communication Outlet: Two modular, keyed, color-coded, RJ-45 jacks for twisted pair cable, complying with requirements in Section 271513 "Communications Copper Horizontal Cabling."
- B. Flap-Type Service Fittings:
1. Manufacturers: Subject to compliance with requirements, available manufacturers offering products that may be incorporated into the Work include, but are not limited to the following:
 - a. Eaton (Arrow Hart).
 - b. Hubbell Premise Wiring.
 - c. Thomas & Betts Power Solutions; ABB Group.
 2. Description: Type: Modular, flap-type, dual-service units suitable for wiring method used, with flaps flush with finished floor.
 3. Compartments: Barrier separates power from voice and data communication cabling.
 4. Flaps: Rectangular, solid brass with satin finish.
 5. Service Plate: Same finish as flaps.
 6. Power Receptacle: NEMA WD 6 Configuration 5-20R, gray finish, unless otherwise indicated.
 7. Data Communication Outlet: Two modular, keyed, color-coded, RJ-45 jacks for twisted pair cable, complying with requirements in Section 271513 "Communications Copper Horizontal Cabling."
- C. Above-Floor Service Fittings:
1. Manufacturers: Subject to compliance with requirements, available manufacturers offering products that may be incorporated into the Work include, but are not limited to the following:
 - a. Eaton (Arrow Hart).
 - b. Hubbell Premise Wiring.
 - c. Thomas & Betts Corporation; A Member of the ABB Group.
 - d. Wiremold / Legrand.
 2. Description: Type: Modular, above-floor, dual-service units suitable for wiring method used.
 3. Compartments: Barrier separates power from voice and data communication cabling.
 4. Service Plate: Rectangular, solid brass with satin finish.
 5. Power Receptacle: NEMA WD 6 Configuration 5-20R, gray finish, unless otherwise indicated.
 6. Data Communication Outlet: Two modular, keyed, color-coded, RJ-45 jacks for twisted pair cable, complying with requirements in Section 271513 "Communications Copper Horizontal Cabling."

PART 3 - EXECUTION

3.1 INSTALLATION

- A. Comply with NECA 1, including mounting heights listed in that standard, unless otherwise indicated.
- B. Coordination with Other Trades:
 - 1. Protect installed devices and their boxes. Do not place wall finish materials over device boxes, and do not cut holes for boxes with routers that are guided by riding against outside of boxes.
 - 2. Keep outlet boxes free of plaster, drywall joint compound, mortar, cement, concrete, dust, paint, and other material that may contaminate the raceway system, conductors, and cables.
 - 3. Install device boxes in brick or block walls so that the cover plate does not cross a joint unless the joint is troweled flush with the face of the wall.
 - 4. Install wiring devices after all wall preparation, including painting, is complete.
- C. Conductors:
 - 1. Do not strip insulation from conductors until right before they are spliced or terminated on devices.
 - 2. Strip insulation evenly around the conductor using tools designed for the purpose. Avoid scoring or nicking of solid wire or cutting strands from stranded wire.
 - 3. The length of free conductors at outlets for devices shall comply with NFPA 70, Article 300, without pigtails.
 - 4. Existing Conductors:
 - a. Cut back and pigtail or replace all damaged conductors.
 - b. Straighten conductors that remain and remove corrosion and foreign matter.
 - c. Pigtailling existing conductors is permitted, provided the outlet box is large enough.
- D. Device Installation:
 - 1. Replace devices that have been in temporary use during construction and that were installed before building finishing operations were complete.
 - 2. Keep each wiring device in its package or otherwise protected until it is time to connect conductors.
 - 3. Do not remove surface protection, such as plastic film and smudge covers, until the last possible moment.
 - 4. Connect devices to branch circuits using pigtails that are not less than 6 inches in length.
 - 5. When there is a choice, use side wiring with binding-head screw terminals. Wrap solid conductor tightly clockwise, two-thirds to three-fourths of the way around terminal screw.
 - 6. Use a torque screwdriver when a torque is recommended or required by manufacturer.
 - 7. When conductors larger than No. 12 AWG are installed on 15- or 20-A circuits, splice No. 12 AWG pigtails for device connections.
 - 8. Tighten unused terminal screws on the device.
 - 9. When mounting into metal boxes, remove the fiber or plastic washers used to hold device-mounting screws in yokes, allowing metal-to-metal contact.
- E. Receptacle Orientation:
 - 1. Install ground pin of vertically mounted receptacles up, and on horizontally mounted receptacles to the right.

2. Install hospital-grade receptacles in patient-care areas with the ground pin or neutral blade at the top.
- F. Device Plates: Do not use oversized or extra-deep plates. Repair wall finishes and remount outlet boxes when standard device plates do not fit flush or do not cover rough wall opening.
- G. Dimmers:
 1. Install dimmers within terms of their listing.
 2. Verify that dimmers used for fan-speed control are listed for that application.
 3. Install unshared neutral conductors on line and load side of dimmers according to manufacturers' device, listing conditions in the written instructions.
- H. Arrangement of Devices: Unless otherwise indicated, mount flush, with long dimension vertical and with grounding terminal of receptacles on top. Group adjacent switches under single, multigang wall plates.
- I. Adjust locations of floor service outlets and service poles to suit arrangement of partitions and furnishings.

3.2 GFCI RECEPTACLES

- A. Install non-feed-through GFCI receptacles where protection of downstream receptacles is not required.

3.3 IDENTIFICATION

- A. Comply with Section 260553 "Identification for Electrical Systems."
- B. Identify each receptacle with panelboard identification and circuit number. Use hot, stamped, or engraved machine printing with white-filled lettering on face of plate, and durable wire markers or tags inside outlet boxes.
- C. Essential Electrical System: Mark receptacles supplied from the essential electrical system to allow easy identification using a self-adhesive label.

3.4 FIELD QUALITY CONTROL

- A. Test Instruments: Use instruments that comply with UL 1436.
- B. Test Instrument for Receptacles: Digital wiring analyzer with digital readout or illuminated digital-display indicators of measurement.
- C. Perform the following tests and inspections with the assistance of a factory-authorized service representative:
 1. In healthcare facilities, prepare reports that comply with NFPA 99.
 2. Test Instruments: Use instruments that comply with UL 1436.
 3. Test Instrument for Receptacles: Digital wiring analyzer with digital readout or illuminated digital-display indicators of measurement.
- D. Tests for Receptacles:
 1. Line Voltage: Acceptable range is 105 to 132 V.
 2. Percent Voltage Drop under 15-A Load: A value of 6 percent or higher is unacceptable.
 3. Ground Impedance: Values of up to 2 ohms are acceptable.
 4. GFCI Trip: Test for tripping values specified in UL 1436 and UL 943.
 5. Using the test plug, verify that the device and its outlet box are securely mounted.
 6. Tests shall be diagnostic, indicating damaged conductors, high resistance at the circuit breaker, poor connections, inadequate fault-current path, defective devices, or similar

problems. Correct circuit conditions remove malfunctioning units and replace with new ones, and retest as specified above.

- E. Wiring device will be considered defective if it does not pass tests and inspections.
- F. Prepare test and inspection reports.

END OF SECTION 262726

THIS PAGE INTENTIONALLY LEFT BLANK

SECTION 262813 - FUSES

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

- A. Drawings and general provisions of the Contract, including General and Supplementary Conditions and Division 1 Specification Sections, apply to this Section.

1.2 SUMMARY

- A. This Section includes cartridge fuses, rated 600 V and less, for use in switches.

1.3 SUBMITTALS

- A. Product Data: Include the following for each fuse type indicated:
 - 1. Dimensions and manufacturer's technical data on features, performance, electrical characteristics, and ratings.
 - 2. Let-through current curves for fuses with current-limiting characteristics.
 - 3. Time-current curves, coordination charts and tables, and related data.
 - 4. Fuse size for elevator feeders and elevator disconnect switches.
- B. Ambient Temperature Adjustment Information. If ratings of fuses have been adjusted to accommodate ambient temperatures, provide list of fuses adjusted.
 - 1. For each adjusted fuse, include location of fuse, original fuse rating, local ambient temperature, and adjusted fuse rating.
 - 2. Provide manufacturer's technical data on which ambient temperature adjustment calculations are based.
- C. Maintenance Data: For tripping devices to include in maintenance manuals specified in Division 1.

1.4 QUALITY ASSURANCE

- A. Source Limitations: Provide fuses from a single manufacturer.
- B. Electrical Components, Devices, and Accessories: Listed and labeled as defined in NFPA 70, Article 100, by a testing agency acceptable to authorities having jurisdiction, and marked for intended use.
- C. Comply with NEMA FU 1.
- D. Comply with NFPA 70.

1.5 PROJECT CONDITIONS

- A. Where ambient temperature to which fuses are directly exposed is less than 40 deg F or more than 100 deg F, apply manufacturer's ambient temperature adjustment factors to fuse ratings.

1.6 COORDINATION

- A. Coordinate fuse ratings with HVAC and refrigeration equipment nameplate limitations of maximum fuse size.

1.7 EXTRA MATERIALS

- A. Furnish extra materials described below that match products installed and that are packaged in original cartons or containers and identified with labels describing contents.
 - 1. Fuses: Quantity equal to 10 percent of each fuse type and size, but not fewer than 1 of each type and size.

PART 2 - PRODUCTS

2.1 MANUFACTURERS

- A. Manufacturers: Subject to compliance with requirements, provide products by one of the following:
 - 1. Cooper Industries, Inc.; Bussmann Div.
 - 2. General Electric Co.; Wiring Devices Div.
 - 3. Gould Shawmut.

2.2 CARTRIDGE FUSES

- A. Characteristics: NEMA FU 1, nonrenewable cartridge fuse; class and current rating indicated; voltage rating consistent with circuit voltage.

PART 3 - EXECUTION

3.1 EXAMINATION

- A. Examine utilization equipment nameplates and installation instructions. Install fuses of sizes and with characteristics appropriate for each piece of equipment.
- B. Evaluate ambient temperatures to determine if fuse rating adjustment factors must be applied to fuse ratings.
- C. Proceed with installation only after unsatisfactory conditions have been corrected.

3.2 FUSE APPLICATIONS

- A. Motor Branch Circuits: Class RK1, time delay.
- B. Other Branch Circuits: Class RK1, time delay.
- C. Plug-in Bus Disconnects: Class J fuses.

3.3 INSTALLATION

- A. Install fuses in fusible devices. Arrange fuses so rating information is readable without removing fuse.

3.4 IDENTIFICATION

- A. Install labels indicating fuse replacement information on inside door of each fused switch.

END OF SECTION 262813

SECTION 265100 - INTERIOR LIGHTING

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

- A. Drawings and general provisions of the Contract, including General and Supplementary Conditions and Division 1 Specification Sections, apply to this Section.

1.2 SUMMARY

- A. This Section includes the following:
1. Interior lighting fixtures with LED lamps.
 2. Lighting fixtures mounted on exterior building surfaces.
 3. Exit signs.
 4. Accessories.
- B. Related Sections include the following:
1. Division 26 Section "Lighting Control Devices" for automatic control of lighting, including time switches, photoelectric relays, occupancy sensors and manual wall-box dimmers for LED fixtures.

1.3 DEFINITIONS

- A. CRI: Color rendering index.
- B. CU: Coefficient of utilization.
- C. Luminaire: Complete lighting fixture, including ballast housing if provided.
- D. LER: Luminaire efficiency rating, which is calculated according to NEMA LE 5. This value can be estimated from photometric data using the following formula:
1. LER is equal to the product of total rated lamp lumens times BF times luminaire efficiency, divided by input watts.
- E. RCR: Room cavity ratio.

1.4 SUBMITTALS

- A. Product Data: For each type of lighting fixture indicated, arranged in order of fixture designation. All lighting fixture types shall be submitted in a single complete brochure, at the same time, which shall be in the form of a soft cover binder with each fixture separated by an identified index tab. Information on each fixture shall include data on features, accessories, and the following:
1. Physical description of fixture, including dimensions and verification of indicated parameters.
 2. Fluorescent and high-intensity-discharge ballasts.
 3. Lamps.
- B. Shop Drawings: Show details of nonstandard or custom fixtures. Indicate dimensions, weights, methods of field assembly, components, features, and accessories.
- C. Coordination Drawings: Reflected ceiling plan(s) and other details, drawn to scale, on which the following items are shown and coordinated with each other, based on input from installers of the items involved:
1. Lighting fixtures.

2. Suspended ceiling components.
 3. Structural members to which suspension systems for lighting fixtures will be attached.
 4. Other items in finished ceiling including the following:
 - a. Air outlets and inlets.
 - b. Speakers.
 - c. Sprinklers.
 - d. Smoke and fire detectors.
 - e. Occupancy sensors.
 - f. Access panels.
 5. Perimeter moldings.
- B. All submittals of NON-SPECIFIED fixtures must include documentation or they will be automatically rejected.
- C. Wiring Diagrams: Power, signal, and control wiring.
- D. Samples for Verification:
- a. For interior lighting fixtures designated for sample submission in the Interior Lighting Fixture Schedule.
 - 1) Lamps: Specified units installed.
 - 2) Ballast: 120-V models of specified ballast types.
 - 3) Accessories: Cords and plugs.
 - b. Substitution fixtures as requested by the engineer at time of submittal.
 - 1) Lamps: Specified units installed.
 - 2) Ballast: 120-V models of specified ballast types.
 - 3) Accessories: Cords and plugs.
 - c. Paint sample for light poles and associated luminaires.
- E. Product Certificates: For each type of ballast for dimmer-controlled fixtures, signed by product manufacturer.
- F. Source quality-control test reports.
- G. Field quality-control test reports.
- H. Operation and Maintenance Data: For lighting equipment and fixtures to include in emergency, operation, and maintenance manuals. In addition to items specified in Division 1 Section Closeout Procedures include the following:
1. Catalog data for each fixture. Include the diffuser, ballast, and lamps installed in that fixture.
- I. Warranties: Special warranties specified in this Section.
- J. Submittals that fail to comply with the above requirements will automatically be rejected.
- K. It is the Contractor's responsibility to provide submittals in an organized and timely manner in order so as not to delay the project schedule and hamper the work of other trades.
- L. All submittals of NON-SPECIFIED equipment and components will be reviewed. It is the submitting Contractor's responsibility to prove compliance and not the Architect/Engineer to prove non-compliance. The submitting Contractor will be charged the prevailing wage of the reviewing Engineer for all submittals requiring over one (1) hour to review that were not originally specified.

1.5 QUALITY ASSURANCE

- A. Testing Agency Qualifications: An independent agency, with the experience and capability to conduct the testing indicated, that is a member company of the InterNational Electrical Testing Association or is a nationally recognized testing laboratory (NRTL) as defined by OSHA in 29 CFR 1910.7, and that is acceptable to authorities having jurisdiction.
1. Testing Agency's Field Supervisor: Person currently certified by the InterNational Electrical Testing Association or the National Institute for Certification in Engineering Technologies to supervise on-site testing specified in Part 3.
- N. Electrical Components, Devices, and Accessories: Listed and labeled as defined in NFPA 70, Article 100, by a testing agency acceptable to authorities having jurisdiction, and marked for intended use.
- O. Luminaire Photometric Data Testing Laboratory Qualifications: Provided by manufacturers' laboratories that are accredited under the National Volunteer Laboratory Accreditation Program for Energy Efficient Lighting Products.
- P. Comply with NFPA 70.
- Q. NFPA 101 Compliance: Comply with visibility and luminance requirements for exit signs.

1.6 COORDINATION

- A. Coordinate layout and installation of lighting fixtures and suspension system with other construction that penetrates ceilings or is supported by them, including HVAC equipment, fire-suppression system, and partition assemblies.

1.7 EXTRA MATERIALS

- A. Furnish extra materials described below that match products installed and that are packaged with protective covering for storage and identified with labels describing contents.
1. Plastic Diffusers and Lenses: 1 for every 100 of each type and rating installed. Furnish at least one of each type.

PART 2 - PRODUCTS

2.1 MANUFACTURERS

- A. Refer to Luminaire Schedule for specified products and manufacturers.
1. Basis-of-Design Product: The design for each lighting fixture is based on the product named. Subject to compliance with requirements, provide either the named product or a product of equal performance and construction.
 2. Non specified products will be subject to possible request of point by point calculations and samples for comparison.

2.2 FIXTURES AND COMPONENTS, GENERAL

- A. Recessed Fixtures: Comply with NEMA LE 4 for ceiling compatibility for recessed fixtures.
- B. Metal Parts: Free of burrs and sharp corners and edges.
- C. Sheet Metal Components: Steel, unless otherwise indicated. Form and support to prevent warping and sagging.

- D. Doors, Frames, and Other Internal Access: Smooth operating, free of light leakage under operating conditions, and designed to permit relamping without use of tools. Designed to prevent doors, frames, lenses, diffusers, and other components from falling accidentally during relamping and when secured in operating position.
- E. Reflecting surfaces shall have minimum reflectance as follows, unless otherwise indicated:
 - 1. White Surfaces: 85 percent.
 - 2. Specular Surfaces: 83 percent.
 - 3. Diffusing Specular Surfaces: 75 percent.
 - 4. Laminated Silver Metallized Film: 90 percent.
- F. Plastic Diffusers, Covers, and Globes:
 - 1. Acrylic Lighting Diffusers: 100 percent virgin acrylic plastic. High resistance to yellowing and other changes due to aging, exposure to heat, and UV radiation.
 - a. Lens Thickness: At least 0.125 inch minimum unless different thickness is scheduled.
 - b. UV stabilized.
 - 2. Glass: Annealed crystal glass, unless otherwise indicated.
 - 3. All fixture lenses shall meet ASTM E-84, maximum smoke developed of 450 and ASTM E-635, maximum burn rate of 2.5 inches per minute.
- G. Electromagnetic-Interference Filters: A component of fixture assembly. Suppress conducted electromagnetic-interference as required by MIL-STD-461D. Fabricate lighting fixtures with one filter on each ballast indicated to require a filter.

2.3 EXIT SIGNS

- A. General: Comply with UL 924; for sign colors and lettering size, comply with authorities having jurisdiction.
- B. Die-cast aluminum housing and canopy.
- C. Universal snap-out directional arrows as required.
- D. Single and double face housing as required.
- E. Universal mounting with canopy.
- F. Internally Lighted Signs:
 - 1. Lamps for AC Operation: White, light-emitting diodes, 70,000 hours minimum of rated lamp life.
- G. Self-Powered Exit Signs (Battery Type): Integral automatic charger in a self-contained power pack.
 - 1. Battery: Sealed, maintenance-free, nickel-cadmium type with special warranty. Battery to deliver 90-minute minimum capacity to fixture.
 - 2. Charger: Fully automatic, solid-state type with sealed transfer relay.
 - 3. Operation: Relay automatically energizes lamp from battery when circuit voltage drops to 80 percent of nominal voltage or below. When normal voltage is restored, relay disconnects lamps from battery, and battery is automatically recharged and floated on charger.

2.4 LED SOURCES

- A. LEDs to meet LM-80 performance for 50,000 hours
- B. High efficiency driver

- C. Standard full range dimming on troffers.
- D. 5-year warranty of entire fixture including fixture construction and LED light engine driver.
- E. LED lamp minimum CRI of 82
- F. Fixture tested in accordance with IESNA LM-79.

2.8 FIXTURE SUPPORT COMPONENTS

- G. Comply with Division 26 Section "Hangers and Supports for Electrical Systems" for channel- and angle-iron supports, and nonmetallic channel and angle supports.
- H. Single-Stem Hangers: 1/2-inch steel tubing with swivel ball fittings and ceiling canopy. Finish same as fixture.
- I. Twin-Stem Hangers: Two, 1/2-inch steel tubes with single canopy designed to mount a single fixture. Finish same as fixture.
- J. Wires: ASTM A 641/A 641M, Class 3, soft temper, zinc-coated, [12 gage].
- K. Wires For Humid Spaces: ASTM A 580/A 580M, Composition 302 or 304, annealed stainless steel, 12 gage.
- L. Rod Hangers: 3/16-inch- minimum diameter, cadmium-plated, threaded steel rod.
- M. Hook Hangers: Integrated assembly matched to fixture and line voltage and equipped with threaded attachment, cord, and locking-type plug.
- N. Aircraft Cable Support: Use cable, anchorages, and intermediate supports recommended by fixture manufacturer.

2.9 FINISHES

- O. Fixtures: Manufacturers' standard, unless otherwise indicated.
 - 1. Paint Finish: Applied over corrosion-resistant treatment or primer, free of defects.
 - 2. Metallic Finish: Corrosion resistant.

2.10 SOURCE QUALITY CONTROL

- P. Provide services of a qualified, independent testing and inspecting agency to factory test fixtures with ballasts and lamps; certify results for electrical ratings and photometric data.
- Q. Factory test fixtures with ballasts and lamps; certify results for electrical ratings and photometric data.

PART 3 - EXECUTION

3.1 INSTALLATION

- A. Fixtures: Set level, plumb, and square with ceilings and walls. Install lamps in each fixture.
- B. Support for Fixtures in or on Grid-Type Suspended Ceilings: Complete all of the following:
 - 1. Install a minimum of two ceiling support system rods or wires for each fixture. Locate not more than 6 inches from fixture corners. Wire or rod shall have breaking strength of the weight of fixture at a safety factor of 3 and be supported by building steel (not ceiling system grid supports).
 - 2. Support Clips: Fasten to fixtures and to ceiling grid members at or near each fixture corner with clips that are UL listed for the application.

3. Fixtures of Sizes Less Than Ceiling Grid: Install as indicated on reflected ceiling plans or center in acoustical panel, and support fixtures independently with at least two 3/4-inch metal channels spanning and secured to ceiling tees.
- C. Suspended Fixture Support: As follows:
 1. Pendants and Rods: Where longer than 48 inches, brace to limit swinging.
 2. Stem-Mounted, Single-Unit Fixtures: Suspend with twin-stem hangers.
 3. Continuous Rows: Use tubing or stem for wiring at one point and tubing or rod for suspension for each unit length of fixture chassis, including one at each end.
 4. Continuous Rows: Suspend from cable.
- D. Adjust aimable fixtures to provide required light intensities.

3.2 CONNECTIONS

- A. Tighten electrical connectors and terminals according to manufacturer's published torque-tightening values. If manufacturer's torque values are not indicated, use those specified in UL 486A and UL 486B.

3.3 FIELD QUALITY CONTROL

- A. Inspect each installed fixture for damage. Replace damaged fixtures and components.
- B. Verify normal operation of each fixture after installation.
- C. Test for Emergency Lighting: Interrupt power supply to demonstrate proper operation. Verify normal transfer to battery power source and retransfer to normal.
- D. Prepare a written report of tests, inspections, observations, and verifications indicating and interpreting results. If adjustments are made to lighting system, retest to demonstrate compliance with standards.
- E. Corroded Fixtures: During warranty period, replace fixtures that show any signs of corrosion.

END OF SECTION 265100

SECTION 270000 – COMMUNICATIONS INSTALLATION OVERVIEW

PART 1 - INSTALLATION OVERVIEW

1.1 SUMMARY

- A. This project encompasses the installation of high capacity cabling backbone and associated hardware to support high-bandwidth communications.

1.2 THE COMPONENTS ASSOCIATED WITH THIS PROJECT ARE:

- A. Conduit and Wiremold will be used to provide a protected pathway for all cables routed or installed in an exposed environment. The pathways for this project are included in the Division 26000 series of specifications.
- B. CAT6, twisted pair cabling will be home run between each telephone and data drop location to the nearest associated telecom closet.

1.3 RELATED SECTIONS

- A. Drawings and general provisions of contract, including General and Supplementary conditions and Division 1 Specifications sections, apply to work in this section.

PART 2 - INSTALLATION PROCESS

2.1 INSTALLATION OF CONDUIT AND WIREMOLD

- A. Unless otherwise stated on drawings, Electrical Contractor under Division 26 of this specification is to provide and install conduit and/or Wiremold in all situations where cabling exits ceiling cavities. All proposed cable routes and drop locations are approximate and should be verified by the contractor. Cable lengths indicated are approximate. It is the contractor responsibility to verify cable distances prior to cutting and routing of cables. It is the contractor responsibility to verify locations and quantities of drops.
- B. All vertical cable runs between floors will be routed in conduit unless installed in a designated wiring closet, existing ceiling cavity, or specified differently. Vertical conduit runs shall be floor to ceiling or terminate in drop ceiling cavities. In all locations, penetration into the corridor ceiling cavities will be continuous and require the replacement of fire stop materials.
- C. All core drills that are required shall be provided by the electrical contractor, unless otherwise noted. It is the responsibility of the contractor to verify locations with school officials prior to drilling and to fire stop in accordance with local and state codes.

PART 3 - EXECUTION

3.1 CABLING

- A. All cables shall be routed in accordance with state and local codes and regulations. All cables installed and terminated shall follow the guidelines set forth by the manufacturer.
 - 1. When routing cables through ceiling cavities all cables shall be supported by bridal rings in a bundled manor and shall not be supported or rest on drop ceiling components. Cables shall be

neatly swept and bundled. The maximum allowable cable sag between supports will be 6 inches as measured vertically. All cable will be run to deck height while in ceiling cavities and fastened to roof supports or the bottom of the deck.

B. Drop locations

1. Drop locations and types are as specified on the associated drawings. All locations are approximate and should be verified with district personnel prior to implementation.

3.2 LABELING

- A. All cables are to be labeled at both the origination and termination locations using as specified a permanent alpha numeric cabling system. Cables shall be labeled at all junction points where a single continuous cable is not used, such as in a splice panel or Demarc.
- B. Each faceplate shall have identification, which includes the cable number, and drop number if more than one of the same type of drop is installed in the room.
- C. Testing
 1. CAT6 cables will be tested as per manufacturers' criteria, EIA/TIA and test specifications identified in this design.

PART 4 - COMPLETION

4.1 PROJECT COMPLETION

- A. All documentation will be completed as specified. All cabling will be neat and secure.
- B. Passing of data from each drop location will be done as specified, in conjunction with Owner. Refer to testing in the general specification section.
- C. All facilities such as walls, ceilings etc., shall be restored to as found or better condition. All fire barriers breached shall be restored / sealed as to local, state and federal codes.
- D. The removal of any construction or installation debris as a result of this project.
- E. The Owner is to be consulted on any alterations of wiring closets, riser locations, and drop locations as required. Should conflicts between this design and the actual install or should any unforeseen circumstance occur during installation the contractor shall consult immediately with an authorized agent of the Owner.

END OF SECTION 270000

SECTION 271513 - COMMUNICATIONS COPPER HORIZONTAL CABLING

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

- A. Drawings and general provisions of the Contract, including General and Supplementary Conditions and Division 01 Specification Sections, apply to this Section.

1.2 SUMMARY

- A. Section Includes:
 - 1. Category 6 twisted pair cable.
 - 2. Twisted pair cable hardware, including plugs and jacks.
 - 3. Cabling identification products.
 - 4. Grounding provisions for twisted pair cable.
 - 5. Source quality control requirements for twisted pair cable.

1.3 DEFINITIONS

- A. Cross-Connect: A facility enabling the termination of cable elements and their interconnection or cross-connection.
- B. EMI: Electromagnetic interference.
- C. FTP: Shielded twisted pair.
- D. F/FTP: Overall foil screened cable with foil screened twisted pair.
- E. F/UTP: Overall foil screened cable with unscreened twisted pair.
- F. IDC: Insulation displacement connector.
- G. LAN: Local area network.
- H. Jack: Also commonly called an "outlet," it is the fixed, female connector.
- I. Plug: Also commonly called a "connector," it is the removable, male telecommunications connector.
- J. RCDD: Registered Communications Distribution Designer.
- K. Screen: A metallic layer, either a foil or braid, placed around a pair or group of conductors.
- L. Shield: A metallic layer, either a foil or braid, placed around a pair or group of conductors.
- M. S/FTP: Overall braid screened cable with foil screened twisted pair.

- N. S/UTP: Overall braid screened cable with unscreened twisted pairs.
- O. UTP: Unscreened (unshielded) twisted pair.

1.4 COPPER HORIZONTAL CABLING DESCRIPTION

- A. Horizontal cable cabling system shall provide interconnections between Distributor A, Distributor B, or Distributor C, and the equipment outlet, otherwise known as "Cabling Subsystem 1," in the telecommunications cabling system structure. Cabling system consists of horizontal cables, intermediate and main cross-connects, mechanical terminations, and patch cords or jumpers used for horizontal-to-horizontal cross-connection.
 - 1. TIA-568-C.1 requires that a minimum of two equipment outlets be installed for each work area.
 - 2. Horizontal cabling shall contain no more than one transition point or consolidation point between the horizontal cross-connect and the telecommunications equipment outlet.
 - 3. Bridged taps and splices shall not be installed in the horizontal cabling.
- B. A work area is approximately 100 sq. ft., and includes the components that extend from the equipment outlets to the station equipment.
- C. The maximum allowable horizontal cable length is 295 feet. This maximum allowable length does not include an allowance for the length of 16 feet to the workstation equipment or in the horizontal cross-connect.

1.5 ACTION SUBMITTALS

- A. Product Data: For each type of product.
- B. Shop Drawings: Reviewed and stamped by RCDD.
 - 1. System Labeling Schedules: Electronic copy of labeling schedules, in software and format selected by Owner.
 - 2. System Labeling Schedules: Electronic copy of labeling schedules that are part of the cabling and asset identification system of the software.
 - 3. Cabling administration Drawings and printouts.
 - 4. Wiring diagrams and installation details of telecommunications equipment, to show location and layout of telecommunications equipment, including the following:
 - a. Telecommunications rooms plans and elevations.
 - b. Telecommunications pathways.
 - c. Telecommunications system access points.
 - d. Telecommunications grounding system.
 - e. Telecommunications conductor drop locations.
 - f. Typical telecommunications details.
 - g. Mechanical, electrical, and plumbing systems.
- C. Twisted pair cable testing plan.

1.6 INFORMATIONAL SUBMITTALS

- A. Qualification Data: For RCDD, Installer, installation supervisor, and field inspector.
- B. Product Certificates: For each type of product.
- C. Source quality-control reports.
- D. Field quality-control reports.

1.7 CLOSEOUT SUBMITTALS

- A. Maintenance Data: For splices and connectors to include in maintenance manuals.
- B. Software and Firmware Operational Documentation:
 - 1. Software operating and upgrade manuals.
 - 2. Program Software Backup: On USB media or compact disk, complete with data files.
 - 3. Device address list.
 - 4. Printout of software application and graphic screens.

1.8 MAINTENANCE MATERIAL SUBMITTALS

- A. Furnish extra materials that match products installed and that are packaged with protective covering for storage and identified with labels describing contents.
 - 1. Connecting Blocks: One of each type.
 - 2. Faceplates: One of each type.
 - 3. Jacks: Ten of each type.
 - 4. Patch-Panel Units: One of each type.
 - 5. Plugs: Ten of each type.

1.9 QUALITY ASSURANCE

- A. Installer Qualifications: Cabling Installer must have personnel certified by BICSI on staff.
 - 1. Layout Responsibility: Preparation of Shop Drawings, cabling administration Drawings, and field testing program development by an RCDD.
 - 2. Installation Supervision: Installation shall be under the direct supervision of Level 2 Installer, who shall be present at all times when Work of this Section is performed at Project site.
 - 3. Testing Supervisor: Currently certified by BICSI as an RCDD to supervise on-site testing.
- B. Testing Agency Qualifications: Testing agency must have personnel certified by BICSI on staff.
 - 1. Testing Agency's Field Supervisor: Currently certified by BICSI as an RCDD.

1.10 DELIVERY, STORAGE, AND HANDLING

- A. Test cables upon receipt at Project site.
 - 1. Test each pair of twisted pair cable for open and short circuits.

1.11 PROJECT CONDITIONS

- A. Environmental Limitations: Do not deliver or install cables and connecting materials until wet work in spaces is complete and dry, and temporary HVAC system is operating and maintaining ambient temperature and humidity conditions at occupancy levels during the remainder of the construction period.

1.12 COORDINATION

- A. Coordinate layout and installation of telecommunications pathways and cabling with Owner's telecommunications and LAN equipment and service suppliers.

1.13 SOFTWARE SERVICE AGREEMENT

- A. Technical Support: Beginning with Substantial Completion, provide software support for two years.
- B. Upgrade Service: Update software to latest version at Project completion. Install and program software upgrades that become available within two years from date of Substantial Completion. Upgrading software shall include operating system. Upgrade shall include new or revised licenses for use of software.
 - 1. Provide 30 days' notice to Owner to allow scheduling and access to system and to allow Owner to upgrade computer equipment if necessary.

PART 2 - PRODUCTS

2.1 PERFORMANCE REQUIREMENTS

- A. General Performance: Horizontal cabling system shall comply with transmission standards in TIA-568-C.1, when tested according to test procedures of this standard.
- B. Telecommunications Pathways and Spaces: Comply with TIA-569-D.
- C. Grounding: Comply with TIA-607-B.

2.2 GENERAL CABLE CHARACTERISTICS

- A. Listed and labeled by an NRTL acceptable to authorities having jurisdiction as complying with the applicable standard and NFPA 70 for the following types:

1. Communications, Plenum Rated: Type CMP complying with UL 1685 or Type CMP in listed plenum communications raceway.
 2. Communications, Plenum Rated: Type CM, Type CMG, Type CMP, Type CMR, or Type CMX in metallic conduit installed according to NFPA 70, Article 300.22, "Wiring in Ducts, Plenums, and Other Air-Handling Spaces."
 3. Communications, Non-plenum: Type CMR complying with UL 1666 and ICEA S-103-701.
 4. Communications, Non-plenum: Type CMP or Type CMR in listed plenum or riser communications raceway.
 5. Communications, Non-plenum: Type CMP or Type CMR in metallic conduit installed according to NFPA 70, Article 300.22, "Wiring in Ducts, Plenums, and Other Air-Handling Spaces."
- B. Surface-Burning Characteristics: Comply with ASTM E84; testing by a qualified testing agency. Identify products with appropriate markings of applicable testing agency.
1. Flame-Spread Index: 25 or less.
 2. Smoke-Developed Index: 50 or less.
- C. RoHS compliant.

2.3 CATEGORY 6 TWISTED PAIR CABLE

- A. Description: Four-pair, balanced-twisted pair cable, with internal spline, certified to meet transmission characteristics of Category 6 cable at frequencies up to 250MHz.
- B. Manufacturers: Subject to compliance with requirements, available manufacturers offering products that may be incorporated into the Work include, but are not limited to the following:
1. Belden CDT Networking Division/NORDX.
 2. Berk-Tek Leviton; a Nexans/Leviton alliance.
 3. CommScope, Inc.
 4. General Cable; General Cable Corporation.
 5. Hitachi Cable America Inc.
 6. Mohawk; a division of Belden Networking, Inc.
- C. Standard: Comply with NEMA WC 66/ICEA S-116-732 and TIA-568-C.2 for Category 6 cables.
- D. Conductors: 100-ohm, 23 AWG solid copper.
- E. Shielding/Screening: Unshielded twisted pairs (UTP).
- F. Cable Rating: Riser.
- G. Jacket: Blue thermoplastic.

2.4 TWISTED PAIR CABLE HARDWARE

- A. Description: Hardware designed to connect, splice, and terminate twisted pair copper communications cable.
- B. Manufacturers: Subject to compliance with requirements, available manufacturers offering products that may be incorporated into the Work include, but are not limited to the following:
 - 1. Belden CDT Networking Division/NORDX.
 - 2. Berk-Tek Leviton; a Nexans/Leviton alliance.
 - 3. CommScope, Inc.
 - 4. General Cable; General Cable Corporation.
 - 5. Hubbell Premise Wiring.
 - 6. Leviton Manufacturing Co., Inc.
 - 7. Mohawk; a division of Belden Networking, Inc.
 - 8. Panduit Corp.
- C. General Requirements for Twisted Pair Cable Hardware:
 - 1. Comply with the performance requirements of Category 6.
 - 2. Comply with TIA-568-C.2, IDC type, with modules designed for punch-down caps or tools.
 - 3. Cables shall be terminated with connecting hardware of same category or higher.
- D. Source Limitations: Obtain twisted pair cable hardware from single source from single manufacturer.
- E. Connecting Blocks:
 - 1. 110-style IDC for Category 6.
- F. Cross-Connect: Modular array of connecting blocks arranged to terminate building cables and permit interconnection between cables.
 - 1. Number of Terminals per Field: One for each conductor in assigned cables.
- G. Patch Panel: Modular panels housing numbered jack units with IDC-type connectors at each jack location for permanent termination of pair groups of installed cables.
 - 1. Features:
 - a. Universal T568A and T568B wiring labels.
 - b. Labeling areas adjacent to conductors.
 - c. Replaceable connectors.
 - d. 24 or 48 ports.
 - 2. Construction: 16-gauge steel and mountable on 19-inch equipment racks.
 - 3. Number of Jacks per Field: One for each four-pair cable indicated.
- H. Patch Cords: Factory-made, four-pair cables in 48-inch lengths; terminated with an eight-position modular plug at each end.

1. Patch cords shall have bend-relief-compliant boots and color-coded icons to ensure performance. Patch cords shall have latch guards to protect against snagging.
2. Patch cords shall have color-coded boots for circuit identification.

I. Plugs and Plug Assemblies:

1. Male; eight position; color-coded modular telecommunications connector designed for termination of a single four-pair, 100-ohm, unshielded or shielded twisted pair cable.
2. Standard: Comply with TIA-568-C.2.
3. Marked to indicate transmission performance.

J. Jacks and Jack Assemblies:

1. Female; eight position; modular; fixed telecommunications connector designed for termination of a single four-pair, 100-ohm, unshielded or shielded twisted pair cable.
2. Designed to snap-in to a patch panel or faceplate.
3. Standard: Comply with TIA-568-C.2.
4. Marked to indicate transmission performance.

K. Faceplate:

1. Two port, vertical single gang faceplates designed to mount to single gang wall boxes.
2. Plastic Faceplate: High-impact plastic. Coordinate color with Section 262726 "Wiring Devices."
3. Metal Faceplate: Stainless steel, complying with requirements in Section 262726 "Wiring Devices."
4. For use with snap-in jacks accommodating any combination of twisted pair, optical fiber, and coaxial work area cords.
 - a. Flush mounting jacks, positioning the cord at a 45-degree angle.

L. Legend:

1. Machine printed, in the field, using adhesive-tape label.
2. Snap-in, clear-label covers and machine-printed paper inserts.

2.5 IDENTIFICATION PRODUCTS

- A. Comply with TIA-606-B and UL 969 for a system of labeling materials, including label stocks, laminating adhesives, and inks used by label printers.

2.6 GROUNDING

- A. Comply with requirements in Section 270526 "Grounding and Bonding for Communications Systems" for grounding conductors and connectors.
- B. Comply with TIA-607-B.

2.7 SOURCE QUALITY CONTROL

- A. Testing Agency: Engage a qualified testing agency to evaluate cables.
- B. Factory test cables on reels according to TIA-568-C.1.
- C. Factory test twisted pair cables according to TIA-568-C.2.
- D. Cable will be considered defective if it does not pass tests and inspections.
- E. Prepare test and inspection reports.

PART 3 - EXECUTION

3.1 WIRING METHODS

- A. Wiring Method: Install cables in raceways and cable trays, except within consoles, cabinets, desks, and counters. Conceal raceway and cables, except in unfinished spaces.
 - 1. Install plenum cable in environmental air spaces, including plenum ceilings.
 - 2. Comply with requirements for raceways and boxes specified in Section 270528 "Pathways for Communications Systems."
- B. Wiring Method: Conceal conductors and cables in accessible ceilings, walls, and floors where possible.
- C. Wiring within Enclosures: Bundle, lace, and train cables within enclosures. Connect to terminal points with no excess and without exceeding manufacturer's limitations on bending radii. Provide and use lacing bars and distribution spools. Install conductors parallel with or at right angles to sides and back of enclosure.

3.2 INSTALLATION OF PATHWAYS

- A. Comply with requirements for demarcation point, cabinets, and racks specified in Section 271100 "Communications Equipment Room Fittings."
- B. Comply with Section 270528 "Pathways for Communications Systems."
- C. Comply with Section 270529 "Hangers and Supports for Communications Systems."
- D. Comply with Section 270536 "Cable Trays for Communications Systems."
- E. Drawings indicate general arrangement of pathways and fittings.

3.3 INSTALLATION OF TWISTED-PAIR HORIZONTAL CABLES

- A. Comply with NECA 1 and NECA/BICSI 568.

B. General Requirements for Cabling:

1. Comply with TIA-568-C.0, TIA-568-C.1, and TIA-568-C.2.
2. Comply with BICSI's "Information Transport Systems Installation Methods Manual (ITSIMM), Ch. 5, "Copper Structured Cabling Systems," "Cable Termination Practices" Section.
3. Install 110-style IDC termination hardware unless otherwise indicated.
4. Do not untwist twisted pair cables more than 1/2 inch from the point of termination to maintain cable geometry.
5. Terminate all conductors; no cable shall contain unterminated elements. Make terminations only at indicated outlets, terminals, cross-connects, and patch panels.
6. MUTOA shall not be used as a cross-connect point.
7. Consolidation points may be used only for making a direct connection to equipment outlets:
 - a. Do not use consolidation point as a cross-connect point, as a patch connection, or for direct connection to workstation equipment.
 - b. Locate consolidation points for twisted-pair cables at least 49 feet from communications equipment room.
8. Cables may not be spliced. Secure and support cables at intervals not exceeding 30 inches and not more than 6 inches from cabinets, boxes, fittings, outlets, racks, frames, and terminals.
9. Install lacing bars to restrain cables, prevent straining connections, and prevent bending cables to smaller radii than minimums recommended by manufacturer.
10. Bundle, lace, and train conductors to terminal points without exceeding manufacturer's limitations on bending radii, but not less than radii specified in BICSI Information Transport Systems Installation Methods Manual , Ch. 5, "Copper Structured Cabling Systems," "Cable Termination Practices" Section. Use lacing bars and distribution spools.
11. Do not install bruised, kinked, scored, deformed, or abraded cable. Do not splice cable between termination, tap, or junction points. Remove and discard cable if damaged during installation, and replace it with new cable.
12. Cold-Weather Installation: Bring cable to room temperature before dereeling. Heat lamps shall not be used for heating.
13. In the communications equipment room, install a 10-foot-long service loop on each end of cable.
14. Pulling Cable: Comply with BICSI Information Transport Systems Installation Methods Manual, Ch. 5, "Copper Structured Cabling Systems," "Pulling and Installing Cable" Section. Monitor cable pull tensions.

C. Open-Cable Installation:

1. Install cabling with horizontal and vertical cable guides in telecommunications spaces with terminating hardware and interconnection equipment.
2. Suspend twisted pair cabling, not in a wireway or pathway, a minimum of 8 inches above ceilings by cable supports not more than 60 inches apart.
3. Cable shall not be run through structural members or in contact with pipes, ducts, or other potentially damaging items.

D. Group connecting hardware for cables into separate logical fields.

E. Separation from EMI Sources:

1. Comply with recommendations from BICSI's "Telecommunications Distribution Methods Manual" and TIA-569-D for separating unshielded copper communication cable from potential EMI sources, including electrical power lines and equipment.
2. Separation between open communications cables or cables in nonmetallic raceways and unshielded power conductors and electrical equipment shall be as follows:
 - a. Electrical Equipment Rating Less Than 2 kVA: A minimum of 5 inches.
 - b. Electrical Equipment Rating between 2 and 5 kVA: A minimum of 12 inches.
 - c. Electrical Equipment Rating More Than 5 kVA: A minimum of 24 inches.
3. Separation between communications cables in grounded metallic raceways and unshielded power lines or electrical equipment shall be as follows:
 - a. Electrical Equipment Rating Less Than 2 kVA: A minimum of 2-1/2 inches.
 - b. Electrical Equipment Rating between 2 and 5 kVA: A minimum of 6 inches.
 - c. Electrical Equipment Rating More Than 5 kVA: A minimum of 12 inches.
4. Separation between communications cables in grounded metallic raceways, power lines, and electrical equipment located in grounded metallic conduits or enclosures shall be as follows:
 - a. Electrical Equipment Rating Less Than 2 kVA: No requirement.
 - b. Electrical Equipment Rating between 2 and 5 kVA: A minimum of 3 inches.
 - c. Electrical Equipment Rating More Than 5 kVA: A minimum of 6 inches.
5. Separation between Communications Cables and Electrical Motors and Transformers, 5 kVA or HP and Larger: A minimum of 48 inches.
6. Separation between Communications Cables and Fluorescent Fixtures: A minimum of 5 inches.

3.4 FIRESTOPPING

- A. Comply with requirements in Section 078413 "Penetration Firestopping."
- B. Comply with TIA-569-D, Annex A, "Firestopping."
- C. Comply with "Firestopping Systems" Article in BICSI's "Telecommunications Distribution Methods Manual."

3.5 GROUNDING

- A. Install grounding according to the "Grounding, Bonding, and Electrical Protection" chapter in BICSI's "Telecommunications Distribution Methods Manual."
- B. Comply with TIA-607-B and NECA/BICSI-607.

- C. Locate grounding bus bar to minimize the length of bonding conductors. Fasten to wall, allowing at least a 2-inch clearance behind the grounding bus bar. Connect grounding bus bar to suitable electrical building ground, using a minimum No. 4 AWG grounding electrode conductor.
- D. Bond metallic equipment to the grounding bus bar, using not smaller than a No. 6 AWG equipment grounding conductor.

3.6 IDENTIFICATION

- A. Identify system components, wiring, and cabling complying with TIA-606-B. Comply with requirements for identification specified in Section 270553 "Identification for Communications Systems."
 - 1. Administration Class: Class 1.
 - 2. Color-code cross-connect fields and apply colors to voice and data service backboards, connections, covers, and labels.
- B. Paint and label colors for equipment identification shall comply with TIA-606-B for Class 2 level of administration, including optional identification requirements of this standard.
- C. Cable Schedule: Install in a prominent location in each equipment room and wiring closet. List incoming and outgoing cables and their designations, origins, and destinations. Protect with rigid frame and clear plastic cover. Furnish an electronic copy of final comprehensive schedules for Project.
- D. Cabling Administration Drawings: Show building floor plans with cabling administration-point labeling. Identify labeling convention and show labels for telecommunications closets, terminal hardware and positions, horizontal cables, work areas and workstation terminal positions, grounding buses and pathways, and equipment grounding conductors.
- E. Cable and Wire Identification:
 - 1. Label each cable within 4 inches of each termination and tap, where it is accessible in a cabinet or junction or outlet box, and elsewhere as indicated.
 - 2. Each wire connected to building-mounted devices is not required to be numbered at the device if wire color is consistent with associated wire connected and numbered within panel or cabinet.
 - 3. Exposed Cables and Cables in Cable Trays and Wire Troughs: Label each cable at intervals not exceeding 15 feet.
 - 4. Label each terminal strip, and screw terminal in each cabinet, rack, or panel.
 - a. Individually number wiring conductors connected to terminal strips, and identify each cable or wiring group, extended from a panel or cabinet to a building-mounted device, with the name and number of a particular device.
 - b. Label each unit and field within distribution racks and frames.
 - 5. Identification within Connector Fields in Equipment Rooms and Wiring Closets: Label each connector and each discrete unit of cable-terminating and -connecting hardware.

Where similar jacks and plugs are used for both voice and data communication cabling, use a different color for jacks and plugs of each service.

- F. Labels shall be preprinted or computer-printed type, with a printing area and font color that contrast with cable jacket color but still comply with TIA-606-B requirements for the following:
 - 1. Cables use flexible vinyl or polyester that flexes as cables are bent.

3.7 FIELD QUALITY CONTROL

- A. Testing Agency: Owner will engage a qualified testing agency to perform tests and inspections.
- B. Testing Agency: Engage a qualified testing agency to perform tests and inspections.
- C. Manufacturer's Field Service: Engage a factory-authorized service representative to test and inspect components, assemblies, and equipment installations, including connections.
- D. Perform tests and inspections with the assistance of a factory-authorized service representative.
- E. Tests and Inspections:
 - 1. Visually inspect jacket materials for NRTL certification markings. Inspect cabling terminations in communications equipment rooms for compliance with color-coding for pin assignments, and inspect cabling connections for compliance with TIA-568-C.1.
 - 2. Visually inspect cable placement, cable termination, grounding and bonding, equipment and patch cords, and labeling of all components.
 - 3. Test twisted pair cabling for DC loop resistance, shorts, opens, intermittent faults, and polarity between conductors. Test operation of shorting bars in connection blocks. Test cables after termination but not cross-connection.
 - a. Test instruments shall meet or exceed applicable requirements in TIA-568-C.2. Perform tests with a tester that complies with performance requirements in "Test Instruments (Normative)" Annex, complying with measurement accuracy specified in "Measurement Accuracy (Informative)" Annex. Use only test cords and adapters that are qualified by test equipment manufacturer for channel or link test configuration.
- F. Data for each measurement shall be documented. Data for submittals shall be printed in a summary report that is formatted similarly to Table 10.1 in BICSI's "Telecommunications Distribution Methods Manual," or shall be transferred from the instrument to the computer, saved as text files, printed, and submitted.
- G. Remove and replace cabling where test results indicate that they do not comply with specified requirements.
- H. End-to-end cabling will be considered defective if it does not pass tests and inspections.
- I. Prepare test and inspection reports.

3.8 SOFTWARE SERVICE AGREEMENT

- A. Technical Support: Beginning with Substantial Completion, provide software support for two years.
- B. Upgrade Service: Update software to latest version at Project completion. Install and program software upgrades that become available within two years from date of Substantial Completion. Upgrading software shall include operating system. Upgrade shall include new or revised licenses for use of software.
 - 1. Provide 30 days' notice to Owner to allow scheduling and access to system and to allow Owner to upgrade computer equipment if necessary.

END OF SECTION 271513

THIS PAGE INTENTIONALLY LEFT BLANK

SECTION 280153 – CONDUCTORS AND CABLES FOR ELECTRONIC SAFETY AND SECURITY

PART 1 - GENERAL

1.1 SUMMARY

- A. Section Includes:
 - 1. RS-232 cabling.
 - 2. RS-485 cabling.
 - 3. Fire alarm wire and cable.

1.2 QUALITY ASSURANCE

- A. Testing Agency Qualifications: An NRTL.
 - 1. Testing Agency's Field Supervisor: Currently certified by BICSI as an RCDD to supervise on-site testing.
- B. Surface-Burning Characteristics: As determined by testing identical products according to ASTM E 84 by a qualified testing agency. Identify products with appropriate markings of applicable testing agency.
 - 1. Flame-Spread Index: 25 or less.
 - 2. Smoke-Developed Index: 50 or less.
- C. Electrical Components, Devices, and Accessories: Listed and labeled as defined in NFPA 70, by a qualified testing agency, and marked for intended location and application.

PART 2 - PRODUCTS

2.1 RS-232 CABLE

- A. Standard Cable: NFPA 70, Type CM.
 - 1. Paired, 2 pairs, No. 22 AWG, stranded (7x30) tinned copper conductors.
 - 2. Polypropylene insulation.
 - 3. Individual aluminum foil-polyester tape shielded pairs with 100 percent shield coverage.
 - 4. PVC jacket.
 - 5. Pairs are cabled on common axis with No. 24 AWG, stranded (7x32) tinned copper drain wire.
 - 6. Flame Resistance: Comply with UL 1581.
- B. Plenum-Rated Cable: NFPA 70, Type CMP.
 - 1. Paired, 2 pairs, No. 22 AWG, stranded (7x30) tinned copper conductors.
 - 2. Plastic insulation.

3. Individual aluminum foil-polyester tape shielded pairs with 100 percent shield coverage.
4. Plastic jacket.
5. Pairs are cabled on common axis with No. 24 AWG, stranded (7x32) tinned copper drain wire.
6. Flame Resistance: Comply with NFPA 262.

2.2 RS-485 CABLE

A. Standard Cable: NFPA 70, Type CM or CMG.

1. Paired, 2 pairs, twisted, No. 22 AWG, stranded (7x30) tinned copper conductors.
2. PVC insulation.
3. Unshielded.
4. PVC jacket.
5. Flame Resistance: Comply with UL 1581.

B. Plenum-Rated Cable: NFPA 70, Type CMP.

1. Paired, 2 pairs, No. 22 AWG, stranded (7x30) tinned copper conductors.
2. Fluorinated ethylene propylene insulation.
3. Unshielded.
4. Fluorinated ethylene propylene jacket.
5. Flame Resistance: NFPA 262, Flame Test.

2.3 FIRE ALARM WIRE AND CABLE

A. Manufacturers: Subject to compliance with requirements, available manufacturers offering products that may be incorporated into the Work include, but are not limited to, the following:

1. Comtran Corporation.
2. Draka Cableteq USA.
3. Genesis Cable Products; Honeywell International, Inc.
4. Rockbestos-Suprenant Cable Corp.
5. West Penn Wire; a brand of Belden Inc.

B. General Wire and Cable Requirements: NRTL listed and labeled as complying with NFPA 70, Article 760.

C. Signaling Line Circuits: Twisted, shielded pair, size as recommended by system manufacturer.

1. Circuit Integrity Cable: Twisted shielded pair, NFPA 70, Article 760, Classification CI, for power-limited fire alarm signal service Type FPL. NRTL listed and labeled as complying with UL 1424 and UL 2196 for a 2-hour rating.

D. Non-Power-Limited Circuits: Solid-copper conductors with 600-V rated, 75 deg C, color-coded insulation.

1. Low-Voltage Circuits: No. 16 AWG, minimum.
2. Line-Voltage Circuits: No. 12 AWG, minimum.

3. Multiconductor Armored Cable: NFPA 70, Type MC, copper conductors, Type TFN/THHN conductor insulation, copper drain wire, copper armor with outer jacket with red identifier stripe, NTRL listed for fire alarm and cable tray installation, plenum rated, and complying with requirements in UL 2196 for a 2-hour rating.

3.0 WIRING METHOD

- A. Install wiring in metal pathways and wireways.
 1. Minimum conduit size shall be 3/4 inch. Control and data-transmission wiring shall not share conduits with other building wiring systems.
 2. Comply with requirements in Section 260529 "Hangers and Supports for Electrical Systems."
- B. Install cable, concealed in accessible ceilings, walls, and floors when possible.

3.1 FIRE ALARM WIRING INSTALLATION

- A. Comply with NECA 1 and NFPA 72.
- B. Wiring Method: Install wiring in metal pathway according to Section 260529 "Hangers and Supports for Electrical Systems."
 1. Install plenum cable in environmental air spaces, including plenum ceilings.
 2. Fire alarm circuits and equipment control wiring associated with the fire alarm system shall be installed in a dedicated pathway system. This system shall not be used for any other wire or cable.
- C. Wiring Method:
 1. Cables and pathways used for fire alarm circuits, and equipment control wiring associated with the fire alarm system, may not contain any other wire or cable.
 2. Fire-Rated Cables: Use of two-hour, fire-rated fire alarm cables, NFPA 70, Types MI and CI, is not permitted.
 3. Signaling Line Circuits: Power-limited fire alarm cables shall not be installed in the same cable or pathway as signaling line circuits.
- D. Wiring within Enclosures: Separate power-limited and non-power-limited conductors as recommended by manufacturer. Install conductors parallel with or at right angles to sides and back of the enclosure. Bundle, lace, and train conductors to terminal points with no excess. Connect conductors that are terminated, spliced, or interrupted in any enclosure associated with the fire alarm system to terminal blocks. Mark each terminal according to the system's wiring diagrams. Make all connections with approved crimp-on terminal spade lugs, pressure-type terminal blocks, or plug connectors.
- E. Cable Taps: Use numbered terminal strips in junction, pull, and outlet boxes, cabinets, or equipment enclosures where circuit connections are made.

- F. Color Coding: Color code fire alarm conductors differently from the normal building power wiring. Use one color code for alarm circuit wiring and another for supervisory circuits. Color code audible alarm-indicating circuits differently from alarm-initiating circuits. Use different colors for visible alarm-indicating devices. Paint fire alarm system junction boxes and covers red.
- G. Risers: Install at least two vertical cable risers to serve the fire alarm system. Separate risers in close proximity to each other with a minimum one-hour-rated wall, so the loss of one riser does not prevent the receipt or transmission of signals from other floors or zones.
- H. Wiring to Remote Alarm Transmitting Device: 1-inch conduit between the fire alarm control panel and the transmitter. Install number of conductors and electrical supervision for connecting wiring as needed to suit monitoring function.

3.2 CONNECTIONS

- A. Comply with requirements in Section 283111 "Digital, Addressable Fire-Alarm System" for connecting, terminating, and identifying wires and cables.

3.3 FIRESTOPPING

- A. Comply with requirements in Section 078413 "Penetration Firestopping."
- B. Comply with TIA-569-D.
- C. Comply with BICSI Information Technology Systems Installation Methods Manual.

3.4 GROUNDING

- A. For low-voltage wiring and cabling, comply with requirements in Section 260526 "Grounding and Bonding."

3.5 FIELD QUALITY CONTROL

- A. Testing Agency: Engage a qualified testing agency to perform tests and inspections.
- B. Manufacturer's Field Service: Engage a factory-authorized service representative to test and inspect components, assemblies, and equipment installations, including connections.
- C. Perform the following tests and inspections with the assistance of a factory-authorized service representative:
 - 1. Visually inspect cable placement, cable termination, grounding and bonding, equipment and patch cords, and labeling of all components.
- B. Prepare test and inspection reports.

END OF SECTION 280153

SECTION 283111 – FIRE ALARM SYSTEM

PART 1 - GENERAL

1.1 SUMMARY

- A. Work of this section includes the following: Modifications to the existing Simplex Fire Alarm System in each building. Modifications to include additional notification devices, initiating devices, addressable relays, one remote annunciator panel, support equipment, and all wiring, components, connections, and testing.

1.2 SCOPE & RELATED DOCUMENTS

- A. The work covered by this section of the specifications includes the furnishing of all labor, equipment, materials, and performance of all operations in connection with the installation of the Fire Alarm System as shown on the drawings and as herein specified.
- B. The requirements of the conditions of the Contract, Supplementary Conditions and General Requirements, apply to the work specified in this section.
- C. The complete installation is to conform to the applicable sections of NFPA-72, Local Code Requirements and National Electrical Code with particular attention to Article 760.
- D. Additionally, the entire installed system and all integrated system operations shall be within the guidelines of the SBCCI Standard Building Code.
- E. The work covered by this section of the specifications is to be coordinated with the related work as specified elsewhere under the project specifications.

1.3 QUALITY ASSURANCE

- A. Each and all items of the Fire Alarm System shall be listed as a product of a SINGLE fire alarm system manufacturer under the appropriate category by Underwriters' Laboratories, Inc. (UL), and shall bear the "U.L." label. All control equipment is to be listed under UL category UOJZ as a single control unit. Partial listing shall NOT be acceptable.
- B. The equipment and installation supervision furnished under this specification is to be provided by a manufacturer who has been engaged in production of this type (software driven) of equipment for at least ten (10) years, and has a fully-quipped service organization within thirty-five (35) miles of the installation.
- C. All control equipment must have transient protection devices to comply with UL864 requirements.
- D. In addition to the UL-UOJZ requirement mentioned above, the system controls shall be UL listed for Power Limited Applications per NEC 760. All circuits must be marked in accordance with NEC article 760.
- E. Supplier shall provide documentation that fire alarm technicians are NICET LEVEL 2 certified (minimum of 4)
- F. Suppliers' service organization must have been established in the local Tappan/Orangeburg area for a minimum of ten (10) years with ten (10) years experience on specific equipment brand supplied.

1.4 GENERAL

- A. Make all connections to the existing building system and leave the entire fire alarm system in first class operating condition.
- B. Add smoke detectors, heat detectors, carbon monoxide detectors, horns (A/V's), visuals, etc., all wiring, connections to devices, outlet boxes, junction boxes, and all other necessary material for a complete operating system.
- C. All peripheral devices shall be the standard product of a single manufacturer and shall display the manufacturer's name on each component.

PART 2 - PRODUCTS

2.1 PERIPHERAL DEVICES

- A. The Contractor shall furnish and install devices that are compatible with the existing Fire Alarm Control Panel in the building.
- B. Devices Required but not limited to:
 - 1. Manual Pull Stations
 - 2. Photoelectric Smoke Detectors
 - 3. Heat Detectors
 - 4. Smoke Duct Detectors
 - 5. Carbon Monoxide Detectors with audible base
 - 6. Remote Test Stations for Smoke Duct Detectors
 - 7. Fan Shut Down Relay Devices
 - 8. Sprinkler System Flow Monitoring Module
 - 9. Sprinkler System Tamper Switch
 - 10. Visual Alarm (Strobe) Stations
 - 11. Combination Horn/Strobe Stations
 - 12. Auxiliary contacts on devices where indicated on drawings.
 - 13. Monitor Modules
 - 14. Heat/Smoke Detector Bases
 - 15. Intelligent Relay Bases
 - 16. Control Relay Modules
 - 17. Magnetic door hold opens
 - 18. Addressable Relay Modules
 - 19. NAC panel and 120v power as required for a complete operating system.
 - 20. Flush mounted remote annunciator panel.

PART 3 - EXECUTION

3.1 INSTALLATION

- A. Provide and install the system in accordance with the plans and specifications, all applicable codes and the manufacturer's recommendations. All wiring shall be installed in strict compliance with all the provisions of NEC - Article 760 A and C, Power-Limited Fire Protective Signaling Circuits or if required may be reclassified as non-power limited and wired in accordance with NEC-Article 760 A and B. Upon completion, the contractor shall so certify in writing to the owner and general contractor.
- B. All junction boxes shall be sprayed red and labeled "Fire Alarm". Wiring color code shall be maintained throughout the installation.

- C. Installation of equipment and devices that pertain to other work in the contract shall be closely coordinated with the appropriate subcontractors.
- D. The contractor shall clean all dirt and debris from the inside and the outside of the fire alarm equipment after completion of the installation.
- E. The manufacturer's authorized representative shall provide on-site supervision of installation.

3.2 TESTING

- A. The completed fire alarm system shall be fully tested in accordance with NFPA-72H by the contractor in the presence of the owner's representative and the Local Fire Marshal. Upon completion of a successful test, the contractor shall certify in writing to the owner and general contractor.

3.3 WARRANTY

- A. The contractor shall warrant the completed fire alarm system wiring and equipment to be free from inherent mechanical and electrical defects for a period of one (1) year from the date of the completed and certified test or from the date of first beneficial use

END OF SECTION 283111

