Volume 1 of 1

BID ISSUANCE: JANUARY 14, 2025

PROJECT MANUAL

Nanuet Union Free School District

Nanuet Bond Projects Phase **5**

101 Church Street, Nanuet, NY 10954

SED Control Numbers:

Highview Elementary School: 50-01-08-03-0-002-020
Barr Middle School: 50-01-08-03-0-004-022
Miller Elementary School: 50-01-08-03-0-001-026
Maintenance Building: 50-01-08-03-7-007-002
Outdoor Education Center: 50-01-08-03-7-012-004

Architect: KSQ Design dba KSQ Architects P.C. 215 West 40th Street, 15th Floor New York, NY 10018 T. 646.435.0660	**MEP Engineer:** Sage Engineering Associates, LLP 9 Columbia Circle Albany, NY 12203 T. 518.453.6091
Structural Engineer: Clapper Structural Engineering 160 Partition Street Saugerties, NY 12477 T. 845.943.9601	**Environmental Engineer:** Quest Environmental Solutions 1376 Route 9 Wappingers Falls, NY 12590 T. 845.298.6251
Construction Manager: Jacobs One Penn Plaza 24th Floor, Suite 2400 New York, NY 10119 T. 646.908.6550	**Owner:** Nanuet Union Free School District 101 Church Street Nanuet, NY 10308 T. 845.343.1481

Design conforms to applicable provisions of the New York State Uniform Fire Prevention and Building Code, New York State Energy Conservation Construction Code, and NY State Education Department Building Standards

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DIVISION 0 - BIDDING DOCUMENTS, CONTRACTS AND CONDITIONS

DIVISION 1 - GENERAL REQUIREMENTS

DIVISION 2 - EXISTING CONDITIONS

DIVISION 3 – CONCRETE

END OF SECTION 00 01 10

SECTION 00 03 00 - NOTICE TO BIDDERS

PART 1 - GENERAL

1.1 The Nanuet Union Free School District, Rockland County, NY, invites bid proposals for the following:

NUFSD Phase 5 Capital Projects:

A. Barr Middle School

1. Entrance Canopy Renovations: (GC-01 & EC-01) **(Alternate)**

B. Miller Elementary School

1. HVAC Upgrades Air Con: (Co-op Contract-not part of bid)

C. Outdoor Education Center

1. HVAC Upgrades & Interior Renovations: (GC-01 MC-01 & EC-01)
2. Exterior Sitework stairs and ramps: (GC-01)

D. Maintenance Building Renovations

1. Interior & Exterior Renovations: (GC-01, MC-01, EC-01)
2. Primary Service Upgrade: (EC-01)

E. Highview Elementary School

1. Security Vestibule Renovations: (GC-01, MC-01, EC-01)
2. Exterior Roofing, Masonry & Lintel Restoration: (Co-op Contract-not part of bid)
3. Toilet Room Renovations: (GC-01, MC-01, EC-01, PC-01)
4. Gymnatorium Renovations: (GC-01 & EC-01)
5. Door Renovations & Replacements: (GC-01 & EC-01)
6. Electrical Panel Replacements: (EC-01)

1.2 CONTRACTS:

A. Separate Prime Contracts will be let for:

1. General Construction #1 – (GC-01)
2. Mechanical Construction #1 – (MC-01)
3. Plumbing Construction #1 – (PC-01)

4. Electrical Construction #1 – (EC-01)

1.3 SCHEDULE:

A. Bidding Documents Available:

1. At **12:00 p.m. on January 14, 2025** Bidding Documents for the proposed project will be on file and publicly exhibited online at http://revplans.biddyhq.com

2. Copies of said Bidding Documents can be obtained from **Rev Plans, 28 Church Street, Unit #7, Warwick, NY 10990** or http://revplans.biddyhq.com

3. Digital Download: Bid documents can be downloaded for **Forty Nine Dollars ($49.00).** Non-refundable fee payable by credit card fromhttp://revplans.biddyhq.com .

4. Hard Copy Drawings: $ 100 refundable upon return of set in good condition. Make checks or Money Orders payable to Nanuet Union Free School District.

5. Any bidder requiring documents to be shipped shall make arrangements with the printer and pay for all packaging and shipping costs.

6. All bid addenda will be transmitted to registered plan holders via email and will be available at http://revplans.biddyhq.com. Plan holders who have paid for hard copies of the Bidding 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.

B. Pre-Bid Conference:

1. Date & Time: Tuesday, January 21, 2025 @ 1:00 PM

2. Location: Nanuet Senior High School

3. Address: 103 Church street, Nanuet, NY 10954

4. Prospective bidders are strongly encouraged to attend.

C. Bid Due Date:

1. Sealed proposals will be received as indicated below, and at that time and place will be publicly opened and read aloud in the administrative conference room. All bidders shall comply with the General Municipal Law (103).

2. Date: **Thursday, February 13, 2025**

3. Time: 1:00 PM (local time)

4. Location: Nanuet Union Free School District Business office

5. Address: 101 Church Street, Nanuet, NY, 10954

D. Request for Information:

1. All pre-bid "Request For Information" (RFI) or Clarification must be submitted NO LATER THAN **Thursday, February 6th, 2025 by 12:00pm (noon)**

E. Anticipated Award/ NTP:

1. February 27th, 2025

PART 2 - PRODUCTS (Not Applicable)

PART 3 - EXECUTION

3.1 PROVISIONS:

A. Wages to workers, laborers and mechanics employed to work on this project, shall be paid in accordance with Section 220 of the Labor Law, and in accordance with the Prevailing Rate Schedules (PRC # found in the Project Manual) and proof of such payments will be required.

B. Each bid for each Contract must be identified, in typed format, on the outside of a sealed manila envelope, with the name and address of the bidder and designated as bid for the Project titled above and appropriate Contract number and name titled above. The Nanuet Union Free School District is not responsible for bids opened prior to the bid opening if bid contract number and opening date do not appear on the envelope. Bids opened prior to date and time indicated are invalid. The bidder assumes the risk of any delay in the mail, or in the handling of the mail by employees of the Nanuet Union Free School District, as well as improper hand delivery.

C. Each proposal must be accompanied by a certified check in the sum of five percent (5%) of the amount of the bid, drawn upon a National or State Bank or Trust Company, payable to the order of the Nanuet Union Free School District, or a bond from a surety licensed to practice business in the State of New York with sufficient sureties in a penal sum equal to five percent (5%) of the bid, conditioned that if this bid is accepted, successful bidder will enter into a contract for the same and that he will execute such further security as may be required for the performance of the contract.

D. A separate Performance Bond, equal to one hundred percent (100%) of the contract amount will also be required of the successful bidders, and the bond shall be from a surety licensed to practice business in the State of New York, satisfactory to the School Board.

E. A separate Payment Bond, equal to one hundred percent (100%) of the contract sum will also be required of the successful bidders, and the bond shall be from a surety licensed to practice business in the State of New York, satisfactory to the School Board.

F. The bidders to whom the above referenced contracts may be awarded, shall within seven (7) days after the date of notification of the acceptance of their proposal, provide insurance and security as required by the above referenced contracts in a form acceptable by the Owner. In case of the bidders' failure to do so, or in case of the bidders' failure to give further security as herein prescribed, the bidders will be considered as having abandoned

the same, and the certified check or other bid security accompanying the proposal shall be forfeited to the School District.

G. All contractors and subcontractors submitting bids or performing construction work on public work projects or private projects covered by Article 8 of the Labor Law are required to register with the New York State Department of Labor (NYSDOL) under Labor Law Section 220-i. NUFSD is prohibited from awarding contracts for Public Work Contracts (construction contracts) unless the bidder has registered with the DOL and included their Certificate of Registration with their bid submission. Failure to provide this certificate with the contract bid submission could result in bidder disqualification. See the below link for registration:https://dol.ny.gov/public-work-contractor-and-subcontractor-registry-landing

H. Each bidder shall agree to hold his/her bid price for forty -five (45) days after the formal bid opening

I. By Order of the Nanuet Union Free School District

1. Dated: January 14, 2025

2. Mr. Mario Spagnuolo, Attorney/Asst. Superintendent of Business

END OF SECTION 00 0300

0SECTION 00 30 01 - GC BID FORM

CONTRACT 1 – GENERAL CONSTRUCTION PROPOSAL (GC-01):

CLOSING: (signature)_____

DATE: _____

BY: _____

TITLE: _____

FIRM: _____

ADDRESS: _____

TELEPHONE NUMBER: _____

FAX NUMBER: _____

CONTACT PERSON: _____

E-MAIL: _____

BID TO (Owner): Attention: Purchasing Agent
Nanuet Union Free School District
101 Church Street
Nanuet, New York 10954

SED Project Control No.	Highview Elementary School	SED#50-01-08-03-0-002-020
	Barr Middle School	SED#50-01-08-03-0-004-022
	Outdoor Education Center	SED#50-01-08-03-7-012-004
	Maintenance Building Renovations	SED#50-01-08-03-7-007-002

1. **Representations**: By making this Bid, the Bidder represents that:

The Bidder (identified above) hereby certifies that they have examined and fully understands the requirements and intent of the Bidding and Contract Documents, including Drawings, Project Manuals, and Addenda; and proposes to provide all labor, material, and equipment necessary to complete the Work on, or before, the dates specified in the Agreement.

To The Board of Education,

The undersigned hereby proposes to furnish all labor, materials, devices, appliances, supplies, equipment, services and other facilities necessary to complete all of the work of the above referenced Contract for the Nanuet Union Free School District, Nanuet, New York, as required by, and in accordance with, the provisions of the Instructions to Bidders, the Supplementary Instructions to Bidders, the Conditions of the Contract, the Drawings and Specifications, all as prepared by KSQ Design designated as Nanuet Union Free School District Phase 5 Projects, dated **January 14, 2025** and that, if this Proposal is accepted, the Undersigned agrees to enter into an Agreement with the owner to perform this work for the lump sum of:

Total Base Bid Lump Sum (All Schools):_____ ($_____)

Highview Elementary School:_____ ($_____)

Barr Middle School:_____ ($_____)

Outdoor Education Center:_____ ($_____)

Maintenance Building Renovations:_____ ($_____)

(Words) (Figures)

ALLOWANCES:

The undersigned Contractor has included the Allowance(s) as specified in Section 01 21 00 in their Base Bid.

UNIT PRICE:

A. **Unit Price GC-#1:** $_____ Dollars $ No Cents

B. **Unit Price GC-#2:** $_____ Dollars $ No Cents

C. **Unit Price GC-#3:** $_____ Dollars $ No Cents

D. **Unit Price GC-#4:** $_____ Dollars $ No Cents

ALTERNATES:

Add Alternate GC-01 Alt #1: $_____ Dollar $ No Cents

Add Alternate GC-01 Alt #2: $_____ Dollar $ No Cents

ADDENDA:

The undersigned acknowledges the receipt of the following addenda:

Addendum Number	Date	Addendum Number	Date
_____	_____	_____	_____
_____	_____	_____	_____
_____	_____	_____	_____
_____	_____	_____	_____
_____	_____	_____	_____

The Undersigned understands that the Owner reserves the right to accept or reject any or all proposals, but that if notice of the acceptance of the above Proposal is sent via United States Postal Service or any other overnight carrier, with signature required, to the Undersigned within sixty (60) days after the formal opening of Bids or anytime thereafter before this Proposal is withdrawn, the Undersigned will enter into, execute, and deliver a Contract within five (5) days after the date of said notification.

1. Time of Commencement and Completion:

The Undersigned agrees in the Base Bid to complete the work as per the Milestone Schedule provided in the Specifications.

2. Rejection of Bids:

The Bidder acknowledges that the Owner reserves the right to waive any informality in, or to reject any or all Bids.

3. Attachments:

Obtain and attach the following documents to each individual Bid.

a. Corporate Resolutions
b. Non-Collusive Bid Certification
c. Iran Divestment Act Affidavit
d. Bid Security
e. Subcontractor List
f. Substitution List
g. NYSDOL Certificate of Registration (See Notice to Bidders for more information)

4. Work Cost Breakdown:

This form shall be filled out in its entirety and submitted by the Contractor. The grand total must equal the TOTAL BASE BID under Section I (A) “THE BID”. UNIT PRICES are required for the items listed in the Unit Prices section of the work cost breakdown. Unit prices will be provided for use if the required quantities are more or less than the quantities indicated in the plans and specifications. Failure to complete the work cost breakdown may result in the disqualification of the bid. As itemized in the “Instructions to Bidders” for a complete Bid Form include the following which must be filled out completely, failure to comply with any listed below bid will be a rejected bid:

a. Bid Form, all costs must be shown in each CSI section and totaled, failure to breakdown these costs will be subject to disqualification of bid.

b. Unit costs

Highview Elementary School

Contract Number: Contract No. 01 – General Construction (GC-01)

Contract Titles: As noted in the Notice to Bidders 00 03 00

Date:

* Refer to specification Section 012900 Payment Procedures for additional information

Description	QTY	Unit	Total
General Requirements (Submittals, Punchlist, etc.)			
012100 Allowances - Unforeseen Conditions	**1**	**NA**	**$140,000**
024100 Selective Demolition (Labor)			
024100 Selective Demolition (Material)			
028200 Asbestos Abatement			
033001 Cast in place concrete (Labor)			
033001 Cast in place concrete (Material)			
033400 Self-Leveling Toppings (Labor)			
033400 Self-Leveling Toppings (Material)			
040120 Maintenance and restoration of brick masonry (Labor)			
040120 Maintenance and restoration of brick masonry (Material)			
040305.13 Restoration mortars (Labor)			
040305.13 Restoration mortars (Material)			
040305.16 Restoration masonry repointing (Labor)			
040305.16 Restoration masonry repointing (Material)			
042200 Concrete Unit Masonry (Labor)			
042200 Concrete Unit Masonry (Material)			
051200 Structural Steel (Labor)			
051200 Structural Steel (Material)			
053100 Steel Decking (Labor)			
053100 Steel Decking (Material)			

054000 Cold Formed Metal Framing (Labor)			
054000 Cold Formed Metal Framing (Material)			
055000 Metal Fabrications (Labor)			
055000 Metal Fabrications (Material)			
055213 Pipe and tube railings (Labor)			
055213 Pipe and tube railings (Material)			
061000 Rough Carpentry (Labor)			
061000 Rough Carpentry (Material)			
061600 Sheathing (Labor)			
061600 Sheathing (Material)			
064023 Interior Architectural Woodwork (Labor)			
064023 Interior Architectural Woodwork (Material)			
071326 Self-Adhering sheet waterproofing (Labor)			
071326 Self-Adhering sheet waterproofing (Material)			
072100 Thermal Insulation (Labor)			
072100 Thermal Insulation (Material)			
072713 Fire-resistant self-adhering membrane air barrier (Labor)			
072713 Fire-resistant self-adhering membrane air barrier (material)			
074213 Composite Metal Panels (Labor)			
074213 Composite Metal Panels (Material)			
076200 Sheet metal flashing and trim (Labor)			
076200 Sheet metal flashing and trim (Material)			
078413 Penetration Firestopping (Labor)			
078413 Penetration Firestopping (Material)			
078446 Fire-resistive Joint Systems (Labor)			
078446 Fire-resistive Joint Systems (Material)			
079200 Joint Sealant (Labor)			
079200 Joint Sealant (Material)			
079500 Expansion Control (Labor)			

079500 Expansion Control (Material)			
081113 Hollow Metal Doors and Frames (Labor)			
081113 Hollow Metal Doors and Frames (Material)			
081116 Fire-rated aluminum full vision doors and frames (Labor)			
081116 Fire-rated aluminum full vision doors and frames (Material)			
081416 flush wood doors (Labor)			
081416 flush wood doors (Material)			
083113 Access Doors and Frames (Labor)			
083113 Access Doors and Frames (Material)			
084113 Aluminum Framed Entrances and Storefronts (Labor)			
084113 Aluminum Framed Entrances and Storefronts (Material)			
085667 Bullet-Resistant Transaction Window (Labor)			
085667 Bullet-Resistant Transaction Window (Material)			
087100 Door Hardware (Labor)			
087100 Door Hardware (Material)			
088000 Glazing (Labor)			
088000 Glazing (Material)			
088300 Mirrors (Labor)			
088300 Mirrors (Material)			
088717 safety and security glazing films (Labor)			
088717 safety and security glazing films (Material)			
092216 non-structural metal framing Labor)			
092216 non-structural metal framing (Material)			
092900 gypsum board (Labor)			
092900 gypsum board (Material)			
093013 Ceramic Tile (Labor)			
093013 Ceramic Tile (Material)			
095123 acoustical ceiling tile (Labor)			
095123 acoustical ceiling tile (Material)			

096513 resilient base and accessories (Labor)			
096513 resilient base and accessories (Material)			
096519 resilient flooring (Labor)			
096519 resilient flooring (Material)			
096723 Resinous Flooring (Labor)			
096723 Resinous Flooring (Material)			
097220 Wall coverings (Labor)			
097220 Wall coverings (Material)			
099100 painting (Labor)			
099100 painting (Material)			
101400 Interior Signage (Labor)			
101400 Interior Signage (Material)			
102100 Toilet Partitions (Labor)			
102100 Toilet Partitions (Material)			
102800 toilet and bath accessories (Labor)			
102800 toilet and bath accessories (Material)			
104413 Fire Extinguisher Cabinets (Labor)			
104413 Fire Extinguisher Cabinets (Material)			
104416 Fire Extinguishers (Labor)			
104416 Fire Extinguishers (Material)			
111600 Bullet resistant fiberglass panels (Labor)			
111600 Bullet resistant fiberglass panels (Material)			
123661 Simulated stone countertops (Labor)			
123661 Simulated stone countertops (Material)			
124813 Entrance mats and frames (Labor)			
124813 Entrance mats and frames (Material)			
144200 wheelchair lift (Labor)			
144200 wheelchair lift (Material)			

Maintenance Building

Contract Number: Contract No. 01 – General Construction (GC-01)

Contract Titles: As noted in the Notice to Bidders 00 03 00

Date:

* Refer to specification Section 012900 Payment Procedures for additional information

Description	QTY	Unit	Total
General Requirements (Submittals, Punchlist, etc.)			
012100 Allowances - Unforeseen Conditions	**1**	**NA**	**$8,000**
024100 Selective Demolition (Labor)			
024100 Selective Demolition (Material)			
051200 Structural Steel (Labor)			
051200 Structural Steel (Material)			
053100 Steel Decking (Labor)			
053100 Steel Decking (Material)			
054000 Cold Formed Metal Framing (Labor)			
054000 Cold Formed Metal Framing (Material)			
055000 Metal Fabrications (Labor)			
055000 Metal Fabrications (Material)			
061000 Rough Carpentry (Labor)			
061000 Rough Carpentry (Material)			
061600 Sheathing (Labor)			
061600 Sheathing (Material)			
064023 Interior Architectural Woodwork (Labor)			
064023 Interior Architectural Woodwork (Material)			
071326 Self-Adhering sheet waterproofing (Labor)			
071326 Self-Adhering sheet waterproofing (Material)			
072100 Thermal Insulation (Labor)			
072100 Thermal Insulation (Material)			
072713 Fire-resistant self-adhering membrane air barrier (Labor)			

072713 Fire-resistant self-adhering membrane air barrier (material)			
074213 Composite Metal Panels (Labor)			
074213 Composite Metal Panels (Material)			
076200 Sheet metal flashing and trim (Labor)			
076200 Sheet metal flashing and trim (Material)			
078413 Penetration Firestopping (Labor)			
078413 Penetration Firestopping (Material)			
078446 Fire-resistive Joint Systems (Labor)			
078446 Fire-resistive Joint Systems (Material)			
079200 Joint Sealant (Labor)			
079200 Joint Sealant (Material)			
079500 Expansion Control (Labor)			
079500 Expansion Control (Material)			
081416 flush wood doors (Labor)			
081416 flush wood doors (Material)			
087100 Door Hardware (Labor)			
087100 Door Hardware (Material)			
088000 Glazing (Labor)			
088000 Glazing (Material)			
092216 Non-structural metal framing (Labor)			
092216 Non-structural metal framing (Material)			
095123 acoustical ceiling tile (Labor)			
095123 acoustical ceiling tile (Material)			
096513 resilient base and accessories (Labor)			
096513 resilient base and accessories (Material)			
096519 resilient flooring (Labor)			
096519 resilient flooring (Material)			
099100 painting (Labor)			
099100 painting (Material)			

Outdoor Education Center

Contract Number: Contract No. 01 – General Construction (GC-01)

Contract Titles: As noted in the Notice to Bidders 00 03 00

Date:

* Refer to specification Section 012900 Payment Procedures for additional information

Description	QTY	Unit	Total
General Requirements (Submittals, Punchlist, etc.)			
012100 Allowances - Unforeseen Conditions	**1**	**NA**	**$15,000**
024100 Selective Demolition (Labor)			
024100 Selective Demolition (Material)			
051200 Structural Steel (Labor)			
051200 Structural Steel (Material)			
053100 Steel Decking (Labor)			
053100 Steel Decking (Material)			
054000 Cold Formed Metal Framing (Labor)			
054000 Cold Formed Metal Framing (Material)			
055000 Metal Fabrications (Labor)			
055000 Metal Fabrications (Material)			
055213 Pipe and tube railings (Labor)			
055213 Pipe and tube railings (Material)			
061000 Rough Carpentry (Labor)			
061000 Rough Carpentry (Material)			
061600 Sheathing (Labor)			
061600 Sheathing (Material)			
064023 Interior Architectural Woodwork (Labor)			
064023 Interior Architectural Woodwork (Material)			
071326 Self-Adhering sheet waterproofing (Labor)			
071326 Self-Adhering sheet waterproofing (Material)			

072100 Thermal Insulation (Labor)			
072100 Thermal Insulation (Material)			
072713 Fire-resistant self-adhering membrane air barriers (Labor)			
072713 Fire-resistant self-adhering membrane air barriers (material)			
076200 Sheet metal flashing and trim (Labor)			
076200 Sheet metal flashing and trim (Material)			
078413 Penetration Firestopping (Labor)			
078413 Penetration Firestopping (Material)			
078446 Fire-resistive Joint Systems (Labor)			
078446 Fire-resistive Joint Systems (Material)			
079200 Joint Sealant (Labor)			
079200 Joint Sealant (Material)			
079500 Expansion Control (Labor)			
079500 Expansion Control (Material)			
081113 Hollow Metal Doors and Frames (Labor)			
081113 Hollow Metal Doors and Frames (Material)			
087100 Door Hardware (Labor)			
087100 Door Hardware (Material)			
095123 acoustical ceiling tile (Labor)			
095123 acoustical ceiling tile (Material)			
096513 resilient base and accessories (Labor)			
096513 resilient base and accessories (Material)			
099100 painting (Labor)			
099100 painting (Material)			

Submit Bid Form in duplicate.

END OF SECTION 00 30 01

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SECTION **00 30 02 - EC BID FORM**

CONTRACT 2 – ELECTRICAL CONSTRUCTION PROPOSAL (EC-01):

CLOSING: (signature)_____

DATE: _____

BY: _____

TITLE: _____

FIRM: _____

ADDRESS: _____

TELEPHONE NUMBER: _____

FAX NUMBER: _____

CONTACT PERSON: _____

E-MAIL: _____

BID TO (Owner): Attention: Purchasing Agent
Nanuet Union Free School District
101 Church Street
Nanuet, New York 10954

SED Project Control No.	Highview Elementary School	SED#50-01-08-03-0-002-020
	Barr Middle School	SED#50-01-08-03-0-004-022
	Outdoor Education Center	SED#50-01-08-03-7-012-004
	Maintenance Building Renovations	SED#50-01-08-03-7-007-002

1. **Representations**: By making this Bid, the Bidder represents that:

The Bidder (identified above) hereby certifies that they have examined and fully understands the requirements and intent of the Bidding and Contract Documents, including Drawings, Project Manuals, and Addenda; and proposes to provide all labor, material, and equipment necessary to complete the Work on, or before, the dates specified in the Agreement.

To The Board of Education,

The undersigned hereby proposes to furnish all labor, materials, devices, appliances, supplies, equipment, services and other facilities necessary to complete all of the work of the above referenced Contract for the Nanuet Union Free School District, Nanuet, New York, as required by, and in accordance with, the provisions of the Instructions to Bidders, the Supplementary Instructions to Bidders, the Conditions of the Contract, the Drawings and Specifications, all as prepared by KSQ Design designated as Nanuet Union Free School District Phase 5 Projects, dated **January 14, 2025** and that, if this Proposal is accepted, the Undersigned agrees to enter into an Agreement with the owner to perform this work for the lump sum of:

Total Base Bid (All Schools): _____ ($_____)

Highview Elementary School: _____ ($_____)

Barr Middle School: _____ ($_____)

Outdoor Education Center: _____ ($_____)

Maintenance Building Renovations: _____ ($_____)

(Words) (Figures)

ALLOWANCES:

The undersigned Contractor has included the Allowance(s) as specified in Section 01 2100 in their Base Bid.

UNIT PRICE:

A. **Unit Price EC-#1:** $_____ Dollars $ No Cents

ALTERNATES:

Add Alternate EC-01 Alt #1: $_____ Dollar $ No Cents

ADDENDA:

The undersigned acknowledges the receipt of the following addenda:

Addendum Number	Date	Addendum Number	Date
_____	_____	_____	_____
_____	_____	_____	_____
_____	_____	_____	_____
_____	_____	_____	_____
_____	_____	_____	_____

The Undersigned understands that the Owner reserves the right to accept or reject any or all proposals, but that if notice of the acceptance of the above Proposal is sent via United States Postal Service or any other overnight carrier, with signature required, to the Undersigned within sixty (60) days after the formal opening of Bids or anytime thereafter before this Proposal is withdrawn, the Undersigned will enter into, execute, and deliver a Contract within five (5) days after the date of said notification.

1. Time of Commencement and Completion:

The Undersigned agrees in the Base Bid to complete the work as per the Milestone Schedule provided in the Specifications.

2. Rejection of Bids:

The Bidder acknowledges that the Owner reserves the right to waive any informality in, or to reject any or all Bids.

3. Attachments:

Obtain and attach the following documents to each individual Bid.

a. Corporate Resolutions
b. Non-Collusive Bid Certification
c. Iran Divestment Act Affidavit
d. Bid Security
e. Subcontractor List
f. Substitution List
g. NYSDOL Certificate of Registration (See Notice to Bidders for more information)

4. Work Cost Breakdown:

This form shall be filled out in its entirety and submitted by the Contractor. The grand total must equal the TOTAL BASE BID under Section I (A) "THE BID". UNIT PRICES are required for the items listed in the Unit Prices section of the work cost breakdown. Unit prices will be provided for use if the required quantities are more or less than the quantities indicated in the plans and specifications. Failure to complete the work cost breakdown may result in the disqualification of the bid. As itemized in the "Instructions to Bidders" for a complete Bid Form include the following which must be filled out completely, failure to comply with any listed below bid will be a rejected bid:

a. Bid Form, all costs must be shown in each CSI section and totaled, failure to breakdown these costs will be subject to disqualification of bid.

b. Unit costs

Highview Elementary School

Contract Number: Contract No. 02 – Electrical Construction (EC-01)

Contract Titles: As noted in the Notec to Bidders 00 03 00

Date:

* Refer to specification Section 012900 Payment Procedures for additional information

Description	QTY	Unit	Total
General Requirements (Submittals, Punchlist, etc.)			
012100 Allowances - Unforeseen Conditions	1	NA	$12,000.00
078413 Penetration Firestopping (Labor)			

078413 Penetration Firestopping (Material)			
078446 Fire-Resistive Joint Systems (Labor)			
078446 Fire-Resistive Joint Systems (Material)			
079200 Joint Sealant (Labor)			
079200 Joint Sealant (Material)			
260505 selective demolition for electrical (Labor)			
260505 selective demolition for electrical (Material)			
260519 low-voltage electrical power conductors and cables (Labor)			
260519 low-voltage electrical power conductors and cables (Material)			
260526 Grounding and bonding for electrical systems (Labor)			
260526 Grounding and bonding for electrical systems (Material)			
260529 hangers and supports for electrical systems (Labor)			
260529 hangers and supports for electrical systems (Material)			
260533.13 conduit for electrical systems (Labor)			
260533.13 conduit for electrical systems (Material)			
260533.16 boxes for electrical systems (Labor)			
260533.16 boxes for electrical systems (Material)			
260533.23 surface raceways for electrical systems (Labor)			
260533.23 surface raceways for electrical systems (Material)			
260553 Identification for electrical systems (Labor)			
260553 Identification for electrical systems (Material)			
260923 lighting control devices (Labor)			
260923 lighting control devices (Material)			
262416 panelboards (Labor)			
262416 panelboards (Material)			
262421 circuit breakers for existing panelboard (Labor)			
262421 circuit breakers for existing panelboard (Material)			
262726 wiring devices (Labor)			
262726 wiring devices (Material)			
262816.16 enclosed switches (Labor)			
262816.16 enclosed switches (Material)			
265100 interior lighting (Labor)			

265100 interior lighting (Material)			
271000 structured cabling-voice and data- inside (Labor)			
271000 structured cabling-voice and data- inside (Material)			
284600 fire detection and alarm (Labor)			
284600 fire detection and alarm (Material)			

Maintenance Building

Contract Number: Contract No. 02 – Electrical Construction (EC-01)

Contract Titles: As noted in the Notec to Bidders 00 03 00

Date:

* Refer to specification Section 012900 Payment Procedures for additional information

Description	QTY	Unit	Total
General Requirements (Submittals, Punchlist, etc.)			
012100 Allowances - Unforeseen Conditions	1	NA	$2,000.00
078413 Penetration Firestopping (Labor)			
078413 Penetration Firestopping (Material)			
078446 Fire-Resistive Joint Systems (Labor)			
078446 Fire-Resistive Joint Systems (Material)			
079200 Joint Sealant (Labor)			
079200 Joint Sealant (Material)			
260505 selective demolition for electrical (Labor)			
260505 selective demolition for electrical (Material)			
260519 low-voltage electrical power conductors and cables (Labor)			
260519 low-voltage electrical power conductors and cables (Material)			
260526 Grounding and bonding for electrical systems (Labor)			
260526 Grounding and bonding for electrical systems (Material)			
260529 hangers and supports for electrical systems (Labor)			

260529 hangers and supports for electrical systems (Material)			
260533.13 conduit for electrical systems (Labor)			
260533.13 conduit for electrical systems (Material)			
260533.16 boxes for electrical systems (Labor)			
260533.16 boxes for electrical systems (Material)			
260533.23 surface raceways for electrical systems (Labor)			
260533.23 surface raceways for electrical systems (Material)			
260553 Identification for electrical systems (Labor)			
260553 Identification for electrical systems (Material)			
260923 lighting control devices (Labor)			
260923 lighting control devices (Material)			
262416 panelboards (Labor)			
262416 panelboards (Material)			
262421 circuit breakers for existing panelboard (Labor)			
262421 circuit breakers for existing panelboard (Material)			
262726 wiring devices (Labor)			
262726 wiring devices (Material)			
262816.16 enclosed switches (Labor)			
262816.16 enclosed switches (Material)			
265100 interior lighting (Labor)			
265100 interior lighting (Material)			
271000 structured cabling-voice and data- inside (Labor)			
271000 structured cabling-voice and data- inside (Material)			
284600 fire detection and alarm (Labor)			
284600 fire detection and alarm (Material)			

Outdoor Education Center

Contract Number: Contract No. 02 – Electrical Construction (EC-01)

Contract Titles: As noted in the Notec to Bidders 00 03 00

Date:

* Refer to specification Section 012900 Payment Procedures for additional information

Description	QTY	Unit	Total
General Requirements (Submittals, Punchlist, etc.)			
012100 Allowances - Unforeseen Conditions	1	NA	$2,000.00
078413 Penetration Firestopping (Labor)			
078413 Penetration Firestopping (Material)			
078446 Fire-Resistive Joint Systems (Labor)			
078446 Fire-Resistive Joint Systems (Material)			
079200 Joint Sealant (Labor)			
079200 Joint Sealant (Material)			
260505 selective demolition for electrical (Labor)			
260505 selective demolition for electrical (Material)			
260519 low-voltage electrical power conductors and cables (Labor)			
260519 low-voltage electrical power conductors and cables (Material)			
260526 Grounding and bonding for electrical systems (Labor)			
260526 Grounding and bonding for electrical systems (Material)			
260529 hangers and supports for electrical systems (Labor)			
260529 hangers and supports for electrical systems (Material)			
260533.13 conduit for electrical systems (Labor)			
260533.13 conduit for electrical systems (Material)			
260533.16 boxes for electrical systems (Labor)			
260533.16 boxes for electrical systems (Material)			
260553 Identification for electrical systems (Labor)			
260553 Identification for electrical systems (Material)			
260923 lighting control devices (Labor)			
260923 lighting control devices (Material)			
262416 panelboards (Labor)			
262416 panelboards (Material)			
262421 circuit breakers for existing panelboard (Labor)			
262421 circuit breakers for existing panelboard (Material)			
262726 wiring devices (Labor)			
262726 wiring devices (Material)			
262816.16 enclosed switches (Labor)			

262816.16 enclosed switches (Material)			
265100 interior lighting (Labor)			
265100 interior lighting (Material)			
284600 fire detection and alarm (Labor)			
284600 fire detection and alarm (Material)			

Submit Bid Form in duplicate.

END OF SECTION 00 30 01

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SECTION 00 30 03 - MC BID FORM

CONTRACT 2 – MECHANICAL CONSTRUCTION PROPOSAL (MC-01):

CLOSING: (signature)_____

DATE: _____

BY: _____

TITLE: _____

FIRM: _____

ADDRESS: _____

TELEPHONE NUMBER: _____

FAX NUMBER: _____

CONTACT PERSON: _____

E-MAIL: _____

BID TO (Owner): Attention: Purchasing Agent
Nanuet Union Free School District
101 Church Street
Nanuet, New York 10954

SED Project Control No.	Highview Elementary School	SED#50-01-08-03-0-002-020
	Outdoor Education Center	SED#50-01-08-03-7-012-004
	Maintenance Building Renovations	SED#50-01-08-03-7-007-002

1. **Representations**: By making this Bid, the Bidder represents that:

The Bidder (identified above) hereby certifies that they have examined and fully understands the requirements and intent of the Bidding and Contract Documents, including Drawings, Project Manuals, and Addenda; and proposes to provide all labor, material, and equipment necessary to complete the Work on, or before, the dates specified in the Agreement.

To The Board of Education,

The undersigned hereby proposes to furnish all labor, materials, devices, appliances, supplies, equipment, services and other facilities necessary to complete all of the work of the above referenced Contract for the Nanuet Union Free School District, Nanuet, New York, as required by, and in accordance with, the provisions of the Instructions to Bidders, the Supplementary Instructions to Bidders, the Conditions of the Contract, the Drawings and Specifications, all as prepared by KSQ Design designated as Nanuet Union Free School District Phase 5 Projects, dated **January 14, 2025** and that, if this Proposal is accepted, the Undersigned agrees to enter into an Agreement with the owner to perform this work for the lump sum of:

Total Base Bid (All Schools): _____ ($_____)

Highview Elementary School: _____ ($_____)

Outdoor Education Center: _____ ($_____)

Maintenance Building Renovations: _____ ($_____)

(Words) (Figures)

ALLOWANCES:

The undersigned Contractor has included the Allowance(s) as specified in Section 01 2100 in their Base Bid.

UNIT PRICE:

N/A

ALTERNATES:

N/A

ADDENDA:

The undersigned acknowledges the receipt of the following addenda:

Addendum Number	Date	Addendum Number	Date
_____	_____	_____	_____
_____	_____	_____	_____
_____	_____	_____	_____
_____	_____	_____	_____
_____	_____	_____	_____

The Undersigned understands that the Owner reserves the right to accept or reject any or all proposals, but that if notice of the acceptance of the above Proposal is sent via United States Postal Service or any other overnight carrier, with signature required, to the Undersigned within sixty (60) days after the formal opening of Bids or anytime thereafter before this Proposal is withdrawn, the Undersigned will enter into, execute, and deliver a Contract within five (5) days after the date of said notification.

1. Time of Commencement and Completion:

The Undersigned agrees in the Base Bid to complete the work as per the Milestone Schedule provided in the Specifications.

2. Rejection of Bids:

The Bidder acknowledges that the Owner reserves the right to waive any informality in, or to reject any or all Bids.

3. Attachments:

Obtain and attach the following documents to each individual Bid.

a. Corporate Resolutions
b. Non-Collusive Bid Certification
c. Iran Divestment Act Affidavit
d. Bid Security
e. Subcontractor List
f. Substitution List
g. NYSDOL Certificate of Registration (See Notice to Bidders for more information)

4. Work Cost Breakdown:

This form shall be filled out in its entirety and submitted by the Contractor. The grand total must equal the TOTAL BASE BID under Section I (A) "THE BID". UNIT PRICES are required for the items listed in the Unit Prices section of the work cost breakdown. Unit prices will be provided for use if the required quantities are more or less than the quantities indicated in the plans and specifications. Failure to complete the work cost breakdown may result in the disqualification of the bid. As itemized in the "Instructions to Bidders" for a complete Bid Form include the following which must be filled out completely, failure to comply with any listed below bid will be a rejected bid:

a. Bid Form, all costs must be shown in each CSI section and totaled, failure to breakdown these costs will be subject to disqualification of bid.

b. Unit costs

Highview Elementary School

Contract Number: Contract No. 03 – Mechanical Construction (MC-01)

Contract Titles: As noted in the Notice to Bidders 00 03 00

Date:

* Refer to specification Section 012900 Payment Procedures for additional information

Description	QTY	Unit	Total
General Requirements (Submittals, Punchlist, etc.)			
012100 Allowances - Unforeseen Conditions	1	NA	$8,000
061000 Rough Carpentry (Labor)			
061000 Rough Carpentry (Material			
078413 Penetration Firestopping (Labor)			
078413 Penetration Firestopping (Material)			
078446 Fire-Resistive Joint Systems (Labor)			
078446 Fire-Resistive Joint Systems (Material)			
079200 Joint Sealant (Labor)			
079200 Joint Sealant (Material)			
230501 basic HVAC materials and methods (Material)			
230501 basic HVAC materials and methods (Labor)			
230516 expansion fittings and loops for HVAC piping (Material)			
230516 expansion fittings and loops for HVAC piping (Labor)			
230519 meters and gauges for HVAC piping (Material)			
230519 meters and gauges for HVAC piping (Labor)			
230548 vibration controls for HVAC piping and equipment (Material)			

230548 vibration controls for HVAC piping and equipment (Labor)			
230553 Identification for HVAC piping and equipment (Material)			
230553 Identification for HVAC piping and equipment (Labor)			
230593 testing, adjusting, and balancing for HVAC (Material)			
230593 testing, adjusting, and balancing for HVAC (Labor)			
230713 Duct insulation (Material)			
230713 Duct insulation (Labor)			
230716 HVAC equipment insulation (Material)			
230716 HVAC equipment insulation (Labor)			
230719 HVAC piping insulation (Material)			
230719 HVAC piping insulation (Labor)			
230800 commissioning of HVAC (Material)			
230800 commissioning of HVAC (Labor)			
230923 Direct-Digital Control System for HVAC (Material)			
230923 Direct-Digital Control System for HVAC (Labor)			
232113 hydronic piping (Material)			
232113 hydronic piping (Labor)			
232114 hydronic specialties (Material)			
232114 hydronic specialties (Labor)			
232123 Hydronic Pumps (Material)			
232123 Hydronic Pumps (Labor)			
232300 Refrigerant piping (Material)			
232300 Refrigerant piping (Labor)			
232500 HVAC water treatment (Material)			
232500 HVAC water treatment (Labor)			
233100 HVAC ducts and casings (Material)			
233100 HVAC ducts and casings (Labor)			
233300 air duct accessories (Material)			
233300 air duct accessories (Labor)			
233423 HVAC power ventilators (Material)			
233423 HVAC power ventilators (Labor)			
233700 air outlets and inlets (Material)			
233700 air outlets and inlets (Labor)			

235100 Breechings, Chimneys, and Stacks (Material)			
235100 Breechings, Chimneys, and Stacks (Labor)			
235216 Condensing Boilers (Material)			
235216 Condensing Boilers (Labor)			
238129 Variable Refrigerant Flow HVAC Systems (Material)			
238129 Variable Refrigerant Flow HVAC Systems (Labor)			
238200 convection heating and cooling units (Material)			
238200 convection heating and cooling units (Labor)			

Maintenance Building

Contract Number: Contract No. 03 – Mechanical Construction (MC-01)

Contract Titles: As noted in the Notice to Bidders 00 03 00

Date:

* Refer to specification Section 012900 Payment Procedures for additional information

Description	QTY	Unit	Total
General Requirements (Submittals, Punchlist, etc.)			
012100 Allowances - Unforeseen Conditions	1	NA	$3,000
061000 Rough Carpentry (Labor)			
061000 Rough Carpentry (Material			
078413 Penetration Firestopping (Labor)			
078413 Penetration Firestopping (Material)			
078446 Fire-Resistive Joint Systems (Labor)			
078446 Fire-Resistive Joint Systems (Material)			
079200 Joint Sealant (Labor)			
079200 Joint Sealant (Material)			
230501 basic HVAC materials and methods (Material)			
230501 basic HVAC materials and methods (Labor)			
230516 expansion fittings and loops for HVAC piping (Material)			
230516 expansion fittings and loops for HVAC piping (Labor)			
230519 meters and gauges for HVAC piping (Material)			
230519 meters and gauges for HVAC piping (Labor)			
230548 vibration controls for HVAC piping and equipment			

(Material)			
230548 vibration controls for HVAC piping and equipment (Labor)			
230553 Identification for HVAC piping and equipment (Material)			
230553 Identification for HVAC piping and equipment (Labor)			
230593 testing, adjusting, and balancing for HVAC (Material)			
230593 testing, adjusting, and balancing for HVAC (Labor)			
230713 Duct insulation (Material)			
230713 Duct insulation (Labor)			
230716 HVAC equipment insulation (Material)			
230716 HVAC equipment insulation (Labor)			
230719 HVAC piping insulation (Material)			
230719 HVAC piping insulation (Labor)			
230800 commissioning of HVAC (Material)			
230800 commissioning of HVAC (Labor)			
230923 Direct-Digital Control System for HVAC (Material)			
230923 Direct-Digital Control System for HVAC (Labor)			
232300 Refrigerant piping (Material)			
232300 Refrigerant piping (Labor)			
232500 HVAC water treatment (Material)			
232500 HVAC water treatment (Labor)			
233100 HVAC ducts and casings (Material)			
233100 HVAC ducts and casings (Labor)			
233300 air duct accessories (Material)			
233300 air duct accessories (Labor)			
233423 HVAC power ventilators (Material)			
233423 HVAC power ventilators (Labor)			
233700 air outlets and inlets (Material)			
233700 air outlets and inlets (Labor)			
235216 Condensing Boilers (Material)			
235216 Condensing Boilers (Labor)			
238129 Variable Refrigerant Flow HVAC Systems (Material)			
238129 Variable Refrigerant Flow HVAC Systems (Labor)			
238200 convection heating and cooling units (Material)			

238200 convection heating and cooling units (Labor)			

Outdoor Education Center

Contract Number: Contract No. 03 – Mechanical Construction (MC-01)

Contract Titles: As noted in the Notice to Bidders 00 03 00

Date:

* Refer to specification Section 012900 Payment Procedures for additional information

Description	QTY	Unit	Total
General Requirements (Submittals, Punchlist, etc.)			
012100 Allowances - Unforeseen Conditions	1	NA	$5,000
061000 Rough Carpentry (Labor)			
061000 Rough Carpentry (Material			
078413 Penetration Firestopping (Labor)			
078413 Penetration Firestopping (Material)			
078446 Fire-Resistive Joint Systems (Labor)			
078446 Fire-Resistive Joint Systems (Material)			
079200 Joint Sealant (Labor)			
079200 Joint Sealant (Material)			
230501 basic HVAC materials and methods (Material)			
230501 basic HVAC materials and methods (Labor)			
230516 expansion fittings and loops for HVAC piping (Material)			
230516 expansion fittings and loops for HVAC piping (Labor)			
230519 meters and gauges for HVAC piping (Material)			
230519 meters and gauges for HVAC piping (Labor)			
230548 vibration controls for HVAC piping and equipment (Material)			
230548 vibration controls for HVAC piping and equipment (Labor)			
230553 Identification for HVAC piping and equipment (Material)			
230553 Identification for HVAC piping and equipment (Labor)			
230593 testing, adjusting, and balancing for HVAC (Material)			
230593 testing, adjusting, and balancing for HVAC (Labor)			
230713 Duct insulation (Material)			

230713 Duct insulation (Labor)			
230716 HVAC equipment insulation (Material)			
230716 HVAC equipment insulation (Labor)			
230719 HVAC piping insulation (Material)			
230719 HVAC piping insulation (Labor)			
230800 commissioning of HVAC (Material)			
230800 commissioning of HVAC (Labor)			
230923 Direct-Digital Control System for HVAC (Material)			
230923 Direct-Digital Control System for HVAC (Labor)			
232300 Refrigerant piping (Material)			
232300 Refrigerant piping (Labor)			
232500 HVAC water treatment (Material)			
232500 HVAC water treatment (Labor)			
233100 HVAC ducts and casings (Material)			
233100 HVAC ducts and casings (Labor)			
233300 air duct accessories (Material)			
233300 air duct accessories (Labor)			
233423 HVAC power ventilators (Material)			
233423 HVAC power ventilators (Labor)			
233700 air outlets and inlets (Material)			
233700 air outlets and inlets (Labor)			
235100 Breechings, Chimneys, and Stacks (Material)			
235100 Breechings, Chimneys, and Stacks (Labor)			
235216 Condensing Boilers (Material)			
235216 Condensing Boilers (Labor)			
238129 Variable Refrigerant Flow HVAC Systems (Material)			
238129 Variable Refrigerant Flow HVAC Systems (Labor)			
238200 convection heating and cooling units (Material)			
238200 convection heating and cooling units (Labor)			

Submit Bid Form in duplicate.

END OF SECTION 00 30 01

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SECTION 00 30 04 - PC BID FORM

CONTRACT 4 – PLUMBING CONSTRUCTION PROPOSAL (PC-01):

CLOSING: (signature)_____

DATE: _____

BY: _____

TITLE: _____

FIRM: _____

ADDRESS: _____

TELEPHONE NUMBER: _____

FAX NUMBER: _____

CONTACT PERSON: _____

E-MAIL: _____

BID TO (Owner): Attention: Purchasing Agent
Nanuet Union Free School District
101 Church Street
Nanuet, New York 10954

SED Project Control No. Highview Elementary School SED#50-01-08-03-0-002-020

1. **Representations**: By making this Bid, the Bidder represents that:

The Bidder (identified above) hereby certifies that they have examined and fully understands the requirements and intent of the Bidding and Contract Documents, including Drawings, Project Manuals, and Addenda; and proposes to provide all labor, material, and equipment necessary to complete the Work on, or before, the dates specified in the Agreement.

To The Board of Education,

The undersigned hereby proposes to furnish all labor, materials, devices, appliances, supplies, equipment, services and other facilities necessary to complete all of the work of the above referenced Contract for the Nanuet Union Free School District, Nanuet, New York, as required by, and in accordance with, the provisions of the Instructions to Bidders, the Supplementary Instructions to Bidders, the Conditions of the Contract, the Drawings and Specifications, all as prepared by KSQ Design designated as Nanuet Union Free School District Phase 5 Projects, dated **January 14, 2025** and that, if this Proposal is accepted, the Undersigned agrees to enter into an Agreement with the owner to perform this work for the lump sum of:

Total Base Bid (All Schools): ($)

Highview Elementary School: ($)

(Words) (Figures)

ALLOWANCES:

The undersigned Contractor has included the Allowance(s) as specified in Section 01 2100 in their Base Bid.

UNIT PRICE:

N/A

ALTERNATES:

N/A

ADDENDA:

The undersigned acknowledges the receipt of the following addenda:

Addendum Number	Date	Addendum Number	Date
_____	_____	_____	_____

_____	_____	_____	_____
_____	_____	_____	_____
_____	_____	_____	_____
_____	_____	_____	_____

The Undersigned understands that the Owner reserves the right to accept or reject any or all proposals, but that if notice of the acceptance of the above Proposal is sent via United States Postal Service or any other overnight carrier, with signature required, to the Undersigned within sixty (60) days after the formal opening of Bids or anytime thereafter before this Proposal is withdrawn, the Undersigned will enter into, execute, and deliver a Contract within five (5) days after the date of said notification.

1. Time of Commencement and Completion:

The Undersigned agrees in the Base Bid to complete the work as per the Milestone Schedule provided in the Specifications.

2. Rejection of Bids:

The Bidder acknowledges that the Owner reserves the right to waive any informality in, or to reject any or all Bids.

3. Attachments:

Obtain and attach the following documents to each individual Bid.

a. Corporate Resolutions
b. Non-Collusive Bid Certification
c. Iran Divestment Act Affidavit
d. Bid Security
e. Subcontractor List
f. Substitution List
g. NYSDOL Certificate of Registration (See Notice to Bidders for more information)

4. Work Cost Breakdown:

This form shall be filled out in its entirety and submitted by the Contractor. The grand total must equal the TOTAL BASE BID under Section I (A) “THE BID”. UNIT PRICES are required for the items listed in the Unit Prices section of the work cost breakdown. Unit prices will be provided for use if the required quantities are more or less than the quantities indicated in the plans and specifications. Failure to complete the work cost breakdown may result in the disqualification of the bid. As itemized in the “Instructions to Bidders” for a complete Bid Form include the following which must be filled out completely, failure to comply with any listed below bid will be a rejected bid:

a. Bid Form, all costs must be shown in each CSI section and totaled, failure to breakdown these costs will be subject to disqualification of bid.

b. Unit costs

Highview Elementary School

Contract Number: Contract No. 04 – Plumbing Construction (PC-01)

Contract Titles: As noted in the Notice to Bidders 00 03 00

Date:

* Refer to specification Section 012900 Payment Procedures for additional information

Description	QTY	Unit	Total
General Requirements (Submittals, Punchlist, etc.)			
012100 Allowances - Unforeseen Conditions	1	NA	$15,000
078413 Penetration Firestopping (labor)			
078413 Penetration Firestopping (material)			
220501 basic plumbing materials and methods (labor)			
210500 Common Work Results for fire suppression (Labor)			
210500 Common Work Results for fire suppression (Material)			
211300 Fire suppression sprinklers (Labor)			
211300 Fire suppression sprinklers (Material)			
220501 basic plumbing materials and methods (material)			
220553 Identification for plumbing piping and equipment (labor)			
220553 Identification for plumbing piping and equipment (material)			
220719 plumbing piping insulation (labor)			
220719 plumbing piping insulation (material)			
221005 plumbing piping (labor)			
221005 plumbing piping (material)			
221006 plumbing piping specialties (labor)			
221006 plumbing piping specialties (material)			
221006 plumbing fixtures (labor)			
221006 plumbing fixtures (material)			

Submit Bid Form in duplicate.

END OF SECTION 00 30 01

SECTION 00 31 13 - PRELIMINARY SCHEDULES

1.1 PROJECT SCHEDULE

A. This Document is part of the Procurement and Contracting Requirements for the Project. They provide Owner's information for Bidders' convenience and are intended to supplement rather than serve in lieu of Bidders' own investigations. They are made available for Bidders' convenience and information, but do not affect Contract Time requirements. This Document and its attachments are not part of the Contract Documents. The contractor is responsible to provide their own schedule and meet the substantial completion dates outlined on the contract documents.

It is a contract requirement for the contractor to meet the milestone dates outlined in this preliminary schedule. The contractor shall incorporate these dates into their master schedules. See AIA 232 General terms and conditions for the contract for construction in reference to liquidated damages associated with failure to meet milestone dates.

END OF DOCUMENT 00 31 13

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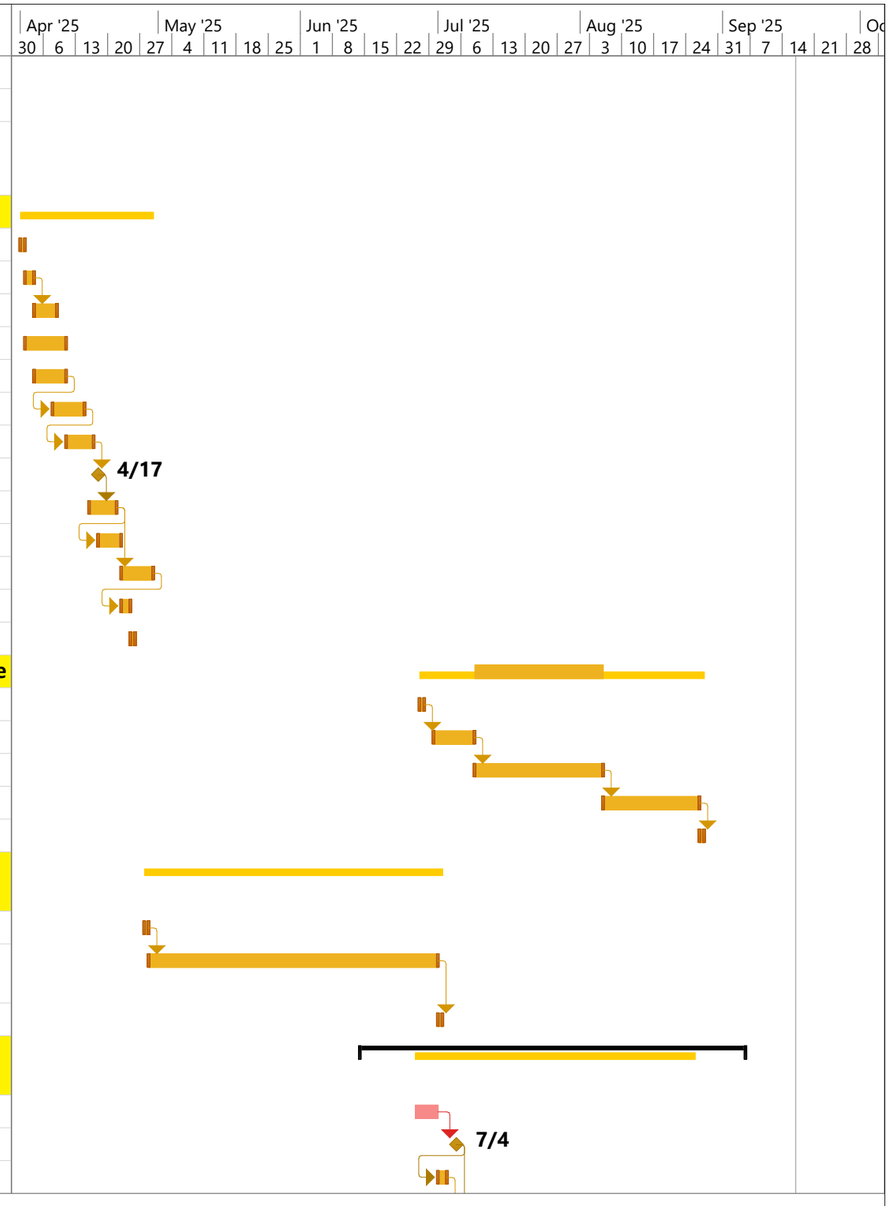
ID		Task Name	Duration	Start	Finish	Notes
1						
2		PHASE 5 CONSTRUCTION PHASE				
3		**HighView Elementary School BE-01, GC-01, MC-01, EC-01**				
4		**Highview Elementary School - Roofing - BE-01**	**37 days?**	**Mon 4/1/24**	**Tue 5/21/24**	**Weekend work and double shift anticipated**
5		Mobilization	1 day	Tue 4/1/25	Tue 4/1/25	Spring Break School Closed March 31 April 4
6		Remove Asphalt Shingle Roof R2	2 days	Wed 4/2/25	Thu 4/3/25	Spring Break School Closed March 31 April 4
7		New Roofing Roof R2	3 days	Fri 4/4/25	Tue 4/8/25	Spring Break School Closed March 31 April 4
8		Wet Removals & Patching	7 days	Wed 4/2/25	Thu 4/10/25	Spring Break School Closed March 31 April 4
9		Roof Cleaning R3,R4	5 days	Fri 4/4/25	Thu 4/10/25	Possible Second Shift. Noise Dependant
10		Flashings R3,R4	5 days	Tue 4/8/25	Mon 4/14/25	
11		Roof Priming R3,R4	4 days	Fri 4/11/25	Wed 4/16/25	
12		Base Coat R3,R4	4 days	Mon 4/14/25	Thu 4/17/25	
13		Top Coat R3,R4	4 days	Wed 4/16/25	Mon 4/21/25	
14		Top Sand R3,R4	3 days	Fri 4/18/25	Tue 4/22/25	
15		Roof Down Spout Replacements	5 days	Wed 4/23/25	Tue 4/29/25	
16		Roof Drain Covers	2 days	Wed 4/23/25	Thu 4/24/25	
17		Cleanup & Demobilize	1 day	Fri 4/25/25	Fri 4/25/25	
18		**Highview Elementary School - Masonry - BE-02**	**11 days?**	**Wed 6/26/24**	**Wed 7/10/24**	**School Year Project - Weekend work and double**
19		Mobilize	1 day	Fri 6/27/25	Fri 6/27/25	
20		Window Lintel Repair	7 days	Mon 6/30/25	Tue 7/8/25	
21		Masonry Repointing	20 days	Wed 7/9/25	Tue 8/5/25	
22		Masonry Cleaning	15 days	Wed 8/6/25	Tue 8/26/25	
23		Cleanup & Demobilize	1 day	Wed 8/27/25	Wed 8/27/25	
24		**Highview Elementary School - Doors & Glazing & Misc. Interior - GC-01**		**Wed 6/26/24**	**7/39/24**	**School Year Project - Weekend work and double shift anticipated**
25		Mobilize	1 day	Mon 4/28/25	Mon 4/28/25	Second Shift
26		Door, Hardware, & Glazing Removal and Replacement	45 days	Tue 4/29/25	Mon 6/30/25	Second Shift
27		Cleanup & Demobilize Interior	1 day	Tue 7/1/25	Tue 7/1/25	
28		**Highview Elementary School - Security Vestibule Renovation - GC-01, MC-01, EC-01**	**61 days?**	**Sat 6/14/25**	**Fri 9/5/25**	**School Year Project - Weekend Work Required**
29		Demolition	3 days	Thu 6/26/25	Mon 6/30/25	
30		Wall Framing	4 days	Tue 7/1/25	Fri 7/4/25	Milestone
31		Exterior Storefront & Doors	2 days	Tue 7/1/25	Wed 7/2/25	



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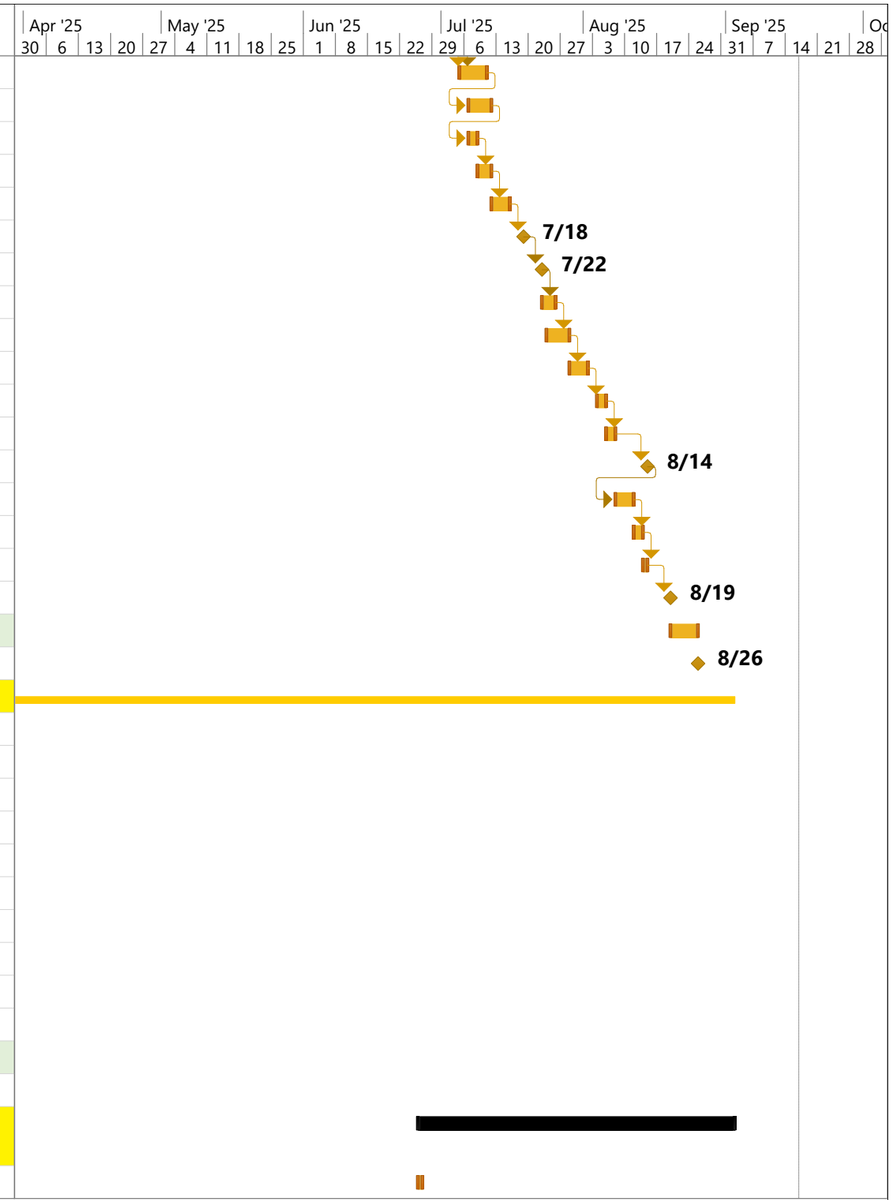
Task	Inactive Summary	External Tasks	Path Driving Predecessor Summary Task		
Split	Manual Task	External Milestone	Path Driving Predecessor Normal Task		
Milestone	Duration-only	Deadline	Critical		
Summary	Manual Summary Rollup	Path Predecessor Milestone Task	Critical Split		
Project Summary	Manual Summary	Path Predecessor Summary Task	Progress		
Inactive Task	Start-only	Path Predecessor Normal Task	Manual Progress		
Inactive Milestone	Finish-only	Path Driving Predecessor Milestone Task			

ID	Task Name	Duration	Start	Finish	Notes
32	Mechanical Rough-in & Equipment Walls	5 days	Sat 7/5/25	Thu 7/10/25	Weekend Work
33	Electrical & Data Rough-in Walls	5 days	Mon 7/7/25	Fri 7/11/25	
34	Interior Door Frames	2 days	Mon 7/7/25	Tue 7/8/25	
35	Bullit Resistive Panel & Sheetrock Walls	3 days	Wed 7/9/25	Fri 7/11/25	Milestone
36	Ceiling Framing	3 days	Sat 7/12/25	Tue 7/15/25	Weekend Work
37	Mechanical Rough-in, Controls & Equipment	3 days	Wed 7/16/25	Fri 7/18/25	
38	Electrical Rough-in Clg	3 days	Sat 7/19/25	Tue 7/22/25	Weekend Work
39	Sheetrock & Grid Clg	3 days	Wed 7/23/25	Fri 7/25/25	
40	Electrical Fixtures	3 days	Thu 7/24/25	Mon 7/28/25	
41	Taping	4 days	Tue 7/29/25	Fri 8/1/25	
42	Painting	2 days	Mon 8/4/25	Tue 8/5/25	
43	Electrical & Mechanical Trim out	2 days	Wed 8/6/25	Thu 8/7/25	
44	Finishes & Casework	5 days	Fri 8/8/25	Thu 8/14/25	Milestone
45	Interior Doors	2 days	Fri 8/8/25	Mon 8/11/25	Weekend Work
46	Testing & Ballancing	2 days	Tue 8/12/25	Wed 8/13/25	Milestone
47	Commissioning	1 day	Thu 8/14/25	Thu 8/14/25	
48	District Move in	3 days	Fri 8/15/25	Tue 8/19/25	Milestone
49	FLOAT	4 days	Wed 8/20/25	Mon 8/25/25	
50	Occupany	0 days	Tue 8/26/25	Tue 8/26/25	
51	**Highview Elementary School - GYM - GC-01 & E**	**30 days?**	**Wed 6/26/24**	**Tue 8/6/24**	**Summer 2025 project**
52	Mobilization	1 day	Thu 6/27/24	Thu 6/27/24	
53	Demolition	8 days	Fri 6/28/24	Tue 7/9/24	
54	Ceilings	10 days	Wed 7/10/24	Tue 7/23/24	
55	Electrical Roughin	3 days	Wed 7/24/24	Fri 7/26/24	
56	Walls / Graphics	4 days	Wed 7/24/24	Mon 7/29/24	
57	Flooring	10 days	Tue 7/30/24	Mon 8/12/24	
58	Wall Padding	5 days	Tue 8/13/24	Mon 8/19/24	
59	Seating	5 days	Wed 7/24/24	Tue 7/30/24	
60	Wheelchair Lift	5 days	Tue 8/13/24	Mon 8/19/24	
61	Electrical Fixtures	3 days	Tue 8/13/24	Thu 8/15/24	
62	FLOAT	4 days	Tue 8/20/24	Fri 8/23/24	
63	Cleanup/ Demobilize	0 days	Sat 8/24/24	Sat 8/24/24	
64	**Highview Elementary School - TOILET ROOMS Ground Floor - GC-01, MC-01,**	**49 days**	**Thu 6/26/25**	**Tue 9/2/25**	**Summer 2025 project**
65	Demolition EC	1 day	Thu 6/26/25	Thu 6/26/25	



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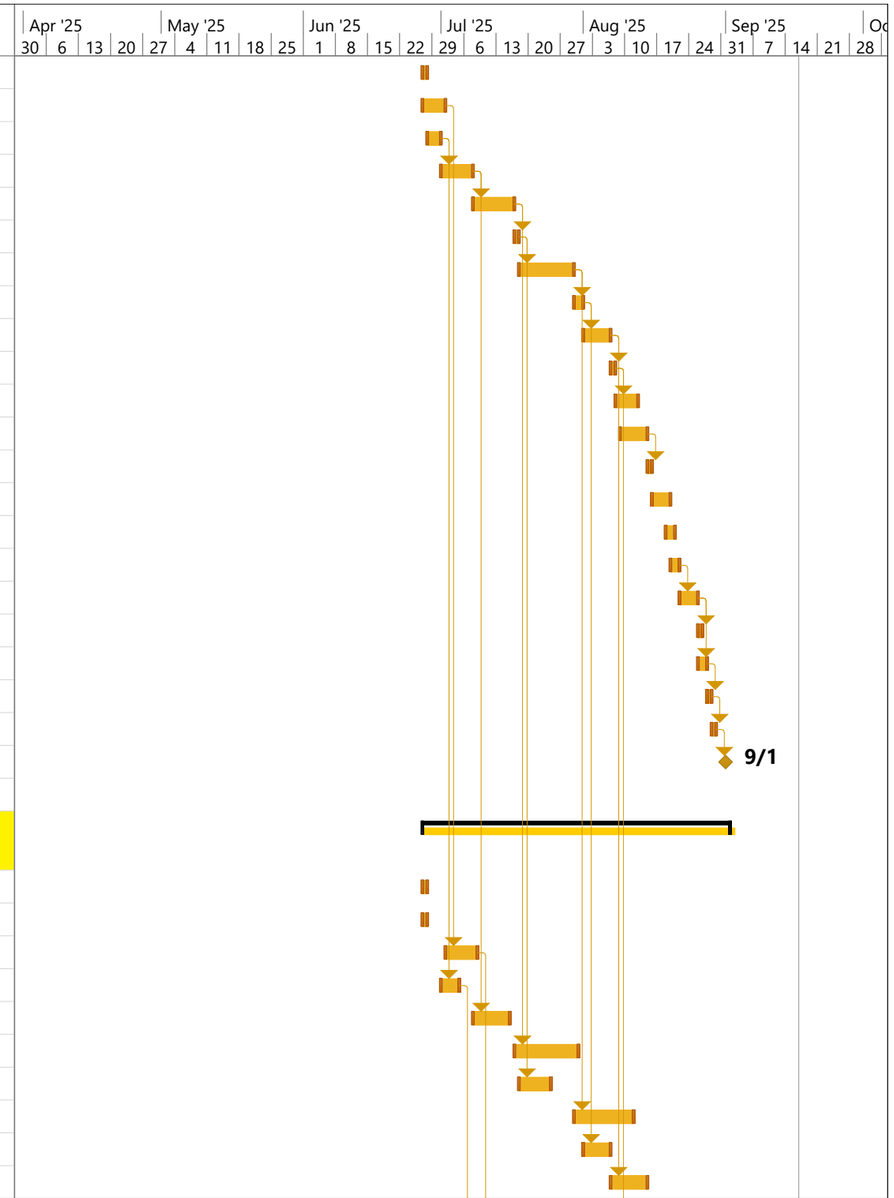
Inactive Task	Start-only	Path Predecessor Normal Task	Manual Progress
Inactive Milestone	Finish-only	Path Driving Predecessor Milestone Task	

ID	Task Name	Duration	Start	Finish	Notes
66	Mobilization	1 day	Fri 6/27/25	Fri 6/27/25	
67	Demolition - GC	3 days	Fri 6/27/25	Tue 7/1/25	
68	Demolition - PC	2 days	Sat 6/28/25	Mon 6/30/25	Weekend Work
69	Framing	5 days	Tue 7/1/25	Mon 7/7/25	
70	Plumbing Rough-in	7 days	Tue 7/8/25	Wed 7/16/25	
71	Mechanical Rough-in	1 day	Thu 7/17/25	Thu 7/17/25	
72	Electrical Rough-in	8 days	Fri 7/18/25	Tue 7/29/25	
73	Sheetrock	2 days	Wed 7/30/25	Thu 7/31/25	
74	Taping	4 days	Fri 8/1/25	Wed 8/6/25	Weekend Work
75	Floor Mud / Pitch	1 day	Thu 8/7/25	Thu 8/7/25	
76	Painting	3 days	Fri 8/8/25	Tue 8/12/25	Weekend Work
77	Tile	5 days	Sat 8/9/25	Thu 8/14/25	
78	Epoxy Floors	1 day	Fri 8/15/25	Fri 8/15/25	
79	Plumbing Fixtures	3 days	Sat 8/16/25	Tue 8/19/25	Weekend Work
80	Electrical Connections for Plumbing	2 days	Tue 8/19/25	Wed 8/20/25	
81	Trim out Lighting and Plumbing	2 days	Wed 8/20/25	Thu 8/21/25	
82	Partitions	2 days	Fri 8/22/25	Mon 8/25/25	
83	HVAC grills registers and diffusers	1 day	Tue 8/26/25	Tue 8/26/25	
84	Toilet Accessories & Mirrors	2 days	Tue 8/26/25	Wed 8/27/25	
85	Touchups	1 day	Thu 8/28/25	Thu 8/28/25	
86	Testing & Balancing	1 day	Fri 8/29/25	Fri 8/29/25	
87	Cleanup and Demobilize	0 days	Mon 9/1/25	Mon 9/1/25	
88					
89	**Highview Elementary School - TOILET ROOMS First Floor - GC-01, MC-01, EC-01**	**47 days**	**Fri 6/27/25**	**Mon 9/1/25**	**Summer 2025 project**
90	Demolition EC	1 day	Fri 6/27/25	Fri 6/27/25	
91	Mobilization	1 day	Fri 6/27/25	Fri 6/27/25	
92	Demolition - GC	5 days	Wed 7/2/25	Tue 7/8/25	
93	Demolition - PC	4 days	Tue 7/1/25	Fri 7/4/25	
94	Framing	6 days	Tue 7/8/25	Tue 7/15/25	
95	Plumbing Rough-in	10 days	Thu 7/17/25	Wed 7/30/25	
96	Mechanical Rough-in	5 days	Fri 7/18/25	Thu 7/24/25	
97	Electrical Rough-in	9 days	Wed 7/30/25	Mon 8/11/25	
98	Sheetrock	4 days	Fri 8/1/25	Wed 8/6/25	
99	Taping	6 days	Thu 8/7/25	Thu 8/14/25	



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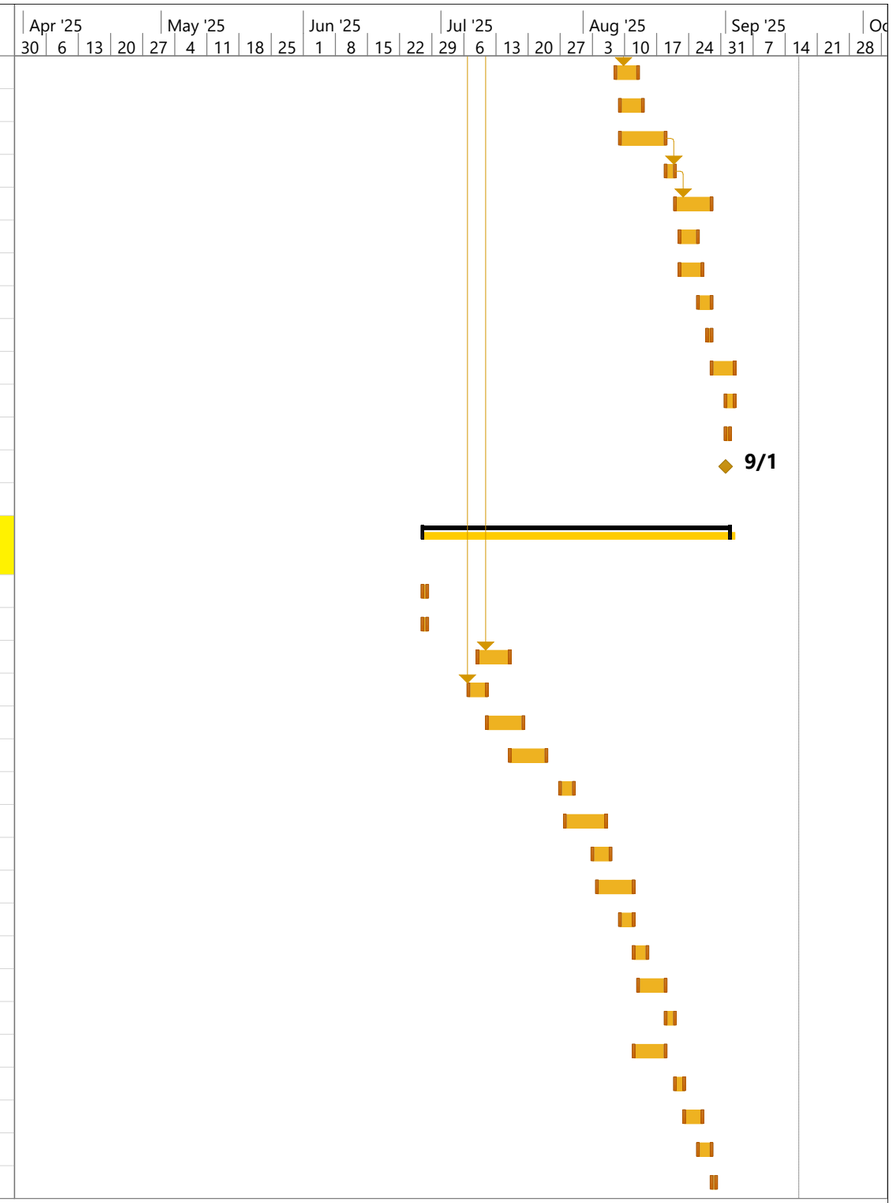
Inactive Task	Start-only	Path Predecessor Normal Task	Manual Progress
Inactive Milestone	Finish-only	Path Driving Predecessor Milestone Task	

ID	Task Name	Duration	Start	Finish	Notes
100	Floor Mud / Pitch	3 days	Fri 8/8/25	Tue 8/12/25	
101	Painting	4 days	Sat 8/9/25	Wed 8/13/25	Weekend Work
102	Tile	7 days	Sat 8/9/25	Mon 8/18/25	
103	Epoxy Floors	2 days	Tue 8/19/25	Wed 8/20/25	
104	Plumbing Fixtures	6 days	Thu 8/21/25	Thu 8/28/25	
105	Electrical Connections for Plumbing	2 days	Fri 8/22/25	Mon 8/25/25	
106	Trim out Lighting and Plumbing	3 days	Fri 8/22/25	Tue 8/26/25	
107	Partitions	3 days	Tue 8/26/25	Thu 8/28/25	
108	HVAC grills registers and diffusers	1 day	Thu 8/28/25	Thu 8/28/25	
109	Toilet Accessories & Mirrors	3 days	Fri 8/29/25	Tue 9/2/25	Weekend Work
110	Touchups	2 days	Mon 9/1/25	Tue 9/2/25	
111	Testing & Balancing	1 day	Mon 9/1/25	Mon 9/1/25	
112	Cleanup and Demobilize	0 days	Mon 9/1/25	Mon 9/1/25	
113					
114	**Highview Elementary School - TOILET ROOMS Second Floor - GC-01, MC-01,**	**47 days**	**Fri 6/27/25**	**Mon 9/1/25**	**Summer 2025 project**
115	Demolition EC	1 day	Fri 6/27/25	Fri 6/27/25	
116	Mobilization	1 day	Fri 6/27/25	Fri 6/27/25	
117	Demolition - GC	5 days	Wed 7/9/25	Tue 7/15/25	
118	Demolition - PC	4 days	Mon 7/7/25	Thu 7/10/25	
119	Framing	6 days	Fri 7/11/25	Fri 7/18/25	
120	Plumbing Rough-in	6 days	Wed 7/16/25	Wed 7/23/25	Weekend Work
121	Mechanical Rough-in	3 days	Sun 7/27/25	Tue 7/29/25	Weekend Work
122	Electrical Rough-in	7 days	Mon 7/28/25	Tue 8/5/25	
123	Sheetrock	4 days	Sun 8/3/25	Wed 8/6/25	Weekend Work
124	Taping	6 days	Mon 8/4/25	Mon 8/11/25	
125	Floor Mud	2 days	Sat 8/9/25	Mon 8/11/25	Weekend Work
126	Painting	3 days	Tue 8/12/25	Thu 8/14/25	
127	Tile	4 days	Wed 8/13/25	Mon 8/18/25	
128	Epoxy Floors	2 days	Tue 8/19/25	Wed 8/20/25	
129	Plumbing Fixtures	5 days	Tue 8/12/25	Mon 8/18/25	
130	Electrical Connections for Plumbing	2 days	Thu 8/21/25	Fri 8/22/25	
131	Trim out Lighting and Plumbing	3 days	Sat 8/23/25	Tue 8/26/25	
132	Partitions	3 days	Tue 8/26/25	Thu 8/28/25	
133	HVAC grills registers and diffusers	1 day	Fri 8/29/25	Fri 8/29/25	



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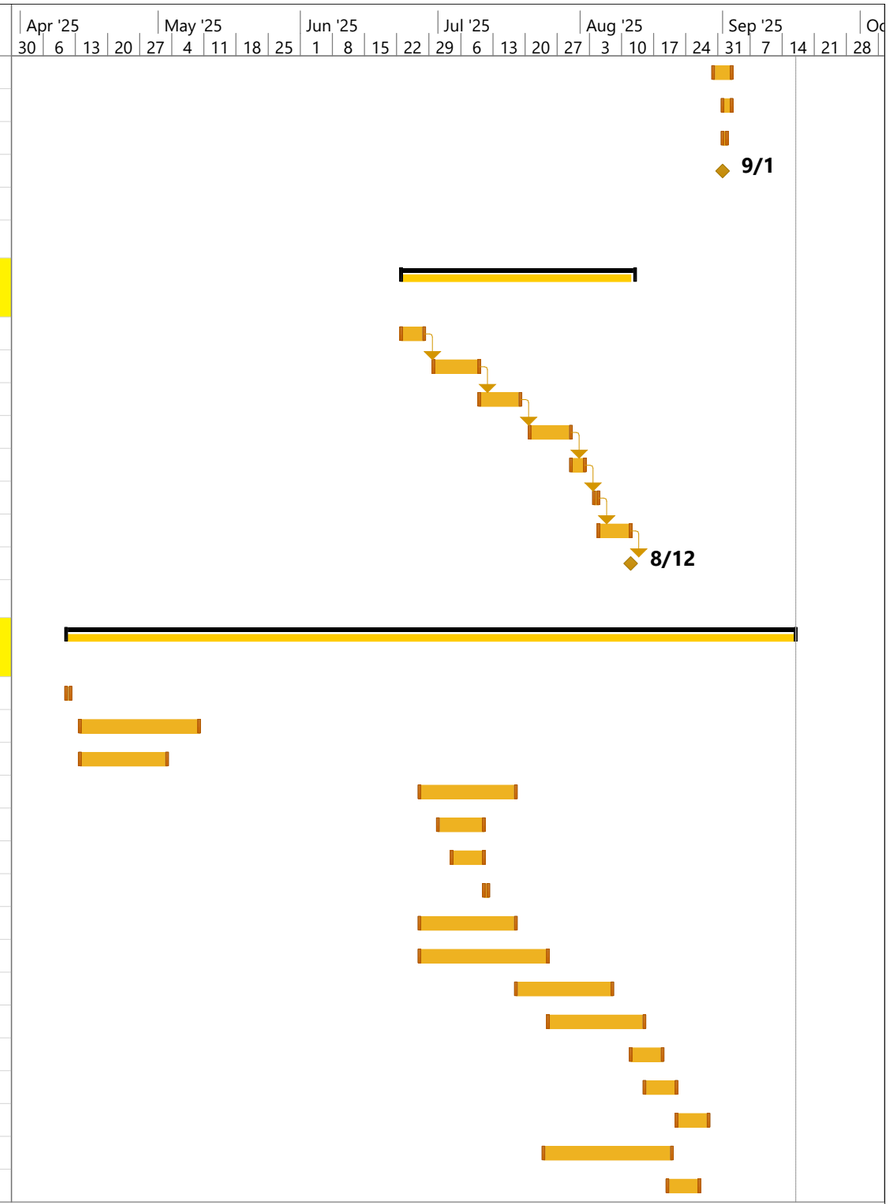
Inactive Task	Start-only	Path Predecessor Normal Task	Manual Progress
Inactive Milestone	Finish-only	Path Driving Predecessor Milestone Task	

ID	Task Name	Duration	Start	Finish	Notes
134	Toilet Accessories & Mirrors	3 days	Sat 8/30/25	Tue 9/2/25	Weekend Work
135	Touchups	2 days	Mon 9/1/25	Tue 9/2/25	
136	Testing & Balancing	1 day	Mon 9/1/25	Mon 9/1/25	
137	Cleanup and Demobilize	0 days	Mon 9/1/25	Mon 9/1/25	
138					
139					
140	**Highview Elementary School - Panel Replacements - EC-01**	**37 days**	**Mon 6/23/25**	**Tue 8/12/25**	**Summer 2025 project**
141	Field Verify Existing Circuits	5 days	Mon 6/23/25	Fri 6/27/25	
142	Remove & Repalce Panel DP-1	8 days	Mon 6/30/25	Wed 7/9/25	
143	Remove & Repalce Panel BLR	7 days	Thu 7/10/25	Fri 7/18/25	
144	Remove & Repalce Panel STAGE	7 days	Mon 7/21/25	Tue 7/29/25	
145	Panel Directories & Labeling	3 days	Wed 7/30/25	Fri 8/1/25	
146	3rd Party Inspections	1 day	Mon 8/4/25	Mon 8/4/25	
147	Punchlist	5 days	Tue 8/5/25	Mon 8/11/25	
148	Cleanup & Demobilize	0 days	Tue 8/12/25	Tue 8/12/25	
149	**Miller Elementary School MC-01, EC-**				
150	**Miller Elementary School - HVAC Upgrades - GC-01, MC-01, EC-01**	**113 days**	**Fri 4/11/25**	**Tue 9/16/25**	**Spring Break Start**
151	Mobilization	1 day	Fri 4/11/25	Fri 4/11/25	
152	Controls Rough in	20 days	Mon 4/14/25	Fri 5/9/25	Spring Recess
153	Electrical Rough in	15 days	Mon 4/14/25	Fri 5/2/25	Spring Recess
154	Temp Ceiling Removals	15 days	Fri 6/27/25	Thu 7/17/25	
155	Rooftop Steel	8 days	Tue 7/1/25	Thu 7/10/25	
156	Roofing Penetrations and flashings	5 days	Fri 7/4/25	Thu 7/10/25	
157	Set Condensing Units	1 day	Fri 7/11/25	Fri 7/11/25	
158	Mount Fancoil units	15 days	Fri 6/27/25	Thu 7/17/25	
159	Suction & Liquid Piping	20 days	Fri 6/27/25	Thu 7/24/25	
160	Final Electrical and Controls Connections	15 days	Fri 7/18/25	Thu 8/7/25	
161	Condensate Piping	15 days	Fri 7/25/25	Thu 8/14/25	
162	Condensate pumps	5 days	Tue 8/12/25	Mon 8/18/25	
163	Pressure Testing	5 days	Fri 8/15/25	Thu 8/21/25	
164	Startup	5 days	Fri 8/22/25	Thu 8/28/25	
165	Controls back end	20 days	Thu 7/24/25	Wed 8/20/25	
166	Testing & Balancing	5 days	Wed 8/20/25	Tue 8/26/25	



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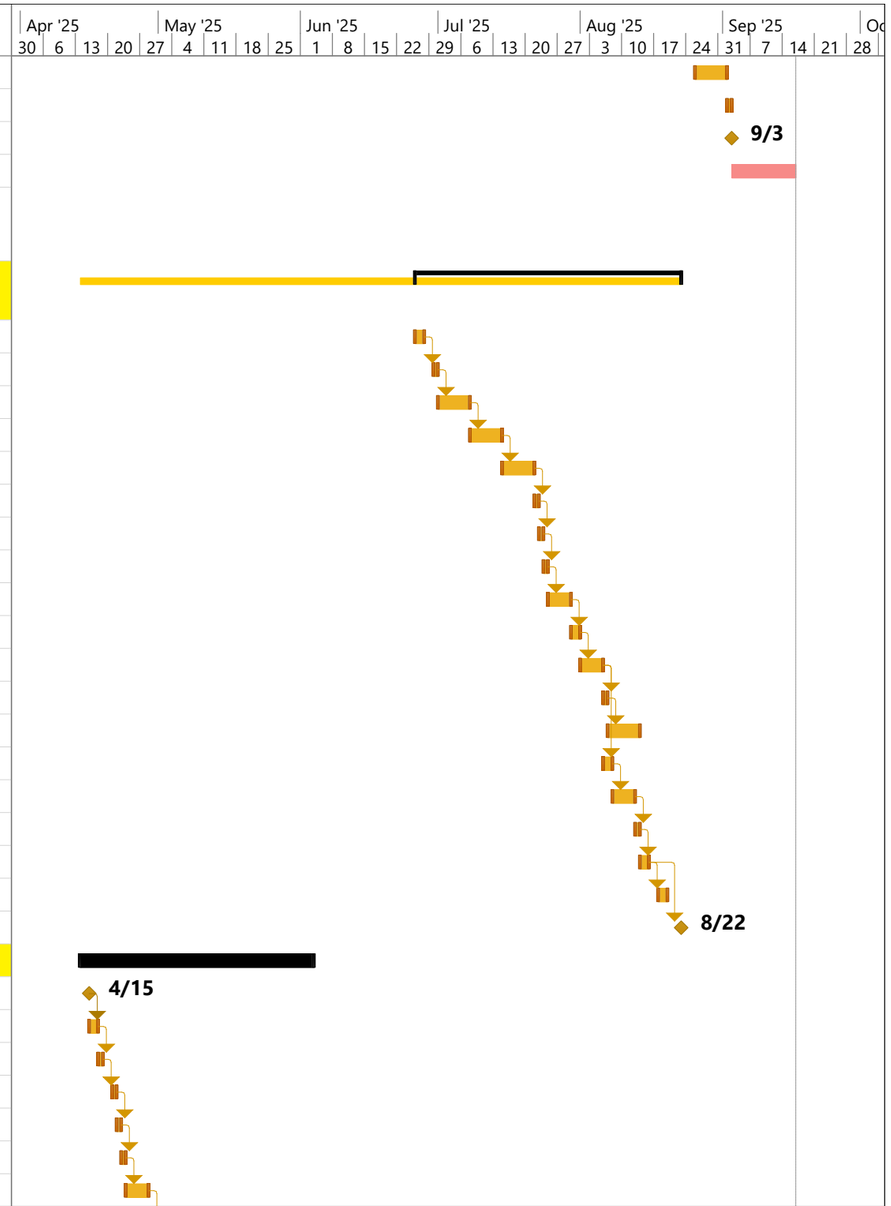
Inactive Task	Start-only	Path Predecessor Normal Task	Manual Progress
Inactive Milestone	Finish-only	Path Driving Predecessor Milestone Task	

ID	Task Name	Duration	Start	Finish	Notes
167	CX/ Punchlist	5 days	Tue 8/26/25	Mon 9/1/25	
168	Training	1 day	Tue 9/2/25	Tue 9/2/25	
169	Turnover	0 days	Wed 9/3/25	Wed 9/3/25	
170	Closeout	10 days	Wed 9/3/25	Tue 9/16/25	
171	**Maintenance Building - GC-01, EC-01, MC-01**				
172	**Maintenance Building Siding & interior - GC-01, EC-01, MC-01**	**42 days**	**Thu 6/26/25**	**Fri 8/22/25**	**Summer 2025 project**
173	District Move Out	2 days	Thu 6/26/25	Fri 6/27/25	
174	Mobilization	1 day	Mon 6/30/25	Mon 6/30/25	
175	Skylight Removals/Infill	5 days	Tue 7/1/25	Mon 7/7/25	
176	Siding Removals	5 days	Tue 7/8/25	Mon 7/14/25	
177	New Siding	5 days	Tue 7/15/25	Mon 7/21/25	
178	Electrical Demo/ temp lighting	1 day	Tue 7/22/25	Tue 7/22/25	
179	Ceiling Demo	1 day	Wed 7/23/25	Wed 7/23/25	
180	HVAC Demo	1 day	Thu 7/24/25	Thu 7/24/25	
181	New Ceilings	3 days	Fri 7/25/25	Tue 7/29/25	
182	Electrical Rough-in	2 days	Wed 7/30/25	Thu 7/31/25	
183	HVAC Rough in - Suction, Liquid, Condensate,	3 days	Fri 8/1/25	Tue 8/5/25	
184	Set new Condecing unit	1 day	Wed 8/6/25	Wed 8/6/25	
185	Fain coil unit & Fin Tube	5 days	Thu 8/7/25	Wed 8/13/25	
186	New Light Fixtures	2 days	Wed 8/6/25	Thu 8/7/25	
187	Paint	3 days	Fri 8/8/25	Tue 8/12/25	
188	White out Ceilings	1 day	Wed 8/13/25	Wed 8/13/25	
189	Flooring	2 days	Thu 8/14/25	Fri 8/15/25	
190	Punchlist	2 days	Mon 8/18/25	Tue 8/19/25	
191	Move in	5 days	Mon 8/18/25	Fri 8/22/25	
192	**Maintenance Building Service Upgrade EC-01**	**37 days**	**Mon 4/14/25**	**Tue 6/3/25**	**Spring Break Start**
193	Primary Trenching	2 days	Mon 4/14/25	Tue 4/15/25	Spring Recess
194	Primary Conduit & Pole Riser	2 days	Wed 4/16/25	Thu 4/17/25	Spring Recess
195	Inspections	1 day	Fri 4/18/25	Fri 4/18/25	Spring Recess
196	Primary Backfill & Asphalt Patch	1 day	Mon 4/21/25	Mon 4/21/25	Spring Recess
197	Set New Transformer Pad	1 day	Tue 4/22/25	Tue 4/22/25	
198	Grounding	1 day	Wed 4/23/25	Wed 4/23/25	
199	Secondary Trenching	3 days	Thu 4/24/25	Mon 4/28/25	



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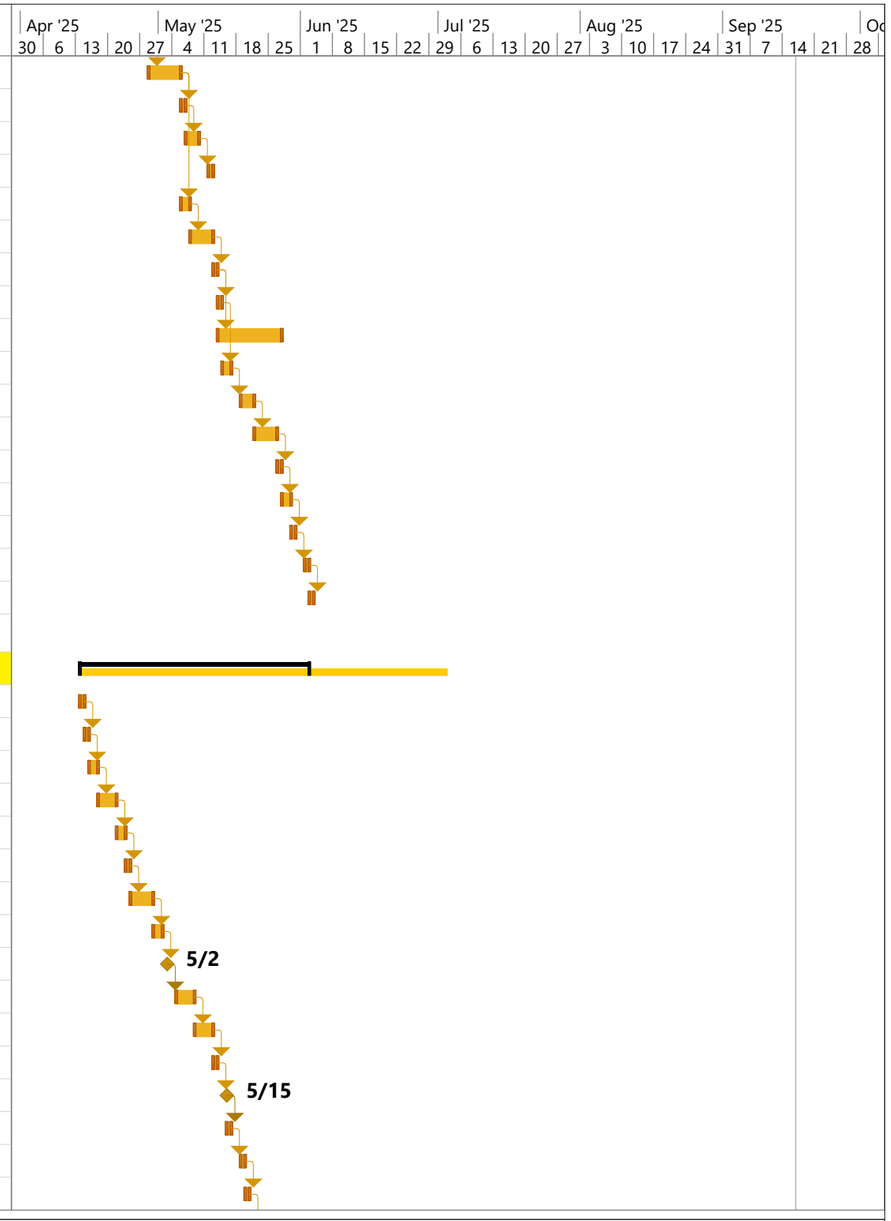
ID	Task Name	Duration	Start	Finish	Notes
200	Secondary Conduit	5 days	Tue 4/29/25	Mon 5/5/25	
201	Inspections	1 day	Tue 5/6/25	Tue 5/6/25	
202	Secondary Trench Backfill	3 days	Wed 5/7/25	Fri 5/9/25	
203	Hot Asphalt Patch	1 day	Mon 5/12/25	Mon 5/12/25	
204	New Interior Panel	2 days	Tue 5/6/25	Wed 5/7/25	
205	CT/ PT Cabinets install	3 days	Thu 5/8/25	Mon 5/12/25	
206	Main Disconnect Install	1 day	Tue 5/13/25	Tue 5/13/25	
207	Inspections	1 day	Wed 5/14/25	Wed 5/14/25	
208	Interior Circuits and breakers	10 days	Wed 5/14/25	Tue 5/27/25	
209	Pull primary conductors	2 days	Thu 5/15/25	Fri 5/16/25	
210	Inspection	3 days	Mon 5/19/25	Wed 5/21/25	
211	Pull secondary conductors	3 days	Thu 5/22/25	Mon 5/26/25	
212	Set Transformer	1 day	Tue 5/27/25	Tue 5/27/25	
213	O&R Overhead	2 days	Wed 5/28/25	Thu 5/29/25	
214	O&R De-energize / Re-Energize	1 day	Fri 5/30/25	Fri 5/30/25	
215	Punchlist	1 day	Mon 6/2/25	Mon 6/2/25	
216	Closeout	1 day	Tue 6/3/25	Tue 6/3/25	
217	**OEC Building - GC-01, EC-01, MC-**				
218	**Outdoor Education Center - Site Work - GC-01**	**36 days?**	**Mon 4/14/25**	**Mon 6/2/25**	**Spring Break Start**
219	Mobilization	1 day	Mon 4/14/25	Mon 4/14/25	Spring Recess
220	Remove North Stair & Handrails	1 day	Tue 4/15/25	Tue 4/15/25	Spring Recess
221	Remove East Stair & Handrails	2 days	Wed 4/16/25	Thu 4/17/25	Spring Recess
222	Form Footings	2 days	Fri 4/18/25	Mon 4/21/25	Spring Recess
223	Rebar	2 days	Tue 4/22/25	Wed 4/23/25	
224	Pour Footings	1 day	Thu 4/24/25	Thu 4/24/25	
225	Form Foundations	3 days	Fri 4/25/25	Tue 4/29/25	
226	Rebar	2 days	Wed 4/30/25	Thu 5/1/25	
227	Pour Foundations	1 day	Fri 5/2/25	Fri 5/2/25	
228	Form Stairs	4 days	Mon 5/5/25	Thu 5/8/25	
229	Rebar	2 days	Fri 5/9/25	Mon 5/12/25	
230	Pour Stairs	1 day	Tue 5/13/25	Tue 5/13/25	
231	Handrails	2 days	Wed 5/14/25	Thu 5/15/25	
232	Remove South Ramp	1 day	Fri 5/16/25	Fri 5/16/25	
233	Form Footings	1 day	Mon 5/19/25	Mon 5/19/25	
234	Rebar	1 day	Tue 5/20/25	Tue 5/20/25	



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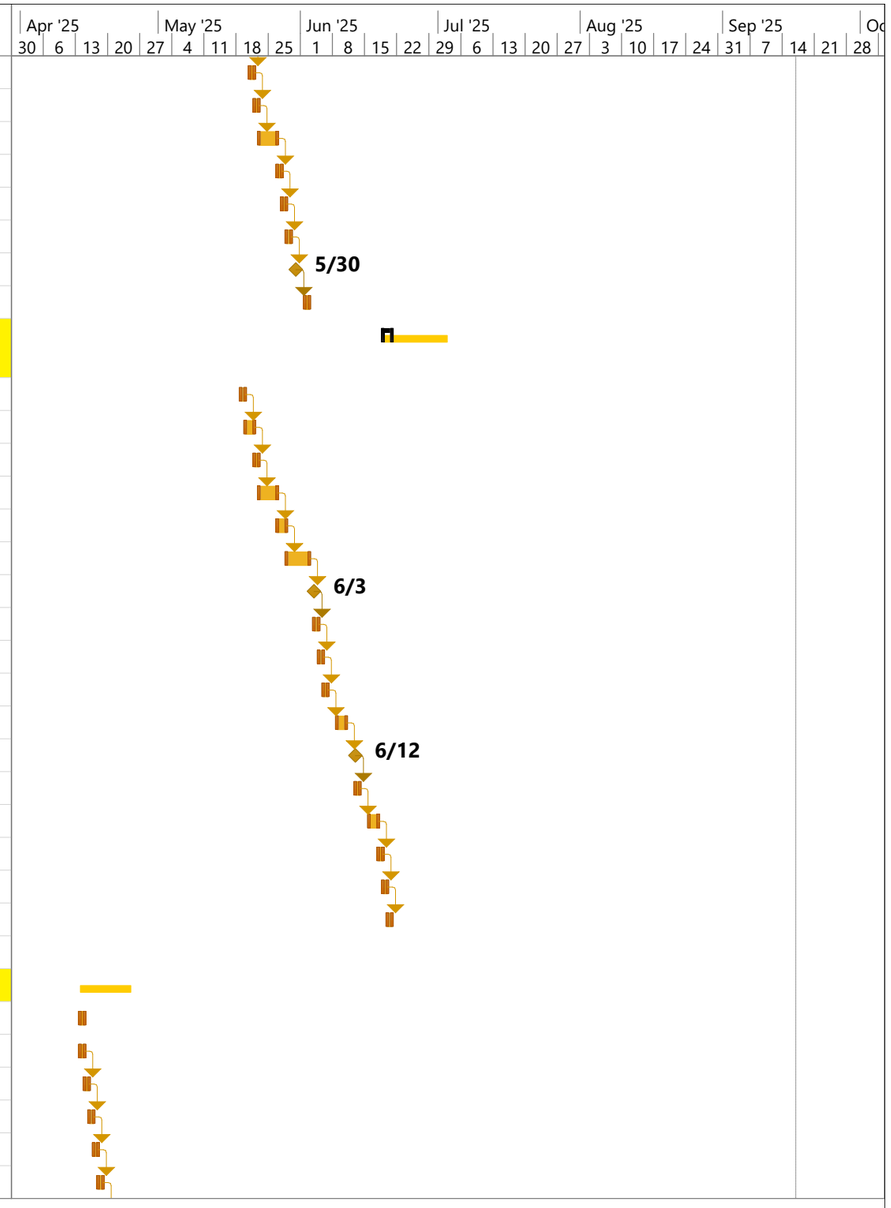
Inactive Milestone	Finish-only	Path Driving Predecessor Milestone Task			

ID	Task Name	Duration	Start	Finish	Notes
235	Pour Footings	1 day	Wed 5/21/25	Wed 5/21/25	
236	Form Foundations	1 day	Thu 5/22/25	Thu 5/22/25	
237	Rebar	2 days	Fri 5/23/25	Mon 5/26/25	
238	Pour Foundations	1 day	Tue 5/27/25	Tue 5/27/25	
239	Form Ramp	1 day	Wed 5/28/25	Wed 5/28/25	
240	Rebar	1 day	Thu 5/29/25	Thu 5/29/25	
241	Pour Ramp	1 day	Fri 5/30/25	Fri 5/30/25	
242	Handrails	1 day	Mon 6/2/25	Mon 6/2/25	
243	**Outdoor Education Center - Boiler & Mini-Split MC-01 & EC-01**	2 days	Thu 6/19/25	Fri 6/20/25	**Spring Break Start**
245	Mobilization	1 day	Mon 5/19/25	Mon 5/19/25	
246	Demo Existing Boiler / Piping	2 days	Tue 5/20/25	Wed 5/21/25	
247	Set New Boiler	1 day	Thu 5/22/25	Thu 5/22/25	
248	New HW Piping, Exhaust, Natural Gas	2 days	Fri 5/23/25	Mon 5/26/25	
249	Electrical Rough in	2 days	Tue 5/27/25	Wed 5/28/25	
250	Controls	3 days	Thu 5/29/25	Mon 6/2/25	
251	Startup	1 day	Tue 6/3/25	Tue 6/3/25	
252	T&B	1 day	Wed 6/4/25	Wed 6/4/25	
253	Set New ACCU-OEC-1	1 day	Thu 6/5/25	Thu 6/5/25	
254	Mount AC-OEC-1	1 day	Fri 6/6/25	Fri 6/6/25	
255	Electrical Rough in	2 days	Mon 6/9/25	Tue 6/10/25	
256	Liquid & Suction Piping	2 days	Wed 6/11/25	Thu 6/12/25	
257	Condensate	1 day	Fri 6/13/25	Fri 6/13/25	
258	Controls	2 days	Mon 6/16/25	Tue 6/17/25	
259	Startup	1 day	Wed 6/18/25	Wed 6/18/25	
260	T&B	1 day	Thu 6/19/25	Thu 6/19/25	
261	Demmobilize	1 day	Fri 6/20/25	Fri 6/20/25	
262					
263	**Outdoor Education Center - Interior IT Closet**				**SPRING BREAK PROJECT**
264	Mobilization	1 day	Mon 4/14/25	Mon 4/14/25	Spring Recess
265	Demo	1 day	Mon 4/14/25	Mon 4/14/25	Spring Recess
266	Wall Framing	1 day	Tue 4/15/25	Tue 4/15/25	Spring Recess
267	Door Frame	1 day	Wed 4/16/25	Wed 4/16/25	Spring Recess
268	Sheetrock	1 day	Thu 4/17/25	Thu 4/17/25	Spring Recess
269	Taping	1 day	Fri 4/18/25	Fri 4/18/25	Spring Recess



Project: \\nycfil02\PROJ\2021 p
Date: Thu 12/12/24

Task	Inactive Summary	External Tasks	Path Driving Predecessor Summary Task
Split	Manual Task	External Milestone	Path Driving Predecessor Normal Task
Milestone	Duration-only	Deadline	Critical
Summary	Manual Summary Rollup	Path Predecessor Milestone Task	Critical Split
Project Summary	Manual Summary	Path Predecessor Summary Task	Progress
Inactive Task	Start-only	Path Predecessor Normal Task	Manual Progress
Inactive Milestone	Finish-only	Path Driving Predecessor Milestone Task	

ID	Task Name	Duration	Start	Finish	Notes
270	Paint	1 day	Mon 4/21/25	Mon 4/21/25	Spring Recess
271	Ceilings	1 day	Tue 4/22/25	Tue 4/22/25	Second Shift
272	Hang New Door	1 day	Wed 4/23/25	Wed 4/23/25	Second Shift
273	Demobilize	1 day	Thu 4/24/25	Thu 4/24/25	Second Shift
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Project: \\nycfil02\PROJ\2021 p
Date: Thu 12/12/24

Task	Inactive Summary	External Tasks	Path Driving Predecessor Summary Task		
Split	Manual Task	External Milestone	Path Driving Predecessor Normal Task		
Milestone	Duration-only	Deadline	Critical		
Summary	Manual Summary Rollup	Path Predecessor Milestone Task	Critical Split		
Project Summary	Manual Summary	Path Predecessor Summary Task	Progress		
Inactive Task	Start-only	Path Predecessor Normal Task	Manual Progress		
Inactive Milestone	Finish-only	Path Driving Predecessor Milestone Task			

4 **Highview Elementary School - Roofing - BE-01**
Weekend work and double shift anticipated
5 **Mobilization**
Spring Break School Closed March 31 April 4
6 **Remove Asphalt Shingle Roof R2**
Spring Break School Closed March 31 April 4
7 **New Roofing Roof R2**
Spring Break School Closed March 31 April 4
8 **Wet Removals & Patching**
Spring Break School Closed March 31 April 4
9 **Roof Cleaning R3,R4**
Possible Second Shift. Noise Dependant
18 **Highview Elementary School - Masonry - BE-02**
School Year Project - Weekend work and double shift anticipated
24 **Highview Elementary School - Doors & Glazing & Misc. Interior - GC-01**
School Year Project - Weekend work and double shift anticipated
25 **Mobilize**
Second Shift
26 **Door, Hardware, & Glazing Removal and Replacement**
Second Shift
28 **Highview Elementary School - Security Vestibule Renovation - GC-01, MC-01, EC-01**
School Year Project - Weekend Work Required
30 **Wall Framing**
Milestone
32 **Mechanical Rough-in & Equipment Walls**
Weekend Work
35 **Bullit Resistive Panel & Sheetrock Walls**
Milestone
36 **Ceiling Framing**
Weekend Work
38 **Electrical Rough-in Clg**
Weekend Work
44 **Finishes & Casework**
Milestone
45 **Interior Doors**
Weekend Work
46 **Testing & Ballancing**
Milestone
48 **District Move in**
Milestone
51 **Highview Elementary School - GYM - GC-01 & EC-01**
Summer 2025 project
64 **Highview Elementary School - TOILET ROOMS Ground Floor - GC-01, MC-01, EC-01**
Summer 2025 project
68 **Demolition - PC**
Weekend Work
74 **Taping**
Weekend Work
76 **Painting**
Weekend Work
79 **Plumbing Fixtures**
Weekend Work

89 **Highview Elementary School - TOILET ROOMS First Floor - GC-01, MC-01, EC-01**
Summer 2025 project
101 **Painting**
Weekend Work
109 **Toilet Accessories & Mirrors**
Weekend Work
114 **Highview Elementary School - TOILET ROOMS Second Floor - GC-01, MC-01, EC-01**
Summer 2025 project
120 **Plumbing Rough-in**
Weekend Work
121 **Mechanical Rough-in**
Weekend Work
123 **Sheetrock**
Weekend Work
125 **Floor Mud**
Weekend Work
134 **Toilet Accessories & Mirrors**
Weekend Work
140 **Highview Elementary School - Panel Replacements - EC-01**
Summer 2025 project
150 **Miller Elementary School - HVAC Upgrades - GC-01, MC-01, EC-01**
Spring Break Start
152 **Controls Rough in**
Spring Recess
153 **Electrical Rough in**
Spring Recess
172 **Maintenance Building Siding & interior - GC-01, EC-01, MC-01**
Summer 2025 project
192 **Maintenance Building Service Upgrade EC-01**
Spring Break Start
193 **Primary Trenching**
Spring Recess
194 **Primary Conduit & Pole Riser**
Spring Recess
195 **Inspections**
Spring Recess
196 **Primary Backfill & Asphalt Patch**
Spring Recess
218 **Outdoor Education Center - Site Work - GC-01**
Spring Break Start
219 **Mobilization**
Spring Recess
220 **Remove North Stair & Handrails**
Spring Recess
221 **Remove East Stair & Handrails**
Spring Recess
222 **Form Footings**
Spring Recess
243 **Outdoor Education Center - Boiler & Mini-Split MC-01 & EC-01**
Spring Break Start
263 **Outdoor Education Center - Interior IT Closet**
SPRING BREAK PROJECT

264 Mobilization
Spring Recess
265 Demo
Spring Recess
266 Wall Framing
Spring Recess
267 Door Frame
Spring Recess
268 Sheetrock
Spring Recess
269 Taping
Spring Recess
270 Paint
Spring Recess
271 Ceilings
Second Shift
272 Hang New Door
Second Shift
273 Demobilize
Second Shift

SECTION 00 43 25 - SUBSTITUTION REQUEST FORM

Should any part or portion of the Work be planned for substitute products, list all substitutes that are proposed for products that have been specified by one or more manufacturers in the specifications. Please print in ink or type in the spaces provided. Attach additional sheets if necessary.

This identification of substitutions is required of Bidder(s) as part of the Supplementary Bid Forms and is in partial fulfillment of requirements of the Instructions to Bidders. Substitutions may affect Owner's acceptance of the Bid and decision to award Contract. Additional data on substitutions may be requested from selected Bidder(s) after the Bid Opening in accordance with Division 01 Section "Product Requirements."

CONTRACTOR NAME _____

CONTRACT NAME/# _____

SPECIFICATION SECTION	SPECIFIED ITEM	SUBSTITUTION

END OF SECTION 004325

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SECTION 00 43 36 - PROPOSED SUBCONTRACTORS FORM

Should any part or portion of the Work be planned for subcontracting, list the name and address of all Subcontractors that Bidder(s) proposes to use on Prime Contract and the assigned Work to each. Please print in ink or type in the spaces provided. Attach additional sheets if necessary.

This identification of subcontractors is required of Bidder(s) as part of the Supplementary Bid Forms and is in partial fulfillment of requirements of the Instructions to Bidders. Additional data on proposed Subcontractors may be requested from selected Bidders after the Bid Opening in accordance with the Instructions to Bidders.

CONTRACTOR NAME _____

CONTRACT NAME/# _____

SUBCONTRACTOR	ADDRESS	ASSIGNED WORK

END OF SECTION 00 43 36

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SECTION 004543 - CORPORATE RESOLUTIONS

INCLUDE WITH BID FORM(S) IF BIDDER IS AN INDIVIDUAL:

By:_____
(Signature)

_____
(Print or type individual's name and title)

_____
(Business Address)

_____
Business Phone Facsimile

INCLUDE WITH BID FORM(S) IF BIDDER IS A PARTNERSHIP:

_____
(Print or type name of firm)

BY:_____
(Signature of general partner)

_____
(Print or type general partner's name and title)

_____
(Business Address)

_____
Business Phone Facsimile

INCLUDE WITH BID FORM(S) IF BIDDER IS A CORPORATION:

_____
(Print or type name of corporation)

_____
(State of incorporation)

BY:_____
(Signature of president or vice-president)

_____
(Print or type individual's name and title)

_____
(Business Address)

_____
Business Phone Facsimile

ATTEST:

_____
(By corporate secretary or assistant secretary)

_____
(Print name and title)

Corporate Seal

END OF SECTION 004543

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Insurance Certification

Bid or Project No. #_____Name of Project:_____

Your insurance representative must complete the form below in order to be considered for the award of this bid or project, and it is important that you complete the Bidder's Acknowledgement section of this form. Please note that a certificate of insurance must accompany your bid submission in order for your bid to be considered.

Insurance Representative's Acknowledgement:

We have reviewed the insurance requirements set forth in the bid and are capable of providing such insurance to our insured in accordance with such requirements in the event the contract is awarded to our insured and provided our insured pays the appropriate premium.

Insurance Representative:

_____

Address:

_____

Are you an agent for the companies providing the coverage?

Yes_____No_____

Date:_____

Insurance Representative Signature:_____

Bidder's Acknowledgement:

I acknowledge that I have received the insurance requirements of this bid and have considered the costs, if any, of procuring the required insurance and will be able to supply the insurance required in accordance with the bid, if it is awarded. I understand that a certificate of insurance must be submitted with my bid: and if it is not, the Nanuet Union Free School District may reject my bid and award to the next lowest bidder.

Firm name:_____

Address:

_____
Bidders Signature

Date:_____

AIA® Document G716™ – 2004

Request for Information ("RFI")

TO:
Areej Sabzwari
asabzwari@ksq.design

FROM:

PROJECT:
Nanuet UFSD
Nanuet Bond Projects Phase 5

ISSUE DATE:

RFI No.:

REQUESTED REPLY DATE:

PROJECT NUMBERS:
2411001.00

COPIES TO:

RFI DESCRIPTION: *(Fully describe the question or type of information requested.)*

REFERENCES/ATTACHMENTS: *(List specific documents researched when seeking the information requested.)*
SPECIFICATIONS: **DRAWINGS:** **OTHER:**

SENDER'S RECOMMENDATION: *(If RFI concerns a site or construction condition, the sender may provide a recommended solution, including cost and/or schedule considerations.)*

RECEIVER'S REPLY: *(Provide answer to RFI, including cost and/or schedule considerations.)*

By: _____ Date: _____

COPIES TO _____

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, Construction Change Directive or a Minor Change in the work must be executed in accordance with the Contract Documents.

Labor Rate Sheet

PROJECT Nanuet Union Free School District – Phase 5 Projects	**DATE** **CONTRACT NO.**
KSQ PROJ. # 24111001.00	**CONTRACTOR**

LABOR RATES

DIRECTIONS
All contractors are requested to submit a schedule of labor rates to be used for the duration of this project. Please provide a separate rate for each trade classification for the work of this contract. These rates will be used to determine labor charges on any additional work of this contract. (Submit a separate sheet for each wage period).

WAGE PERIOD

LABOR CLASSIFICATION

	Straight Time	Over Time	Double Time
Base Rate	$		
'Benefits	$		
Subtotal	$		
All Payroll Taxes _____ % of Base Rate	$		
Total Straight Time (Rate/Hour)	$		

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SECTION 00 90 00 - NY SED REGULATIONS 155.5

PART 1 - GENERAL

1.1 NYSSED 155.5 REGULATIONS - Uniform Safety Standards for School Construction and Maintenance Projects

A. These regulations are the responsibility of each contractor and his/her subcontractor(s)

PART 2 - Section 155.5 Uniform Safety Standards for School Construction and Maintenance Projects

PART 3 - (a) Monitoring of construction and maintenance activities.

PART 4 - The occupied portion of any school building shall always comply with the minimum requirements necessary to maintain a certificate of occupancy and shall be monitored during construction or maintenance activities for safety violations by school district personnel. It is the responsibility of the board of education or board of cooperative educational services to assure that these standards are continuously maintained when the building or any portion thereof is occupied.

PART 5 - (b) Investigation and disposition of complaints relating to health and safety received as a result of construction and maintenance activities.

PART 6 - Boards of education and boards of cooperative educational services shall follow procedures established under section 155.4(d)(7) of this Part.(c) Pre-construction testing and planning for construction projects.

PART 7 - (1) Boards of education and boards of cooperative educational services shall assure that proper planning is made for safety of building occupants during construction. For all construction projects for which bids are issued on or after September 30, 1999, such boards shall assure that safety is addressed in the bid specifications and contract documents before contract documents are advertised for bid. All school areas to be disturbed during renovation or demolition shall be tested for lead and asbestos. Appropriate procedures to protect the health of building occupants shall be included in the final construction documents for bidding.

PART 8 - (2) Boards of education and boards of cooperative educational services shall establish procedures for involvement of the health and safety committee to monitor safety during school construction projects. The health and safety committees in school districts other than in cities with one million inhabitants or more shall be expanded during construction projects to include the project architect, construction manager, and the contractors. Such committee shall meet periodically to review issues and address complaints related to health and safety resulting from the construction project. In the case of a city school district in a city of one million inhabitants or

more, the board of education shall submit procedures for protecting health and safety during construction to the commissioner for approval. Such procedures shall outline methods for compliance with this section.

PART 9 - (3) The district emergency management plan shall be updated to reflect any changes necessary to accommodate the construction process, including an updated emergency exit plan indicating temporary exits required due to construction. Provisions shall be made for the emergency evacuation and relocation or release of students and staff in the event of a construction incident.

PART 10 - (4) Fire drills shall be held to familiarize students and staff with temporary exits and revised emergency procedures whenever such temporary exits and revised emergency procedures are required.

PART 11 - (d) Pre-construction notification of construction projects.

PART 12 - The board of education or board of cooperative educational services shall establish procedures for notification of parents, staff and the community in advance of a construction project of $10,000 or more to be conducted in a school building while the building is occupied. Such procedures shall provide notice at least two months prior to the date on which construction is scheduled to begin, provided that in the case of emergency construction projects, such notice shall be provided as far in advance of the start of construction as is practicable. Such notice shall include information on the district's obligations under this section to provide a safe school environment during construction projects. Such notice requirement may be met by publication in district newsletters, direct mailings, or holding a public hearing on the project to inform parents, students, school personnel and community members.

PART 13 - (e) General safety and security standards for construction projects.

PART 14 - (1) All construction materials shall be stored in a safe and secure manner.

PART 15 - (2) Fences around construction supplies or debris shall be maintained.

PART 16 - (3) Gates shall always be locked unless a worker is in attendance to prevent unauthorized entry.

PART 17 - (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.

PART 18 - (5) Workers shall be required to wear photo identification badges at all times for identification and security purposes while working at occupied sites.

PART 19 - (f) Separation of construction areas from occupied spaces.

PART 20 - 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.

PART 21 - (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.

PART 22 - (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 of occupied spaces of the building. No material shall be dropped or thrown outside the walls of the building.

PART 23 - (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.

PART 24 - (g) Maintaining exiting and ventilation during school construction projects.

PART 25 - The following information shall be included in all plans and specifications for school building projects:

PART 26 - (1) 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.

PART 27 - A plan detailing how adequate ventilation will be maintained during construction. The plan shall indicate ductwork which 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 construction will be maintained during the project.

PART 28 - (h) Fire and hazard prevention.

PART 29 - Areas of buildings under construction that are to remain occupied shall maintain a certificate of occupancy. In addition, the following shall be strictly enforced:

PART 30 - (1) No smoking is allowed on public school property, including construction areas.

PART 31 - (2) During construction daily inspections of district occupied areas shall be conducted by school district personnel to assure that construction materials, equipment or debris not block fire exits or emergency egress windows.

PART 32 - (3) Proper operation of fire extinguishers, fire alarm, and smoke/fire detection systems shall be maintained throughout the project.

PART 33 - (i) Noise abatement during construction and maintenance activities.

PART 34 - 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. 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 the noise. Complaints regarding excessive noise shall be addressed through the health and safety committee. The district should anticipate those times when construction noise is unacceptable and incorporate "no work" periods into the bid specifications.

PART 35 - (j) Control of chemical fumes, gases, and other contaminants during construction and maintenance projects.

PART 36 - The bid specifications and construction contracts for each construction project shall indicate how and where welding, gasoline engine, roofing, paving, painting or other fumes will be exhausted. Care must be taken to assure fresh air intakes do not draw in such fumes.

PART 37 - (1) The bid specifications shall require schedules of work on construction and maintenance projects which include time for off-gassing of volatile organic compounds introduced during construction before occupancy is allowed. Specific attention is warranted for activities including glues, 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 a space can be assured. 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. If the work will generate toxic gases that cannot be contained in an isolated area, the work must be done when school classes and programs are not in session. The building must be properly ventilated and the material must be given proper time to cure or off-gas before re-occupancy.

PART 38 - (2) Manufacturer's material safety data sheets (MSD) shall be maintained at the site for all products used in the project. MSDS must be provided to anyone who requests them. MSDS indicate chemicals used in the product, product toxicity, typical side effects of exposure to the product and safe procedures for use of the product.

PART 39 - (k) Asbestos abatement protocols.

PART 40 - All asbestos abatement projects shall comply with all applicable Federal and State laws including but not limited to the New York State Department of Labor industrial code rule 56 (12 NYCRR 56), and the Federal Asbestos Hazard Emergency Response Act (AHERA), 40 CFR part 763 (Code of Federal Regulations, 1998 Edition, Superintendent of Public Documents, U.S. Government Printing Office, Washington, DC 20402; 1998; available at the Office of Facilities Planning, Education Building Annex, Room 1060, State Education Department, Albany, NY 12234). Large and small asbestos projects as defined by 12 NYCRR 56 shall not be performed while the building is occupied. Minor asbestos projects defined by 12 NYCRR 56 as an asbestos project involving the removal, disturbance, repair, encapsulation, enclosure or handling of 10 square feet or less of asbestos or asbestos material, or 25 linear feet or less of asbestos or asbestos material may be performed in unoccupied areas of an occupied building in accordance with the above referenced regulations.

PART 41 - (l) Lead paint.

PART 42 - Any construction or maintenance operations which will disturb lead based paint will require abatement of those areas pursuant to protocols detailed in the "Guidelines for the Evaluation and Control of Lead-Based Paint Hazards in Housing" (June 1995; U.S. Department of Housing and Urban Development, Washington, D.C. 20410; available at the Office of Facilities Planning, Education Building Annex, Room 1060, State Education Department, Albany, NY 12234). All areas scheduled for construction as well as areas of flaking and peeling paint shall be tested for the presence of lead and abated or encapsulated in accordance with the above noted guidelines.

PART 43 - (m) Radon.

PART 44 - Districts shall take responsibility to be aware of the geological potential for high levels of radon and to test and mitigate as appropriate. This information is available from the New York State Department of Health Radon Measurement Database.

PART 45 - (n) Post construction inspection.

PART 46 - The school district or board of cooperative educational services shall provide the opportunity for a walk-through inspection by the health and safety committee members to confirm that the area is ready to be reopened for use.

END OF SECTION 00 90 00

SECTION 01 10 00 - MULTIPLE PRIME CONTRACT

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

A. Drawings and general provisions of the Contract, including General and Supplementary Conditions and other Division 1 Specification Sections, apply to this Section.

1.2 PROJECT/WORK IDENTIFICATION

A. General – GC-01 - Project name is Nanuet Phase 5 Projects in the Nanuet Union Free School District as shown in Contract Documents prepared by KSQ Architects. The site location for this contract is: Nanuet Outdoor Education Center, Maintenance Building, Barr Middle School and Highview Elementary School.

B. Electrical – EC-01 - Project name is Nanuet Phase 5 Projects in the Nanuet Union Free School District as shown in Contract Documents prepared by KSQ Architects. The site location for this contract is: Nanuet Outdoor Education Center, Maintenance Building, Barr Middle School and Highview Elementary School.

C. Mechanical – MC-01 - Project name is Nanuet Phase 5 Projects in the Nanuet Union Free School District as shown in Contract Documents prepared by KSQ Architects. The site location for this contract is: Nanuet Outdoor Education Center, Maintenance Building, and Highview Elementary School.

D. Plumbing – PC-01 - Project name is Nanuet Phase 5 Projects in the Nanuet Union Free School District as shown in Contract Documents prepared by KSQ Architects. The site location for this contract is: Highview Elementary School.

E. Prime Contracts, in the context used in this Section, are separate contracts that represent significant elements of work that are performed concurrently with and in close coordination with work performed on the project under other Prime Contracts and Owner. Each is recognized to be a major part of the project (See Section 01 12 XX).

1.3 CONTRACT DOCUMENTS

A. Contract Documents indicate the work of each Prime Contract and related requirements and conditions that have an impact on the project. Related requirements and conditions that are indicated on the Contract Documents include, but are not necessarily limited to the following:

1. Existing site conditions and restrictions on use of the site.
2. Work performed prior to work under these Prime Contracts.
3. Alterations and coordination with existing work.
4. Other work to be performed concurrently by the Owner.
5. Work to be performed subsequent to work under these Prime Contracts.
6. Alternates.
7. Allowances.

1.4 SUMMARY, PRIME CONTRACT WORK

A. The work of each Prime Contract, as defined in greater detail by other provisions of the Contract Documents, is summarized in Section 01 12 XX.

B. Definition of the extent of Prime Contract Work

1. The extent of the work of each Contract is indicated in the Contract Documents. General names and terminology on the drawings and in the specification, sections controls the determination of which Contract includes a specific element of required work, except where no other more specific definition is contained in the Contract Documents.
2. Local custom and trade-union jurisdictional settlements do not control the scope-of-work in each Contract. When a potential jurisdictional dispute or similar potential work interruption is first identified or threatened, affected parties of the Contracts shall promptly negotiate a reasonable settlement which will avoid or minimize such pending interruption and its delays or losses.

1.5 SCHEDULE

A. Within Ten (10) calendar days of award of its Contract by the Owner, the Prime Contractor shall submit a construction schedule to the Construction Manager for the work to be performed under its Contract with the Owner. The construction schedule shall be in a detailed precedence style critical path (CPM) of Primavera type format satisfactory to the Owner, Construction Manager, which shall also:

1. Provide a graphic representation of all activities and events that will occur during the performance of the work.
2. Identify each phase of construction and occupancy.
3. Set forth dates that are critical in ensuring the timely and orderly completion of the Work in accordance with the requirements of the Contract Documents (hereinafter referred to as Milestone Dates).
4. Conform to the Construction Schedule included in the Drawings for each Prime Contractor's Work.
5. Coordinate with and include other primes milestone dates in relation to their portion of work.

B. The Construction Manager & Architect shall review such schedule and shall advise the Prime Contractor if its schedule is acceptable for incorporation into the Master Schedule of work to be performed by the Prime Contractor engaged by the Owner. If the schedule is unacceptable, the Construction Manager will advise the Prime Contractor that its schedule will be revised in the Master Schedule. The Prime Contractor shall monitor the progress of its work for conformance with the requirements of the Construction Schedule and shall promptly advise the Owner and Construction Manager of any delays or potential delays. In the event any progress report indicates any delays, each Prime Contractor shall propose an affirmative plan to correct the delay, including overtime and/or additional labor, if necessary. In no event shall any progress report constitute an adjustment in the Contract Time, the Milestone Dates, or the Contract Sum unless any such adjustment is agreed to by the Owner and authorized pursuant to a Change Order.

C. If the Schedule is not submitted by the Prime Contractor in a timely fashion, such Prime Contractor shall accept the Master Schedule prepared by the Construction Manager as the Construction Schedule to be used in carrying out its work and that prime Contractor shall waiver its rights to claim damage or delay associated with the time requirements set forth in the Master Schedule. Such schedule will become the product and ownership of that Prime Contractor and that Prime Contractor will be back-charged all costs pertaining to the service of producing the schedule.

D. The Prime Contractor shall provide revised schedules at appropriate intervals as required by the conditions of the work and Project or as directed by the Construction Manager.

E. The Prime Contractor will perform all work in the existing building in the evening or on weekends, except during summer breaks, or when the school is closed. Contractor shall obtain approval from the Construction Manager prior to performing the work.

1.6 **PROOF OF ORDERS, DELIVERY DATES AND SUPPLY CHAIN TRACKING**

A. Within 2 weeks after the approval of shop drawings, samples, product data, and any other documents requiring approval before purchasing. The contractor shall provide copies of purchase orders for all equipment and materials which are not available in local stock. The contractor shall submit written statements from suppliers confirming the orders and stating promised delivery dates. Failure to provide this critical information will result in owner holding monthly requisition payments until received or liquidated damages for delay.

Due to ongoing supply chain disruptions, the contractors may be required to obtain all materials for the project and store them onsite in their individually provided Conex boxes. This includes general material items typically readily available (piping, conduits, wire, metal studs, CMU, drainage structures, light fixtures, etc.) The owner will pay for these stored items delivered to the jobsite in accordance with section 012900.

END OF SECTION 011200

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SECTION 01 11 00 - MILESTONE SCHEDULE

PART 1 - GENERAL

1.1 Milestone

The following milestone schedule serves as a basis for bidding. A Master Schedule will be developed at a general meeting of all successful bidders within 21 days of Letter of Intent to Award the Contracts. This sequence and time frame has been coordinated with the school program, no acceleration or changes will be permitted. Each prime contractor will coordinate activities, forward submittals, deliver materials and provide necessary manpower to meet the milestones listed below.

1.2 Milestone Schedule - Highview Elementary School Projects: GC-01, MC-01, EC-01, PC-01

Start of Construction Roofing and Exterior Masonry (BE):	April 1, 2025
Start of Construction Doors (GC):	April 28, 2025
Start of Construction Toilet Rooms (GC,MC,PC,EC):	June 26, 2025
Start of Construction Security Vestibule (GC,MC,EC):	June 26, 2025
Start of Construction Gymnatorium Renovations	June 26, 2025
Start of Construction Electrical Panel Replacements (EC)	June 26, 2025
Equipment Submittals & Approvals:	March-May 2025
Substantial Completion Roofing and Exterior Masonry (BE):	August 27, 2025
Substantial Completion Doors (GC):	July 1, 2025
Substantial Completion Toilet Rooms (GC, MC, PC, EC):	August 29, 2025
Substantial Completion Security Vestibule (GC,MC,EC):	August 26, 2025
Substantial Completion Gymnatorium Renovations(GC,MC,EC):	August 24, 2025
Substantial Completion Electrical Panel Replacements (EC):	August 12, 2025

1.3 Milestone Schedule – Barr Middle School Projects: GC-01, EC-01 (Pending Alternate)

Start of Construction Canopy Renovation (GC & EC):	June 26th, 2025
Equipment Submittals & Approvals:	March-May 2025
Substantial Completion Canopy Renovation	August 22nd, 2025

1.4 Milestone Schedule – Miller Elementary School Projects: MC-01, EC-01

Start of Construction HVAC/Air Con (MC & EC):	April 5th, 2025
Equipment Submittals & Approvals:	March-May 2025
Substantial Completion HVAC/Air Con:	September 2, 2025

1.5 Milestone Schedule – Maintenance Building Projects: GC-01, MC-01, EC-01

Start of Construction Interior & Exterior Renovations (GC, MC, EC):	June 26, 2025
Start of Construction Exterior Service Upgrade (EC)	April 14, 2025
Equipment Submittals & Approvals:	March-May 2025
Substantial Completion Interior & Exterior Renovations:	August 22, 2025
Substantial Completion Service Upgrade	June 3, 2025

1.6 Milestone Schedule – Outdoor Edd Center Projects: GC-01, MC-01, EC-01

Start of Construction Interior & Exterior Renovations (GC & EC):	April 14, 2025
Equipment Submittals & Approvals:	March-May 2025
Substantial Completion Interior & Exterior Renovations:	June 20, 2025

Note: Second shift/double shift work will be required to meet substantial completion dates. Second shift/ double shift work is expected to take place as required to meet the milestone schedule if necessary. The contractor will have blackout dates during school days where work may not take place. It is the contractor's responsibility to request in writing any blackout dates prior to commencement of work to coordinate schedule.
Second shift hours are before 6AM or after 3:30 pm.
Failure to meet the milestone schedule will result in a per day financial penalty as indicated in the AIA A232/A132

All work required by any of the Owner's representatives and consultants, including the Architect, Construction Manager and their consultants, Owner's Attorneys, etc., to execute final close-out of contract after 60 days beyond Milestone dates if determined to be caused by contractor, shall result in payment(s) to the Owner's representatives and consultants, including the Architect, Architect's consultants, Owner's Attorneys, etc., in the form of a change order deduct to the base contract.

PART 2 - PRODUCTS (Not Applicable)

PART 3 - EXECUTION (Not Applicable)

END OF SECTION 011100

SECTION 01 12 02 – CONTRACT SUMMARY – GC-01

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

This Section includes a summary of each Prime Contract, including responsibilities for coordination and temporary facilities and controls. One set of Construction Documents is issued covering the Work of multiple Prime Contracts. Each Prime Contract is responsible to review all drawings and specifications for specific requirements indicated, and for a general understanding and knowledge of the work of other Prime Contracts. All Prime Contracts are responsible for all Work of their Contract no matter what drawing on which the Work appears. All Prime Contracts are responsible to coordinate their work related to the complete set of drawings and specifications, not limited to each prime contractor scope. **All Bidders should acknowledge that for each contract listed below, each contractor is their own General Contractor and subject to all General Contractor requirements.**

General Contract: The Interior Contractor shall be selected based on the bid procedure as described in the Bid Documents. Contract Bidders are responsible for (a) trade work coordination, (b) the scope contained in drawings listed below and (c) any and all additional scope specifically identified to be performed by the Interior Contractor in other Bid Packages in the Contract.

a. Interior & Exterior Contract: All work related to Interior and exterior construction includes but is not limited to the following items: (Refer to the Contract Documents for full scope of work.

1) Demolition, ACT, GWB, Plaster Ceiling, Painting, Patching, tiling, epoxy flooring, Flooring, interior steel framing, exterior site work, masonry, doors, windows, and carpentry.
2) Work related to drawings: (*In addition to these drawings, the contractor is required to review all specifications included in the overall contract that may contain related scope or detail for this specific contract.)*

a) Barr Middle School
- Entrance Canopy Renovations

b) Outdoor Education Center
- HVAC Upgrades
- Exterior Sitework stairs and ramps

c) Maintenance Building Renovations
- Interior & Exterior Renovations

d) Highview Elementary School
- Security Vestibule Renovations
- Toilet Room Renovations
- Gymnatorium Renovations
- Door Renovations & Replacements

B. Applicable Drawings: All drawings itemized below are to be provided complete by this Prime Contract, unless noted otherwise. In addition to these drawings, the contractor is required to review all drawings included in the overall contract that may contain related scope or detail for this specific contract.

1. All "G" drawings – All Schools
2. Barr Middle School
   a. All canopy scope "S" drawings
   b. All demo and new canopy scope "A" drawings
3. Outdoor Education Center:
   a. All sitework scope "S" drawings
   b. All demo scope "AD" drawings
   c. All new stair, ramp, door, and ceiling scope "A" drawings
4. Maintenance Building Renovations
   a. All demo scope "AD" drawings
   b. All new interior and exterior scope "A" drawings
5. Highview Elementary School
   a. All new "S" drawings
   b. All demo "AD" drawings
   c. All new interior and exterior envelope "A" drawings

1.3 **This GC-01 contract requires the awarded entity to self-perform the largest scope of work shown in the contract documents. There are no provisions within this contract to solely subcontractor ALL trade scope required to complete the project and its design intent. All other work in this contract is allowed to be subcontracted other than as stated herein. It is further**

required to clearly present what scope your own forces will be doing with your bid submission. Failure to present this at time of bid will be subject to disqualification.

1.4 It is the GC's responsibility to review the MEP drawings to coordinate the GC's portion of the work with MEP.

1.5 Related Sections include, but are not limited to, the following:

A. Division 01 Section "Work Restrictions" for use of the Project site and for requirements for continued Owner occupancy of premises.

B. Division 01 Section "Project Management and Coordination" for general coordination requirements.

C. Division 01 Section "Project Forms" for documents required for Testing and Coordination.

D. Division 01 Section "Temporary Facilities and Controls" for specific requirements for temporary facilities and controls

E. Applicable Specification Sections: All specification Sections itemized below are to be provided complete by this Prime Contract, unless noted otherwise. In addition to these specifications, the contractor is required to review all specifications included in the overall contract that may contain related scope or detail for this specific contract.

1. Divisions 00 and 01 – Procurement and Contracting Requirements & General Requirements.
2. Division 02- Existing Conditions
3. Division 03 – Concrete
4. Division 04 Masonry
5. Division 05 – Metals
6. Division 06 – Wood and Plastics
7. Division 07 – Thermal and Moisture Protection
8. Division 08 – Openings
9. Division 09 – Finishes
10. Division 10 – Specialties
11. Division 11 – Equipment
12. Division 12 – Furnishings
13. Division 14 – Conveying Equipment

14. Division 31 – Earthwork
15. Division 32 – Exterior Improvements

1.6 DEFINITIONS

1.7 MANAGEMENT AND COORDINATION

A. The Owner shall provide a Construction Manager.

1. The Construction Manager shall provide a full time construction site representative recognized as the Construction Manager.

1.8 CONSTRUCTION MANAGER

A. The construction manager shall provide on-site administration of the Contracts for Construction in cooperation with the Architect as set in AIA Document A232 TM – 2009, General Conditions of the Contract for Construction, Construction Manager as Adviser Edition, as modified.

B. The Construction Manager shall provide administrative, management and related services to coordinate scheduled activities and responsibilities of the Multiple Prime Contractors with each other and with those of the Construction Manager, the Owner and the Architect. The Construction Manager shall coordinate the activities of the Multiple Prime Contractors in accordance with the latest approved Project Schedule and the Contract Documents.

C. Utilizing the construction schedules provided by the Prime Contractors, the Construction Manager shall update the Project schedule, incorporating the activities of the Owner, Architect, and Multiple Prime Contractors on the Projects, including activity sequences and durations, allocation of labor and materials, processing of Shop Drawings, Product Data and Samples, and delivery and procurement of products, including those that must be ordered will in advance of construction. The Project schedule shall include the Owner's occupancy requirements showing portions of the Project having occupancy priority.

D. Utilizing information from the Multiple Prime Contractors, the Construction Manager shall schedule and coordinate the sequence of construction and assignment of space in areas where the Multiple Prime Contractors are performing Work, in accordance with the Contract Documents and the latest approved Project Schedule.

1.9 GENERAL REQUIREMENTS OF PRIME CONTRACTS

A. Prime Contracts: The context used in this Section are separate Prime Contracts that represent significant elements of work that is to be performed concurrently and in close coordination with the work of other Prime Contracts for the benefits of the Owner. Each Prime Contract is recognized to be a major part of the Work.

B. Assignment of Work: Should a conflict be indicated, Section 011200 shall take precedence over all scope of work assignments that may be indicated elsewhere within the Construction Documents.

C. Layout and Installation: Each Prime Contractor shall schedule, layout and install their Work in such manner as not to delay or interfere with, but to compliment the execution of the work of other Prime Contracts, utility companies and Owner's operations.

D. Extent of Contract: The Contract Documents, drawings and specifications each contain more specific descriptions of the Work facilitating which Prime Contract includes specific elements of the Project.

1. Work provided by each Prime Contract shall mean complete and operable systems and assemblies, including products, components, accessories and installations required by the Construction Documents or indicated otherwise.
2. Prime Contractors shall exercise good judgment and perform all work according to related industry standards.
3. The Owner is exempt from payment of Federal, State and local taxes, including sales and compensating use taxes on all materials and supplies incorporated in completing the Work; these taxes are not to be included in the Bid. This exemption does not apply to tools, machinery, equipment or other property leased by, or to, the Contractor or sub-contractor, or to supplies and materials, which even though consumed are not incorporated into the completed work. Prime Contractors, and their sub-contractors, shall be responsible for paying any and all applicable taxes on said tools, machinery, equipment or property, and upon all said unincorporated supplies and materials, whether purchased or leased.
4. Prime Contracts shall understand that time is of the essence, and will adequately staff the Project by employing the appropriate trade's people to perform the Work; these people shall be experienced in their respective trades. A shortage of labor in the industry shall not be accepted as an excuse for not properly staffing the Project; all efforts shall be made to meet or exceed the schedule, including additional staff and/or labor hours necessary. All cost associated with this item shall be included within the Bid.
5. Local custom and trade union jurisdictional settlements will not control the scope of the Work of each Prime Contract.
    a. When a potential jurisdictional dispute or similar interruption of Work is first identified, or threatened, the affected Prime Contracts shall promptly negotiate

a reasonable settlement to avoid or minimize the pending interruption and delays.

b. Contractor's trade-related issues shall not be grounds for modification or extension of scheduled completion date(s).

6. The Work of all Prime Contracts requires close coordination with other Prime Contracts and construction personnel. Maintain flexibility and cooperation through the Project. "Out of Sequence" and "Delay" claims will only be considered when requirements of Division 01 "Administrative Requirements" have been adhered to. Delay claims must be in writing and forwarded to the Architect, per the requirements of the General Conditions of the Contract. Claims not submitted per these requirements will be rejected and/or denied.
7. The intention of the Work is to follow a logical sequence, however, a Prime Contractor may be required by the Architect or Construction Manager, to temporarily install, omit or leave out a section(s) of Work, out of sequence. All such out of sequence work, and come back time, at these areas shall be performed at no additional cost to the Owner.

E. Substitutions: Per Division 01 Section "Substitution Procedures", each Prime Contractor shall cooperate with the other Prime Contractors involved, to coordinate approved substitutions with remainder of the Work. Contractors shall submit all "Substitutions" at least ten (10) days prior to the date for receipt of Bids as specified in the Instructions to Bidders 002113 Section 3.3 Equivalents or bid will be considered per "basis of design".

F. Construction Schedules: Refer to Divisions 01 Section "Construction Progress Documentation", "Preliminary Schedule" and "Project Management and Coordination" for requirements related to meetings and schedules.

G. Construction Sequencing and Phasing: Prime Contractor shall understand that Sequencing and/or Phasing Plans are contingent upon the work areas being complete/occupied, prior to the next area of Work beginning. Should an area of construction not be complete per the Project Preliminary Schedule, the Project Master Construction Schedule/Sequencing Plans will be adjusted accordingly. The Owner will not be responsible for delay claims due to adjustments being no fault of their own.

1. Prime Contracts may be required to re-sequence the phasing of the project as a result of changes to the schedule. Prime Contracts shall provide these adjustments at no additional cost to the Owner.

H. Existing Conditions: Each Prime Contract shall verify existing conditions in the field prior to work commencing in that area and immediately report conditions to the Architect that are not represented correctly by the Construction Documents.

1. Each Prime Contract is responsible for familiarizing himself with Project Site Logistics and provide a "site logistics plan locating storage area, scaffolds, rubbish

areas, stock piles and egress related to all work, included phased construction within 30 days of award.

2. Each Prime Contract has been given ample opportunity to review Existing Conditions related to the Project. Existing Conditions not noted in the Construction Documents that could be easily recognized during pre-bid review that interfere with the respective Prime Contract's work, shall be the responsibility of the respective Prime Contract. This includes all costs associated with removal, patching, relocation or re-fabrication of installations.

I. Hazardous Materials: Each Prime Contract shall familiarize themselves with the Hazardous Materials Sections/Drawings of the Construction Documents and follow DOL/OSHA/EPA/SED regulations while performing their respective Work in these areas. Discovery of non-identified or concealed hazardous materials shall be reported to the Construction Manager immediately and followed up with written documentation of the event.

J. Protection of Installations: Each Prime Contract is responsible for protecting their installations at all times. All costs incurred to repair, replace or clean insufficiently protected materials/installations shall be the responsibility of the installing Prime Contract.

1. Architect shall be notified, in writing, immediately upon material/installation being damaged; notification shall indicate responsible party.
2. Owner will not be liable for damaged materials and/or installations by "others", when "others" cannot be identified.
3. Repair damaged work, clean exposed surfaces or replace construction installations that cannot be repaired.
4. Each Prime Contract shall be responsible for removing all labels not required to remain from their installations.
5. Installations shall be wiped clean and proper protection then installed.
6. Each Prime Contract is responsible to protect another primes work in the event that prime has to work over or on top of that other primes work being complete. The prime working over the completed work takes full responsibility of that other primes completed work both in condition and operation.
7. Gc shall install hevy duty "Ram Board" or equivalent to protect new floor surfaces from damage until final cleaning and acceptance by owner.

K. Daily Cleaning: All Prime Contracts are responsible for any and all debris caused by their Work, including the Work of their subcontractors. A daily clean up and disposal is required by each Prime Contract for the periods which that Prime Contract, or its sub-contractors, are performing Work on site.

1. Assign at least one person for a daily clean and sweep of the work area(s). Prime Contractor shall allot sufficient manpower and time for this to be completed by the end of each shift. Submit name of this person(s) to Construction Manager.
    a. Construction Manager shall have the authority to give direction to person(s) on the Project Site identified by the Prime Contract as designated for cleanup tasks. This shall include the safety review/securing of the site-work zone after each shift.
    b. This person has check that no construction debris was dumped in any district dumpers during this end of shift site review, if found the contractor must remove immediately the next morning to avoid back charges costs of $1500 per day not removed.
2. Any Prime Contract not providing personnel for Daily Cleaning will be Back Charged for labor provided by the Owner to complete this task.
3. Contractor working solely in an area shall be responsible for clean/sweep of that area.
4. Daily cleaning will not mean any one Prime Contract is responsible for assisting another Prime Contract with removing major quantities of debris created by a particular Prime Contract's Work.
5. Daily cleaning will be mandated to remove from the building any debris created by day-to-day activities. All Prime shall assist in sweeping shared work areas and shared corridors while working on site. Each Prime shall assist in mopping of shared corridors while working on site or as required by the Owner.
6. All prime contractors and subcontractors are required to provide sweeping compound for daily cleaning in their respective exterior and interior work areas. Each Prime Contract shall provide a sufficient number of brooms or other necessary tools, for use by their personnel to adequately fulfill their obligations.
7. All prime contractors shall provide and maintain garbage cans/refuse containers with liners for each construction area of their respective contracts as directed by the Construction Manager and shall be responsible for disposing of these materials to a dumpster.
8. All prime contractors provide the necessary equipment/containers (lull/skip-box) to move daily clean/sweep debris from the building to a dumpster on a daily basis, for each construction area of their respective contracts. Skip-box shall be emptied to a dumpster by 9:00 a.m. the following day.
9. Cleaning shall be deemed a Safety & Health issue, with Prime Contracts being held accountable for fulfilling their contractual obligations.

L. Final Cleaning: At Substantial Completion of each area of construction, each Prime Contract shall wipe/vacuum clean all of their respective installations; All interior contracts performing work inside the buildings shall mop clean all building surrounding areas and finish flooring and remove all marks/blemishes to the finish, for each construction area

of their respective contracts. Each area of construction shall be wiped clean of all construction dust and debris prior to turnover to the Owner.

M. Cutting and Patching: All Primes are responsible for cutting and patching required to complete their Work. All repair of existing finish Work (including finish floors) shall be performed by contract requiring work, meeting or exceeding minimum contract requirements for that particular section, specification, or type of work. All concealed openings (piping, ductwork, conduit, etc.) must be repaired to comply with specified wall or deck conditions as well as required fire and sound ratings. All corridor penetrations require fire safing. If contractor elects to install their new work in an existing unrated wall or floor opening, whereas the wall/floor is a fire rated condition, that contractor is responsible to fire rate that opening to match the wall/floor fire rating with new and all other existing wire, piping, ducts etc. Other areas are noted in drawings and specifications.

1.10 Project Schedule. The nature of this project is to complete all the work listed as Phase 5 in the schedule by **the Project Closeout Dates specific to each Prime Contract as listed below**. Each Prime Contractor shall include in their bid proper allowances for foul weather.

A. Bids Received: 2/13/2025

B. Notice to Proceed: 2/27/2025

C. Submittals: The following items are to be submitted within 60 business days after Notice to Proceed:
   1. Submittal List and Submission Schedule – **15 days after NTP**
   2. Field Investigations
   3. Shop Drawings
   4. Long Lead Items Letter – **30 days after NTP**
   5. Schedule of Values and Key Submittal List – **15 days after NTP**
   6. Preliminary Construction Schedule
   7. Site Specific Health and Safety Manual
   8. Project Contact Directory
   9. Labor and Equipment Rates

D. Mobilization: 4/07/2025

E. Substantial Completion and Project Closeout:

   1. **General Contract 01**
      a. Substantial Completion: See Milestone Schedule

b. Project Closeout: See milestone Schedule

1.11 TEMPORARY FACILITIES AND CONTROLS OF PRIME CONTRACTS

A. Conditions of Use: Keep temporary services or conditions clean and neat in appearance. Operate in a safe and efficient manner. Relocate temporary facilities as required as 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 to develop or persist on the Project site.

1. Installation, operation, maintenance, and removal of each temporary service or condition are considered part of the respective Prime Contract's own construction activity, as are costs and use charges associated with each facility.
2. Locate service or condition where they will serve the Project adequately and with minimum interference of the Work, coordinate with the Construction Manager and the other Prime Contracts prior to installation.

B. Temporary Use of Permanent Facilities: Prime Contract, as installer of each permanent service or condition, 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 temporary facilities and controls responsibility.

C. Owner's Facilities: Contractors are not allowed to use the Owner's facilities (toilets, telephones, food service, etc.) for their own benefit or convenience. Prime Contract Superintendents shall enforce this policy with their respective work forces.

1. Construction personnel parking will be restricted to area as directed and agreed to by the Owner, and to facilitate the completion of the work. Owner reserves the right to remove from their property, unauthorized vehicles occupying unauthorized areas, at respective vehicle owner's expense.

D. Storage on the Project Site: Each Prime Contract shall provide their own respective sufficient secure weather-tight storage facilities for their materials and equipment. These storage containers are required to be located on the "site logistics plan." The Owner's facilities and the Project's building areas shall not be used for storage unless agreed upon, in writing, with the Owner via the Construction Manager.

1. Until permanently incorporated into the Work, all materials on the Project site are considered to be the Prime Contract's responsibility for security and protection.
2. Prime contractor is required to check on their onsite stored material periodically to ensure that all material continues to be located in the stored location and that it remains protected from all damage, theft, and endangerment to others and ready to be used on notice for coordination with other contractors. Failure to arrange for

materials to be on site to complete coordinated work with other Prime Contractors will result in back charges for delays resulting therefrom.

3. Temporary long-term storage facilities are not available to Prime Contracts by the Owner.
4. Prime Contractors and their subcontractors, shall coordinate deliveries with the Construction Manager to ensure that disruptions and Owner inconvenience are avoided.

E. Tools and Equipment: Each Prime Contractor shall provide all tools and equipment necessary for its own activities; this includes secure lock-up and storage for all items on the Project Site.

1. Provide all construction aids and miscellaneous services and facilities necessary exclusively for its own construction activities; this shall include any additional supplementary power, ventilation, lighting requirements and weather protection.

F. Project Site Communication: Each Prime Contractor shall provide their Project a full time on site at all times Superintendent with a mobile phone for the duration of the Project, as indicated in their Scope of Work. Construction Manager shall be furnished with contact numbers associated with each phone.

G. Safety: Prime Contracts, not the Architect or Construction Manager, are responsible for Project Site Safety, as related to their operations (refer to Section 013150 "Special Procedures" for further requirements).

1. Each Prime Contract shall correct safety hazards and violations immediately. If safety issues are not immediately rectified, the Owner shall secure outside sources to correct the deficiency and back charge the responsible Prime Contract.
2. Maintain unobstructed access/egress to fire extinguishers, fire hydrants, stairways, corridors, ladders and other safety routes/devices.

H. Fire Extinguishers: All Prime Contracts provide and maintain "general use" fire extinguishers for each construction area of their respective contracts; comply with applicable codes for quantities required. Use of the Owner's fire extinguishers to meet this requirement is not permitted. Comply with NFPA for recommended classes for exposure; extinguishers shall be inspected and appropriately tagged prior to being brought on site. Provide stands, painted bright orange, sturdy enough to carry the extinguisher, and built as not to create a tipping hazard.

1. Each Prime Contract shall supplement this requirement by providing additional fire extinguishers specifically related to their work activity (e.g., welding, soldering, abrasive cutting, etc.).
2. Each Prime Contract shall provide and maintain proper fire extinguishers at/in their respective on site office and storage facilities.

3. Store combustible materials in approved containers in fire-safe locations.

I. Welding: Any Prime Contract performing welding, cutting or other activities with open flames or producing sparks shall at a minimum:

1. Coordinate interruption/shutdown of detection system(s) to avoid creating false alarms.
2. Protect the area and surrounding areas from fire and damage.
3. Maintain fire extinguishers, compatible with activity, at the location of the activity.
4. Provide a continuous Fire Watch during the activity and one-half hour beyond the completion of the activity.
5. Provide all necessary fans and ventilation required for the activity.
6. Any welding, burning and or use of flame the contractor is required to provide all required "hot work permit" to use such equipment prior to start of work. Its mandatory that no "hot work" shall start without these permits issued to the CM and Owner. Failure to this requirement will result to the removal of the project super of that company from all district projects.

J. Remove each temporary facility when it can be replaced by the authorized permanent facility no later than Substantial Completion, or as directed by the Architect and/or Construction Manager. Complete or restore permanent facilities that may have been delayed due to interim use of a temporary barrier or condition.

K. Temporary Power: Each Prime Contractor shall provide for their own temporary power needs for any scheduled electrical utility shut downs. Each Prime Contractor shall provide for their own temporary generators, power cords and temporary lighting as needed during these periods to continue to perform their work and maintain adherence to the Preliminary Schedule and approved Project Master Schedules. All temporary power equipment shall comply with all applicable codes and regulations.

L. Waste Disposal Facilities:

1. **General debris/refuse/construction waste containers (dumpsters) shall be provided by each prime contractor and secured as specified herein this contract.**
2. It shall be the responsibility/requirement of each Prime Contract to bring their waste to the dumpsters, including but not limited to all equipment, demolition debris, discarded materials with further identification including the following; construction and demolition debris refers to discarded materials generally considered non-hazardous in nature, including but not limited to steel, glass, brick, concrete, asphalt material, pipe, gypsum wallboard, and lumber, from the construction or destruction of a structure as part of a construction or demolition project or from the renovation of a structure, including such debris from

construction of structures at a site remote from the construction or demolition project site.

3. It shall be the responsibility and requirement of each Prime Contract to recycle metals generated by its Work, and the Work of its subcontracts.
4. Joint-effort recycling by all Prime Contracts is encouraged.

M. Temporary Sanitary Facilities: Each Prime Contractor is to provide temporary self-contained toilets units for duration of the project.
   1. Temporary Sanitary Facilities:
      a. **Each prime contractor is required to provide their own Temporary Sanitary Facilities and secured behind fencing and/or locked after work hours and weekends.**
   2. Comply with regulations and health codes for type, number, location, operation, and maintenance of fixtures and facilities.
   3. Provide separate facilities (minimum of one ea.) for male and female personnel in proportion required by OSHA.
   4. Shield toilets to ensure privacy.
   5. Coordinate mobilization and demobilization of units with Construction Manager.
   6. Toilets shall be cleaned at least once per week, with additional facilities or cleanings provided if requested by Construction Manager.
   7. Provide and maintain adequate supply of toilet tissue and hand sanitizer for each facility.

1.12 WORK HOURS & SEQUENCE

A. Unless otherwise approved by the Construction Manager, *During the school days*, Work is to be performed in this contract during the hours of 3:30pm to 10:00pm on weekdays, and Saturdays and Sundays from 7:00am to 3:30pm. During School breaks, work is to be performed from 7:00am to 10:00pm. There is no additional cost to the owner for working the hours of 3:30pm through 11:00pm, or weekend work during the school year. **Any work done during these times MUST BE COMPLETED, CLEANED, AND TESTED AS NECESSARY FOR STUDENT OCCUPANCY BEFORE THE START OF THE NEXT SCHOOL DAY. Contractors are required to schedule work during school breaks, school days off, and school holidays.**

B. Summer work starts June 28th through August 23rd for 2025. The Summer working hours are from 7:00am to 9:30pm. There is no additional cost to the owner for working the hours of 3:30pm through 9:30pm or on weekends and holidays during the Summer.

C. As approved by the CM. Working hours during the school day will be 7:00am-3:30pm

D. Contractors are required to start working on site within 30 days of execution of

contract, to the extent permitted by contract. Contractors are required to coordinate and perform work simultaneously with other Contractors. Contractors are required to complete their contract work by the designated Substantial Completion and Final Completion end dates as indicated on the Invitation to Bid.

E. Mandatory clean up periods - From August 24th, 2025 to August 31st , 2025 and August 30th , 2025 to September 6th, 2025, contractors shall clean up all interior and exterior areas.

F. Contractors are required per contract to fully staff the project during the work shifts stated above with the required manpower to complete their work within the allowed scheduled time frame. Contractors are required to provide a 72-hour advanced request to the Owner via the Construction Manager for any Saturday and Sunday work. If a project schedule delay has been caused by the fault of the contractor, the contractor is required to provide 3rd shift work from 9pm to 6am to make up the project schedule. All costs for CM, Architect and district personal related to this 3rd shift request will be charged to the contractor at a combined rate for all at $3,000 per 8hr shift.

G. The shifts noted above are not considered overtime or premium time hours.

H. Contract summaries will provide start and end dates for each contractor.

I. Additional requirements:

1. Multiple Crews: Each Prime Contract shall provide multiple crews, supervision, cranes, scaffolding, and other necessary means to perform the Work and maintain the Project Master Schedules. If multiple crews are required, the prime contractor shall ensure that multiple crews are present at each location simultaneously to adhere to the schedule.
2. Interruption of any utility and/or power must be coordinated with the Owner, via the Construction Manager.
3. Any and all overtime, weekend and/or holiday work required to meet the Project Master Schedules shall be incorporated in the respective Prime Contract's bid.
4. Should a Contractor's progress fall behind, as to schedule, Prime Contractor shall employ additional – 3rd shift and/or overtime and/or weekend workforce until situation is rectified, to the satisfaction of the Architect and Construction Manager, at no additional cost to the Owner, however subject to charges as stated in section 1.10 E for lack of maintaining schedule.
5. Should a Prime Contract feel another Prime Contract is delaying them sufficient time to complete their installations, per the schedule, the Architect and Construction Manager shall be notified in writing immediately of the situation (refer to Conditions of the Contract for protocol). A Prime Contract creating such a delay, that causes a proven burden upon another Prime Contract to maintain schedule, shall bear all costs incurred by the delayed Prime Contract to maintain

the schedule.

6. The Architect and Construction Manager shall not be overburdened as to overtime cost, to monitor the work, due to no cause of his or her own. Owner will compensate the Architect and Construction Manager for all additional cost related to the issue of a Prime Contractor's failing to execute the Contract by fully staffing per the work hours and days noted herein. The Owner reserves the right to back charge the responsible Prime Contract for these fees if incurred.
7. All Asbestos and/or Lead Abatement shall take place to meet the requirements of the Preliminary Schedule and Project Master Schedules and shall be coordinated with the other Prime Contractors prior to commencement.

J. The Work shall be conducted to provide the least possible interference to the activities of the Owner's personnel and the surrounding property owners (neighbors).

1. Prime Contracts are hereby notified that: All Prime Contractors and their subcontractors shall limit excessive noise during 2nd shift known as work extending to 10PM weekdays upon approval by owner and city work hour restrictions. These operations shall not create a disturbance to neighboring properties.

K. Construction access to the site shall be limited to personnel, equipment and deliveries by suppliers relative to the Work of Prime Contractors and their subcontractors. Prime Contracts shall keep the Construction Manager advised of persons accessing the site and shall seek assistance with coordinating parking and storage facility locations for all Prime Contracts.

1. Where applicable, Contractors shall provide Building Site perimeter barricades as described herein the project and all temporary exit doors/lockable gates on the Project, securing these doors, fencing and/or gates at the end of each work shift. **Contractor is to use the provided site logistics plans as a minimum standard. The contractor is required to provide their own coordinated site logistics plan and update as required throughout construction.**
2. When a Prime Contract engages in overtime, weekend or 2nd shift work, during the summer months and or during the normal school year, the respective Prime Contract shall notify Construction Manager of such and be responsible for securing the Project Site at the end of that work shift and perform site walk around the outside of construction area/work zone ensuring all debris is pickup up and there are no construction related hazards of any kind present once the responsible person leaves the site for the evening or weekend. This includes that all materials and equipment are fenced in and keys are removed. All interior projects have the same requirement to ensure that outside the work zone is clean from dust-dirt and that no materials are left outside the work area at any time.

1.11 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.

1.12 DRAWINGS AND SPECIFICATIONS

A. Construction Documents indicate the sum total of the Contract that make up the complete work for the Project. Through this Section "Summary of Work", the intent of the Contractor's scope of Work and responsibility is generally described. Related requirements and conditions that are indicated in the Contract Documents include but are not limited to the following:

1. General Conditions and Requirements.
2. Referenced and applicable Codes, Regulations and Standards.
3. Scheduling and phasing requirements.
4. Existing conditions and restrictions on use of the site and facilities.

B. Drawings and Specifications are cooperative and supplementary. Portions of the Work, which can best be illustrated by Drawings, are not included in the Specifications and portions best described by Specifications are not depicted on Drawings.

1. All items necessary to complete the work shall be furnished whether written or illustrated.
2. All primes shall exercise good judgment and perform all work according to related industry standards.

PART 2 - SCOPE OF WORK

2.1 PRIME CONTRACTS

A. Scope of Work: Work includes but is not limited to, the following:
1. Provide all work identified in the Contract Documents.
2. All Specification Sections provided.
3. GC is responsible to install all required access hatches. GC to coordinate with MEP trades for locations and hatches.
4. GC is responsible to install sleeves in foundation walls for penetrations by other prime contractors, MEP contractors to provide GC a written sketch showing exact height/locations with distance from column line and depth below finished slab within sufficient time for GC to install. If information is not

provided in a timely manner by MEP, then core drilling is the responsibility of the affected contractor.

5. GC will coordinate MEP opening sizes and locations (HVAC units, louvers, vents, grilles, registers, diffusers, electrical fixtures etc.) with MEP trades. Lintels for these openings are provided and installed by the GC. **GC WILL BE REQUIRED TO PROVIDE CEILING SHOP DRAWINGS COORDINATED WITH MEP CONTRACTS PRIOR TO INSTALLATION.**
6. Fire alarm mag holds furnished and wired by EC and will be installed on doors by GC.
7. **GC is to assume the use of self-level topping for all flooring substrates. The use of feather finish is at the Architect's discretion dependent on observed substrate.**

PART 3 - EXECUTION

3.1 WORK SEQUENCE

A. The Work shall be conducted to provide the least possible interference to the activities of the Owner's personnel, per the Project Preliminary Schedule.

B. Work required during overtime, extended shifts or holidays due to failure of contractor to maintain schedule, will be monitored by Architect/Construction Site representative, and may be monitored by Owners' personnel. Additional costs for Architect/Construction Site Representative and/or Owner personnel will be borne by the Contractor.

C. Coordination of any utility and power interruption must be done with approval of the Architect/Construction Site Representative. Shutdowns must occur during non-occupied timeframes only.

D. Construction access to the site shall be limited to those designated for personnel, equipment and deliveries by the Owner. All contractor staging, parking and storage shall be coordinated with the Construction Site Representative and subject to change.

E. Payments: Each bid that covers more than one school (i.e. one SED project) shall provide completed AIA G732 CM as Advisor edition & G703 by building (for each SED project).

F. No work shall be installed without approved shop drawings. Any work in place without approved shop drawings will be rejected and removed by that contractor at their expense and backed charge all other costs related to.

G. Any work deemed by CM, Architect and District not properly installed by a contractor per the contract drawings and specifications shall be removed immediately and corrected, with all associated costs to be borne solely by that contractor.
H. All prime contractors shall coordinate their contract work with other primes to meet the project schedule and for a complete operational system or area or work.
I. All contractors are to provide within 3 weeks of award a "base line" construction schedule for their work from commencement to completion including all phasing. This schedule is to be updated monthly to show percentage progress of each item listed. This schedule shall be revised to provide a recovery schedule in the event of a delay for any reason. The recovery schedule shall include the "base line" item and the recovery to show how the delay is affecting the overall project schedule. This schedule is to be provided in MS Project or Primavera. Excel schedules are not accepted.
J. Prime contractor "base line" schedules are to be reviewed by each prime contractor and coordinated where work is related and that each prime's work shall be included in each "base line" contractor's schedule as necessary for coordination.
K. All contractors are to provide 2-week look ahead schedules showing work related to the base line and shall be coordinated with other prime 2-week look ahead schedules. These schedules will be Excel format. Format will be provided by the CM.
L. Contractors to provide a full-time supervisor on site 100% of the time. This is not a working foreman. Supervisors are not working with tools they are supervising their workers and coordinating with other contractors and district/ CM. Failure to provide will be default of your contract and subject costs related to and termination.
M. All prime contractors are the provide a project manpower structure showing names and telephone numbers of each responsible person on the project. This shall be updated as needed if personal changes are made.
N. All site equipment and dumpsters are to be behind temporary chain link fence when stored on site and or within the construction work zone where temporary chain link fence has been providing and installed by the prime. Each prime contractor is responsible to provide and install temporary chain link fence around their own stored equipment and dumpsters on site.
O. No equipment, panels or any services shall be turned off for any reason without written request and approval by the district. Project form shall be used for all shutdowns and required a 3-day notice. Other shutdowns may require more time.

3.5 CONTRACT No. 1 GENERAL CONTRACT (GC-01) – GENERAL CONSTRUCTION PRIME CONTRACT FOR INTERIOR AND EXTERIOR WORKS AT CONTRACT AT NANUET BARR MIDDLE SCHOOL, MILLER ELEMENTARY SCHOOL, OUTDOOR EDUCATION CENTER, MAINTENANCE BUILDING, AND HIGHVIEW ELEMENTARY SCHOOL.

A. Project Site Superintendent: GC shall provide one (1) full time, non-working Project Site Superintendent while any work related to this Contract is being performed. Superintendent shall be responsible for the daily activities of this Contract and work closely with the Construction Manager and the other Prime Contract Superintendents/Foremen, in a manner that best promotes the objectives of the Project.

B. Superintendent shall be on-site while Contractor's own forces, and/or subcontractors are performing work on the Project Site; also while other Prime Contracts are installing work, or require the coordination of work related to this Prime Contract, and/or as requested by the Construction Manager.

1. Superintendent shall be the same individual throughout the duration of the Project.
2. Project Site Superintendent shall be an individual with minimum of five (5) years' experience in this field of work. **GC to provide a resume upon request to validate experience level.**
3. Refer to Section 013100 "Project Management and Coordination" for further requirements.

B. Project Foreman: GC shall provide at least one (1) full time Project Foreman during each shift of work at each school; Foreman shall be able to make binding decisions, as they relate to the daily activities of their crew, as related to achieving the goals of the Project.

C. Site Communications: GC shall provide Project Superintendent with a mobile phone; all costs and service charges shall be paid for by GC; provide Construction Manager with contact number(s).

D. Project Site Field Office: Provide site office facilities for this Contract's Project Superintendent. Site Office shall be equipped with telephone with answering machine, fax and e-mail. Contact information shall be provided to the Construction Manager.

1. The Owner reserves the right to seek reimbursement for temporary facilities not provided by this Prime Contract.

E. Scope of Work: Work of the GC includes, but is not limited to, the following:

1. Coordination with other Prime Contracts, Owner and Construction Manager as required to adhere to and maintain approved Project Master Schedules. Prior to first payment, this includes developing and submitting the Project Master Schedule for Interior works
2. Provide all interior demolition as indicated in the Construction Documents, or required for Work of this Prime Contract:
   a. Coordinate all demolition with Hazardous Materials documents. Coordinate with all other Prime Contracts regarding removals required for the Project.

Demolition of a system shall mean any and all components removed in their entirety, to the point of origin, source or substrate.

3. Provide all new ceiling systems and patching of existing ceilings, complete where indicated in Contract Documents.
4. Contractor access doors furnished by the prime trade requiring access; installation of all access doors will be by contract GC. General contractor is to coordinate with other primes as to location and quantity of access doors to be installed at the appropriate time. Framing for all access doors is by GC.
5. The GC shall provide and install flooring protection at all schools prior to demolition to protect the owner's property, and to accommodate storage of Owner property Flooring protection shall be 6 Mil plastic sheeting covered by Masonite hardboard of 1/8" thickness installed so as to cover entire floor area of designated spaces, with joints abutting one another and each joint fully taped with duct tape. At the conclusion of interior work, all interior work areas shall be cleaned and Masonite hardboard and plastic sheeting removed in order for the district to restore the classroom(s) and/or corridors. After the removal of Masonite and plastic sheeting, the exposed existing flooring shall be swept clean by the GC.
6. The GC shall provide one (1) 45' storage containers for the Owner's use, to be placed as directed by the Owner. GC shall provide a Schedule of Values line item in the base bid for storage trailers. If Owner chooses not to utilize this provision, the value of the storage trailers shall be credited back to the Owner at the end of the project.
7. This prime contractor shall provide ALL demolition and new construction of housekeeping pads for MEP contractors for all schools as shown on the contract documents.
8. GC shall conform to phasing and sequencing of interior work as coordinated with the Owner. See Milestone Schedule
9. Environmental Protection: Provide protection, and conduct construction in ways and by methods that comply with environmental regulations and that minimize possible air, waterway, and subsoil contamination or pollution or other undesirable effects.
    a. Restrict use of noisemaking tools and equipment to hours that will minimize complaints from persons or firms on or near the Project site.
10. Provide dust control within delineated building site while the Work of this Contract is being performed. Limit situations that may create dust contamination while Work of this Contract is idle.
11. Provide all Control Lines and Elevations as required. GC shall transfer lines and elevations to other locations as necessary.
12. Provide cut and patch work related to that of this Prime Contract, and at those areas specifically identified in the Construction Documents, regardless of trade creating the area to be patched.

a. Each Prime Contract is responsible for all other respective cutting and patching required of their installations (refer to Section 01 73 29 for further information).

13. Provide all access panels indicated, and those not indicated whereas inaccessible installations have been provided by this Prime Contract, located above hard ceilings or in walls. Access panels required for MEP equipment accessibility are to be provided by the MEP contractors and installed by the interior general contractor. Coordinate locations for access panels with MEP contracts. Any miss coordination of access panels resulting in corrective work will be the sole responsibility of the GC contract.
14. Provide all prep/paint finishes as indicated in the Construction Documents.
15. Provide finishes including, but not limited to; CMU, gypsum board assemblies, plaster, suspended ceiling systems, and all paint and finish systems including those on all surfaces adjacent to and damaged by renovation work during the Project.
    a. Provide all associated surface preparation for each finish included in this Prime Contract.
    b. Provide all plaster wall patch at all removal locations and any locations shown on the contract documents
16. Provide all miscellaneous wood blocking, shimming and supports for items or equipment installed under this Prime Contract, and as coordinated with other Prime Contracts for metal strapping and/or wood blocking for installation of MEP for interior Work.
17. Provide through-penetration fire stop systems in new and existing unit masonry assemblies, gypsum wall construction, floor penetrations, and at all structural member penetrations as per contract documents. Contractor shall coordinate with all MEP contractors to complete the scope of work.
18. GC is specifically reminded that there may be miscellaneous asbestos pipe insulation/fittings above some ceilings and inside wall areas. Contractor will investigate above the ceiling and walls prior to demolition and carefully perform the work as necessary to not disturb any insulation/fittings.
19. GC will provide all necessary patching/self-leveling/grinding of flooring substrate to insure a suitable smooth flat floor finish prior to installation of new VCT or urethane flooring.
20. Substantial Completion: Clean all GC installations and provided equipment at the time of Substantial Completion or as directed by Construction Manager.
21. GC to provide negative air machines to properly exhaust all work areas of any odors, dust, fumes.
22. Refer to Division 00 Section “Project Forms” and make use of these forms for the installation and coordination of the Work. These forms are included to assist this Prime Contract with coordinating the installation of Work by others prior to enclosing and/or finishing work. Owner will not compensate Prime Contract for work not properly coordinated that result in added work, or removal of work.

Secure the proper signatures or acknowledgements, as indicated, prior to installing/completing the Work.

23. Coordinate all the preceding requirements, accordingly, with all applicable Alternates indicated in Section 01 23 00 "Alternates".

F. Supplemental Temporary Facilities and Controls by GC include, but are not limited to:

1. Waste Disposal Facilities: Provided by each contractor.
2. Temporary Interior Barricades: Provide, maintain and eventually remove all temporary barricades per OSHA Regulations, Industry Standards, or as indicated in the Construction Documents. These include, but are not limited to, the following areas:
    a. To isolate new construction areas.
    b. To isolate renovation areas.
    c. Floor openings/penetrations, including stairwells.
        1) Horizontal Openings: close openings in floors and horizontal surfaces with load bearing, wood and/or steel framed construction per applicable regulations.
3. Temporary Doors, Frames & Wall Assemblies: Provide, maintain and eventually remove all temporary installations per OSHA Regulations, Industry Standards, or as indicated in the Construction Documents. Provide fire rated assemblies as required. Provide exit (panic bar/crash bar) devices at locations of egress. Coordinate locations with Construction Exiting Plan, Sequencing/Phasing Plans, and the Construction Manager. Temporary doors shall be constructed using ½" plywood and 2x construction, equipped with hasps, locks, handle and latch mechanism, and spring or counter weight installed to allow door to close after opening. Permanent doors will not be used in temporary conditions.
4. Temporary Sanitary Facilities: Provided by each contractor.
5. Existing Stair Usage: Use of Owner's existing stairs in unoccupied areas will be permitted, provided that at Substantial Completion, stairs are restored to conditions existing before initial use.
    a. Provide photo documentation of existing stair conditions prior to use by all Prime Contracts. Document during use, and at completion of the Renovation Project in order to document any and all damage to the Owner's property.
    b. 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.
6. Indoor air quality management at all areas of Construction, once building is enclosed.

a. Provide all necessary dust partitions, fans, temporary ducts, and barricades to properly contain and ventilate all work area fumes and odors, created by demolition and new construction or alterations, directly to the outside. Ventilate to an area outside the building, sufficiently away from the building, as not to contaminate other areas. There will be no additional claims honored if the Construction Manager requests additional ventilation or requirements.
b. Provide and exhaust air system for the project indoor areas that could produce fumes, VOC's, off gasses, dusts, mists, or other emissions.
c. System Operation:
    1) A sufficient quantity of exhaust fans in existing window openings or other approved locations shall be operated.
    2) Exhaust air system shall operate for a minimum of 72 hours after work is completed or until all materials have cured sufficiently so as to stop out – gassing of fumes or odors and area has been ventilated to remove all detectable traces of odors and fumes.
    3) Maintain 25 feet clearance from all temporary exhaust outlets to all active building outdoor air intakes.
    4) Refer to Division 01 Section "Work Restrictions" for further information.

7. Provide all shoring required for Work of this Prime Contract, including but not limited to;
    a. Cutting or altering of existing construction.
    b. Provide protection of all new and existing surfaces during the Work. Do not stand, walk, or work off of any unprotected finished surface above the floor.
8. Maintain temporary fencing and barricading to keep unauthorized persons away from dangerous and hazardous areas for which this Prime Contract is responsible.
9. Traffic Controls: Provide flagman while any operation of this Prime Contract interferes with traffic flow on adjacent roadways.
10. No import recycled materials will be allowed.

END OF SECTION 01 12 02

SECTION 01 12 03 –CONTRACT SUMMARY – MC-01

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. This Section includes a summary of each Prime Contract, including responsibilities for coordination and temporary facilities and controls. One set of Construction Documents is issued covering the Work of multiple Prime Contracts. Each Prime Contract is responsible to review all drawings and specifications for specific requirements indicated, and for a general understanding and knowledge of the work of other Prime Contracts. All Prime Contracts are responsible for all Work of their Contract no matter what drawing on which the Work appears. All Prime Contracts are responsible to coordinate their work related to the complete set of drawings and specifications, not limited to each prime contractor scope. **All Bidders should acknowledge that for each contract listed below, each contractor is their own General Contractor and subject to all General Contractor requirements.**

1. **Mechanical Contract:** The Mechanical Contractor shall be selected based on the bid procedure as described in the Bid Documents. Contract Bidders are responsible for (a) trade work coordination, (b) the scope contained in drawings listed below and (c) any and all additional scope specifically identified to be performed by the Mechanical Contractor in other Bid Packages in the Contract.

2. **MC-01 contract requires the awarded entity to self-perform the largest scope of work shown in the contract documents. There are no provisions within this contract to solely subcontract ALL trade scope required to complete the project and its design intent. All other work in this contract is allowed to be subcontracted other than as stated herein. It is further required to clearly present what scope your own forces will be doing with your bid submission. Failure to present this at time of bid will be subject to disqualification.**

B.

1) Work related to drawings: (*In addition to these drawings, the contractor is required to review all specifications included in the overall contract that may contain related scope or detail for this specific contract.)*

- Miller Elementary School
  a) HVAC Upgrades Air Conditioning

- Outdoor Education Center
  b) HVAC Upgrades

- Maintenance Building Renovations
  c) Interior & Exterior Renovations

- Highview Elementary School
  d) Security Vestibule Renovations
  e) Toilet Room Renovations

1.3 Related Sections include, but are not limited to, the following:

A. Division 01 Section "Work Restrictions" for use of the Project site and for requirements for continued Owner occupancy of premises.

B. Division 01 Section "Project Management and Coordination" for general coordination requirements.

C. Division 01 Section "Project Forms" for documents required for Testing and Coordination.

D. Division 01 Section "Temporary Facilities and Controls" for specific requirements for temporary facilities and controls

1.4 DEFINITIONS

1.5 MANAGEMENT AND COORDINATION

A. The Owner shall provide a Construction Manager.

1. The Construction Manager shall provide a full time construction site representative recognized as the Construction Manager.

1.6 CONSTRUCTION MANAGER

A. The construction manager shall provide on-site administration of the Contracts for Construction in cooperation with the Architect as set in AIA Document A232 ™ – 2009, General Conditions of the Contract for Construction, Construction Manager as Adviser Edition, as modified.

B. The Construction Manager shall provide administrative, management and related services to coordinate scheduled activities and responsibilities of the Multiple Prime Contractors with each other and with those of the Construction Manager, the Owner and the Architect. The Construction Manager shall coordinate the activities of the Multiple Prime Contractors in accordance with the latest approved Project Schedule and the Contract Documents.

C. Utilizing the construction schedules provided by the Multiple Prime Contractors, the Construction Manager shall update the Project schedule, incorporating the activities of the Owner, Architect, and Multiple Prime Contractors on the Projects, including activity sequences and durations, allocation of labor and materials, processing of Shop Drawings, Product Data and Samples, and delivery and procurement of products, including those that must be ordered will in advance of construction. The Project schedule shall include the Owner's occupancy requirements showing portions of the Project having occupancy priority.

D. Utilizing information from the Multiple Prime Contractors, the Construction Manager shall schedule and coordinate the sequence of construction and assignment of space in areas where the Multiple Prime Contractors are performing Work, in accordance with the Contract Documents and the latest approved Project Schedule.

1.7 GENERAL REQUIREMENTS OF PRIME CONTRACTS

A. Prime Contracts: The context used in this Section are separate Prime Contracts that represent significant elements of work that is to be performed concurrently and in close coordination with the work of other Prime Contracts for the benefits of the Owner. Each Prime Contract is recognized to be a major part of the Work.

B. Assignment of Work: Should a conflict be indicated, Section 011200 shall take precedence over all scope of work assignments that may be indicated elsewhere within the Construction Documents.

C. Seismic Requirements: Prime Contracts are to be aware that the building(s) is located within a Seismic Zone indicated in the documents and shall provide installations in compliance with all related code requirements.

D. Layout and Installation: Each Prime Contractor shall schedule, layout and install their Work in such manner as not to delay or interfere with, but to compliment the execution of the work of other Prime Contracts, utility companies and Owner's operations.

E. Extent of Contract: The Contract Documents, drawings and specifications each contain more specific descriptions of the Work facilitating which Prime Contract includes specific elements of the Project.

1. Work provided by each Prime Contract shall mean complete and operable systems and assemblies, including products, components, accessories and installations required by the Construction Documents or indicated otherwise.
2. Prime Contractors shall exercise good judgment and perform all work according to related industry standards.
3. The Owner is exempt from payment of Federal, State and local taxes, including sales and compensating use taxes on all materials and supplies incorporated in completing the Work; these taxes are not to be included in the Bid. This exemption does not apply to tools, machinery, equipment or other property leased by, or to, the Contractor or sub-contractor, or to supplies and materials, which even though consumed are not incorporated into the completed work. Prime Contractors, and their sub-contractors, shall be responsible for paying any and all applicable taxes on said tools, machinery, equipment or property, and upon all said unincorporated supplies and materials, whether purchased or leased.
4. Prime Contracts shall understand that time is of the essence, and will adequately staff the Project by employing the appropriate trade's people to perform the Work; these people shall be experienced in their respective trades. A shortage of labor in the industry shall not be accepted as an excuse for not properly staffing the Project; all efforts shall be made to meet or exceed the schedule, including additional staff and/or labor hours necessary. All cost associated with this item shall be included within the Bid.
5. Local custom and trade union jurisdictional settlements will not control the scope of the Work of each Prime Contract.
    a. When a potential jurisdictional dispute or similar interruption of Work is first identified, or threatened, the affected Prime Contracts shall promptly negotiate a reasonable settlement to avoid or minimize the pending interruption and delays.
    b. Contractor's trade-related issues shall not be grounds for modification or extension of scheduled completion date(s).
6. The Work of all Prime Contracts requires close coordination with other Prime Contracts and construction personnel. Maintain flexibility and cooperation through

the Project. "Out of Sequence" and "Delay" claims will only be considered when requirements of Division 01 "Administrative Requirements" have been adhered to. Delay claims must be in writing and forwarded to the Architect, per the requirements of the General Conditions of the Contract. Claims not submitted per these requirements will be rejected and/or denied.

7. The intention of the Work is to follow a logical sequence, however, a Prime Contractor may be required by the Architect or Construction Manager, to temporarily install, omit or leave out a section(s) of Work, out of sequence. All such out of sequence work, and come back time, at these areas shall be performed at no additional cost to the Owner.

F. Substitutions: Per Division 01 Section "Substitution Procedures", each Prime Contractor shall cooperate with the other Prime Contractors involved, to coordinate approved substitutions with remainder of the Work. Contractors shall submit all "Substitutions" at least ten (10) days prior to the date for receipt of Bids as specified in the Instructions to Bidders 002113 Section 3.3 Equivalents or bid will be considered per "basis of design".

G. Construction Schedules: Refer to Divisions 01 Section "Construction Progress Documentation", "Milestone Phasing Schedule" and "Project Management and Coordination" for requirements related to meetings and schedules.

H. Construction Sequencing and Phasing: Prime Contractor shall understand that Sequencing and/or Phasing Plans are contingent upon the work areas being complete/occupied, prior to the next area of Work beginning. Should an area of construction not be complete per the Project Preliminary Schedule, the Project Master Construction Schedule/Sequencing Plans will be adjusted accordingly. The Owner will not be responsible for delay claims due to adjustments being no fault of their own.

1. Prime Contracts may be required to re-sequence the phasing of the project as a result of changes to the schedule. Prime Contracts shall provide these adjustments at no additional cost to the Owner.

I. Existing Conditions: Each Prime Contract shall verify existing conditions in the field prior to work commencing in that area and immediately report conditions to the Architect that are not represented correctly by the Construction Documents.

1. Each Prime Contract is responsible for familiarizing himself with Project Site Logistics and provide a "site logistics plan locating storage area, scaffolds, rubbish areas, stock piles and egress related to all work, included phased construction within 30 days of award.
2. Each Prime Contract has been given ample opportunity to review Existing Conditions related to the Project. Existing Conditions not noted in the Construction

Documents that could be easily recognized during pre-bid review that interfere with the respective Prime Contract's work, shall be the responsibility of the respective Prime Contract. This includes all costs associated with removal, patching, relocation or re-fabrication of installations.

J. Hazardous Materials: Each Prime Contract shall familiarize themselves with the Hazardous Materials Sections/Drawings of the Construction Documents and follow DOL/OSHA/EPA/SED regulations while performing their respective Work in these areas. Discovery of non-identified or concealed hazardous materials shall be reported to the Construction Manager immediately and followed up with written documentation of the event.

K. Protection of Installations: Each Prime Contract is responsible for protecting their installations at all times. All costs incurred to repair, replace or clean insufficiently protected materials/installations shall be the responsibility of the installing Prime Contract.

1. Architect shall be notified, in writing, immediately upon material/installation being damaged; notification shall indicate responsible party.
2. Owner will not be liable for damaged materials and/or installations by "others", when "others" cannot be identified.
3. Repair damaged work, clean exposed surfaces or replace construction installations that cannot be repaired.
4. Each Prime Contract shall be responsible for removing all labels not required to remain from their installations.
5. Installations shall be wiped clean and proper protection then installed.
6. Each Prime Contract is responsible to protect another primes work in the event that prime has to work over or on top of that other primes work being complete. The prime working over the completed work takes full responsibility of that other primes completed work both in condition and operation.

L. Daily Cleaning: All Prime Contracts are responsible for any and all debris caused by their Work, including the Work of their subcontractors. A daily clean up and disposal is required by each Prime Contract for the periods which that Prime Contract, or its sub-contractors, are performing Work on site.

1. Assign at least one person for a daily clean and sweep of the work area(s). Prime Contractor shall allot sufficient manpower and time for this to be completed by the end of each shift. Submit name of this person(s) to Construction Manager.
    a. Construction Manager shall have the authority to give direction to person(s) on the Project Site identified by the Prime Contract as designated for cleanup tasks. This shall include the safety review/securing of the site-work zone after each shift.

b. This person has check that no construction debris was dumped in any district dumpers during this end of shift site review, if found the contractor must remove immediately the next morning to avoid back charges costs of $1500 per day not removed.

2. Any Prime Contract not providing personnel for Daily Cleaning will be Back Charged for labor provided by the Owner to complete this task.
3. Contractor working solely in an area shall be responsible for clean/sweep of that area.
4. Daily cleaning will not mean any one Prime Contract is responsible for assisting another Prime Contract with removing major quantities of debris created by a particular Prime Contract's Work.
5. Daily cleaning will be mandated to remove from the building any debris created by day-to-day activities. All Prime shall assist in sweeping shared work areas and shared corridors while working on site. Each Prime shall assist in mopping of shared corridors while working on site or as required by the Owner.
6. All prime contractors and subcontractors are required to provide sweeping compound for daily cleaning in their respective exterior and interior work areas. Each Prime Contract shall provide a sufficient number of brooms or other necessary tools, for use by their personnel to adequately fulfill their obligations.
7. All prime contractors shall provide and maintain garbage cans/refuse containers with liners for each construction area of their respective contracts as directed by the Construction Manager and shall be responsible for disposing of these materials to a dumpster.
8. All prime contractors provide the necessary equipment/containers (lull/skip-box) to move daily clean/sweep debris from the building to a dumpster on a daily basis, for each construction area of their respective contracts. Skip-box shall be emptied to a dumpster by 9:00 a.m. the following day.
9. Cleaning shall be deemed a Safety & Health issue, with Prime Contracts being held accountable for fulfilling their contractual obligations.

M. Final Cleaning: At Substantial Completion of each area of construction, each Prime Contract shall wipe/vacuum clean all of their respective installations; All interior contracts performing work inside the buildings shall mop clean all building surrounding areas and finish flooring and remove all marks/blemishes to the finish, for each construction area of their respective contracts. Each area of construction shall be wiped clean of all construction dust and debris prior to turnover to the Owner.

N. Cutting and Patching: All Primes are responsible for cutting and patching required to complete their Work. All repair of existing finish Work (including finish floors) shall be performed by contract requiring work, meeting or exceeding minimum contract requirements for that particular section, specification, or type of work. All concealed openings (piping, ductwork, conduit, etc.) must be repaired to comply with specified wall

or deck conditions as well as required fire and sound ratings. All corridor penetrations require fire safing. If contractor elects to install their new work in an existing unrated wall or floor opening, whereas the wall/floor is a fire rated condition, that contractor is responsible to fire rate that opening to match the wall/floor fire rating with new and all other existing wire, piping, ducts etc. Other areas are noted in drawings and specifications.

1.8 Project Schedule. The nature of this project is to complete all the work listed as Phase 5 in the schedule by **the Project Closeout Dates specific to each Prime Contract as listed below**. Each Prime Contractor shall include in their bid proper allowances for foul weather.

A. Bids Received: 2/13/2025

B. Notice to Proceed: 2/27/2025

C. Submittals: The following items are to be submitted within 60 business days after Notice to Proceed:
   1. Submittal List and Submission Schedule - **15 days after NTP**
   2. Field Investigations
   3. Shop Drawings
   4. Long Lead Items Letter – **30 days after NTP**
   5. Schedule of Values and Key Submittal List – **15 days after NTP**
   6. Preliminary Construction Schedule
   7. Site Specific Health and Safety Manual
   8. Project Contact Directory
   9. Labor and Equipment Rates

D. Mobilization: 5/05/2025

   1. **Mechanical Contract 01**
      a. Substantial Completion: See Milestone Schedule
      b. Project Closeout: See Milestone Schedule

1.9 TEMPORARY FACILITIES AND CONTROLS OF PRIME CONTRACTS

A. Conditions of Use: Keep temporary services or conditions clean and neat in appearance. Operate in a safe and efficient manner. Relocate temporary facilities as required as 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 to develop or persist on the Project site.

1. Installation, operation, maintenance, and removal of each temporary service or condition are considered part of the respective Prime Contract's own construction activity, as are costs and use charges associated with each facility.
2. Locate service or condition where they will serve the Project adequately and with minimum interference of the Work, coordinate with the Construction Manager and the other Prime Contracts prior to installation.

B. Temporary Use of Permanent Facilities: Prime Contract, as installer of each permanent service or condition, 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 temporary facilities and controls responsibility.

C. Owner's Facilities: Contractors are not allowed to use the Owner's facilities (toilets, telephones, food service, etc.) for their own benefit or convenience. Prime Contract Superintendents shall enforce this policy with their respective work forces.

1. Construction personnel parking will be restricted to area as directed and agreed to by the Owner, and to facilitate the completion of the work. Owner reserves the right to remove from their property, unauthorized vehicles occupying unauthorized areas, at respective vehicle owner's expense.

D. Storage on the Project Site: Each Prime Contract shall provide sufficient secure weather-tight storage facilities for their materials and equipment. These storage containers are required to be located on the "site logistics plan." The Owner's facilities and the Project's building areas shall <u>not</u> be used for storage unless agreed upon, in writing, with the Owner via the Construction Manager.

1. Until permanently incorporated into the Work, all materials on the Project site are considered to be the Prime Contract's responsibility for security and protection.
2. Prime contractor is required to check on their onsite stored material periodically to ensure that all material continues to be located in the stored location and that it remains protected from all damage, theft, and endangerment to others and ready to be used on notice for coordination with other contractors. Failure to arrange for materials to be on site to complete coordinated work with other Prime Contractors will result in back charges for delays resulting therefrom.
3. Temporary long-term storage facilities are not available to Prime Contracts by the Owner.
4. Prime Contractors and their subcontractors, shall coordinate deliveries with the Construction Manager to ensure that disruptions and Owner inconvenience are avoided.

E. Tools and Equipment: Each Prime Contractor shall provide all tools and equipment necessary for its own activities; this includes secure lock-up and storage for all items on the Project Site.

1. Provide all construction aids and miscellaneous services and facilities necessary exclusively for its own construction activities; this shall include any additional supplementary power, ventilation, lighting requirements and weather protection.

F. Project Site Communication: Each Prime Contractor shall provide their Project a full time on site at all times Superintendent with a mobile phone for the duration of the Project, as indicated in their Scope of Work. Construction Manager shall be furnished with contact numbers associated with each phone.

G. Safety: Prime Contracts, not the Architect or Construction Manager, are responsible for Project Site Safety, as related to their operations (refer to Section 013150 "Special Procedures" for further requirements).

1. Each Prime Contract shall correct safety hazards and violations immediately. If safety issues are not immediately rectified, the Owner shall secure outside sources to correct the deficiency and back charge the responsible Prime Contract.
2. Maintain unobstructed access/egress to fire extinguishers, fire hydrants, stairways, corridors, ladders and other safety routes/devices.

H. Fire Extinguishers: All Prime Contracts provide and maintain "general use" fire extinguishers for each construction area of their respective contracts; comply with applicable codes for quantities required. Use of the Owner's fire extinguishers to meet this requirement is not permitted. Comply with NFPA for recommended classes for exposure; extinguishers shall be inspected and appropriately tagged prior to being brought on site. Provide stands, painted bright orange, sturdy enough to carry the extinguisher, and built as not to create a tipping hazard.

1. Each Prime Contract shall supplement this requirement by providing additional fire extinguishers specifically related to their work activity (e.g., welding, soldering, abrasive cutting, etc.).
2. Each Prime Contract shall provide and maintain proper fire extinguishers at/in their respective on site office and storage facilities.
3. Store combustible materials in approved containers in fire-safe locations.

I. Welding: Any Prime Contract performing welding, cutting or other activities with open flames or producing sparks shall at a minimum:

1. Coordinate interruption/shutdown of detection system(s) to avoid creating false alarms.
2. All burning and or welding (all hot work) is to be done from 3:30pm to 10:00pm when the public is not in the building.

3. Protect the area and surrounding areas from fire and damage.
4. Maintain fire extinguishers, compatible with activity, at the location of the activity.
5. Provide a continuous Fire Watch during the activity and one-half hour beyond the completion of the activity.
6. Provide all necessary fans and ventilation required for the activity.
7. Any welding, burning and or use of flame the contractor is required to provide all required "hot work permit" to use such equipment prior to start of work. Its mandatory that no "hot work" shall start without these permits issued to the CM and Owner. Failure to this requirement will result to the removal of the project super of that company from all district projects.

J. Temporary Power: Each Prime Contractor shall provide for their own temporary power needs for any scheduled electrical utility shut downs. Each Prime Contractor shall provide for their own temporary generators, power cords and temporary lighting as needed during these periods to continue to perform their work and maintain adherence to the Preliminary Schedule and approved Project Master Schedules. All temporary power equipment shall comply with all applicable codes and regulations.
    1. All other schools in this phase, have local electrical work, therefore each prime contractor and their sub-contractors are required to provide their own generator power for equipment and lighting to perform their work during these times with no additional cost to the owner.

K. Waste Disposal Facilities:

    1. **General debris/refuse/construction waste containers (dumpsters) shall be provided by each prime contractor and secured as specified herein this contract.**
    2. It shall be the responsibility/requirement of each Prime Contract to bring their waste to the dumpsters, including but not limited to all equipment, demolition debris, discarded materials with further identification including the following; construction and demolition debris refers to discarded materials generally considered non-hazardous in nature, including but not limited to steel, glass, brick, concrete, asphalt material, pipe, gypsum wallboard, and lumber, from the construction or destruction of a structure as part of a construction or demolition project or from the renovation of a structure, including such debris from construction of structures at a site remote from the construction or demolition project site.
    3. It shall be the responsibility and requirement of each Prime Contract to recycle metals generated by its Work, and the Work of its subcontracts.
    4. Joint-effort recycling by all Prime Contracts is encouraged.

L. Temporary Sanitary Facilities: Provide temporary self-contained toilets units for duration of the project.

1. Temporary Sanitary Facilities:
   a. **Each prime contractor is required to provide their own Temporary Sanitary Facilities and secured behind fencing and/or locked after work hours and weekends.**
2. Comply with regulations and health codes for type, number, location, operation, and maintenance of fixtures and facilities.
3. Provide separate facilities (minimum of one ea.) for male and female personnel in proportion required by OSHA.
4. Shield toilets to ensure privacy.
5. Coordinate mobilization and demobilization of units with Construction Manager.
6. Toilets shall be cleaned at least once per week, with additional facilities or cleanings provided if requested by Construction Manager.
7. Provide and maintain adequate supply of toilet tissue and hand sanitizer for each facility.

1.10 WORK HOURS & SEQUENCE

A. During the school days, Work is to be performed in this contract during the hours of 3:30pm to 10:00pm on weekdays, and Saturdays and Sundays from 7:00am to 3:30pm. During School breaks, work is to be performed from 7:00am to 10:00pm. There is no additional cost to the owner for working the hours of 3:30pm through 10:00pm, or weekend work during the school year. **Any work done during these times MUST BE COMPLETED, CLEANED, AND TESTED AS NECESSARY FOR STUDENT OCCUPANCY BEFORE THE START OF THE NEXT SCHOOL DAY. Contractors are required to schedule work during school breaks, school days off, and school holidays**.

B. Summer work starts June 28th through August 23rd for 2025. The Summer working hours are from 7:00am to 9:30pm. There is no additional cost to the owner for working the hours of 3:30pm through 9:30pm or on weekends and holidays during the Summer.

C. Contractors are required to start working on site within 30 days of execution of contract, to the extent permitted by contract. Contractors are required to coordinate and perform work simultaneously with other Contractors. Contractors are required to complete their contract work by the designated Substantial Completion and Final Completion end dates as indicated on the Invitation to Bid.

D. Mandatory clean up periods - From August 24th, 2025 to August 31st, 2025 and September 1st , 2025 to September 6th, 2025, contractors shall clean up all interior and exterior areas.

E. As approved by the CM. Working hours during the school day will be 7:00am-3:30pm.

F. Contractors are required per contract to fully staff the project during the work shifts

stated above with the required manpower to complete their work within the allowed scheduled time frame. Contractors are required to provide a 72-hour advanced request to the Owner via the Construction Manager for any Saturday and Sunday work. If a project schedule delay has been caused by the fault of the contractor, the contractor is required to provide 3rd shift work from 9pm to 6am to make up the project schedule. All costs for CM, Architect and district personal related to this 3rd shift request will be charged to the contractor at a combined rate for all at $3,000 per 8hr shift.

G. The shifts noted above are not considered overtime or premium time hours.

H. Contract summaries will provide start and end date for each contractor.

I. Additional requirements:

1. Multiple Crews: Each Prime Contract shall provide multiple crews, supervision, cranes, scaffold and other means necessary to perform the Work, and maintain the Project Master Schedules. If multiple crews are required, the prime contractor shall ensure that multiple crews are present at each project location simultaneously to adhere to the schedule.
2. Interruption of any utility and/or power must be coordinated with the Owner, via the Construction Manager.
3. Any and all -3rd shift, overtime, weekend and/or holiday work required to meet the Project Master Schedules shall be incorporated in the respective Prime Contract's bid.
4. Should a Contractor's progress fall behind, as to schedule, Prime Contractor shall employ additional – 3rd shift and/or overtime and/or weekend workforce until situation is rectified, to the satisfaction of the Architect and Construction Manager, at no additional cost to the Owner, however subject to charges as stated in section 1.8 C for lack of maintaining schedule.
5. Should a Prime Contract feel another Prime Contract is delaying them enough time to complete their installations, per the schedule, the Architect and Construction Manager shall be notified in writing immediately of the situation (refer to Conditions of the Contract for protocol). A Prime Contract creating such a delay, that causes a proven burden upon another Prime Contract to maintain schedule, shall bear all costs incurred by the delayed Prime Contract to maintain the schedule.
6. The Architect and Construction Manager shall not be overburdened as to overtime cost, to monitor the work, due to no cause of his or her own. Owner will compensate the Architect and Construction Manager for all additional cost related to the issue of a Prime Contractor's failing to execute the Contract by fully staffing per the work hours and days noted herein. The Owner reserves the right

to back charge the responsible Prime Contract for these fees if incurred.

7. All Asbestos and/or Lead Abatement shall take place to meet the requirements of the Preliminary Schedule and Project Master Schedules and shall be coordinated with the other Prime Contractors prior to commencement.

J. The Work shall be conducted to provide the least possible interference to the activities of the Owner's personnel and the surrounding property owners (neighbors).

1. Prime Contracts are hereby notified that: All Prime Contractors and their subcontractors shall limit excessive noise during 2nd shift known as work extending to 10PM weekdays upon approval by owner and city work hour restrictions. These operations shall not create a disturbance to neighboring properties.

K. Construction access to the site shall be limited to personnel, equipment and deliveries by suppliers relative to the Work of Prime Contractors and their subcontractors. Prime Contracts shall keep the Construction Manager advised of persons accessing the site and shall seek assistance with coordinating parking and storage facility locations for all Prime Contracts.

1. Where applicable, Contractors shall provide Building Site perimeter barricades as described herein the project and all temporary exit doors/lockable gates on the Project, securing these doors, fencing and/or gates at the end of each work shift.
2. When a Prime Contract engages in overtime, weekend or 2nd shift work, during the summer months and or during the normal school year, the respective Prime Contract shall notify Construction Manager of such and be responsible for securing the Project Site at the end of that work shift and perform site walk around the outside of construction area/work zone ensuring all debris is pickup up and there are no construction related hazards of any kind present once the responsible person leaves the site for the evening or weekend. This includes that all materials and equipment are fenced in and keys are removed. All interior projects have the same requirement to ensure that outside the work zone is clean from dust-dirt and that no materials are left outside the work area at any time.

1.11 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.

1.12 DRAWINGS AND SPECIFICATIONS

A. Construction Documents indicate the sum total of the Contract that make up the complete work for the Project. Through this Section "Summary of Work", the intent

of the Contractor's scope of Work and responsibility is generally described. Related requirements and conditions that are indicated in the Contract Documents include but are not limited to the following:

1. General Conditions and Requirements.
2. Referenced and applicable Codes, Regulations and Standards.
3. Scheduling and phasing requirements.
4. Existing conditions and restrictions on use of the site and facilities.

B. Drawings and Specifications are cooperative and supplementary. Portions of the Work, which can best be illustrated by Drawings, are not included in the Specifications and portions best described by Specifications are not depicted on Drawings.

1. All items necessary to complete the work shall be furnished whether written or illustrated.
2. All primes shall exercise good judgment and perform all work according to related industry standards.

PART 2 - SCOPE OF WORK

2.1 PRIME CONTRACTS

A. Scope of Work: Work includes but is not limited to, the following:
1. Provide all work identified in the Contract Documents.
2. All Specification Sections provided.

PART 3 - EXECUTION

3.1 WORK SEQUENCE

A. The Work shall be conducted to provide the least possible interference to the activities of the Owner's personnel, per the Project Preliminary Schedule.

B. Work required during overtime, extended shifts or holidays due to failure of contractor to maintain schedule, will be monitored by Architect/Construction Site representative, and may be monitored by Owners' personnel. Additional costs for

Architect/Construction Site Representative and/or Owner personnel will be borne by the Contractor.

C. Coordination of any utility and power interruption must be done with approval of the Architect/Construction Site Representative. Shutdowns must occur during non-occupied timeframes only.

D. Construction access to the site shall be limited to those designated for personnel, equipment and deliveries by the Owner. All contractor staging, parking and storage shall be coordinated with the Construction Site Representative and subject to change.

E. Payments: Each bid that covers more than one school (i.e. one SED project) shall provide completed AIA G732 & G703 by building (for each SED project).

F. No work shall be installed without approved shop drawings. Any work in place without approved shop drawings will be rejected and removed by that contractor at their expense and backed charge all other costs related to.

G. Any work deemed by CM, Architect and District not properly installed by a contractor per the contract drawings and specifications shall be removed immediately and corrected, with all associated costs to be borne solely by that contractor.

H. All prime contractors shall coordinate their contract work with other primes to meet the project schedule and for a complete operational system or area or work.

I. All contractors are to provide within 3 weeks of award a "base line" construction schedule for their work from commencement to completion including all phasing. This schedule is to be updated monthly to show percentage progress of each item listed. This schedule shall be revised to provide a recovery schedule in the event of a delay for any reason. The recovery schedule shall include the "base line" item and the recovery to show how the delay is affecting the overall project schedule. This schedule is to be provided in MS Project or Primavera. Excel schedules are not accepted.

J. Prime contractor "base line" schedules are to be reviewed by each prime contractor and coordinated where work is related and that each prime's work shall be included in each "base line" contractor's schedule as necessary for coordination.

K. All contractors are to provide 2-week look ahead schedules showing work related to the base line and shall be coordinated with other prime 2-week look ahead schedules. These schedules will be Excel format. Format will be provided by the CM.

L. Contractors to provide a full-time supervisor on site 100% of the time. This is not a working foreman. Supervisors are not working with tools they are supervising their workers and coordinating with other contractors and district/ CM. Failure to provide will be default of your contract and subject costs related to and termination.

M. All prime contractors are the provide a project manpower structure showing names and telephone numbers of each responsible person on the project. This shall be updated as needed if personal changes are made.

N. All site equipment and dumpsters are to be behind temporary chain link fence when stored on site and or within the construction work zone where temporary chain link fence has been providing and installed by the prime. Each prime contractor is responsible to provide and install temporary chain link fence around their own stored equipment and dumpsters on site.

O. No equipment, panels or any services shall be turned off for any reason without written request and approval by the district. Project form shall be used for all shutdowns and required a 3-day notice. Other shutdowns may require more time.

P. **CONTRACT MC-01 – MECHANICAL WORK (MC)** — MECHANICAL PRIME CONTRACT AT, NANUET MILLER ELEMENTARY SCHOOL, BARR MIDDLE SCHOOL, OUTDOOR EDUCATION CENTER, MAINTENANCE BUILIDNG RENOVATIONS, AND HIGHVIEW ELEMENTARY SCHOOL FOR (BUT NOT LIMITED TOO), MECHANICAL PIPING, DUCTING, CONTROLS, HYDRONIC PIPING, NG PIPING, EXHAUST FANS, UNIT HEATERS, RAIDIATORS, HEAT PUMPS, GRD'S, VRF SYSTEMS, BOILERS, SPLIT SYSTEMS, . ALL INTERIOR WORK SHALL BE COORDINATED WITH ELECTRICAL AND GENERAL CONTRACTS. SEE MILESTONE & PHASING SCHEDULED FOR MORE DETAILS.

Q. All roof top, under roof steel support/dunnage, and flashing of all penetrations is by MC-01. Review S drawings for scope.

R. MC-01 is responsible for all ceiling removal and reinstallation associated with HVAC work. See "A" drawings for scope. ALL CEILINGS SCHEDULED TO BE NEW, ARE REMOVED AND INSTALLED NEW BY GC.

S. MC-01 shall provide any chases required for HVAC risers through stories of the buildings. All slab penetrations are to be fire-stopped. All chases to have eased edges.

T. All HVAC louvers/vents, grilles, registers, diffusers are supplied by MC-01. Coordinate openings with other primes.

U. HVAC control wiring is provided and installed by MC-01. Power wiring by EC-01. Low voltage controls are by MC-01.

V. Housekeeping pads for new HVAC equipment are by MC-01.

W. MC-01 is responsible for making their own through wall or through floor and roof piping penetrations and is responsible for associated patching and firestopping as required through

new and existing construction. Pitch pockets and portals provided by MC. Refer to Architectural roofing details.

X. Access doors for piping, dampers, or any HVAC access is provided by MC-01 and installed by GC-01. MC is to coordinate at time of bid all locations required for access panels and shall include these costs in their prospective bid.

Y. MC-01 is to provide any roof top curbs or rails for mechanical equipment and a coordinated sketch showing exact locations with distance from column line. MC responsible for all flashings of rooftop equipment.

Z. All duct detectors are furnished by EC and installed by MC. Wiring and connection to the building's fire alarm system is by the EC. Testing is by the electrical contractor. Each prime contract shall coordinate to ensure proper installation and compliance with relevant local codes.

AA. All fire and or fire/smoke dampers are installed by MC.

BB. ALL CONTROL WIRING, TERMINATIONS AND BMS INTEGRATION IS BY MC.

CC. MC shall provide coordinated shop drawings for approval for all piping, ducting, and other HVAC equipment.

DD. MC shall work with the district's commissioning authority to commission all new equipment. Cx shall employ the use of online software for the purpose of managing and tracking Cx progress. MC shall be required to fill out online pre functional checklists, test reports, and startup reports, and submit to Cx for review and approval.

A. Project Site Superintendent: MC shall provide one (1) full time Project Site Superintendent while any work related to this Contract is being performed on site. Superintendent may be a working Foreman as long as the daily requirements of this Contract are maintained, as they relate to the Construction Documents and the Project Schedule. Construction Manager reserves the right, in their opinion, to revoke this privilege if these requirements are not maintained. Superintendent shall work closely with the Construction Manager, and the other Prime Contract Superintendents and Foremen, in a manner that best promotes the Project Master Schedules and the objectives of the Project.

1. Superintendent shall be on site while Prime Contractor's own forces, and/or their sub-contractors forces, are on site; also while other Prime Contracts are installing work, or require coordination of work, related to this Contract, and/or as requested by the Construction Manager.

2. Superintendent shall be the same individual throughout the Project.
3. Project Site Superintendent shall be an individual with minimum of five (5) years' experience in this field of work.
4. Refer to Section 013100 "Project Management and Coordination" for further requirements.

B. Project Foreman: MC shall provide at least one (1) full time Project Foreman during each shift of work at each school; Foreman shall be able to make binding decisions, as they relate to the daily activities of their crew, as related to achieving the goals of the Project.

C. Site Communications: MC shall provide Project Superintendent with a mobile phone, all costs and service charges paid for by MC; provide Construction Manager with contact number(s).

D. Project Site Field Office: Provide site office facilities for this Contract's Project Superintendent. Site Office shall be equipped with telephone w/answering machine, fax, and e-mail. Contact information shall be provided to the Construction Manager.

1. The Owner reserves the right to seek reimbursement for temporary facilities not provided by this Prime Contract.

E. Scope of Work: Work of the MC includes but is not limited to, the following:

1. Coordination with other Prime Contracts, Owner and Construction Manager as required to adhere to and maintain approved Project Master Schedules. Prior to first payment, this includes submitting the Contractor's Construction Schedule to the Construction Manager for preparation of the Project Master Schedule.
2. All Mechanical demolition and new construction as indicated in the Contract Documents.
3. Mechanical scope is identified in the Contract Documents which include but is not limited to ALL drawings, specifications, this multiple contract summary, etc. This contract includes furnishing and installing access doors for walls and ceiling as required, which may include fire rated conditions., Prior to the submission of shop drawings for mechanical curbs, survey all existing curbs for accurate measurements. Determination of new curb height shall be made in coordination with Contract Documentation..
4. Prior to removal, survey condition of all existing roof top mechanical equipment scheduled to be removed and reinstalled and submit a report of the condition of each piece of existing equipment. Report shall include photographs and a location plan, and be submitted to the Architect and Construction Manager.
5. Removal, safe storage off roof (or outside of work area, as coordinated with BE Contractor), and reinstallation of all existing mechanical roof top equipment as indicated in the Contract Documents. Demolish existing curbs (following asbestos abatement by others) and provide and install new equipment curbs.

6. Reinstallation mechanical scope includes all miscellaneous piping, ductwork extension, low voltage wiring, equipment, hardware and insulation required for a complete and functional reinstallation of existing rooftop equipment. Coordinate any new roof penetrations, if required, with BE Contractor.
7. Reinstallation mechanical scope includes start-up, testing & balancing and recommissioning services for reinstalled mechanical equipment. Submit testing & balancing and commissioning reports to Architect and Construction Manager.
8. Prime Contract shall understand that renovation work may require work to proceed while existing systems are required to be maintained; all cost associated with this sequence shall be anticipated, and incorporated into the Bid.
    a. MC shall be cognizant of phasing and sequencing conditions, that may require MC to make temporary connections or installations of heating system components, in order to maintain operation of existing/new system configuration(s). It shall be the Prime Contract's responsibility to employ its own means and methods of accomplishing any such temporary conditions, at no additional cost to the owner.
    b. All new heating system components must be protected, from potential contamination, by any existing components that are still employed during system operation, should a partial existing/new configuration exist during the required heating period, September 15th – May 31st.
9. Prime Contractor shall read and familiarized themselves with the Lead Sections of the Construction Documents. Lead-based paint has been identified to exist on specific areas/surfaces of the work located within the building(s), and when encountered the Prime Contractor shall follow all applicable regulations while working with this material.
10. Prime Contractor shall read and familiarized themselves with the Asbestos Sections of the Construction Documents. Asbestos Containing Material is scheduled to be abated throughout specific areas of the building(s). Should ACM be encountered (after Abatement is completed), that may interfere with an installation; Prime Contractor shall cease work, and notify Construction Manager immediately.
    a. Penetrations not coordinated with the Prime Contractor responsible for asbestos abatement, prior to abatement of these spaces, shall become the responsibility of the respective Prime Contract requiring the penetration.
    b. Contractor is required to review their work in the field prior to starting and advise if ACM is suspect on the work they intend to alter in anyway. There is no delay claim for lack of inspection of work.
11. Environmental Protection: Provide protection, and conduct construction in ways and by methods that comply with environmental regulations and that minimize possible air, waterway, and subsoil contamination or pollution or other undesirable effects.
    a. Restrict use of noisemaking tools and equipment to hours that will minimize complaints from persons or firms on or near the Project site.

12. The HVAC drawings are schematic in nature, and the MC will make adequate provisions to accommodate the actual field conditions without additional cost to the Owner.
13. Document on the Record Drawings all ductwork openings and penetrations larger than 2 inches in diameter.
14. Provide all demolition of Mechanical Systems indicated in the Construction Documents, and/or required for Work of this Prime Contract.
    a. Coordinate all demolition with Hazardous Materials documents.
    b. Coordinate with all other Prime Contracts regarding all removals required for the Project.
    c. Demolition of a system shall mean any and all components, removed in their entirety, to the point of origin or source.
15. Provide valves, whether permanent or temporary, to permit shutoff and/or capping of systems to achieve the Work of this Prime Contract.
16. Each Prime Contract shall be responsible for all respective SOG/SOD removals, and related infill thereof (doweled with #4 bar 16"o.c. unless otherwise detailed), that are not indicated on the Architectural Demolition plans.
    a. All concrete/masonry demolition shall be completed using wet saw methods.
17. MC Contractor shall provide all Work associated with creating structural openings or penetrations requiring lintels, for their own work (i.e. ductwork and pipe or conduit penetrations). This applies to all openings/penetrations greater than 5-inches through masonry or concrete walls.
    a. MC shall provide lintels and shop drawings for such openings for review by Design Team. MC shall indicate all required openings/penetrations requiring lintels on their Shop Drawings. Mechanical contractor is required to provide openings/penetrations on the coordination drawings that will require structural openings in accordance with the contract documents at no additional cost. Non-structural openings/penetrations, including those for convenience, shall be self-provided by the respective Prime Contractor.
    b. This assignment applies to new and existing construction areas.
    c. Refer to Structural documents for lintel type/size requirements and Architectural drawings for wall types. Walls not specifically identified in the documents are to be assumed as masonry construction.
    d. All openings/penetrations are to be identified on Record Drawings by the Prime Contract requiring the opening.
    e. All scheduled exterior wall louver openings indicated on Architectural and/or Structural documents are to be created by this MC Contractor. MC shall supply and install louver.
    f. Exact physical locations shall be laid-out by MC for coordinated sequencing with other respective Prime Contractors.

18. Provide cut and patch work related to that of this Prime Contract,, related to that of their Prime Contract, and at those areas specifically identified on the Construction Documents, regardless of trade creating the area to be patched.
    a. Each Prime Contract is responsible for all other respective Cutting & Patching required of their installations. Refer to Section 017329 "Cutting and Patching" for further information.
    b. Provide cut and patch for all affected materials at building interiors as required to provide access for relocation of existing or installation of new roof drains and rood drain leaders, to point of connection to existing piping or to building exterior, as indicated in Contract Documents.
19. Provide new HVAC system(s), or modifications of existing system(s) as indicated in the Construction Documents, complete and fully operational.
    a. Furnish all disconnects and motor starters (including related "heaters, fuses, and phase protection relays") for all equipment provided under this contract, for coordinated installation by EC.
    b. Provide Instrumentation and Controls (Energy Management System) complete as indicated on the drawings or specifications:
        1) Electrical Contractor shall provide line voltage power wiring to the control panels as indicated in the Contract Documents.
        2) EMS installer shall provide all low voltage wiring of controls, transformers, actuated dampers, motors, etc., as required for a complete operational system.
    c. Provide thermal insulation of all HVAC components provided by this Prime Contract.
20. Final connections of utilities are by MC, EC or PC, unless noted or assigned otherwise.
21. Provide sleeves required for piping penetrating walls, slabs and/or decks.
22. Provide through-penetration fire stop systems at all penetrations made by MC. MC Contractor shall maintain listed ratings of indicated assemblies. Provide repair of existing through-penetration fire stopping damaged by work of this Prime Contract.
    a. Sleeves with fire stopping are to be installed in sequence with fire-rated construction. This Prime Contract shall be responsible for installing fire stopping material at intersection of sleeve and constructed materials.
23. Provide coordination with, and notification to, the Construction Manager for all specified testing, training, commissioning, etc., of the Work of this Prime Contract. Refer to Division 00 Section "Project Forms" for applicable documentation documents.
24. Substantial Completion: Clean all mechanical installations and provided equipment at the time of Substantial Completion or as directed by Construction Manager.
25. Coordinate all the preceding requirements, accordingly, with all applicable Alternates indicated in Section 012300 "Alternates".

F. Applicable Specification Sections: All specification Sections itemized below are to be provided complete by this Prime Contract, unless noted otherwise. In addition to these specifications, the contractor is required to review all specifications included in the overall contract that may contain related scope or detail for this specific contract.

i) All Division 00 and 01 – Procurement and Contracting Requirements & General Requirements
ii) Division 03 – Concrete
iii) Division 04 – Masonry
iv) Division 05 – Structural Steel
v) Division 06 – Woods & Plastics
vi) Division 07 – Thermal & Moisture Protection
vii) Division 08 – Openings
viii) Division 09 – Finishes
ix) Division 23 – Heating, Ventilating, and Air Conditioning

G. Applicable Drawings: All drawings itemized below are to be provided complete by this Prime Contract, unless noted otherwise. In addition to these drawings, the contractor is required to review all drawings included in the overall contract that may contain related scope or detail for this specific contract.

a. All "G" drawings – All Schools
b. All "M" Drawings – All schools
c. All "MR" Drawings – All Schools

Miller Elementary School
a) All new "S" drawings

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SECTION 01 12 03 – CONTRACT SUMMARY – EC-01

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. This Section includes a summary of each Prime Contract, including responsibilities for coordination and temporary facilities and controls. One set of Construction Documents is issued covering the Work of multiple Prime Contracts. Each Prime Contract is responsible to review all drawings and specifications for specific requirements indicated, and for a general understanding and knowledge of the work of other Prime Contracts. All Prime Contracts are responsible for all Work of their Contract no matter what drawing on which the Work appears. All Prime Contracts are responsible to coordinate their work related to the complete set of drawings and specifications, not limited to each prime contractor scope. **All Bidders should acknowledge that for each contract listed below, each contractor is their own General Contractor and subject to all General Contractor requirements.**

B.

1. **Electrical Contract EC-01:** The Electrical Contractor shall be selected based on the bid procedure as described in the Bid Documents. Contract Bidders are responsible for (a) trade work coordination, (b) the scope contained in drawings listed below and (c) any and all additional scope specifically identified to be performed by the Electrical Contractor in other Bid Packages in the Contract.
    1) Work related to drawings: (*In addition to these drawings, the contractor is required to review all specifications included in the overall contract that may contain related scope or detail for this specific contract.)*
        a) Highview Elementary School
            - Security Vestibule Renovations
            - Toilet Room Renovations
            - Gymnatorium Renovations
            - Door Renovations and Replacements
            - Electrical Panel Replacements

b) Barr Middle School
- Canopy Renovation

c) Maintenance Building
- Interior and Exterior Renovations
- Primary Service Upgrade

d) Outdoor Education Center
- HVAC Upgrades and Interior Renovations

a. Bid Package Contract No. 03 - Electrical Work: All work related to Electrical Contractor which includes but is not limited to the following items: (Refer to the Contract Documents for full scope of work.)

1) Provide access panels, fire rating/firestopping, electrical work, line voltage to controllers, Transformers, feeders for Air condition, provide all temporary power for all trades, power to all MEP equipment, lighting fixture (new, remove and replace) all patching and painting related to the installation of this scope, all city filings and permits for any reason and as required.

2) **This EC-01 contract requires the awarded entity to self-perform the largest scope of work shown in the contract documents. There are no provisions within this contract to solely subcontractor ALL trade scope required to complete the project and its design intent. All other work in this contract is allowed to be subcontracted other than as stated herein. It is further required to clearly present what scope your own forces will be doing with your bid submission. Failure to present this at time of bid will be subject to disqualification.**

1.3 Related Sections include, but are not limited to, the following:

A. Division 01 Section "Work Restrictions" for use of the Project site and for requirements for continued Owner occupancy of premises.

B. Division 01 Section "Project Management and Coordination" for general coordination requirements.

C. Division 01 Section "Project Forms" for documents required for Testing and Coordination.

D. Division 01 Section "Temporary Facilities and Controls" for specific requirements for temporary facilities and controls

1.4 DEFINITIONS

A. Building Site: The Building Site shall be defined in the Construction Documents, as the building footprint, and all related construction within a five-foot (5'0") distance of the building's exterior face, unless noted or assigned otherwise. Coordinate with specific exceptions to the 5'0" limit indicated within each Scope of Work outline.

B. Permanent Enclosure: As determined by the Architect: permanent or temporary roofing is complete, insulated, and weathertight; and all openings are closed with permanent construction or substantial temporary closures. All cost associated with failure to maintain described installations that result in any damage or contamination to the Owner's property, shall be borne by the Prime Contract responsible for the installation.

1.5 MANAGEMENT AND COORDINATION

A. The Owner shall provide a Construction Manager.

1. The Construction Manager shall provide a full time construction site representative recognized as the Construction Manager.

1.6 CONSTRUCTION MANAGER

A. The construction manager shall provide on-site administration of the Contracts for Construction in cooperation with the Architect as set in AIA Document A232 ™ – 2019, General Conditions of the Contract for Construction, Construction Manager as Adviser Edition, as modified.

B. The Construction Manager shall provide administrative, management and related services to coordinate scheduled activities and responsibilities of the Multiple Prime Contractors with each other and with those of the Construction Manager, the Owner and the Architect. The Construction Manager shall coordinate the activities of the Multiple Prime Contractors in accordance with the latest approved Project Schedule and the Contract Documents.

C. Utilizing the construction schedules provided by the Prime Contractors, the Construction Manager shall update the Project schedule, incorporating the activities of the Owner,

Architect, and Multiple Prime Contractors on the Projects, including activity sequences and durations, allocation of labor and materials, processing of Shop Drawings, Product Data and Samples, and delivery and procurement of products, including those that must be ordered will in advance of construction. The Project schedule shall include the Owner's occupancy requirements showing portions of the Project having occupancy priority.

D. Utilizing information from the Prime Contractors, the Construction Manager shall schedule and coordinate the sequence of construction and assignment of space in areas where the Prime Contractors are performing Work, in accordance with the Contract Documents and the latest approved Project Schedule.

1.7 GENERAL REQUIREMENTS OF PRIME CONTRACTS

A. Prime Contracts: The context used in this Section are separate Prime Contracts that represent significant elements of work that is to be performed concurrently and in close coordination with the work of other Prime Contracts for the benefits of the Owner. Each Prime Contract is recognized to be a major part of the Work.

B. Assignment of Work: Should a conflict be indicated, Section 011200 shall take precedence over all scope of work assignments that may be indicated elsewhere within the Construction Documents.

C. Seismic Requirements: Prime Contracts are to be aware that the building(s) is located within a Seismic Zone indicated in the documents and shall provide installations in compliance with all related code requirements.

D. Layout and Installation: Each Prime Contractor shall schedule, layout and install their Work in such manner as not to delay or interfere with, but to compliment the execution of the work of other Prime Contracts, utility companies and Owner's operations.

E. Extent of Contract: The Contract Documents, drawings and specifications each contain more specific descriptions of the Work facilitating which Prime Contract includes specific elements of the Project.

1. Work provided by each Prime Contract shall mean complete and operable systems and assemblies, including products, components, accessories and installations required by the Construction Documents or indicated otherwise.
2. Prime Contractors shall exercise good judgment and perform all work according to related industry standards.
3. The Owner is exempt from payment of Federal, State and local taxes, including sales and compensating use taxes on all materials and supplies incorporated in completing the Work; these taxes are not to be included in the Bid. This exemption does not apply

to tools, machinery, equipment or other property leased by, or to, the Contractor or sub-contractor, or to supplies and materials, which even though consumed are not incorporated into the completed work. Prime Contractors, and
their sub-contractors, shall be responsible for paying any and all applicable taxes on said tools, machinery, equipment or property, and upon all said unincorporated supplies and materials, whether purchased or leased.

4. Prime Contracts shall understand that time is of the essence, and will adequately staff the Project by employing the appropriate trade's people to perform the Work; these people shall be experienced in their respective trades. A shortage of labor in the industry shall not be accepted as an excuse for not properly staffing the Project; all efforts shall be made to meet or exceed the schedule, including additional staff and/or labor hours necessary. All cost associated with this item shall be included within the Bid.
5. Local custom and trade union jurisdictional settlements will not control the scope of the Work of each Prime Contract.
    a. When a potential jurisdictional dispute or similar interruption of Work is first identified, or threatened, the affected Prime Contracts shall promptly negotiate a reasonable settlement to avoid or minimize the pending interruption and delays.
    b. Contractor's trade-related issues shall not be grounds for modification or extension of scheduled completion date(s).
6. The Work of all Prime Contracts requires close coordination with other Prime Contracts and construction personnel. Maintain flexibility and cooperation through the Project. "Out of Sequence" and "Delay" claims will only be considered when requirements of Division 01 "Administrative Requirements" have been adhered to. Delay claims must be in writing and forwarded to the Architect, per the requirements of the General Conditions of the Contract. Claims not submitted per these requirements will be rejected and/or denied.
7. The intention of the Work is to follow a logical sequence, however, a Prime Contractor may be required by the Architect or Construction Manager, to temporarily install, omit or leave out a section(s) of Work, out of sequence. All such out of sequence work, and come back time, at these areas shall be performed at no additional cost to the Owner.

F. Substitutions: Per Division 01 Section "Substitution Procedures", each Prime Contractor shall cooperate with the other Prime Contractors involved, to coordinate approved substitutions with remainder of the Work. Contractors shall submit all "Substitutions" at least ten (10) days prior to the date for receipt of Bids as specified in the Instructions to Bidders 002113 Section 3.3 Equivalents or bid will be considered per "basis of design".

G. Construction Schedules: Refer to Divisions 01 Section "Construction Progress Documentation", "Preliminary Schedule" and "Project Management and Coordination" for requirements related to meetings and schedules.

H. Construction Sequencing and Phasing: Prime Contractor shall understand that Sequencing and/or Phasing Plans are contingent upon the work areas being complete/occupied, prior to the next area of Work beginning. Should an area of construction not be complete per the Project Preliminary Schedule, the Project Master Construction Schedule/Sequencing Plans will be adjusted accordingly. The Owner will not be responsible for delay claims due to adjustments being no fault of their own.

1. Prime Contracts may be required to re-sequence the phasing of the project as a result of changes to the schedule. Prime Contracts shall provide these adjustments at no additional cost to the Owner.

I. Testing and Inspections by Owner: The Owner shall employ an independent qualified testing and inspection agency for monitoring on-site soils analysis (excluding top soil analysis), soils compaction, cast-in-place concrete, asbestos and lead abatement monitoring and Special Inspections indicated in the Construction Documents (refer to Division 01 "Quality Requirements" and/or Statement of Special Inspections" for additional specific information)

1. Prime Contractor shall give one week notice as to commencement for these requirements. Once underway, Prime Contractor shall coordinate with the Construction Manager and give 48 hours' notice as to test(s) required, by Owner's Agency, and further verify the need 24 hours in advance. Full cooperation and coordination is expected of all Contractors and their personnel with the Owner's Testing Agency in fulfilling test requirements; provide all data and materials requested for required reports.
2. Other than with regard to compliance with state and federal laws, the testing agency holds no execution authority other than to provide test results. Should testing indicate a discrepancy or non-compliance during execution of the Work, the Testing and Inspection Agent shall promptly notify the Construction Manager and Project Superintendent of such; however, the Prime Contract shall bear full responsibility for making any decision with regard to proceeding with, or stopping, the Work.
3. This assignment of Testing and Inspection responsibilities shall take precedence over any respective responsibilities that are indicated otherwise in the Construction Documents.

J. Testing by Others: All testing requirements not listed in preceding "Testing & Inspections by Owner" or otherwise identified in Division 01 "Quality Requirements" and/or "Statement

of Special Inspections" shall be the responsibility of the Prime Contract providing the respective Work as indicated in the Construction Documents.

1. The respective Prime Contract shall have performed testing requirements indicated in individual Specification Sections which may inadvertently indicate "Owner to provide," which are not identified in preceding paragraph "Testing & Inspections by Owner".
2. Prime Contractor shall submit their Testing Agency qualifications to the Architect for approval prior to any test being performed. Construction Manager shall be given 48 hours' notice of any test/inspections to be performed by Prime Contractor's Testing Agency. 24- hour notification shall be given to the Construction Manager for test/inspections requiring his/her presence; 72-hour notification shall be given to the Architect for test/inspections requiring his/her presence.
3. Determinations required of the Architect shall be anticipated by the Prime Contractor to allow ample time for inspection, investigation and reporting.
4. Prime Contractor shall secure a UFPO clearance prior to start of any UG installation work; coordinate with and advise Construction Manager.

K. Existing Conditions: Each Prime Contract shall verify existing conditions in the field prior to work commencing in that area and immediately report conditions to the Architect that are not represented correctly by the Construction Documents.

1. Each Prime Contract is responsible for familiarizing himself with Project Site Logistics and provide a "site logistics plan locating storage area, scaffolds, rubbish areas, stock piles and egress related to all work, included phased construction within 30 days of award.
2. Each Prime Contract has been given ample opportunity to review Existing Conditions related to the Project. Existing Conditions not noted in the Construction Documents that could be easily recognized during pre-bid review that interfere with the respective Prime Contract's work, shall be the responsibility of the respective Prime Contract. This includes all costs associated with removal, patching, relocation or re-fabrication of installations.

L. Hazardous Materials: Each Prime Contract shall familiarize themselves with the Hazardous Materials Sections/Drawings of the Construction Documents and follow DOL/OSHA/EPA/SED regulations while performing their respective Work in these areas. Discovery of non-identified or concealed hazardous materials shall be reported to the Construction Manager immediately and followed up with written documentation of the event.

M. Protection of Installations: Each Prime Contract is responsible for protecting their installations at all times. All costs incurred to repair, replace or clean insufficiently protected materials/installations shall be the responsibility of the installing Prime Contract.

1. Architect shall be notified, in writing, immediately upon material/installation being damaged; notification shall indicate responsible party.
2. Owner will not be liable for damaged materials and/or installations by "others", when "others" cannot be identified.
3. Repair damaged work, clean exposed surfaces or replace construction installations that cannot be repaired.
4. Each Prime Contract shall be responsible for removing all labels not required to remain from their installations.
5. Installations shall be wiped clean and proper protection then installed.
6. Each Prime Contract is responsible to protect another primes work in the event that prime has to work over or on top of that other primes work being complete. The prime working over the completed work takes full responsibility of that other primes completed work both in condition and operation.

N. Daily Cleaning: All Prime Contracts are responsible for any and all debris caused by their Work, including the Work of their subcontractors. A daily clean up and disposal is required by each Prime Contract for the periods which that Prime Contract, or its subcontractors, are performing Work on site.

1. Assign at least one person for a daily clean and sweep of the work area(s). Prime Contractor shall allot sufficient manpower and time for this to be completed by the end of each shift. Submit name of this person(s) to Construction Manager.
    a. Construction Manager shall have the authority to give direction to person(s) on the Project Site identified by the Prime Contract as designated for cleanup tasks. This shall include the safety review/securing of the site-work zone after each shift.
    b. This person has check that no construction debris was dumped in any district dumpers during this end of shift site review, if found the contractor must remove immediately the next morning to avoid back charges costs of $1500 per day not removed.
2. Any Prime Contract not providing personnel for Daily Cleaning will be Back Charged for labor provided by the Owner to complete this task.
3. Contractor working solely in an area shall be responsible for clean/sweep of that area.
4. Daily cleaning will not mean any one Prime Contract is responsible for assisting another Prime Contract with removing major quantities of debris created by a particular Prime Contract's Work.

5. Daily cleaning will be mandated to remove from the building any debris created by day-to-day activities. All Prime shall assist in sweeping shared work areas and shared corridors while working on site. Each Prime shall assist in mopping of shared corridors while working on site or as required by the Owner.
6. All prime contractors and subcontractors are required to provide sweeping compound for daily cleaning in their respective exterior and interior work areas. Each Prime Contract shall provide a sufficient number of brooms or other necessary tools, for use by their personnel to adequately fulfill their obligations.
7. All prime contractors shall provide and maintain garbage cans/refuse containers with liners for each construction area of their respective contracts as directed by the Construction Manager and shall be responsible for disposing of these materials to a dumpster.
8. All prime contractors provide the necessary equipment/containers (lull/skip-box) to move daily clean/sweep debris from the building to a dumpster on a daily basis, for each construction area of their respective contracts. Skip-box shall be emptied to a dumpster by 9:00 a.m. the following day.
9. Cleaning shall be deemed a Safety & Health issue, with Prime Contracts being held accountable for fulfilling their contractual obligations.

O. Final Cleaning: At Substantial Completion of each area of construction, each Prime Contract shall wipe/vacuum clean all of their respective installations; All interior contracts performing work inside the buildings shall mop clean all building surrounding areas and finish flooring and remove all marks/blemishes to the finish, for each construction area of their respective contracts. Each area of construction shall be wiped clean of all construction dust and debris prior to turnover to the Owner.

P. Cutting and Patching: All Primes are responsible for cutting and patching required to complete their Work. All repair of existing finish Work (including finish floors) shall be performed by contract requiring work, meeting or exceeding minimum contract requirements for that particular section, specification, or type of work. All concealed openings (piping, ductwork, conduit, etc.) must be repaired to comply with specified wall or deck conditions as well as required fire and sound ratings. All corridor penetrations require fire safing. If contractor elects to install their new work in an existing unrated wall or floor opening, whereas the wall/floor is a fire rated condition, that contractor is responsible to fire rate that opening to match the wall/floor fire rating with new and all other existing wire, piping, ducts etc. Other areas are noted in drawings and specifications.

1.8 Project Schedule. The nature of this project is to complete all the work listed as Elevator Addition in the schedule by **the Project Closeout Dates specific to each Prime Contract**

as listed below. Each Prime Contractor shall include in their bid proper allowances for foul weather.

B. Bids Received: 2/13/2025

C. Notice to Proceed: 2/26/2025

D. Submittals: The following items are to be submitted within 60 business days after Notice to Proceed:

1. Submittal List and Submission Schedule – **15 days after NTP**
2. Field Investigations
3. Shop Drawings
4. Long Lead Items Letter – **30 days after NTP**
5. Schedule of Values and Key Submittal List – **15 days after NTP**
6. Preliminary Construction Schedule
7. Site Specific Health and Safety Manual
8. Project Contact Directory
9. Labor and Equipment Rates

a Mobilization: 4/11/2025

G. Substantial Completion and Project Closeout:

1. **Electrical Contract 01**
    1 Substantial Completion: See Milestone Schedule
    2 Project Closeout: See Milestone Schedule

1.9 TEMPORARY FACILITIES AND CONTROLS OF PRIME CONTRACTS

A. Conditions of Use: Keep temporary services or conditions clean and neat in appearance. Operate in a safe and efficient manner. Relocate temporary facilities as required as 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 to develop or persist on the Project site.

1. Installation, operation, maintenance, and removal of each temporary service or condition are considered part of the respective Prime Contract's own construction activity, as are costs and use charges associated with each facility.
2. Locate service or condition where they will serve the Project adequately and with minimum interference of the Work, coordinate with the Construction Manager and the other Prime Contracts prior to installation.

B. Temporary Use of Permanent Facilities: Prime Contract, as installer of each permanent service or condition, 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 temporary facilities and controls responsibility.

C. Owner's Facilities: Contractors are not allowed to use the Owner's facilities (toilets, telephones, food service, etc.) for their own benefit or convenience. Prime Contract Superintendents shall enforce this policy with their respective work forces.

1. Construction personnel parking will be restricted to area as directed and agreed to by the Owner, and to facilitate the completion of the work. Owner reserves the right to remove from their property, unauthorized vehicles occupying unauthorized areas, at respective vehicle owner's expense.

D. Storage on the Project Site: **Each Prime Contract shall provide sufficient secure weathertight storage facilities for their materials and equipment.** These storage containers are required to be located on the "site logistics plan." The Owner's facilities and the Project's building areas shall not be used for storage unless agreed upon, in writing, with the Owner via the Construction Manager.

1. Until permanently incorporated into the Work, all materials on the Project site are considered to be the Prime Contract's responsibility for security and protection.
2. Prime contractor is required to check on their onsite stored material periodically to ensure that all material continues to be located in the stored location and that it remains protected from all damage, theft, and endangerment to others and ready to be used on notice for coordination with other contractors. Failure to arrange for materials to be on site to complete coordinated work with other Prime Contractors will result in back charges for delays resulting therefrom.
3. Temporary long-term storage facilities are not available to Prime Contracts by the Owner.
4. Prime Contractors and their subcontractors, shall coordinate deliveries with the Construction Manager to ensure that disruptions and Owner inconvenience are avoided.

E. Tools and Equipment: Each Prime Contractor shall provide all tools and equipment necessary for its own activities; this includes secure lock-up and storage for all items on the Project Site.

1. Provide all construction aids and miscellaneous services and facilities necessary exclusively for its own construction activities; this shall include any additional supplementary power, ventilation, lighting requirements and weather protection.

F. Project Site Communication: Each Prime Contractor shall provide their Project a full time on site at all times Superintendent with a mobile phone for the duration of the Project, as indicated in their Scope of Work. Construction Manager shall be furnished with contact numbers associated with each phone.

G. Safety: Prime Contracts, not the Architect or Construction Manager, are responsible for Project Site Safety, as related to their operations (refer to Section 013150 "Special Procedures" for further requirements).

1. Each Prime Contract shall correct safety hazards and violations immediately. If safety issues are not immediately rectified, the Owner shall secure outside sources to correct the deficiency and back charge the responsible Prime Contract.
2. Maintain unobstructed access/egress to fire extinguishers, fire hydrants, stairways, corridors, ladders and other safety routes/devices.

H. Fire Extinguishers: All Prime Contracts provide and maintain "general use" fire extinguishers for each construction area of their respective contracts; comply with applicable codes for quantities required. Use of the Owner's fire extinguishers to meet this requirement is not permitted. Comply with NFPA for recommended classes for exposure; extinguishers shall be inspected and appropriately tagged prior to being brought on site. Provide stands, painted bright orange, sturdy enough to carry the extinguisher, and built as not to create a tipping hazard.
1. Each Prime Contract shall supplement this requirement by providing additional fire extinguishers specifically related to their work activity (e.g., welding, soldering, abrasive cutting, etc.).
2. Each Prime Contract shall provide and maintain proper fire extinguishers at/in their respective on site office and storage facilities.
3. Store combustible materials in approved containers in fire-safe locations.

I. Welding: Any Prime Contract performing welding, cutting or other activities with open flames or producing sparks shall at a minimum:

1. Coordinate interruption/shutdown of detection system(s) to avoid creating false alarms.

2. Protect the area and surrounding areas from fire and damage.
3. Maintain fire extinguishers, compatible with activity, at the location of the activity.
4. Provide a continuous Fire Watch during the activity and one-half hour beyond the completion of the activity.
5. Provide all necessary fans and ventilation required for the activity.
6. Any welding, burning and or use of flame the contractor is required to provide all required "hot work permit" to use such equipment prior to start of work. Its mandatory that no "hot work" shall start without these permits issued to the CM and Owner. Failure to this requirement will result to the removal of the project super of that company from all district projects.

J. Temporary Power: Each Prime Contractor shall provide for their own temporary power needs for any scheduled electrical utility shut downs.

K. Each Prime Contractor shall provide for their own temporary generators, power cords and temporary lighting as needed during these periods to continue to perform their work and maintain adherence to the Preliminary Schedule and approved Project Master Schedules. All temporary power equipment shall comply with all applicable codes and regulations.

N. Waste Disposal Facilities:

1. **General debris/refuse/construction waste containers (dumpsters) shall be provided by each prime contractor and secured as specified herein this contract.**
2. It shall be the responsibility/requirement of each Prime Contract to bring their waste to the dumpsters, including but not limited to all equipment, demolition debris, discarded materials with further identification including the following; construction and demolition debris refers to discarded materials generally considered non-hazardous in nature, including but not limited to steel, glass, brick, concrete, asphalt material, pipe, gypsum wallboard, and lumber, from the construction or destruction of a structure as part of a construction or demolition project or from the renovation of a structure, including such debris from construction of structures at a site remote from the construction or demolition project site.
3. It shall be the responsibility and requirement of each Prime Contract to recycle metals generated by its Work, and the Work of its subcontracts.
4. Joint-effort recycling by all Prime Contracts is encouraged.

O. Temporary Sanitary Facilities: Provide temporary self-contained toilets units for duration of the project.
    1. Temporary Sanitary Facilities:

a. **Each prime contractor is required to provide their own Temporary Sanitary Facilities and secured behind fencing and/or locked after work hours and weekends.**

2. Comply with regulations and health codes for type, number, location, operation, and maintenance of fixtures and facilities.
3. Provide separate facilities (minimum of one ea.) for male and female personnel in proportion required by OSHA.
4. Shield toilets to ensure privacy.
5. Coordinate mobilization and demobilization of units with Construction Manager.
6. Toilets shall be cleaned at least once per week, with additional facilities or cleanings provided if requested by Construction Manager.
7. Provide and maintain adequate supply of toilet tissue and hand sanitizer for each facility.

1.10 WORK HOURS & SEQUENCE

A. EC-01 Contract is permitted to work during the school day on non-disruptive work. Sawcutting, jackhammering, power shutdowns, or work that may affect emergency egress must be performed second shift or weekends. The contractor is responsible to factor this into their bids.

B. Unless otherwise approved by the Construction Manager, During the school days, Work is to be performed in this contract during the hours of 3:30pm to 10:00pm on weekdays, and Saturdays and Sundays from 7:00am to 3:30pm. During School breaks, work is to be performed from 7:00am to 10:00pm. There is no additional cost to the owner for working the hours of 3:30pm through 10:00pm, or weekend work during the school year. **Any work done during these times MUST BE COMPLETED, CLEANED, AND TESTED AS NECESSARY FOR STUDENT OCCUPANCY BEFORE THE START OF THE NEXT SCHOOL DAY.** Contractors are required to schedule work during school breaks, school days off, and school holidays.

C. Summer work starts June 28th through August 23rd for 2025. The Summer working hours are from 7:00am to 9:30pm. There is no additional cost to the owner for working the hours of 3:30pm through 9:30pm or on weekends and holidays during the Summer.

D. Contractors are required to start working on site within 30 days of execution of contract, to the extent permitted by contract. Contractors are required to coordinate and perform work simultaneously with other Contractors. Contractors are required to complete their contract work by the designated Substantial Completion and Final Completion end dates as indicated on the Invitation to Bid.

E. Mandatory clean up periods - From August 24th, 2025 to August 31st , 2025 and August 30th , 2025 to September 6th, 2025, contractors shall clean up all interior and exterior areas.

F. Contractors are required per contract to fully staff the project during the work shifts stated above with the required manpower to complete their work within the allowed scheduled time frame. Contractors are required to provide a 72-hour advanced request to the Owner via the Construction Manager for any Saturday and Sunday work. If a project schedule delay has been caused by the fault of the contractor, the contractor is required to provide 3rd shift work from 9pm to 6am to make up the project schedule. All costs for CM, Architect and district personal related to this 3rd shift request will be charged to the contractor at a combined rate for all at $3,000 per 8hr shift.

G. The shifts noted above are not considered overtime or premium time hours.

H. Contract summaries will provide start and end dates for each contractor.

I. Additional requirements:

1. Multiple Crews: Each Prime Contract shall provide multiple crews, supervision, cranes, scaffold and other means necessary to perform the Work, and maintain the Project Master Schedules. If multiple crews are required, the prime contractor shall ensure that multiple crews are present at each project location simultaneously to adhere to the schedule.
2. Interruption of any utility and/or power must be coordinated with the Owner, via the Construction Manager.
3. Any and all -3rd shift, overtime, weekend and/or holiday work required to meet the Project Master Schedules shall be incorporated in the respective Prime Contract's bid.
4. Should a Contractor's progress fall behind, as to schedule, Prime Contractor shall employ additional – 3rd shift and/or overtime and/or weekend workforce until situation is rectified, to the satisfaction of the Architect and Construction Manager, at no additional cost to the Owner, however subject to charges as stated in section 1.8 C for lack of maintaining schedule
5. Should a Prime Contract feel another Prime Contract is delaying them sufficient time to complete their installations, per the schedule, the Architect and Construction Manager shall be notified in writing immediately of the situation (refer to Conditions of the Contract for protocol). A Prime Contract creating such a delay, that causes a proven burden upon another Prime Contract to maintain

schedule, shall bear all costs incurred by the delayed Prime Contract to maintain the schedule.

6. The Architect and Construction Manager shall not be overburdened as to overtime cost, to monitor the work, due to no cause of his or her own. Owner will compensate the Architect and Construction Manager for all additional cost related to the issue of a Prime Contractor's failing to execute the Contract by fully staffing per the work hours and days noted herein. The Owner reserves the right to back charge the responsible Prime Contract for these fees if incurred.
7. All Asbestos and/or Lead Abatement shall take place to meet the requirements of the Preliminary Schedule and Project Master Schedules and shall be coordinated with the other Prime Contractors prior to commencement.

J. The Work shall be conducted to provide the least possible interference to the activities of the Owner's personnel and the surrounding property owners (neighbors).

1. Prime Contracts are hereby notified that: All Prime Contractors and their subcontractors shall limit excessive noise during 2nd shift known as work extending to 10PM weekdays upon approval by owner and city work hour restrictions. These operations shall not create a disturbance to neighboring properties.

K. Construction access to the site shall be limited to personnel, equipment and deliveries by suppliers relative to the Work of Prime Contractors and their subcontractors. Prime Contracts shall keep the Construction Manager advised of persons accessing the site and shall seek assistance with coordinating parking and storage facility locations for all Prime Contracts.

1. Where applicable, Contractors shall provide Building Site perimeter barricades as described herein the project and all temporary exit doors/lockable gates on the Project, securing these doors, fencing and/or gates at the end of each work shift.
2. When a Prime Contract engages in overtime, weekend or 2nd shift work, during the summer months and or during the normal school year, the respective Prime Contract shall notify Construction Manager of such and be responsible for securing the Project Site at the end of that work shift and perform site walk around the outside of construction area/work zone ensuring all debris is pickup up and there are no construction related hazards of any kind present once the responsible person leaves the site for the evening or weekend. This includes that all materials and equipment are fenced in and keys are removed. All interior projects have the same requirement to ensure that outside the work zone is clean from dust-dirt and that no materials are left outside the work area at any time.

3. All electrical disconnects and reconnects for roof top equipment is by EC-01. EC-01 shall review "M" drawings to coordinate this work.

4. All "lay in" electrical fixtures installed in ACT grid shall be independently hung by EC-01.

5. Required Access doors are to be furnished by EC-01 and installed by GC-01. EC-01 to coordinate location and quantity with GC as to not hinder GC work.

6. Any existing ceiling removal/replacement necessary to install new electrical work to be done by Electrical Contract #1 (e.g. – new conduits for feeders through existing ceilings, etc.).

7. Any wood blocking or panel backboards for electrical items by EC Contract #1.

8. EC specifically notified construction is phased which necessitates that utilities/services will need to be temporarily connected and maintained as necessary to ensure that all occupied areas have the required services. (power, fire alarm, PA, internet, etc.

9. All Flushometers are provided by PC and installed by EC. EC to review P drawings for any required low voltage transformers and confirm with PC.

10. In areas where the GC is removing existing ceilings, the EC or MC will remove any ceiling-mounted electrical items, light fixtures, FA devices, Speakers, WAPs, exit signs, cameras, etc. EC to reinstall after new ceilings are completed. Please review A, S, M, & P drawings.

11. After GC ceiling removals for areas scheduled to receive new acoustic grid/tile, the EC will properly tie up any sagging wires at 6' o.c. to be supported above the ceiling grid in accordance with code. EC is to verify with GC before proceeding with any ceiling-mounted fixture installations.

12. All Fire Alarm connections, smoke detectors, Carbon monoxide detectors, duct detectors, remote test stations etc. are provided by EC.

13. **Duct detectors are provided by the EC, installed in the duct by MC, and wired by EC. EC is to review E & M drawings for locations and quantities. Consult division 28 in the project specifications. EC is to provide all FA connections & commissioning of FA components to main panel through districts preferred FA vendor. Testing is by the electrical contractor. Each prime contract shall**

coordinate to ensure proper installation and compliance with relevant local codes.

14. All Mag Holds are provided and mounted by the GC. EC is to run power and FA wiring for all mag holds. Review the A drawings for new doors requiring mag holds. Review Architectural scope for Mag Holds.

15. EC is responsible for any trenching and patching associated with their work. Trenches within concrete slabs require type 2 backfill, vapor barrier, and #4 rebar dowels at 16" O.C. epoxy into existing slab. See Div 03 for concrete infill PSI strength.

16. No work may be performed to live panels or connections of live fixtures. The EC is to locate existing main panels and associated circuits and perform lockout tagout procedures to de-energize the sub panel or fixture to which work is being performed.

1.11 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.

1.12 DRAWINGS AND SPECIFICATIONS

A. Construction Documents indicate the sum total of the Contract that make up the complete work for the Project. Through this Section "Summary of Work", the intent of the Contractor's scope of Work and responsibility is generally described. Related requirements and conditions that are indicated in the Contract Documents include but are not limited to the following:

1. General Conditions and Requirements.
2. Referenced and applicable Codes, Regulations and Standards.
3. Scheduling and phasing requirements.
4. Existing conditions and restrictions on use of the site and facilities.

B. Drawings and Specifications are cooperative and supplementary. Portions of the Work, which can best be illustrated by Drawings, are not included in the Specifications and portions best described by Specifications are not depicted on Drawings.
1. All items necessary to complete the work shall be furnished whether written or illustrated.

2. All primes shall exercise good judgment and perform all work according to related industry standards.

PART 2 - SCOPE OF WORK

2.1 PRIME CONTRACTS

A. Scope of Work: Work includes but is not limited to, the following:

1. Provide all work identified in the Contract Documents.

2. Applicable Specification Sections: All specification Sections itemized below are to be provided complete by this Prime Contract, unless noted otherwise. In addition to these specifications, the contractor is required to review all specifications included in the overall contract that may contain related scope or detail for this specific contract.

ii Divisions 00 and 01 – Procurement and Contracting Requirements & General Requirements.
iii Division 02- Existing Conditions
iv Division 03 – Concrete
v Division 26 – Electrical
vi Division 27 – Communications
vii Division 28 – Fire Detection and Alarm

3. Applicable Drawings: All drawings itemized below are to be provided complete by this Prime Contract, unless noted otherwise. In addition to these drawings, the contractor is required to review all drawings included in the overall contract that may contain related scope or detail for this specific contract.

4. All “G” Drawings
5. All “HE-E Drawings”
6. All “ME-E Drawings”
7. All “OEC-E Drawings”
8. All “MB-E Drawings”
9. All “BM-E Drawings”
10. EC-01 Shall review all HE, ME, OEC, MB, BM “M” & “A” drawings for locations and quantities of duct detectors or electrical connections to HVAC equipment.

NOTE: Only low voltage connections are by MC. All feeders/circuits for HVAC equipment or architectural fixtures are by EC. EC shall review A drawings and coordinate with E drawings for lighting fixture layout. Any electrical fixtures shown on A drawings & E drawings is by EC-01 contract.

PART 3 - EXECUTION

3.1 WORK SEQUENCE

A. The Work shall be conducted to provide the least possible interference to the activities of the Owner's personnel, per the Project Preliminary Schedule.

B. Work required during overtime, extended shifts or holidays due to failure of contractor to maintain schedule, will be monitored by Architect/Construction Site representative, and may be monitored by Owners' personnel. Additional costs for Architect/Construction Site Representative and/or Owner personnel will be borne by the Contractor.

C. Coordination of any utility and power interruption must be done with approval of the Architect/Construction Site Representative. Shutdowns must occur during non-occupied timeframes only.

D. Construction access to the site shall be limited to those designated for personnel, equipment and deliveries by the Owner. All contractor staging, parking and storage shall be coordinated with the Construction Site Representative and subject to change.

E. Payments: Each bid that covers more than one school (i.e. one SED project) shall provide completed AIA G732 & G703 by building (for each SED project).

F. No work shall be installed without approved shop drawings. Any work in place without approved shop drawings will be rejected and removed by that contractor at their expense and backed charge all other costs related to.

G. Any work deemed by CM, Architect and District not properly installed by a contractor per the contract drawings and specifications shall be removed immediately and corrected, with all associated costs to be borne solely by that contractor.

H. All prime contractors shall coordinate their contract work with other primes to meet the project schedule and for a complete operational system or area or work.

I. All contractors are to provide within 3 weeks of award a "base line" construction schedule for their work from commencement to completion including all phasing. This schedule is to be updated monthly to show percentage progress of each item listed.

This schedule shall be revised to provide a recovery schedule in the event of a delay for any reason. The recovery schedule shall include the "base line" item and the recovery to show how the delay is affecting the overall project schedule. This schedule is to be provided in MS Project or Primavera. Excel schedules are not accepted.

J. Prime contractor "base line" schedules are to be reviewed by each prime contractor and coordinated where work is related and that each prime's work shall be included in each "base line" contractor's schedule as necessary for coordination.

K. All contractors are to provide 2-week look ahead schedules showing work related to the base line and shall be coordinated with other prime 2-week look ahead schedules. These schedules will be Excel format. Format will be provided by the CM.

L. Contractors to provide a full-time supervisor on site 100% of the time. This is not a working foreman. Supervisors are not working with tools they are supervising their workers and coordinating with other contractors and district/ CM. Failure to provide will be default of your contract and subject costs related to and termination.

M. All prime contractors are the provide a project manpower structure showing names and telephone numbers of each responsible person on the project. This shall be updated as needed if personal changes are made.

N. All site equipment and dumpsters are to be behind temporary chain link fence when stored on site and or within the construction work zone where temporary chain link fence has been providing and installed by the prime. Each prime contractor is responsible to provide and install temporary chain link fence around their own stored equipment and dumpsters on site.

O. No equipment, panels or any services shall be turned off for any reason without written request and approval by the district. Project form shall be used for all shutdowns and required a 3-day notice. Other shutdowns may require more time.

3.2 **CONTRACT ELECTRICAL WORK (EC-01)** – ELECTRICAL PRIME CONTRACT AT HIGHVIEW ELEMENTARY SCHOOL, MILLER ELEMENTARY SCHOOL & BARR MIDDLE SCHOOL, OEC, AND MAINTAINENCE - SECURITY AND TOILET ROOM RENOVATIONS, HVAC EQUIPMENT CONNECTIONS, FIRE ALARM, LIGHTING, POWER, DATA, COMMUNICATIONS, SERVICE UPGRADES, AND PANEL REPLACEMENTS WORK.

C. Project Site Superintendent: EC shall provide one (1) full time Project Site Superintendent while any work related to this Contract is being performed on site. Superintendent may be a working Foreman as long as the daily requirements of this Contract are maintained, as they relate to the Construction Documents and the Project Schedule. Construction Manager reserves the right, in their opinion, to revoke this privilege if these requirements

are not maintained. Superintendent shall work closely with the Construction Manager, and the other Prime Contract Superintendent(s), in a manner that best promotes the Master Construction Schedule and the objectives of the Project.

1. Superintendent shall be on site while Prime Contractor's own forces, and/or their sub-contractors' forces, are on site; also, while other Prime Contracts are installing work, or require coordination of work, related to this Prime Contract, and/or as requested by the Construction Manager.
2. Superintendent shall be the same individual throughout the Project.
3. Refer to Section 01 31 00 "Project Management and Coordination" for further requirements.

D. Project Foreman: EC shall provide at least one (1) full time Project Foreman during each shift of work for each school; Foreman shall be able to make binding decisions, as they relate to the daily activities of their crew as related to achieving the goals of the Project.

b Site Communications: EC shall provide Project Superintendent with a mobile phone, all costs and service charges paid for by EC; provide Construction Manager with contact number(s).

c Project Site Field Office: Provide site office facilities for this Contract's Project Superintendent. Site Office shall be equipped with telephone w/answering machine, fax, and e-mail. Contact information shall be provided to the Construction Manager.

i The Owner reserves the right to seek reimbursement for temporary facilities not provided by this Prime Contract.

d Scope of Work: In addition to Divisions 26, 27 and 28, Work of the EC includes but is not limited to, the following:

i Coordination with other Prime Contracts, Owner and Construction Manager as required to adhere to and maintain approved Project Master Schedules. Prior to first payment, this includes submitting the Contractor's Construction Schedule to Construction Manager of the Project Master Schedule.

ii Electrical scope is identified on the Contract Documents for removal, installation and replacement of all electrical interior and exterior components shown on the Contract Documents for all schools. Including but not limited to coordination and installation of conduits and panels. Provide all removals of existing Electrical Devices, Fixtures & Systems indicated, or required, for Work of this Prime Contract.

iii Coordinate all removals with Hazardous Materials documents.

iv **This contract includes furnishing access doors for walls and ceiling as required, which may include fire rated conditions, and coordinate with General Contractor (GC) for installation. EC shall provide Access Door for GC to install.**

EC is required to review reflected ceiling plan and all locations where accessible electrical devices or equipment will require access panels.

v **All duct Detectors are provided by EC contract and Installed by MC contract. All FA Control and power wiring for duct detectors are provided by EC contract. EC is to refer to the HVAC schematic diagrams for quantity of duct detectors to be furnished.**

vi **EC is to review HVAC drawings and provide power to all Fire Smoke dampers as indicated on the drawings.**

vii **All FA shutdown relays are by EC.**

viii **Coordinate all required inspections with local jurisdiction.**

ix Provide all reinstallation of existing Electrical Devices, Fixtures & Systems, replacement or new Electrical Devices, Fixtures & Systems associated the classrooms.

x EC shall conform to phasing and sequencing of renovations. See Preliminary Schedule for all work as shown on the phasing plans.

xi The Electrical Contractor shall review the Contract Documents in its entirety for complete electrical scope of work in this contract.

xii EC shall install work in accordance with the National Electrical Code requirements. No additional compensation will be made for extra offsets in conduit or retro-fit work due to improper component location, or lack of Prime Contractor's coordination.

xiii Prime Contract shall understand that renovation work may require work to proceed while existing systems are required to be maintained; all cost associated with this sequence shall be anticipated, and incorporated into the Bid.

xiv Prime Contractor shall read and familiarized themselves with the Lead Sections of the Construction Documents. Lead-based paint has been identified to exist on specific areas/surfaces of the work located within the building(s), and when encountered the Prime Contractor shall follow all applicable regulations while working with this material.

xv Prime Contractor shall read and familiarized themselves with the Asbestos Sections of the Construction Documents. Asbestos Containing Material is scheduled to be abated throughout specific areas of the building(s). Should ACM be encountered (after Abatement is completed), that may interfere with an installation; Prime Contractor shall cease work, and notify Construction Manager immediately.

xvi Penetrations not coordinated with GC, prior to abatement of these spaces, shall become the responsibility of the respective Prime Contract requiring the penetration.

xvii EC shall provide all Work associated with creating structural openings or penetrations requiring lintels whether for their own work (i.e. conduit penetrations). This applies to all openings/penetrations greater than 5-inches through masonry or concrete walls.

xviii Non-structural openings/penetrations, including those for convenience, shall be self-provided by the EC.

xix This assignment applies to new and existing construction areas.

xx Refer to Structural documents for lintel type/size requirements and Architectural drawings for wall types. Walls not specifically identified in the documents are to be assumed as masonry construction.

xxi All openings/penetrations are to be identified on Record Drawings by the Prime Contract requiring the opening.

xxii **Provide cut and patch work related to that of this Prime Contract in new and existing construction, related to that of their Prime Contract, and at those areas specifically identified on the Construction Documents, regardless of trade creating the area to be patched.**

xxiii Each Prime Contract is responsible for all other respective Cutting & Patching required of their installations (refer to Section 017329 for further information).

xxiv Provide complete electrical requirements, materials and methods including, but not limited to:

1 Service and distribution including bus-way, switchgear, panel boards, and disconnect switches.

2 Provide grounding protection for all circuits and outlets and as required by applicable codes and authorities having jurisdiction. Properly ground building equipment provided by this project.

3 Coordinate any electrical switchover as to least impact the Project Schedule. This scope is considered "critical path" and is required to be addressed submitted and shop drawing submitted within 2 weeks upon BoE approval.

4 Provide all power, controls, and standby generator requirements for temporary power that might be required during the renovation upgrade for all other prime contractors working during the shutdown.

5 Immediately after installation, provide and maintain temporary ID of all circuit breakers and at all shut offs/disconnects until permanent ID is in place.

6 Exterior lighting and lighting control equipment; provide occupancy sensors and/or timing devices as indicated.

7 Provide raceways, boxes, cabinets and sleeves through existing and new construction as part of the complete electrical installation.

8 Provide wire, cable, conduit, boxes, and wiring devices as part of the complete electrical installation.

9 Provide permanent electrical identification.

Provide type written panel board schedules.

Clearly label all panel boards, disconnects, relays, junction boxes, and other electrical devices and equipment.

xxv Final connections of utilities are by EC unless noted or assigned otherwise.

xxvi Final connection of installations or equipment that are provided by others.

a Provide final connections to all scheduled equipment furnished by the Owner.

xxvii Provide Fire Alarm system as indicated in the Construction Documents.

1 EC shall provide Fire Alarm and/ or coordinate as indicated on drawings.

xxviii Coordinate with Owner and provide confirmation to Construction Manager of low voltage systems, including but not limited to telephone, building access, security, PA/intercom, data and CCTV systems, as indicated in the Construction Documents.

1 EC shall confirm full operational status of existing low voltage systems following reinstallation of existing devices. Replace and commission all devices and components damaged by construction work.

2 Provide all components, and their installations required for a complete system.

3 Provide, terminate, test, and label all point-to-point field wiring.

4 Provide all associated power circuits and requirements that support these systems, including but not limited to, final connections.

xxix Provide sleeves required for piping penetrating walls, slabs and/or decks.

xxx Provide through-penetration fire stop systems at all penetrations made by EC. Maintain listed ratings of indicated assemblies. Provide repair of existing through-penetration fire stopping damaged by work of this Prime Contract.

1 Sleeves with fire stopping are to be installed in sequence with fire-rated construction. This Prime Contract shall be responsible for installing fire stopping material at intersection of sleeve and constructed materials.

xxxi Provide all testing and adjusting, instruction and guarantees for materials and equipment of this Prime Contract. Refer to Division 00 Section "Project Forms" for applicable documents.

1 Substantial Completion: Clean all light fixtures and electrical equipment at the time of installation or at Substantial Completion, whichever is later, or as directed by Construction Manager.

xxxii Coordinate all the preceding requirements, accordingly, with all applicable Alternates indicated in Section 012300 "Alternates."

xxxiii Submission of all required closeout documentation and final application for payment no later than -September 30 2022.

xxxiv **EC-01 is required to work with the districts fire alarm vendor to connect new systems to the existing FA. Contractor's pricing shall include all integration into the buildings fire alarm controls and panel. Upon contractor's request, a contact will be provided for coordination.**

e Supplemental Temporary Facilities and Controls by the EC include, but are not limited to:

i **Waste Disposal Facilities: Provided by each contractor.**

ii Temporary Interior Barricades: Provide, maintain and eventually remove all temporary barricades per OSHA Regulations, Industry Standards, or as indicated in the Construction Documents. These include, but are not limited to, the following areas:
1 Roof openings/penetrations.
2 To isolate Abatement areas.
3 To isolate renovation areas.
4 Floor openings/penetrations, including stairwells.
a Horizontal Openings: close openings in floors, roof decks, and horizontal surfaces with load bearing, wood and/or steel framed construction per applicable regulations.

iii Temporary Doors, Frames & Wall Assemblies: Provide, maintain and eventually remove all temporary installations where required per OSHA Regulations, Industry Standards, or as indicated in the Construction Documents. Provide fire rated assemblies as required. Provide exit (panic bar/crash bar) devices at locations of egress. Coordinate locations with Construction Exiting Plan, Sequencing/Phasing Plans, and the Construction Manager. Temporary doors shall be constructed using 1/2' plywood and 2x construction, equipped with hasps, locks, handle and latch mechanism, and spring or counter weight installed to allow door to close after opening. Permanent doors will not be used in temporary conditions.

iv Temporary Heat: The existing heating system and ventilation system in the building area are not to be used for temporary heat or ventilation in construction areas. The contractor for General Construction must provide temporary heat in construction in construction areas. Provide submittal for temporary heat strategy that states what equipment will be used and where fuel will be stored. Fuel source cannot be located in the building. Heaters with self-contained fuel sources are not allowed to be placed in the building.

v Temporary Window Openings: Window openings shall be enclosed using 2x construction, 1/2' plywood, and reinforced polyethylene. Where window opening start at or near the floor, plywood shall be installed from finish floor to minimum of 42" AFF; reinforced poly may be installed from this point up. Should contractor choose to install plywood across the entire opening, sufficient area will be installed with reinforced poly to allow emergency escape, if required, and to allow natural light into the work area.
1 Installation shall be insulated if temporary heat or cooling is being employed.

vi Temporary Exterior Wall Enclosure: Provide and maintain temporary enclosures for weather protection and security of the construction in progress, where needed, up until completion of permanent installation specified. Enclosures shall protect the building from exposure, foul weather, other construction operations, and similar activities. Provide temporary weather tight enclosure for building exterior.
1 Where heating and cooling is needed and permanent enclosure is not complete, provide insulated temporary enclosures. Coordinate enclosure with venting and

material drying or curing requirements to avoid dangerous conditions and effects.

2 Install tarpaulins securely; install fire retardant materials only.

3 Where temporary wood enclosures exceed 100 sq. ft. in area, use fire retardant treated materials for framing and sheathing.

4 All cost incurred to repair and/or replace materials damaged, due to the failure of EC to provide and maintain weather tight enclosure shall be borne by this Prime Contract. This includes any contamination of materials that may lead to the introduction of mold and mildew.

5 Immediately notify the Construction Manager, in writing, as to damage to temporary enclosures by "others"; identify responsible party in the submission. Owner shall not be liable for damages caused by "others" if Prime Contract cannot identify responsible party.

vii Temporary Sanitary Facilities: Provided by each contractor.

viii Existing Stair Usage: Use of Owner's existing stairs in unoccupied areas will be permitted, provided that at Substantial Completion, stairs are restored to conditions existing before initial use.

1 Provide photo documentation of existing stair conditions prior to use by all Prime Contracts. Document during use, and at completion of the Renovation Project in order to document any and all damage to the Owner's property.

2 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.

ix Provide all shoring required for Work of this Prime Contract, including but not limited to;

1 Cutting or altering of existing construction.

2 Provide protection of all new and existing surfaces during the Work. Do not stand, walk, or work off of any unprotected finished surface above the floor.

x Maintain temporary fencing and barricading to keep unauthorized persons away from hazardous areas for which this Prime Contract is responsible.

xi Traffic Controls: Provide flagman while any operations of this Prime Contract interfere with traffic flow on adjacent roadways.

END OF SECTION 01 12 03

SECTION 01 12 05 –CONTRACT SUMMARY – PC-01

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. This Section includes a summary of each Prime Contract, including responsibilities for coordination and temporary facilities and controls. One set of Construction Documents is issued covering the Work of multiple Prime Contracts. Each Prime Contract is responsible to review all drawings and specifications for specific requirements indicated, and for a general understanding and knowledge of the work of other Prime Contracts. All Prime Contracts are responsible for all Work of their Contract no matter what drawing on which the Work appears. All Prime Contracts are responsible to coordinate their work related to the complete set of drawings and specifications, not limited to each prime contractor scope. **All Bidders should acknowledge that for each contract listed below, each contractor is their own General Contractor and subject to all General Contractor requirements.**

B.

1. **Plumbing Work Contract :** The Plumbing Contractor shall be selected based on the bid procedure as described in the Bid Documents. Contract Bidders are responsible for (a) trade work coordination, (b) the scope contained in drawings listed below and (c) any and all additional scope specifically identified to be performed by the Plumbing Contractor in other Bid Packages in the Contract.

C.

1) Work related to drawings: (In addition to these drawings, the contractor is required to review all specifications included in the overall contract that may contain related scope or detail for this specific contract.)

a) Highview Elementary School:
- Toilet Room Renovations

a. Bid Package Contract No. 04 - Plumbing Work: All work related to mechanical construction which includes but is not limited to the following items: (Refer to the Contract Documents for full scope of work.)
    i. Provide access panels, fire rating/firestopping, All plumbing work, except underground services on site plans. Contract includes but not limited to, all concrete demo and interior pads related to PC Equipment, fire protection, all demo and discard of, piping, insulation and fittings, domestic water, cold water grounding reconnections, feed water, all patching and painting related to the installation of their scope, all city filings and permits for any reason and as required
    ii. All work related to drawings; (*In addition to these drawings, the contractor is required to review all specifications included in the overall contract that may contain related scope or detail for this specific contract.)*

1.3 **This PC-01 contract requires the awarded entity to self-perform the largest scope of work shown in the contract documents. There are no provisions within this contract to solely subcontractor ALL trade scope required to complete the project and its design intent. All other work in this contract is allowed to be subcontracted other than as stated herein. It is further required to clearly present what scope your own forces will be doing with your bid submission. Failure to present this at time of bid will be subject to disqualification.**

1.4 It is the PC's responsibility to review the A drawings to coordinate the PC's portion of the work with the GC.

1) Related Sections include, but are not limited to, the following:

2. Division 01 Section "Work Restrictions" for use of the Project site and for requirements for continued Owner occupancy of premises.
3. Division 01 Section "Project Management and Coordination" for general coordination requirements.
4. Division 01 Section "Project Forms" for documents required for Testing and Coordination.
5. Division 01 Section "Temporary Facilities and Controls" for specific requirements for temporary facilities and controls.

Applicable Specification Sections: All specification Sections itemized below are to be provided complete by this Prime Contract, unless noted otherwise. In addition to these specifications, the contractor is required to review all specifications included in the overall contract that may contain related scope or detail for this specific contract.

1. Divisions 00 and 01 – Procurement and Contracting Requirements & General Requirements.
2. Division 02- Existing Conditions
3. Division 21 – Fire Suppression
4. Division 22 - Plumbing

1.5 DEFINITIONS

A. Building Site: The Building Site shall be defined in the Construction Documents, as the building footprint, and all related construction within a five-foot (5'0") distance of the building's exterior face, unless noted or assigned otherwise. Coordinate with specific exceptions to the 5'0" limit indicated within each Scope of Work outline.

B. Permanent Enclosure: As determined by the Architect: permanent or temporary roofing is complete, insulated, and weathertight; and all openings are closed with permanent construction or substantial temporary closures. All cost associated with failure to maintain described installations that result in any damage or contamination to the Owner's property, shall be borne by the Prime Contract responsible for the installation.

1.6 MANAGEMENT AND COORDINATION

A. The Owner shall provide a Construction Manager.

1. The Construction Manager shall provide a full time construction site representative recognized as the Construction Manager.

1.7 CONSTRUCTION MANAGER

A. The construction manager shall provide on-site administration of the Contracts for Construction in cooperation with the Architect as set in AIA Document A232 TM – 2009, General Conditions of the Contract for Construction, Construction Manager as Adviser Edition, as modified.

B. The Construction Manager shall provide administrative, management and related services to coordinate scheduled activities and responsibilities of the Multiple Prime Contractors with each other and with those of the Construction Manager, the Owner and

the Architect. The Construction Manager shall coordinate the activities of the Multiple Prime Contractors in accordance with the latest approved Project Schedule and the Contract Documents.

C. Utilizing the construction schedules provided by the Multiple Prime Contractors, the Construction Manager shall update the Project schedule, incorporating the activities of the Owner, Architect, and Multiple Prime Contractors on the Projects, including activity sequences and durations, allocation of labor and materials, processing of Shop Drawings, Product Data and Samples, and delivery and procurement of products, including those that must be ordered will in advance of construction. The Project schedule shall include the Owner's occupancy requirements showing portions of the Project having occupancy priority.

D. Utilizing information from the Multiple Prime Contractors, the Construction Manager shall schedule and coordinate the sequence of construction and assignment of space in areas where the Multiple Prime Contractors are performing Work, in accordance with the Contract Documents and the latest approved Project Schedule.

1.8 GENERAL REQUIREMENTS OF PRIME CONTRACTS

A. Prime Contracts: The context used in this Section are separate Prime Contracts that represent significant elements of work that is to be performed concurrently and in close coordination with the work of other Prime Contracts for the benefits of the Owner. Each Prime Contract is recognized to be a major part of the Work.

B. Assignment of Work: Should a conflict be indicated, Section 011200 shall take precedence over all scope of work assignments that may be indicated elsewhere within the Construction Documents.

C. Seismic Requirements: Prime Contracts are to be aware that the building(s) is located within a Seismic Zone indicated in the documents and shall provide installations in compliance with all related code requirements.

D. Layout and Installation: Each Prime Contractor shall schedule, layout and install their Work in such manner as not to delay or interfere with, but to compliment the execution of the work of other Prime Contracts, utility companies and Owner's operations.

E. Extent of Contract: The Contract Documents, drawings and specifications each contain more specific descriptions of the Work facilitating which Prime Contract includes specific elements of the Project.

1. Work provided by each Prime Contract shall mean complete and operable systems and assemblies, including products, components, accessories and installations required by the Construction Documents or indicated otherwise.

2. Prime Contractors shall exercise good judgment and perform all work according to related industry standards.
3. The Owner is exempt from payment of Federal, State and local taxes, including sales and compensating use taxes on all materials and supplies incorporated in completing the Work; these taxes are not to be included in the Bid. This exemption does not apply to tools, machinery, equipment or other property leased by, or to, the Contractor or sub-contractor, or to supplies and materials, which even though consumed are not incorporated into the completed work. Prime Contractors, and their sub-contractors, shall be responsible for paying any and all applicable taxes on said tools, machinery, equipment or property, and upon all said unincorporated supplies and materials, whether purchased or leased.
4. Prime Contracts shall understand that time is of the essence, and will adequately staff the Project by employing the appropriate trade's people to perform the Work; these people shall be experienced in their respective trades. A shortage of labor in the industry shall not be accepted as an excuse for not properly staffing the Project; all efforts shall be made to meet or exceed the schedule, including additional staff and/or labor hours necessary. All cost associated with this item shall be included within the Bid.
5. Local custom and trade union jurisdictional settlements will not control the scope of the Work of each Prime Contract.
    a. When a potential jurisdictional dispute or similar interruption of Work is first identified, or threatened, the affected Prime Contracts shall promptly negotiate a reasonable settlement to avoid or minimize the pending interruption and delays.
    b. Contractor's trade-related issues shall not be grounds for modification or extension of scheduled completion date(s).
6. The Work of all Prime Contracts requires close coordination with other Prime Contracts and construction personnel. Maintain flexibility and cooperation through the Project. "Out of Sequence" and "Delay" claims will only be considered when requirements of Division 01 "Administrative Requirements" have been adhered to. Delay claims must be in writing and forwarded to the Architect, per the requirements of the General Conditions of the Contract. Claims not submitted per these requirements will be rejected and/or denied.
7. The intention of the Work is to follow a logical sequence, however, a Prime Contractor may be required by the Architect or Construction Manager, to temporarily install, omit or leave out a section(s) of Work, out of sequence. All such out of sequence work, and come back time, at these areas shall be performed at no additional cost to the Owner.

F. Substitutions: Per Division 01 Section "Substitution Procedures", each Prime Contractor shall cooperate with the other Prime Contractors involved, to coordinate approved substitutions with remainder of the Work. Contractors

shall submit all "Substitutions" at least ten (10) days prior to the date for receipt of Bids as specified in the Instructions to Bidders 002113 Section 3.3 Equivalents or bid will be considered per "basis of design".

G. Construction Schedules: Refer to Divisions 01 Section "Construction Progress Documentation", "Milestone and Phasing Schedule" and "Project Management and Coordination" for requirements related to meetings and schedules.

H. Construction Sequencing and Phasing: Prime Contractor shall understand that Sequencing and/or Phasing Plans are contingent upon the work areas being complete/occupied, prior to the next area of Work beginning. Should an area of construction not be complete per the Milestone and Phasing Schedule, the Project Master Construction Schedule/Sequencing Plans will be adjusted accordingly. The Owner will not be responsible for delay claims due to adjustments being no fault of their own.

1. Prime Contracts may be required to re-sequence the phasing of the project as a result of changes to the schedule. Prime Contracts shall provide these adjustments at no additional cost to the Owner.

I. Prime Contract shall verify existing conditions in the field prior to work commencing in that area and immediately report conditions to the Architect that are not represented correctly by the Construction Documents.

1. Each Prime Contract is responsible for familiarizing himself with Project Site Logistics and provide a "site logistics plan locating storage area, scaffolds, rubbish areas, stock piles and egress related to all work, included phased construction within 30 days of award.
2. Each Prime Contract has been given ample opportunity to review Existing Conditions related to the Project. Existing Conditions not noted in the Construction Documents that could be easily recognized during pre-bid review that interfere with the respective Prime Contract's work, shall be the responsibility of the respective Prime Contract. This includes all costs associated with removal, patching, relocation or re-fabrication of installations.

J. Hazardous Materials: Each Prime Contract shall familiarize themselves with the Hazardous Materials Sections/Drawings of the Construction Documents, and follow DOL/OSHA/EPA/SED regulations while performing their respective Work in these areas. Discovery of non-identified or concealed hazardous materials shall be reported to the Construction Manager immediately and followed up with written documentation of the event.

K. Protection of Installations: Each Prime Contract is responsible for protecting their installations at all times. All costs incurred to repair, replace or clean insufficiently

protected materials/installations shall be the responsibility of the installing Prime Contract.

1. Architect shall be notified, in writing, immediately upon material/installation being damaged; notification shall indicate responsible party.
2. Owner will not be liable for damaged materials and/or installations by "others", when "others" cannot be identified.
3. Repair damaged work, clean exposed surfaces or replace construction installations that cannot be repaired.
4. Each Prime Contract shall be responsible for removing all labels not required to remain from their installations.
5. Installations shall be wiped clean and proper protection then installed.
6. Each Prime Contract is responsible to protect another primes work in the event that prime has to work over or on top of that other primes work being complete. The prime working over the completed work takes full responsibility of that other primes completed work both in condition and operation.

L. Daily Cleaning: All Prime Contracts are responsible for any and all debris caused by their Work, including the Work of their subcontractors. A daily clean up and disposal is required by each Prime Contract for the periods which that Prime Contract, or its sub-contractors, are performing Work on site.

1. Assign at least one person for a daily clean and sweep of the work area(s). Prime Contractor shall allot sufficient manpower and time for this to be completed by the end of each shift. Submit name of this person(s) to Construction Manager.
    a. Construction Manager shall have the authority to give direction to person(s) on the Project Site identified by the Prime Contract as designated for cleanup tasks. This shall included the safety review/securing of the site-work zone after each shift.
    b. This person has check that no construction debris was dumped in any district dumpers during this end of shift site review, if found the contractor must remove immediately the next morning to avoid back charges costs of $1500 per day not removed.
2. Any Prime Contract not providing personnel for Daily Cleaning will be Back Charged for labor provided by the Owner to complete this task.
3. Contractor working solely in an area shall be responsible for clean/sweep of that area.
4. Daily cleaning will not mean any one Prime Contract is responsible for assisting another Prime Contract with removing major quantities of debris created by a particular Prime Contract's Work.
5. Daily cleaning will be mandated to remove from the building any debris created by day-to-day activities. All Prime shall assist in sweeping shared work areas and

shared corridors while working on site. Each Prime shall assist in mopping of shared corridors while working on site or as required by the Owner.

6. All prime contractors and subcontractors are required to provide sweeping compound for daily cleaning in their respective exterior and interior work areas. Each Prime Contract shall provide a sufficient number of brooms or other necessary tools, for use by their personnel to adequately fulfill their obligations.
7. All prime contractors shall provide and maintain garbage cans/refuse containers with liners for each construction area of their respective contracts as directed by the Construction Manager and shall be responsible for disposing of these materials to a dumpster.
8. All prime contractors provide the necessary equipment/containers (lull/skip-box) to move daily clean/sweep debris from the building to a dumpster on a daily basis, for each construction area of their respective contracts. Skip-box shall be emptied to a dumpster by 9:00 a.m. the following day.
9. Cleaning shall be deemed a Safety & Health issue, with Prime Contracts being held accountable for fulfilling their contractual obligations.
10. Final Cleaning: At Substantial Completion of each area of construction, each Prime Contract shall wipe/vacuum clean all of their respective installations; All interior contracts performing work inside the buildings shall mop clean all building surrounding areas and finish flooring and remove all marks/blemishes to the finish, for each construction area of their respective contracts. Each area of construction shall be wiped clean of all construction dust and debris prior to turnover to the Owner.

M. Cutting and Patching: All Primes are responsible for cutting and patching required to complete their Work. All repair of existing finish Work (including finish floors) shall be performed by contract requiring work, meeting or exceeding minimum contract requirements for that particular section, specification, or type of work. All concealed openings (piping, ductwork, conduit, etc.) must be repaired to comply with specified wall or deck conditions as well as required fire and sound ratings. All corridor penetrations require fire safing. If contractor elects to install their new work in an existing unrated wall or floor opening, whereas the wall/floor is a fire rated condition, that contractor is responsible to fire rate that opening to match the wall/floor fire rating with new and all other existing wire, piping, ducts etc. Other areas are noted in drawings and specifications.

1.7 Project Schedule. The nature of this project is to complete all the work listed as Phase 5 in the schedule by **the Project Closeout Dates specific to each Prime Contract as listed below**. Each Prime Contractor shall include in their bid proper allowances for foul weather.

A. Bids Received: 2/13/2025

B. Anticipated Notice to Proceed: 2/26/2025

C. Submittals: The following items are to be submitted within 60 business days after Notice to Proceed:

1. Submittal List and Submission Schedule– **15 days after NTP**
2. Field Investigations
3. Shop Drawings
4. Long Lead Items Letter – **30 days after NTP**
5. Schedule of Values and Key Submittal List – **15 days after NTP**
6. Preliminary Construction Schedule
7. Site Specific Health and Safety Manual
8. Project Contact Directory
9. Labor and Equipment Rates

D. Mobilization: 6/26/2025

E. Substantial Completion and Project Closeout: Per 01 11 00 Milestone Schedule

1.9 TEMPORARY FACILITIES AND CONTROLS OF PRIME CONTRACTS

A. Conditions of Use: Keep temporary services or conditions clean and neat in appearance. Operate in a safe and efficient manner. Relocate temporary facilities as required as 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 to develop or persist on the Project site.

1. Installation, operation, maintenance, and removal of each temporary service or condition are considered part of the respective Prime Contract's own construction activity, as are costs and use charges associated with each facility.
2. Locate service or condition where they will serve the Project adequately and with minimum interference of the Work, coordinate with the Construction Manager and the other Prime Contracts prior to installation.

B. Temporary Use of Permanent Facilities: Prime Contract, as installer of each permanent service or condition, 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 temporary facilities and controls responsibility.

C. Owner's Facilities: Contractors are not allowed to use the Owner's facilities (toilets, telephones, food service, etc.) for their own benefit or convenience. Prime Contract Superintendents shall enforce this policy with their respective work forces.

1. Construction personnel parking will be restricted to area as directed and agreed to by the Owner, and to facilitate the completion of the work. Owner reserves the right to remove from their property, unauthorized vehicles occupying unauthorized areas, at respective vehicle owner's expense.

D. **Storage on the Project Site: Each Prime Contract shall provide sufficient secure weather-tight storage facilities for their materials and equipment.** These storage containers are required to be located on the "site logistics plan" The Owner's facilities and the Project's building areas shall not be used for storage unless agreed upon, in writing, with the Owner via the Construction Manager.

1. Until permanently incorporated into the Work, all materials on the Project site are considered to be the Prime Contract's responsibility for security and protection.
2. Prime contractor is required to check on their onsite stored material periodically to ensure that all material continues to be located in the stored location and that it remains protected from all damage, theft, and endangerment to others and ready to be used on notice for coordination with other contractors. Failure to arrange for materials to be on site to complete coordinated work with other Prime Contractors will result in back charges for delays resulting therefrom.
3. Temporary long-term storage facilities are not available to Prime Contracts by the Owner.
4. Prime Contractors and their subcontractors, shall coordinate deliveries with the Construction Manager to ensure that disruptions and Owner inconvenience are avoided.

E. Tools and Equipment: Each Prime Contractor shall provide all tools and equipment necessary for its own activities; this includes secure lock-up and storage for all items on the Project Site.

1. Provide all construction aids and miscellaneous services and facilities necessary exclusively for its own construction activities; this shall include any additional supplementary power, ventilation, lighting requirements and weather protection.

F. Project Site Communication: Each Prime Contractor shall provide their Project a full time on site at all times Superintendent with a mobile phone for the duration of the Project, as indicated in their Scope of Work. Construction Manager shall be furnished with contact numbers associated with each phone.

G. Safety: Prime Contracts, not the Architect or Construction Manager, are responsible for Project Site Safety, as related to their operations (refer to Section 013150 "Special Procedures" for further requirements).

1. Each Prime Contract shall correct safety hazards and violations immediately. If safety issues are not immediately rectified, the Owner shall secure outside sources to correct the deficiency and back charge the responsible Prime Contract.
2. Maintain unobstructed access/egress to fire extinguishers, fire hydrants, stairways, corridors, ladders and other safety routes/devices.

H. Fire Extinguishers: All Prime Contracts provide and maintain "general use" fire extinguishers for each construction area of their respective contracts; comply with applicable codes for quantities required. Use of the Owner's fire extinguishers to meet this requirement is not permitted. Comply with NFPA for recommended classes for exposure; extinguishers shall be inspected and appropriately tagged prior to being brought on site. Provide stands, painted bright orange, sturdy enough to carry the extinguisher, and built as not to create a tipping hazard.

1. Each Prime Contract shall supplement this requirement by providing additional fire extinguishers specifically related to their work activity (e.g., welding, soldering, abrasive cutting, etc.).
2. Each Prime Contract shall provide and maintain proper fire extinguishers at/in their respective on site office and storage facilities.
3. Store combustible materials in approved containers in fire-safe locations.

I. Welding: Any Prime Contract performing welding, cutting or other activities with open flames or producing sparks shall at a minimum:

1. Coordinate interruption/shutdown of detection system(s) to avoid creating false alarms.
2. Protect the area and surrounding areas from fire and damage.
3. Maintain fire extinguishers, compatible with activity, at the location of the activity.
4. Provide a continuous Fire Watch during the activity and one-half hour beyond the completion of the activity.
5. Provide all necessary fans and ventilation required for the activity.
6. Any welding, burning and or use of flame the contractor is required to provide all required "hot work permit" to use such equipment prior to start of work. Its mandatory that no "hot work" shall start without these permits issued to the CM and Owner. Failure to this requirement will result to the removal of the project super of that company from all district projects.

J. Remove each temporary facility when it can be replaced by the authorized permanent facility no later than Substantial Completion, or as directed by the Architect and/or

Construction Manager. Complete or restore permanent facilities that may have been delayed due to interim use of a temporary barrier or condition.

K. Temporary Power: Each Prime Contractor shall provide for their own temporary power needs for any scheduled electrical utility shut downs. Each Prime Contractor shall provide for their own temporary generators, power cords and temporary lighting as needed during these periods to continue to perform their work and maintain adherence to the Milestone Phasing Schedule and approved Project Master Schedules. All temporary power equipment shall comply with all applicable codes and regulations.
    1. In all other schools in this phase 5, known as HBE; GMD; WBW & DWE have local electrical panel replacements, therefore each prime contractor and their sub-contractors are required to provide their own generator power for equipment and lighting to perform their work during these times with no additional cost to the owner.

L. Waste Disposal Facilities:

1. **General debris/refuse/construction waste containers (dumpsters) shall be provided by each prime contractor and secured as specified herein this contract.**
2. It shall be the responsibility/requirement of each Prime Contract to bring their waste to the dumpsters, including but not limited to all equipment, demolition debris, discarded materials with further identification including the following; construction and demolition debris refers to discarded materials generally considered non-hazardous in nature, including but not limited to steel, glass, brick, concrete, asphalt material, pipe, gypsum wallboard, and lumber, from the construction or destruction of a structure as part of a construction or demolition project or from the renovation of a structure, including such debris from construction of structures at a site remote from the construction or demolition project site.
3. It shall be the responsibility and requirement of each Prime Contract to recycle metals generated by its Work, and the Work of its subcontracts.
4. Joint-effort recycling by all Prime Contracts is encouraged.

M. Temporary Sanitary Facilities: Provide temporary self-contained toilets units for duration of the project.
    a. Temporary Sanitary Facilities:
        1) **Each prime contractor is required to provide their own Temporary Sanitary Facilities and secured behind fencing and/or locked after work hours and weekends.**
    b. Comply with regulations and health codes for type, number, location, operation, and maintenance of fixtures and facilities.

c. Provide separate facilities (minimum of one ea.) for male and female personnel in proportion required by OSHA.
d. Shield toilets to ensure privacy.
e. Coordinate mobilization and demobilization of units with Construction Manager.
f. Toilets shall be cleaned at least once per week, with additional facilities or cleanings provided if requested by Construction Manager.
g. Provide and maintain adequate supply of toilet tissue and hand sanitizer for each facility.

1.10 WORK HOURS & SEQUENCE

A. During the school days, Work is to be performed in this contract during the hours of 3:30pm to 10:00pm on weekdays, and Saturdays and Sundays from 7:00am to 3:30pm. During School breaks, work is to be performed from 7:00am to 10:00pm. There is no additional cost to the owner for working the hours of 3:30pm through 10:00pm, or weekend work during the school year. **Any work done during these times MUST BE COMPLETED, CLEANED, AND TESTED AS NECESSARY FOR STUDENT OCCUPANCY BEFORE THE START OF THE NEXT SCHOOL DAY. Contractors are required to schedule work during school breaks, school days off, and school holidays**.

B. Summer work starts June 28th through August 23rd for 2025. The Summer working hours are from 7:00am to 9:30pm. There is no additional cost to the owner for working the hours of 3:30pm through 9:30pm or on weekends and holidays during the Summer.

C. Contractors are required to start working on site within 30 days of execution of contract, to the extent permitted by contract. Contractors are required to coordinate and perform work simultaneously with other Contractors. Contractors are required to complete their contract work by the designated Substantial Completion and Final Completion end dates as indicated on the Invitation to Bid.

D. Mandatory clean up periods - From August 24th, 2025 to August 31st , 2025 and August 30th , 2025 to September 6th, 2025, contractors shall clean up all interior and exterior areas Contractors are required per contract to fully staff the project during the work shifts stated above with the required manpower to complete their work within the allowed scheduled time frame. Contractors are required to provide a 72-hour advanced request to the Owner via the Construction Manager for any Saturday and Sunday work. If a project schedule delay has been caused by the fault of the contractor, the contractor is required to provide 3rd shift work from 9pm to 6am to make up the project schedule. All costs for CM, Architect and district personal related to this 3rd shift request will be charged to the contractor at a combined rate for all at $3,000 per 8hr shift.

E. The shifts noted above are not considered overtime or premium time hours.

F. Contract summaries will provide start and end dates for each contractor.

G. Additional requirements:

1. Multiple Crews: Each Prime Contract shall provide multiple crews, supervision, cranes, scaffold and other means necessary to perform the Work, and maintain the Project Master Schedules.
2. Interruption of any utility and/or power must be coordinated with the Owner, via the Construction Manager.
3. Any and all overtime, weekend and/or holiday work required to meet the Project Master Schedules shall be incorporated in the respective Prime Contract's bid.
4. Should a Contractor's progress fall behind, as to schedule, Prime Contractor shall employ additional – 3rd shift and/or overtime and/or weekend workforce until situation is rectified, to the satisfaction of the Architect and Construction Manager, at no additional cost to the Owner, however subject to charges as stated in section 1.10 E for lack of maintaining schedule
5. Should a Prime Contract feel another Prime Contract is delaying them sufficient time to complete their installations, per the schedule, the Architect and Construction Manager shall be notified in writing immediately of the situation (refer to Conditions of the Contract for protocol). A Prime Contract creating such a delay, that causes a proven burden upon another Prime Contract to maintain schedule, shall bear all costs incurred by the delayed Prime Contract to maintain the schedule.
6. The Architect and Construction Manager shall not be overburdened as to overtime cost, to monitor the work, due to no cause of his or her own. Owner will compensate the Architect and Construction Manager for all additional cost related to the issue of a Prime Contractor's failing to execute the Contract by fully staffing per the work hours and days noted herein. The Owner reserves the right to back charge the responsible Prime Contract for these fees if incurred.
7. All Asbestos and/or Lead Abatement shall take place to meet the requirements of the Milestone Phasing Schedule and Project Master Schedules and shall be coordinated with the other Prime Contractors prior to commencement.

H. The Work shall be conducted to provide the least possible interference to the activities of the Owner's personnel and the surrounding property owners (neighbors).

1. Prime Contracts are hereby notified that: All Prime Contractors and their subcontractors shall limit excessive noise during 2nd shift known as work extending to 10PM weekdays upon approval by owner and city work hour restrictions. These operations shall not create a disturbance to neighboring properties.

I. Construction access to the site shall be limited to personnel, equipment and deliveries by suppliers relative to the Work of Prime Contractors and their subcontractors. Prime Contracts shall keep the Construction Manager advised of persons accessing the site and shall seek assistance with coordinating parking and storage facility locations for all Prime Contracts.

1. Where applicable, Contractors shall provide Building Site perimeter barricades as described herein the project and all temporary exit doors/lockable gates on the Project, securing these doors, fencing and/or gates at the end of each work shift.
2. When a Prime Contract engages in overtime, weekend or 2nd shift work, during the summer months and or during the normal school year, the respective Prime Contract shall notify Construction Manager of such and be responsible for securing the Project Site at the end of that work shift and perform site walk around the outside of construction area/work zone ensuring all debris is pickup up and there are no construction related hazards of any kind present once the responsible person leaves the site for the evening or weekend. This includes that all materials and equipment are fenced in and keys are removed. All interior projects have the same requirement to ensure that outside the work zone is clean from dust-dirt and that no materials are left outside the work area at any time.

1.11 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.

1.9 DRAWINGS AND SPECIFICATIONS

A. Construction Documents indicate the sum total of the Contract that make up the complete work for the Project. Through this Section "Summary of Work", the intent of the Contractor's scope of Work and responsibility is generally described. Related requirements and conditions that are indicated in the Contract Documents include but are not limited to the following:

1. General Conditions and Requirements.
2. Referenced and applicable Codes, Regulations and Standards.
3. Scheduling and phasing requirements.
4. Existing conditions and restrictions on use of the site and facilities.

B. Drawings and Specifications are cooperative and supplementary. Portions of the Work, which can best be illustrated by Drawings, are not included in the Specifications and portions best described by Specifications are not depicted on Drawings.

1. All items necessary to complete the work shall be furnished whether written or illustrated.
2. All primes shall exercise good judgment and perform all work according to related industry standards.

PART 2 - SCOPE OF WORK

2.1 PRIME CONTRACTS

A. Scope of Work: Work includes but is not limited to, the following:
   1. Provide all work identified in the Contract Documents.
   2. All Specification Sections provided.
   3. All abatement drawings provided for reference.

PART 3 - EXECUTION

3.1 WORK SEQUENCE

A. The Work shall be conducted to provide the least possible interference to the activities of the Owner's personnel, per the Project Milestone Phasing Schedule.

B. Work required during overtime, extended shifts or holidays due to failure of contractor to maintain schedule, will be monitored by Architect/Construction Site representative, and may be monitored by Owners' personnel. Additional costs for Architect/Construction Site Representative and/or Owner personnel will be borne by the Contractor.

C. Coordination of any utility and power interruption must be done with approval of the Architect/Construction Site Representative. Shutdowns must occur during non-occupied timeframes only.

D. Construction access to the site shall be limited to those designated for personnel, equipment and deliveries by the Owner. All contractor staging, parking and storage shall be coordinated with the Construction Site Representative and subject to change.

E. Payments: Each bid that covers more than one school (i.e. one SED project) shall provide completed AIA G732 & G703 by building (for each SED project).

F. No work shall be installed without approved shop drawings. Any work in place without approved shop drawings will be rejected and removed by that contractor at their expense and backed charge all other costs related to.
G. Any work deemed by CM, Architect and District not properly installed by a contractor per the contract drawings and specifications shall be removed immediately and corrected, with all associated costs to be borne solely by that contractor.
H. All prime contractors shall coordinate their contract work with other primes to meet the project schedule and for a complete operational system or area or work.
I. All contractors are to provide within 3 weeks of award a "base line" construction schedule for their work from commencement to completion including all phasing. This schedule is to be updated monthly to show percentage progress of each item listed. This schedule shall be revised to provide a recovery schedule in the event of a delay for any reason. The recovery schedule shall include the "base line" item and the recovery to show how the delay is affecting the overall project schedule. This schedule is to be provided in MS Project or Primavera. Excel schedules are not accepted.
J. Prime contractor "base line" schedules are to be reviewed by each prime contractor and coordinated where work is related and that each prime's work shall be included in each "base line" contractor's schedule as necessary for coordination.
K. All contractors are to provide 2-week look ahead schedules showing work related to the base line and shall be coordinated with other prime 2-week look ahead schedules. These schedules will be Excel format. Format will be provided by the CM.
L. Contractors to provide a full time supervisor on site 100% of the time. This is not a working foreman. Supervisors are not working with tools they are supervising their workers and coordinating with other contractors and district/ CM. Failure to provide will be default of your contract and subject costs related to and termination.
M. All prime contractors are the provide a project manpower structure showing names and telephone numbers of each responsible person on the project. This shall be updated as needed if personal changes are made.
N. All site equipment and dumpsters are to be behind temporary chain link fence when stored on site and or within the construction work zone where temporary chain link fence has been providing and installed by the prime. Each prime contractor is responsible to provide and install temporary chain link fence around their own stored equipment and dumpsters on site.
O. No equipment, panels or any services shall be turned off for any reason without written request and approval by the district. Project form shall be used for all shutdowns and required a 3-day notice. Other shutdowns may require more time.

3.1 **CONTRACT NO. 4 PLUMBING WORK** (PC-01) —PLUMBING PRIME CONTRACT AT HIGHVIEW ELEMENTARY SCHOOL – PLUMBING AND FIRE PROTECTION WORK.

A. Project Site Superintendent: PC shall provide one (1) full time Project Site Superintendent while any work related to this Contract is being performed on site. Superintendent may be a working Foreman as long as the daily requirements of this Contract are maintained, as they relate to the Construction Documents and the Project Schedule. Construction Manager reserves the right, in their opinion, to revoke this privilege if these requirements are not maintained. Superintendent shall work closely with the Construction Manager, and the other Prime Contract Superintendents and Foremen, in a manner that best promotes the Project Master Schedules and the objectives of the Project.

1. Superintendent shall be on site while Prime Contractor's own forces, and/or their sub-contractors forces, are on site; also while other Prime Contracts are installing work, or require coordination of work, related to this Contract, and/or as requested by the Construction Manager.
2. Superintendent shall be the same individual throughout the Project.
3. Project Site Superintendent shall be an individual with minimum of five (5) years' experience in this field of work.
4. Refer to Section 013100 "Project Management and Coordination" for further requirements.

B. Project Foreman: PC shall provide at least one (1) full time Project Foreman during each shift of Work at each school; Foreman shall be able to make binding decisions, as they relate to the daily activities of their crew, as related to achieving the goals of the Project.

C. Site Communications: PC shall provide Project Superintendent with a mobile phone, all costs and service charges paid for by PC; provide Construction Manager with contact number(s).

D. Project Site Field Office: Provide site office facilities for this Contract's Project Superintendent. Site Office shall be equipped with telephone w/answering machine, fax, and e-mail. Contact information shall be provided to the Construction Manager.

1. The Owner reserves the right to seek reimbursement for temporary facilities not provided by this Prime Contract.

E. Scope of Work: In addition to Divisions 01, 02, 21, and 22, Work of the PC includes but is not limited to, the following:

1. Coordination with other Prime Contracts, Owner and Construction Manager as required to adhere to and maintain approved Project Master Schedules. Prior to first payment, this includes submitting the Contractor's Construction Schedule to the Lead Contractors for preparation of the Project Master Schedules for all work

related noted in the Contract Documents. All Plumbing demolition and new construction as indicated in the Contract Documents.

2. All Plumbing scope is identified on the drawings as noted on the Contract Documents. Prior to the submission of shop drawings for work related to this contract and as shown on the Contract Documents.
3. All housekeeping pads for mechanical equipment shall be furnish and installed by this prime contract.
4. This contract includes furnishing access doors for walls and ceiling as required, which may include fire rated conditions, and coordinate with Interior Contractor (IC) for installation.
5. Removal, safe storage off roof (or outside of work area, as coordinated with BE), and reinstallation of all existing roof mounted piping as indicated in the Contract Documents. Seal all penetrations upon removal of piping to protect building from weather. New supports for piping will be supplied by PC, coordinate with BE for installation of supports. Provide new roof mounted piping as indicated in the Contract Documents, inclusive of all supports, painting and labeling.
6. Temporary connection and disconnection of domestic water as required to facilitate asbestos abatement by others.
7. Work delineation between building and site is at five feet (5') outside of the face of building, existing and new, unless noted or assigned otherwise. The new underground water service final connection outside the structure shall be completed by this PC contractor and coordinated with the SW contractor for location and final connection.
8. Prime Contract shall understand that renovation work may require work to proceed while existing systems are required to be maintained; all cost associated with this sequence shall be anticipated, and incorporated into the Bid.
    a. PC shall be cognizant of phasing and sequencing conditions, that may require PC to make temporary connections or installations of plumbing components, in order to maintain operation of existing/new system configuration(s). It shall be the Prime Contract's responsibility to employ its own means and methods of accomplishing any such temporary conditions, at no additional cost to the owner.
9. Prime Contractor shall read and familiarized themselves with the Lead Sections of the Construction Documents. Lead-based paint has been identified to exist on specific areas/surfaces of the work located within the building(s), and when encountered the Prime Contractor shall follow all applicable regulations while working with this material.
10. Prime Contractor shall read and familiarized themselves with the Asbestos Sections of the Construction Documents. Asbestos Containing Material is scheduled to be abated throughout specific areas of the building(s). Should ACM be encountered (after Abatement is completed), that may interfere with an installation; Prime Contractor shall cease work, and notify Construction Manager immediately.

a. Penetrations not coordinated with the Prime Contractor responsible for asbestos abatement, prior to abatement of these spaces, shall become the responsibility of the respective Prime Contract requiring the penetration.

11. Environmental Protection: Provide protection, and conduct construction in ways and by methods that comply with environmental regulations and that minimize possible air, waterway, and subsoil contamination or pollution or other undesirable effects.
    a. Restrict use of noisemaking tools and equipment to hours that will minimize complaints from persons or firms on or near the Project site.
12. The Plumbing Drawings are schematic in nature, and the PC will make adequate provisions to accommodate the actual field conditions without additional cost to the Owner.
13. **Plumbing contractor provides and installs flushometers and drills holes. PC supplies the associated transformer to the EC. All wiring of Flushometers is by EC.**
14. **All access doors for plumbing items provided by PC and installed by GC. PC is to review architectural and plumbing drawings and coordinate areas that will require access panels per building code.**
15. **PC is responsible for all cutting, trenching, and patching for new plumbing as required.**
16. **PC is required to cut or raise any floor drains to meet new finish floor.**
17. **All wall carriers are to be furnished and installed by PC. Coordinated with GC for FFL to adjust carrier height. PC to verify adequate wall clearance is met for carriers before installation.**
18. **All plumbing lines are to be pressure tested and documented per specification before concealed. The CM shall be present and witness pressure tests. PC to provide 1 week written notice for all testing. CM/Engineer may request PC to expose work for any plumbing not tested and concealed. All costs shall be those of the PC.**
19. **PC shall demonstrate flushing of all plumbing lines to CM prior to pressurization with water.**
20. Document on the Record Drawings all openings and penetrations larger than 2 inches in diameter.
21. Provide all demolition of Plumbing Systems indicated in the Construction Documents, and/or required for Work of this Prime Contract.
    a. Coordinate all demolition with Hazardous Materials documents.
    b. Coordinate with all other Prime Contracts regarding all removals required for the Project.
    c. Demolition of a system shall mean any and all components, removed in their entirety, to the point of origin or source.
22. Provide valves, whether permanent, chlorination, or temporary, to permit shutoff and/or capping of systems to achieve the Work of this Prime Contract.

23. Each Prime Contract shall be responsible for all respective SOG/SOD removals, and related infill thereof (doweled with #4 bar 16" o.c. unless otherwise detailed), that are not indicated on the Architectural Demolition plans.
    a. All concrete/masonry demolition shall be completed using wet saw methods.
24. PC shall coordinate housekeeping pads for new equipment with Interior Contractor. PC shall provide all shop drawings and information of new equipment.
25. PC shall provide all Work associated with creating structural openings or penetrations requiring lintels for their own work (i.e. ductwork and pipe penetrations). This applies to all openings/penetrations greater than 5-inches through masonry or concrete walls.
    a. MC, EC and PC shall indicate all required openings/penetrations requiring lintels on Coordination Drawings. Failure to note required openings/penetrations on the coordination drawings will require that the respective MC, EC and PC provide their own structural openings in accordance with the contract documents at no additional cost.
    b. Non-structural openings/penetrations, including those for convenience, shall be self-provided by the respective MC, EC and PC.
    c. This assignment applies to new and existing construction areas.
    d. Refer to Structural documents for lintel type/size requirements and Architectural drawings for wall types. Walls not specifically identified in the documents are to be assumed as masonry construction.
    e. All openings/penetrations are to be identified on Record Drawings by the Prime Contract requiring the opening.
    f. Exact physical locations shall be laid-out by PC for coordinated sequencing with all other prime contracts.
26. Provide cut and patch work related to that of this Prime Contract,, related to that of their Prime Contract, and at those areas specifically identified on the Construction Documents, regardless of trade creating the area to be patched.
    a. Each Prime Contract is responsible for all other respective Cutting & Patching required of their installations. Refer to Section 017329 "Cutting and Patching" for further information.
    b. Provide cut and patch for all affected materials at building interiors as required to provide access for relocation of existing or installation of new roof drains and roof drain leaders, to point of connection to existing piping or to building exterior, as indicated in Contract Documents.
27. Provide new Plumbing system(s), or modifications of existing system(s) as indicated in the Construction Documents, complete and fully operational.
28. Final connections of utilities are by MC, EC or PC unless noted or assigned otherwise.
29. Provide sleeves required for piping penetrating walls, slabs and/or decks.
30. Provide through-penetration fire stop systems at all penetrations made by PC.. This Prime Contract shall maintain listed ratings of indicated assemblies.

Provide repair of existing through-penetration fire stopping damaged by work of this Prime Contract.

a. Sleeves with fire stopping are to be installed in sequence with fire-rated construction. This Prime Contract shall be responsible for installing fire stopping material at intersection of sleeve and constructed materials.

31. Provide coordination with, and notification to, the Construction Manager for all specified testing, training, commissioning, etc., of the Work of this Prime Contract. Refer to Division 00 Section "Project Forms" for applicable documentation documents.
32. Substantial Completion: Clean all mechanical and plumbing installations and provided equipment at the time of Substantial Completion or as directed by Construction Manager.
33. Coordinate all the preceding requirements, accordingly, with all applicable Alternates indicated in Section 012300 "Alternates".

F. Applicable Specification Sections: All specification Sections itemized below are to be provided complete by this Prime Contract, unless noted otherwise. In addition to these specifications, the contractor is required to review all specifications included in the overall contract that may contain related scope or detail for this specific contract.

29. All plumbing work, except underground services on site plans. Contract includes but not limited to, sprinkler piping and head replacements, all concrete demo and interior pads related to PC Equipment, all demo and discard of, piping, insulation and fittings, domestic water, cold water grounding reconnections, controls for any meters and equipment related to the water main work, feed water, all patching and painting related to the installation of their scope, all city filings and permits for any reason and as required, West Chester County Department of Health, throughout the District Wide Project (DW).

1. All Division 00 and 01 – Procurement and Contracting Requirements & General Requirements
2. Division 02 – Existing Conditions
3. Division 03 – Concrete Division 07 – Thermal and Moisture Protection
4. Division 21 – Fire Suppression
5. Division 22 – Plumbing
6. Division 26 – Electrical, as related to installations of this Prime Contract specifically identified herein

G. Applicable Drawings: All drawings itemized below are to be provided complete by this Prime Contract, unless noted otherwise. In addition to these

drawings, the contractor is required to review all drawings included in the overall contract that may contain related scope or detail for this specific contract.

H. **All "HES-P" and "HES-FP" drawings**

I. Supplemental Temporary Facilities and Controls by PC include, but are not limited to:

1. Waste Disposal Facilities: Provided by each contractor.
2. Temporary Interior Barricades: Provide, maintain and eventually remove all temporary barricades per OSHA Regulations, Industry Standards, or as indicated in the Construction Documents. These include, but are not limited to, the following areas:
   a. To isolate new construction areas.
   b. To isolate renovation areas.
   c. Floor openings/penetrations, including stairwells.
      1) Horizontal Openings: close openings in floors and horizontal surfaces with load bearing, wood and/or steel framed construction per applicable regulations.
3. Temporary Doors, Frames & Wall Assemblies: Provide, maintain and eventually remove all temporary installations per OSHA Regulations, Industry Standards, or as indicated in the Construction Documents. Provide fire rated assemblies as required. Provide exit (panic bar/crash bar) devices at locations of egress. Coordinate locations with Construction Exiting Plan, Sequencing/Phasing Plans, and the Construction Manager. Temporary doors shall be constructed using ½" plywood and 2x construction, equipped with hasps, locks, handle and latch mechanism, and spring or counter weight installed to allow door to close after opening. Permanent doors will not be used in temporary conditions.
4. Temporary Sanitary Facilities: Provided by each contractor.
5. Existing Stair Usage: Use of Owner's existing stairs in unoccupied areas will be permitted, provided that at Substantial Completion, stairs are restored to conditions existing before initial use.
   a. Provide photo documentation of existing stair conditions prior to use by all Prime Contracts. Document during use, and at completion of the Renovation Project in order to document any and all damage to the Owner's property.
   b. 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.

6. Indoor air quality management at all areas of Construction, once building is enclosed.
   a. Provide all necessary dust partitions, fans, temporary ducts, and barricades to properly contain and ventilate all work area fumes and odors, created by demolition and new construction or alterations, directly to the outside. Ventilate to an area outside the building, sufficiently away from the building, as not to contaminate other areas. There will be no additional claims honored if the Construction Manager requests additional ventilation or requirements.
   b. Provide and exhaust air system for the project indoor areas that could produce fumes, VOC's, off gasses, dusts, mists, or other emissions.
   c. System Operation:
      1) A sufficient quantity of exhaust fans in existing window openings or other approved locations shall be operated.
      2) Exhaust air system shall operate for a minimum of 72 hours after work is completed or until all materials have cured sufficiently so as to stop out – gassing of fumes or odors and area has been ventilated to remove all detectable traces of odors and fumes.
      3) Maintain 25 feet clearance from all temporary exhaust outlets to all active building outdoor air intakes.
      4) Refer to Division 01 Section "Work Restrictions" for further information.
7. Provide all shoring required for Work of this Prime Contract, including but not limited to;
   a. Cutting or altering of existing construction.
   b. Provide protection of all new and existing surfaces during the Work. Do not stand, walk, or work off of any unprotected finished surface above the floor.
8. Maintain temporary fencing and barricading to keep unauthorized persons away from dangerous and hazardous areas for which this Prime Contract is responsible.
9. Traffic Controls: Provide flagman while any operation of this Prime Contract interferes with traffic flow on adjacent roadways.

END OF SECTION 01 12 05

SECTION 01 21 00 – ALLOWANCES

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

A. Drawings and general provisions of the Contract, including General and Supplementary Conditions and other Division 1 Specification Sections, apply to this Section.

1.2 SUMMARY

A. This Section includes administrative and procedural requirements governing allowances.
   1. Selected materials and equipment are specified in the Contract Documents by allowances. In some cases, these allowances include installation. Allowances have been established in lieu of additional requirements and to defer selection of actual materials and equipment to a later date when additional information is available for evaluation. If necessary, additional requirements will be issued by Change Order.

B. Types of allowances include the following:
   1. Lump-sum allowances.
   2. Contingency allowances.

C. Related Sections: The following Sections contain requirements that relate to this Section:
   1. Division 1 Section "Modification Procedures" specifies procedures for submitting and handling Change Orders.
   2. Division 1 Section "Quality Control Services" specifies procedures governing the use of allowances for inspection and testing.

1.3 SELECTION AND PURCHASE

A. At the earliest practical date after award of the Contract, advise the Architect of the date when the final selection and purchase of each product or system described by an allowance must be completed to avoid delaying the Work.

B. At the 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 the Architect from the designated supplier

1.4 SUBMITTALS

A. Submit proposals for purchase of products or systems included in allowances, in the form specified for Change Orders.

B. Submit invoices or delivery slips to show the actual quantities of materials delivered to the site for use in fulfillment of each allowance.

1.5 CONTINGENCY ALLOWANCES

A. Use the contingency allowance only as directed for the Owner's purposes and only by Change Orders that indicate amounts to be charged to the allowance.

B. The Contractor's overhead and profit, including costs for bonds and insurance, delivery, equipment rental and similar costs, for these allowances shall be included in the values of the general requirements of contract sum and are not chargeable under allowance disbursement.

C. At Project closeout, credit unused amounts remaining in the contingency allowance to the Owner by Change Order.

1.6 UNUSED MATERIALS

A. Return unused materials to the manufacturer or supplier for credit to the Owner, after installation has been completed and accepted.
   1. When requested by the Architect, prepare unused material for storage by Owner where it is not economically practical to return the material for credit. When directed by the Architect, deliver unused material to the Owner's storage space. Otherwise, disposal of unused material is the Contractor's responsibility.

PART 2 - PRODUCTS (Not Used)

PART 3 - EXECUTION

3.1 EXAMINATION

A. Examine products covered by an allowance promptly upon delivery for damage or defects.

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. Include a contingency allowance for each Base Bid according to the following schedule:

1. Contract GC-01 – General Contract Work: Provide a Contingency Allowance of:
   a. $15,000 for use at **Outdoor Education Center** according to Owner’s instructions.
   b. $8,000 for use at **Maintenance Building** according to Owner’s instructions.
   c. $140,000 for use at **Highview Elementary School** according to Owner’s instructions.

2. Contract EC-01 – General Contract Work: Provide a Contingency Allowance of:
   a. $2,000 for use at **Outdoor Education Center** according to Owner’s instructions.
   b. $2,000 for use at **Maintenance Building** according to Owner’s instructions.
   c. $12,000 for use at **Highview Elementary School** according to Owner’s instructions.

3. Contract MC-01 – General Contract Work: Provide a Contingency Allowance of:
   a. $5,000 for use at **Outdoor Education Center** according to Owner’s instructions.
   b. $3,000 for use at **Maintenance Building** according to Owner’s instructions.
   c. $8,000 for use at **Highview Elementary School** according to Owner’s instructions.

4. Contract PC-01 – General Contract Work: Provide a Contingency Allowance of:
   a. $15,000 for use at **Highview Elementary School** according to Owner's instructions

END OF SECTION 012100

SECTION 01 22 00 - UNIT PRICES

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 unit prices.

B. Related Requirements:

1. Section 01 26 00 "Contract Modification Procedures" for procedures for submitting and handling Change Orders.
2. Section 01 45 00 "Quality Requirements" for general testing and inspecting requirements.

1.3 DEFINITIONS

A. Unit price is an amount incorporated in the Agreement, applicable during the duration of the Work as a price per unit of measurement for materials, equipment, or services, or a portion of the Work, added to or deducted from the Contract Sum by appropriate modification, if the scope of Work or estimated quantities of Work required by the Contract Documents are increased or decreased.

1.4 PROCEDURES

A. Unit prices include all necessary material, plus cost for delivery, installation, insurance, overhead, and profit.

B. Measurement and Payment: See individual Specification Sections for work that requires establishment of unit prices. Methods of measurement and payment for unit prices are specified in those Sections.

C. Owner reserves the right to reject Contractor's measurement of work-in-place that involves use of established unit prices and to have this work measured, at Owner's expense, by an independent surveyor acceptable to Contractor.

D. List of Unit Prices: A schedule of unit prices is included in Part 3. Specification Sections referenced in the schedule contain requirements for materials described under each unit price.

PART 2 - PRODUCTS (Not Used)

PART 3 - EXECUTION

3.1 SCHEDULE OF UNIT PRICES

General Contractor – GC-01

A. Unit Price GC #1: Abatement of VAT
   1. Description: Abatement of ACM floor Tile & Mastic (VAT) to be used as an add or deduct from base bid quantities.
   2. Unit of Measurement: Per Square Foot (SF) of flooring

B. Unit Price GC#2: Installation of Acoustic Ceiling Tile (24" x 24")
   1. Description: Furnish and install of ACT tile to be used as an add or deduct from base bid quantities.
   2. Unit of Measurement: Per Square Foot (SF) of Ceiling Tile

C. Unit Price GC#3: Installation of Luxury Vinyl Tile
   1. Description: Furnish and install of LVT flooring to be used as an add or deduct from base bid quantities.
   2. Unit of Measurement: Per Square Foot (SF) of LVT flooring

D. Unit Price GC #4: Abatement of ACM pipe insulation
   1. Description: Abatement of ACM pipe insulation (including elbows) to be used as an add or deduct from base bid quantities.
   2. Unit of Measurement: Per Linear Foot (LF) of insulation

Electrical Contractor – EC-01

A. Unit Price EC #1: Abatement of ACM wire insulation
   1. Description: Abatement of ACM wire insulation (including elbows) to be used as an add or deduct from base bid quantities. As identified by the electrical contractor.
   2. Unit of Measurement: Per Linear Foot (LF) of insulation

Mechanical Contractor – MC

None

Plumbing Contractor – PC

None

END OF SECTION 01 22 00

SECTION 012500 - SUBSTITUTION PROCEDURES

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

A. Drawings and general provisions of the Contract, including General and Supplementary Conditions and other Division 1 Specification Sections, apply to this Section.

1.2 SUMMARY

A. This Section includes administrative and procedural requirements for handling requests for substitutions made after award of the Contract.
   1. Single General Contracts: Provisions of this Section apply to the construction activities of General Contractor.

B. Related Sections: The following Sections contain requirements that relate to this Section:
   1. Division 1 Section "Submittals" specifies requirements for submitting the Contractor's Construction Schedule and the Submittal Schedule.
   2. Division 1 Section "Materials and Equipment" specifies requirements governing the Contractor's selection of products and product options.

1.3 DEFINITIONS

A. Definitions in this Article do not change or modify the meaning of other terms used in the Contract Documents.

B. Substitutions: Changes in products, materials, equipment, and methods of construction required by the Contract Documents proposed by the Contractor after award of the Contract are considered to be requests for substitutions. The following are not considered to be requests for substitutions:
   1. Substitutions requested during the bidding period, and accepted by Addendum prior to award of the Contract, are included in the Contract Documents and are not subject to requirements specified in this Section for substitutions.
   2. Revisions to the Contract Documents requested by the Owner or Architect.
   3. Specified options of products and construction methods included in the Contract Documents.
   4. The Contractor's determination of and compliance with governing regulations and orders issued by governing authorities.

1.4 SUBMITTALS

A. Substitution Request Submittal: The Architect will consider requests for substitution if received within 15 days after the award of the Work. Requests received more than 15 days after the award of the Work may be considered or rejected at the discretion of the Architect.
   1. Submit 3 copies of each request for substitution for consideration. Submit requests in the form and according to procedures required for change-order proposals. See 00 43 25 for the Substitution Request From.
   2. Identify the product or the fabrication or installation method to be replaced in each request. Include related Specification Section and Drawing numbers.
   3. Provide complete documentation showing compliance with the requirements for substitutions, and the following information, as appropriate:

a. Coordination information, including a list of changes or modifications needed to other parts of the Work and to construction performed by the Owner and separate contractors, that will be necessary to accommodate the proposed substitution.
b. A detailed comparison of significant qualities of the proposed substitution with those of the Work specified. Significant qualities may include elements, such as performance, weight, size, durability, and visual effect.
c. Product Data, including Drawings and descriptions of products and fabrication and installation procedures.
d. Samples, where applicable or requested.
e. A statement indicating the substitution's effect on the Contractor's Construction Schedule compared to the schedule without approval of the substitution. Indicate the effect of the proposed substitution on overall Contract Time.
f. Cost information, including a proposal of the net change, if any in the Contract Sum.
g. The Contractor's certification that the proposed substitution conforms to requirements in the Contract Documents in every respect and is appropriate for the applications indicated.
h. The Contractor's waiver of rights to additional payment or time that may subsequently become necessary because of the failure of the substitution to perform adequately.

4. Architect's Action: If necessary, the Architect will request additional information or documentation for evaluation within one week of receipt of a request for substitution. The Architect will notify the Contractor of acceptance or rejection of the substitution within 2 weeks of receipt of the request, or one week of receipt of additional information or documentation, whichever is later. Acceptance will be in the form of a change order.
   a. Use the product specified if the Architect cannot make a decision on the use of a proposed substitute within the time allocated.

PART 2 - PRODUCTS

2.1 SUBSTITUTIONS

A. Conditions: The Architect will receive and consider the Contractor's request for substitution when one or more of the following conditions are satisfied, as determined by the Architect. If the following conditions are not satisfied, the Architect will return the requests without action except to record noncompliance with these requirements.

1. Extensive revisions to the Contract Documents are not required.
2. Proposed changes are in keeping with the general intent of the Contract Documents.
3. The request is timely, fully documented, and properly submitted.
4. The specified product or method of construction cannot be provided within the Contract Time. The Architect will not consider the request if the product or method cannot be provided as a result of failure to pursue the Work promptly or coordinate activities properly.
5. The request is directly related to an "or-equal" clause or similar language in the Contract Documents.
6. The requested substitution offers the Owner a substantial advantage, in cost, time, energy conservation, or other considerations, after deducting additional responsibilities the Owner must assume. The Owner's additional responsibilities may include compensation to the Architect for redesign and evaluation services, increased cost of other construction by the Owner, and similar considerations.

7. The specified product or method of construction cannot receive necessary approval by a governing authority, and the requested substitution can be approved.
8. The specified product or method of construction cannot be provided in a manner that is compatible with other materials and where the Contractor certifies that the substitution will overcome the incompatibility.
9. The specified product or method of construction cannot be coordinated with other materials and where the Contractor certifies that the proposed substitution can be coordinated.
10. The specified product or method of construction cannot provide a warranty required by the Contract Documents and where the Contractor certifies that the proposed substitution provides the required warranty.
11. Where a proposed substitution involves more than one general contractor, each contractor shall cooperate with the other contractors involved to coordinate the Work, provide uniformity and consistency, and assure compatibility of products.

B. The Contractor's submittal and the Architect's acceptance of Shop Drawings, Product Data, or Samples for construction activities not complying with the Contract Documents do not constitute an acceptable or valid request for substitution, nor do they constitute approval.

PART 3 - EXECUTION (Not Applicable)

END OF SECTION 012500

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SECTION 012600 – CONTRACT MODIFICATION PROCEDURES

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

A. Drawings and general provisions of the Contract, including General and Supplementary Conditions and other Division 1 Specification Sections, apply to this Section.

1.2 SUMMARY

A. This Section specifies administrative and procedural requirements for handling and processing contract modifications.

1. Multiple Prime Contracts: Provisions of this Section apply to the work of each prime contractor.

B. Related Sections: The following Sections contain requirements that relate to this Section:

1. Division 1 Section "Submittals" for requirements for the Contractor's Construction Schedule.
2. Division 1 Section "Applications for Payment" for administrative procedures governing Applications for Payment.
3. Division 1 Section "Substitutions" for administrative procedures for handling requests for substitutions made after award of the Contract.

1.3 MINOR CHANGES IN THE WORK

A. The Architect will issue supplemental instructions authorizing minor changes in the Work, not involving adjustment to the Contract Sum or Contract Time, on AIA Form G710, Architect's Supplemental Instructions.

1.4 SUBMITTALS

A. Every change or allowance proposal (regardless of whom initiated) will be accompanied by the following information:

1. Labor Rate worksheet (attached at the end of this section) must be filled out for each trade and notarized with the required supporting documentation.

2. Full itemized breakdown: All proposals to be broken down by material, labor, man hours, quantities, unit prices, overhead, profit, subcontractor, and supplier quotes attached.

3. If the contractor fails to submit this required information timely, it will be cause for delay and will be addressed as such under the applicable sections of the contract.

1.5 CHANGE ORDER PROPOSAL REQUESTS

A. Owner-Initiated Proposal Requests: The Architect will issue a detailed description of proposed changes in the Work that will require adjustment to the Contract Sum or Contract Time. If necessary, the description will include supplemental or revised Drawings and Specifications.

1. Proposal requests issued by the Architect are for information only. Do not consider them as an instruction either to stop work in progress or to execute the proposed change.

2. Within 10 days of receipt of a proposal request, submit an estimate of cost necessary to execute the change to the Architect for the Owner's review.

a. Include an itemized list of quantities of products required and unit costs, with the total amount of purchases to be made. Furnish survey data and backup paperwork to substantiate quantities. Separate labor hours by trade and indicate labor rate.
b. Indicate applicable taxes, delivery charges, equipment rental, and amounts of trade discounts.

c. Include a statement indicating the effect the proposed change in the Work will have on the Contract Time.

B. Contractor-Initiated Proposals: When latent or unforeseen conditions require modifications to the Contract, the Contractor may propose changes by submitting a request for a change to the Architect.

1. Include a statement outlining the 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 Contract Time.
2. Include an itemized list of quantities of products required and unit costs, with the total amount of purchases to be made. Furnish survey data to substantiate quantities.
3. Indicate applicable taxes, delivery charges, equipment rental, and amounts of trade discounts.
4. Comply with requirements in Section "Product Substitutions" if the proposed change requires substitution of one product or system for a product or system specified.

C. Proposal Request Form: Use AIA Document G731 for Change Order Proposal Requests.

1.6 ALLOWANCES

A. Allowance Adjustment: For allowance-cost adjustment, base each Change Order Proposal on the difference between the actual purchase amount and the allowance, multiplied by the final measurement of work-in-place. Where applicable, include reasonable allowances for cutting losses, tolerances, mixing wastes, normal product imperfections, and similar margins.

1. Include installation costs in the purchase amount only where indicated as part of the allowance.

2. When requested, prepare explanations and documentation to substantiate the margins claimed.
3. Submit substantiation of a change in scope of work claimed in the Change Orders related to unit-cost allowances.
4. The Owner reserves the right to establish the actual quantity of work-in-place by independent quantity survey, measure, or count.
5. Contractor's overhead and profit, including costs for bonds & insurances, for these allowances shall be included in the values of the general requirements of contract sum and are not chargeable under allowance disbursement.

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 the Contractor's handling, labor, installation, overhead, and profit. Submit claims within 15 days of receipt of the Change Order or Construction Change Directive authorizing work to proceed. The Owner will reject claims submitted later than 15 days.

1. Do not include the 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 Contract Documents.
2. No change to the 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.

1.7 CONSTRUCTION CHANGE DIRECTIVE

A. Construction Change Directive: When the Owner and the Contractor disagree on the terms of a Proposal Request, the Architect may issue a Construction Change Directive on AIA Form G733. The Construction Change Directive instructs the Contractor to proceed with a change in the Work, for subsequent inclusion in a Change Order.

1. The Construction Change Directive contains a complete description of the change in the Work. It also designates the method to be followed to determine change in the Contract Sum or Contract Time.

B. Documentation: Maintain detailed records on a time and material basis of work required by the Construction Change Directive.

1. After completion of the change, submit an itemized account and supporting data necessary to substantiate cost and time adjustments to the Contract.

1.8 CHANGE ORDER PROCEDURES

A. Upon the Owner's approval of a Proposal Request, the Architect will issue a Change Order for signatures of the Owner and the Contractor on AIA Form G731.

PART 2 - PRODUCTS (Not Applicable)

PART 3 - EXECUTION (Not Applicable)

END OF SECTION 012600

SECTION 012900 – PAYMENT PROCEDURES

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

A. Drawings and general provisions of the Contract, including General and Supplementary Conditions and other Division 1 Specification Sections, apply to this Section.

1.2 SUMMARY

A. This Section specifies administrative and procedural requirements governing each prime contractor's Applications for Payment.

1. Coordinate the Schedule of Values and Applications for Payment with the Contractor's Construction Schedule, Submittal Schedule, and List of Subcontracts.

B. Related Sections: The following Sections contain requirements that relate to this Section.

1. Schedules: The Contractor's Construction Schedule and Submittal Schedule are specified in Division 1 Section "Submittals."

1.3 SCHEDULE OF VALUES

A. Coordination: Each prime Contractor shall coordinate preparation of its Schedule of Values for its part of the Work with preparation of the Contractors' Construction Schedule.

1. Correlate line items in the Schedule of Values with other required administrative schedules and forms, including:

a. Contractor's Construction Schedule.
b. Application for Payment forms, including Continuation Sheets.
c. List of subcontractors.
d. Schedule of allowances.
e. Schedule of alternates.
f. Schedule of submittals.

2. Submit the Schedule of Values to the Construction Manager within 10 days of receipt of Letter of Intent but no later than 7 days before the date scheduled for submittal of the initial Applications for Payment.

B. Format and Content: Use the Project Manual table of contents as a guide to establish the format for the Schedule of Values. Provide at least one line item for each Specification Section.

1. Identification: Include the following Project identification on the Schedule of Values:

a. Project name and location.
b. Name of the Architect.
c. Name of the Construction manager
d. Project number.
e. Contractor's name and address and contract number.
f. 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 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.
1) Percentage of Contract Sum to nearest one-hundredth percent, adjusted to total 100 percent.

3. Provide a breakdown of the Contract Sum in sufficient detail to facilitate continued evaluation of Applications for Payment and progress reports. Coordinate with the Project Manual table of contents. Break principal subcontract amounts down into several line items. All items to have separate material and labor lines. Front end items will be broken out separately and have categories for bonds, insurance, submittals, field supervision, project management, cleanup, final cleanup (allowance – last page / entry). Balance of items separated by spec section and / or work activity (as directed by ARCHITECT).
4. Round amounts to nearest whole dollar; the total shall equal the Contract Sum.
5. Provide a separate line item in the Schedule of Values for each part of the Work where Applications for Payment may include materials or equipment, purchased or fabricated and stored, but not yet installed.
6. **Payment Applications must be broken down and submitted by schools separately. The contractor shall list the SED number of each school as the project number on the header of each payment application and SOV.**

7. General Conditions shall be broken out in the contractor's SOV in the following format:
a. Project Administration – 2%
b. Supervision – 2%
c. Meetings – 1%
d. Submittals – 2%
e. Cleanup – 1%
f. Punchlist – 2%
g. Closeout – 2%

8. Bonds and Insurance shall be a separate line items.

9. Differentiate between items stored on-site and items stored off-site. Include requirements for insurance and bonded warehousing, if required.

10. Provide separate line items on the Schedule of Values for initial cost of the materials, for each subsequent stage of completion, and for total installed value of that part of the Work.

11. Unit-Cost Allowances: Show the line-item value of unit-cost allowances, as a product of the unit cost, multiplied by the measured quantity. Estimate quantities from the best indication in the Contract Documents.
12. Margins of Cost: Show line items for indirect costs and margins on actual costs only when such items are listed individually in Applications for Payment. Each item in the Schedule of Values and Applications for Payment shall be complete. Include the total cost and proportionate share of general overhead and profit margin 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 the Contractor's option.

13. Schedule Updating: Update and resubmit the Schedule of Values prior to the next Applications for Payment when Change Orders or Construction Change Directives result in a change in the Contract Sum.

1.4 APPLICATIONS FOR PAYMENT

A. Each Application for Payment shall be consistent with previous applications and payments as certified by the Architect and paid for by the Owner.

   1. The initial Application for Payment, the Application for Payment at time of Substantial Completion, and the final Application for Payment involve additional requirements.

B. Payment-Application Times: Each progress-payment date is indicated in the Agreement. The period of construction Work covered by each Application for Payment is the period indicated in the Agreement.

C. Payment-Application Times: The date for each progress payment is as designated by the Owner – typically the last Friday of the month). The period covered by each Application for Payment is the previous month. Contractors will submit their pencil copy of the 25th of the month. Late applications will not be processed until the next months billing period.

D. Payment-Application Forms: Use AIA Document G732/CMa and Continuation Sheets G703 as the form for Applications for Payment.

   1. Separate Continuation Sheets shall be provided for work which takes place on each building, which will detail that portion of the contract which is attributable to the specific building. The appropriate S.E.D. project number shall be shown on the top of each continuation form.

E. Application Preparation: Complete every entry on the form. Include notarization and execution by a person authorized to sign legal documents on behalf of the Contractor. The Architect will return incomplete applications without action.

   1. Entries shall match data on the Schedule of Values and the Contractor's Construction Schedule. Use updated schedules if revisions were made.
   2. Include amounts of Change Orders and Construction Change Directives issued prior to the last day of the construction period covered by the application.
   3. Provide copies of payrolls which are signed and notarized documenting compliance with prevailing wage laws. Payroll for Prime Contractors is required from the 25th of the

previous month to the 24th of the current month. Payroll for Subcontractors is required from the 16th of the previous month to the 15th of the current month.

4. Provide copies of lien waivers for the previous payment. Include certificate of monthly payment for subcontractors for the previous month.
5. CONTRACTOR MUST SUBMIT AIA G706 & G706A with each payment application or the application will not be processed.
6. Provide tool box talks for pay period.
7. Provide OSHA Cards
8. Provide receipts and photos for any stored material being billed.

F. Transmittal: Submit 1 digital signed and notarized original copy of each Application for Payment to the Construction Manager by a method ensuring receipt within 24 hours. Each copy shall be complete, including waivers of lien, affidavit of debts and claims, certified payroll, OSHA 10 cards, tool box talks, and similar attachments, when required. Application for payments without the required backup will not be signed by the Architect, CM, or owner and thus will not be processed.

G. Waivers of Mechanics Lien: With each Application for Payment, submit waivers of mechanics liens (G706A) from subcontractors, sub-subcontractors and suppliers for the construction period covered by the previous application.

1. Submit partial waivers on each item for the amount requested, prior to deduction for retainage, on each item.
2. When an application shows completion of an item, submit final or full waivers.
3. The Owner reserves the right to designate which entities involved in the Work must submit waivers.

    a. Submit final Applications for Payment with or preceded by final waivers from every entity involved with performance of the Work covered by the application who is lawfully entitled to a lien.

4. Waiver Forms: Submit waivers of lien on forms, and executed in a manner, acceptable to the Owner.

H. Initial Application for Payment: Administrative actions and submittals, that must precede or coincide with submittal of the first Application for Payment include the following. The initial payment application will not be processed until all of these actions and submittals have been received by the Architect. When preliminary submissions are received with the initial application (items 4 and 7), the final submission for these items must be received and approved by the Architect prior to submission of the second application for payment.

1. List of subcontractors.
2. List of principal suppliers and fabricators.
3. Schedule of Values.
4. Contractor's Construction Schedule (preliminary if not final).
5. Schedule of principal products.
6. Schedule of unit prices.
7. Submittal Schedule (preliminary if not final).
8. List of Contractor's staff assignments.
9. List of Contractor's principal consultants.
10. Copies of building permits.
11. Copies of authorizations and licenses from governing authorities for performance of the Work.

12. Initial progress report.
13. Report of preconstruction meeting.
14. Certificates of insurance and insurance policies.
15. Performance and payment bonds.
16. Data needed to acquire the Owner's insurance.
17. Initial settlement survey and damage report, if required.

I. Application for Payment at Substantial Completion: Following issuance of the Certificate of Substantial Completion, submit an Application for Payment.

1. This application shall reflect Certificates of Partial Substantial Completion issued previously for Owner occupancy of designated portions of the Work.
2. Administrative actions and submittals that shall precede or coincide with this application include:

a. Occupancy permits and similar approvals.
b. Warranties (guarantees) and maintenance agreements.
c. Test/adjust/balance records.
d. Maintenance instructions.
e. Meter readings.
f. Startup performance reports.
g. Changeover information related to Owner's occupancy, use, operation, and maintenance.
h. Final cleaning.
i. Application for reduction of retainage and consent of surety.
j. Advice on shifting insurance coverages.
k. Final progress photographs.
l. List of incomplete Work, recognized as exceptions to Architect's Certificate of Substantial Completion.

J. Final Payment Application: Administrative actions and submittals that must precede or coincide with submittal of the final Application for Payment include the following:

1. Completion of Project closeout requirements.
2. Completion of items specified for completion after Substantial Completion.
3. Ensure that unsettled claims will be settled.
4. Ensure that incomplete Work is not accepted and will be completed without undue delay.
5. Transmittal of required Project construction records to the Owner.
6. Certified property survey.
7. Proof that taxes, fees, and similar obligations were paid.
8. Removal of temporary facilities and services.
9. Removal of surplus materials, rubbish, and similar elements.
10. Change of door locks to Owner's access.

PART 2 - PRODUCTS (Not Applicable)

PART 3 - EXECUTION (Not Applicable)

END OF SECTION 012900

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SECTION 013100 - PROJECT MANAGEMENT AND COORDINATION

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

A. Drawings and general provisions of the Contract, including General and Supplementary Conditions and other Division 1 Specification Sections, apply to this Section.

1.2 SUMMARY

A. This Section includes administrative and supervisory requirements necessary for coordinating construction operations including, but not necessarily limited to, the following:

1. General project coordination procedures.
2. Conservation.
3. Coordination Drawings.
4. Administrative and supervisory personnel.
5. Cleaning and protection.

B. Related Sections: The following Sections contain requirements that relate to this Section:

1. Division 1 Section "Project Meetings" for progress meetings, coordination meetings, and pre-installation conferences.
2. Division 1 Section "Submittals" for preparing and submitting the Contractor's Construction Schedule.
3. Division 1 Section "Materials and Equipment" for coordinating general installation.
4. Division 1 Section "Contract Closeout" for coordinating contract closeout.

1.3 COORDINATION

A. Coordinate construction operations included in various Sections of these Specifications to assure efficient and orderly installation of each part of the Work. Coordinate construction operations included under different Sections that depend on each other for proper installation, connection, and operation.

1. Schedule construction operations in the 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 assure maximum accessibility for required maintenance, service, and repair.
3. Make provisions to accommodate items scheduled for later installation.
4. Each Prime Contractor is required to coordinate with the General Contract #1, and be on site as walls are being built to lay out all penetrations to walls under construction and install their roughing as the walls are progressing.

B. Where necessary, prepare memoranda for distribution to each party involved, outlining special procedures required for coordination. Include such items as required notices, reports, and attendance at meetings.

1. Prepare similar memoranda for the Owner and separate contractors where coordination of their work is required.

C. Administrative Procedures: Coordinate scheduling and timing of required administrative procedures with other construction activities to avoid conflicts and assure orderly progress of the Work. Such administrative activities include, but are not limited to, the following:

1. Preparation of schedules.
2. Installation and removal of temporary facilities.
3. Processing of submittals and photocopying/delivery to affected contractors.
4. Progress meetings.
5. Project closeout activities.

D. Conservation: Coordinate construction operations to assure that operations are carried out with consideration given to conservation of energy, water, and materials.

1. Salvage materials and equipment involved in performance of, but not actually incorporated in, the Work.

1.4 SUBMITTALS

A. Coordination Drawings: Prepare coordination drawings where careful coordination is needed for installation of products and materials fabricated by separate entities. Prepare coordination drawings where limited space availability necessitates maximum utilization of space for efficient installation of different components.

1. Show the relationship of components shown on separate Shop Drawings.
2. Indicate required installation sequences.
3. Comply with requirements contained in Section "Submittals."
4. A coordination meeting with all Prime Contractors to review completed coordination drawings will be held within 30 days of Contract award.

B. Staff Names: Within 15 days of commencement of construction operations, submit a list of the Contractor's principal staff assignments, including the superintendent and other personnel in attendance at the Project Site. Identify individuals and their duties and responsibilities. List their addresses and telephone numbers.

1. Post copies of the list in the Project meeting room, the temporary field office, and each temporary telephone.

PART 2 - PRODUCTS (Not Applicable)

PART 3 - EXECUTION

3.1 GENERAL COORDINATION PROVISIONS

A. Inspection of Conditions: Require the Installer of each major component to inspect both the substrate and conditions under which Work is to be performed. Do not proceed until unsatisfactory conditions have been corrected in an acceptable manner.

B. Coordinate temporary enclosures with required inspections and tests to minimize the necessity of uncovering completed construction for that purpose.

3.2 CLEANING AND PROTECTION

A. Each Prime Contractor is to clean and protect construction in progress and adjoining materials in place, during handling and installation. Apply protective covering where required to assure protection from damage or deterioration at Substantial Completion.

B. Clean and provide maintenance on completed construction as frequently as necessary through the remainder of the construction period. Adjust and lubricate operable components to assure operability without damaging effects.

C. 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. Where applicable, such exposures include, but are not limited to, the following:

1. Excessive static or dynamic loading.
2. Excessive internal or external pressures.
3. Excessively high or low temperatures.
4. Thermal shock.
5. Excessively high or low humidity.
6. Air contamination or pollution.
7. Water or ice.
8. Solvents.
9. Chemicals.
10. Light.
11. Radiation.
12. Puncture.
13. Abrasion.
14. Heavy traffic.
15. Soiling, staining, and corrosion.
16. Bacteria.
17. Rodent and insect infestation.
18. Combustion.
19. Electrical current.
20. High-speed operation.
21. Improper lubrication.
22. Unusual wear or other misuse.
23. Contact between incompatible materials.
24. Destructive testing.
25. Misalignment.
26. Excessive weathering.
27. Unprotected storage.
28. Improper shipping or handling.
29. Theft.
30. Vandalism.

END OF SECTION 013100

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SECTION 013119 - PROJECT MEETINGS

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 specifies administrative and procedural requirements for project meetings, including, but not limited to, the following:
   1. Preconstruction conferences.
   2. Preinstallation conferences.
   3. Progress meetings.
   4. Coordination meetings.

B. Related Sections: The following Sections contain requirements that relate to this Section:
   1. Division 1 Section "Coordination" for procedures for coordinating project meetings with other construction activities.
   2. Division 1 Section "Submittals" for submitting the Contractor's Construction Schedule.

1.3 PRECONSTRUCTION CONFERENCE

A. A preconstruction conference will be scheduled before starting construction, at a time convenient to the Owner and the Architect and construction manager, but no later than 14 days after execution of the Agreement. The conference will be held at the Project Site or another convenient location.

B. Attendees: Authorized representatives of the Owner, Architect, construction manager and their consultants; the Contractor and its superintendent; major subcontractors; manufacturers; suppliers; and other concerned parties shall attend the conference. All participants at the conference shall be familiar with the Project and authorized to conclude matters relating to the Work.

C. Agenda: Discuss items of significance that could affect progress, including the following:
   1. Tentative construction schedule.
   2. Critical work sequencing.
   3. Designation of responsible personnel.
   4. Procedures for processing field decisions and Change Orders.
   5. Procedures for processing Applications for Payment.
   6. Distribution of Contract Documents.
   7. Submittal of Shop Drawings, Product Data, and Samples.
   8. Preparation of record documents.
   9. Use of the premises.
   10. Parking availability.
   11. Office, work, and storage areas.

12. Equipment deliveries and priorities.
13. Safety procedures.
14. First aid.
15. Security.
16. Housekeeping.
17. Working hours.

D. Reporting: Construction Manager shall prepare and issue minutes to attendees and interested parties.

1.4 PREINSTALLATION CONFERENCES

A. Conduct a pre-installation conference at the Project Site before each construction activity that requires coordination with other construction.

B. Attendees: The Installer and representatives of the Prime Contractor, 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 the Construction Manager of scheduled meeting dates.
   1. Review the progress of other construction activities and preparations for the particular activity under consideration at each pre-installation conference, including requirements for the following:
      a. Contract Documents.
      b. Options.
      c. Related Change Orders.
      d. Purchases.
      e. Deliveries.
      f. Shop Drawings, Product Data, and quality-control samples.
      g. Review of mockups.
      h. Possible conflicts.
      i. Compatibility problems.
      j. Time schedules.
      k. Weather limitations.
      l. Manufacturer's recommendations.
      m. Warranty requirements.
      n. Compatibility of materials.
      o. Acceptability of substrates.
      p. Temporary facilities.
      q. Space and access limitations.
      r. Governing regulations.
      s. Safety.
      t. Inspecting and testing requirements.
      u. Required performance results.
      v. Recording requirements
      w. Protection.
   2. Record significant discussions and agreements and disagreements of each conference and the approved schedule. Promptly distribute the record of the meeting to everyone concerned, including the Owner and the Architect.
   3. Do not proceed with the installation if the conference cannot be successfully concluded. Initiate whatever actions are necessary to resolve impediments to performance of Work and reconvene the conference at the earliest feasible date.

4. Reporting: Prime Contractor or Installer shall issue minutes to attendees, Owner and Architect, and construction manager.

1.5 PROGRESS MEETINGS

A. Progress meetings will be held at the Project Site on a weekly basis.

B. Attendees: In addition to representatives of the Owner and the Architect and Construction Manager, each Prime Contractor shall be represented at these meetings. **Attendance is mandatory at each meeting and a penalty sum of $500.00 per missed meeting will be assessed to the Prime Contractor not attending without prior written authorization from the Architect. This sum can be deducted from the contractors Schedule of Values.** Subcontractors, suppliers, or other entities will be invited at the discretion of the Owner and the Architect. All participants at the conference shall be familiar with the Project and authorized to conclude matters relating to the Work.

C. Agenda: Review and correct or approve minutes of the previous progress meeting. Review other items of significance that could affect progress. Include topics for discussion as appropriate to the status of the Project.
   1. Contractor's Construction Schedule: Review progress since the last meeting. Determine where each activity is in relation to the Contractor's Construction Schedule, whether on time or ahead or behind schedule. Determine how construction behind schedule will be expedited; secure commitments from parties involved to do so. Discuss whether schedule revisions are required to insure that current and subsequent activities will be completed within the Contract Time.
   2. Review the present and future needs of each entity present, including the following:
      a. Interface requirements.
      b. Time.
      c. Sequences.
      d. Status of submittals.
      e. Deliveries.
      f. Off-site fabrication problems.
      g. Access.
      h. Site utilization.
      i. Temporary facilities and services.
      j. Hours of work.
      k. Hazards and risks.
      l. Housekeeping.
      m. Quality and work standards.
      n. Change Orders.
      o. Documentation of information for payment requests.

D. Reporting: Approximately 5 days after each meeting, Construction Manager will prepare and distribute minutes of the meeting to each party present and to parties who should have been present. Include a brief summary, in narrative form, of progress since the previous meeting and report.

1.6 COORDINATION MEETINGS

A. Conduct project coordination meetings at regular intervals convenient for all parties involved. Project coordination meetings are in addition to specific meetings held for other purposes, such as regular progress meetings and special pre-installation meetings.

B. Request representation at each meeting by every party currently involved in coordination or planning for the construction activities involved.

C. Record meeting results and distribute copies to everyone in attendance and to others affected by decisions or actions resulting from each meeting.

D. The Owner's Field Manager will conduct daily meetings with all prime contractors performing work. The purpose of the meeting is to provide the opportunity for each prime contractor to communicate to the Field Manager any items relating to their respective construction activity for that day (request for shutdown, deliveries, etc.) The meetings will commence from 7:00 o'clock am until 7:30 o'clock am. The foreman of each Prime Contractor must attend. These meetings are generally informal. The Field Manager will keep minutes of these meetings when appropriate and will be available upon request.

1.7 SAFETY MEETINGS

A. Each Prime Contractor will be responsible to conduct safety meetings on a regular basis (but not less than three times during any thirty day period.)

B. Minutes of the Safety Meeting must be submitted to the construction manager within 4 business days. Failure to conduct and submit meeting minutes will be grounds to reject the Prime Contractor's progress payment.

PART 2 - PRODUCTS (Not Applicable)

PART 3 - EXECUTION (Not Applicable)

END OF SECTION 013119

SECTION 01 31 50 - SAFETY AND HEALTH

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 PROJECT SITE SAFETY

A. The Prime Contractor, not the Architect, is responsible for Project site safety.

1.3 SAFETY AND HEALTH REGULATIONS

A. The Prime Contractor, and any entity working for the Prime Contractor, shall comply with the U.S. Department of Labor Safety and Health Regulations for construction promulgated under the Occupational Safety and Health Act of 1970 (PL 91-54), latest revisions and with the latest requirements of the "Right to Know" laws and the New York State Labor Law.

B. In order to protect the general public and the lives and health of his/her employees under the Contract, the Prime Contractor shall comply with all pertinent provisions of the latest issues of the Federal Register, Bureau of Labor Standards, Safety and Health Regulations; New York State Industrial Code Rule 30 pertaining to Tunneling Operations; New York State Industrial Code Rule 23 pertaining to Trenching Operations; and the "Manual of Accident Prevention in Construction" issued by the Associated General Contractors of America, Inc., and shall maintain an accurate record of all cases of death, occupational disease, and injury requiring medical attention or causing loss of time from work under this Contract. In case of a conflict between the above noted authorities the most stringent shall prevail.

C. The Prime Contractor shall have on the project site at all times, while work is in progress, at least one person skilled in safety and health procedures and familiar with State and Federal safety and health regulations whose responsibility shall be to observe methods and procedures. He shall have the duty and authority to stop and correct all unsafe and unhealthy conditions.

D. Toxic, noxious or otherwise hazardous fumes, gases or dusts, etc. from welding, cadwelding, painting, grinding, sawing, sweeping or any other operations shall be kept

to the absolute minimum and shall be vented directly to the outside by the Contractor, and only used when authorized by the Architect.

E. The Prime Contractor to submit to the Architect, prior to first payment application approval, 2 copies of Material Safety and Data Sheets (MSDS) for all material used on site. The Prime Contractor shall also keep one (1) complete set of Material Safety and Data Sheets (MSDS) onsite at all times.

1. These reference materials shall be updated continuously throughout the Project, as additional materials are added to/brought to the Project site.

1.4 SAFETY AND FIRST AID

A. The Prime Contractor shall at all times exercise caution of his/her operations and shall be responsible for the safety and protection of all persons on or about the site arising out of or relating to his/her Work. All hazards shall be avoided or guarded in accordance with the provisions of the Manual of Accident Prevention in Construction of the AGCA, unless such provisions contravene local law. The safety provisions of all applicable laws, codes and ordinances shall be observed.

B. The Prime Contractor shall provide and maintain at the Site, at each location where work is in progress, as part of his/her plant, an approved first aid kit. Ready access thereto shall be provided at all times when persons are employed on the work site.

C. The Prime Contractor shall take due precautions against infectious diseases and shall arrange for the immediate isolation and removal from the Site of any employee who becomes ill or is injured while engaged on the work site.

D. The Prime Contractor shall, upon request of the Architect, immediately correct all conditions that constitute a clear and present danger to persons as interpreted by the Architect. If such danger is not so corrected, the Owner or the Architect will employ other persons to do such work and the expense thereof shall be deducted from any monies due or to become due to the Prime Contractor.

E. Clean up of the Prime Contractor's, and/or their subcontractor's, materials and/or debris shall be deemed a safety and health issue.

1.5 ACCIDENTS AND ACCIDENT REPORTS

A. Notify Architect immediately of any accidents involving Prime Contractor, subcontractor or supplier personnel on site.

B. Within 24 hours of the occurrence, the Prime Contractor shall submit a written accident report, to the Architect, fully detailing the occurrence.

1.6 TOOL BOX SAFETY MEETINGS

A. The Prime Contractor shall hold weekly toolbox safety meetings with his/her own workers. Records of these meetings shall be forwarded to the Owner, through the Construction Site Coordinator's office, each week.

1. Failure to comply with this requirement shall result in Applications for Payment not being reviewed and processed.

2. **Tool box talks must be submitted with application for payment**.

1.7 OTHER SAFETY REQUIREMENTS

A. All prime contractors are required to perform the following safety measures on all project sites and construction zones/areas.
1. Hard hats, safety googles/glasses, and safety vests are mandatory and shall be worn at all times by all persons on the project.
2. All construction workers shall wear photo ID at all times and be visible on the person, failure to do so will result to that employee being asked to leave until such ID has been worn visible.
3. All visitors are required to check in with the CM for any reason and not allowed on site without proper PPE.
4. Any workers not wearing PPE will asked to stop working until PPE is appropriate donned. All second offense of said worker, he /she will be removed from site and all district work. All contractors are required to keep the work areas clean and safe from all hazards at all times.
5. Site contractor is to review provided phasing/logistics plan and assume at a minimum quantities of site fencing/protections indicated in those plans be provided in their contract.
6. Some contracts will not be provided a logistics plan to reference due the nature of their work. The contractor is still required to assume the use of construction fencing around all dumpsters and any exterior work area. Any interior work to proceed while school building are occupied require the use of 1 hour rated fire barriers to separate students and staff from active construction. This is to be assumed in the contractor's bid, and is at the CM's discretion to request additional protections as deemed necessary during construction.
7. All fencing shall have construction sign at every 50 feet stating ''CONSTRUCTION AREA; NO UNAUTHORIZED PERSONAL; NO TRESSPASSING. and continuous scrim.

8. All site contractors are required to clean up outside of their chain link and gated fenced in work zone(s) where construction debris may have fallen on a non-work zone area. Sand bags are not considered anchoring.
9. Where driven anchoring of fencing is not feasible due to protection of installed finishes and existing conditions, contractor shall provide YODOCK barriers around construction sites with integral fence panels above.
10. Contractor shall ensure that all chain link construction fence/barriers around the work zone is closed off to any adjacent structure, building, etc. ending the fence perimeter work zone at all times. These areas are the be checked 3 times a day, once before the start of work, mid shift and before the contractor leaves at the end of shift.
11. All site contractors are to have a 24-hour available emergency contact person available to fix and correct areas that have been compromised after hours, weekends and holidays. Upon notification of such incident the contractor is required to deploy workers as necessary within 1-2 hours maximum to be on site to correct such matters reported.
12. All gas-powered equipment shall have the spark plugs removed at the end of each day so that these cannot be started in any way.
13. All LULLS, man lifts, and all equipment shall not have keys left inside and all booms shall be lowered when not in use.
14. All site contractors shall have a dedicated site safety experienced (Manager) person responsible for the site safety with a minimum of 30 hours OSHA training certificate. This person shall be responsible to ensure that the perimeter work zones are free from any fallen construction and trip hazards at the minimum of the 3 field surveys as stated in item 9 above and as noted elsewhere in contract. . Site walk logs are to be submitted daily to the CM including safety status and any items found and corrected.
15. All dumpsters are to be fully surrounded with chain link fence if stored outside other fenced/barricaded work areas.
16. All safety observation reports issued to contractors shall be corrected immediately. If the contractor fails to respond and/or correct the condition(s) included in the safety observation report, that contractor will be subject to termination and charged by the District with all costs related to correcting the reported condition(s) and any other items related thereto.
17. **All contractors are to conform to 155.5 SED Code.**
18. All contractors are to submit their "tool box talks" weekly to the CM.
19. All contractors are to submit daily reports of their activities related to work performed, manpower, equipment onsite and all safety measures put in place that day and any maintenance/monitoring thereof.
20. All contractors are required to provide "egress plans" for both interior and exterior work for locations where work will close off any exits, corridors, pathways, roads, and any access way. These plans are to be provided in advance at least 2 months

before work commences in that area, no work shall be started in any manner without approval of such plan. The failure to provide such plan for coordinating and scheduling will result into back charges to the prime(s) involved. These plans must include all locations and details where scaffolding, fencing and all temporary construction barriers are required.

21. All contractors are to provide their corporate safety manuals to the CM prior to commencement of any work. Under no circumstances can any field work can start without receipt of such manual. This shall be provided in a 3-ring binder in PDF format. Contractors shall maintain a copy on site.
22. All personnel who fail to wear the required PPE while onsite will be warned and directed to stop work until PPE is properly worn. In the event that an employee is warned a second time for failure to comply with PPE requirements, said employee will be removed from all New Rochelle School projects. If the company continues to fail with their employees not abiding by the safety contract requirements, that contractor will be subject to termination for such endangerment of other workers and others.
23. All contractors are required to have a full time flagman(men) as needed at all times escorting construction vehicles into entrances and out of exits to the property/work zone. when . Flagman are required to escort construction vehicles to and from work areas to property lines and public streets. At every gate, the Prime Contractor shall post signage indicating contractor name and contact information including 24-hour emergency telephone number.
24. All contractors storing any materials and equipment on site shall be surrounded with chain link fencing.

END OF SECTION 013150

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SECTION 013300 - ELECTRONIC SUBMITTAL PROCEDURES

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 requirements for the submittal schedule and administrative and procedural requirements for submitting Shop Drawings, Product Data, Samples, and other submittals.

B. Related Sections:

1. Division 01 Section “Payment Procedures” for submitting Applications for Payment and the schedule of values.

2. Division 01 Section “Construction Progress Documentation” for submitting schedules and reports, including Contractor’s construction schedule.

3. Division 01 Section “Operation and Maintenance Data” for submitting operation and maintenance manuals.

1.3 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. File Transfer Protocol (FTP): Communications protocol that enables transfer of files to and from another computer over a network and that serves as the basis for standard Internet protocols. An FTP site is a portion of a network located outside of network firewalls within which internal and external users are able to access files.

D. 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.

1.4 ACTION SUBMITTALS

A. Submittal Schedule: Submit a schedule 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 modifications to submittals noted by the Architect and additional time for handling and reviewing submittals required by those corrections.

1. Coordinate submittal schedule with list of subcontracts, the schedule of values, and Contractor's construction schedule.

2. Initial Submittal: Submit concurrently with start-up construction schedule. Include submittals required during the first 60 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.

3. Final Submittal: Submit concurrently with the first complete submittal of Contractor's construction schedule.

   a. Submit revised submittal schedule to reflect changes in current status and timing for submittals.

4. 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 final release or approval.
   g. Scheduled dates for purchasing.
   h. Scheduled dates for installation.
   i. Activity or event number.

1.5 SUBMITTAL ADMINISTRATIVE REQUIREMENTS

A. Architect's Digital Data Files: Electronic copies of REVIT Drawings of the Contract Drawings will be provided by Architect for Contractor's use in preparing submittals.

   1. Architect will furnish Contractor one set of digital data drawing files of the Contract Drawings for use in preparing Shop Drawings and Project record drawings.

      a. Architect makes no representations as to the accuracy or completeness of digital data drawing files as they relate to the Contract Drawings.

      b. Digital Drawing Software Program: The Contract Drawings are available in REVIT Version 2024.

      c. Contractor shall execute a data licensing agreement that will be supplied by Architect.

      d. The following plot files will by furnished for each appropriate discipline:

         1) Floor plans
         2) Site plans .

B. 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 transmittal of different types of submittals for related 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 related submittals are received.

C. Processing Time: Allow time for submittal review, including time for resubmittals, 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 resubmittals.

1. Initial Review: Allow 10 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.

2. Intermediate Review: If intermediate submittal is necessary, process it in same manner as initial submittal.

3. Resubmittal Review: Allow 10 days for review of each resubmittal.

4. Sequential Review: Where sequential review of submittals by Architect's consultants, Owner, or other parties is indicated, allow 15 days for initial review of each submittal.

5. Concurrent Consultant Review: Where the Contract Documents indicate that submittals may be transmitted simultaneously to Architect and to Architect's consultants, allow 15 days for review of each submittal. Submittal will be returned to Architect before being returned to Contractor.

D. Identification and Information: Identify and incorporate information in each electronic submittal file as follows:

1. Assemble complete submittal package into a single indexed file with links enabling navigation to each item.

2. Name file with submittal number or other unique identifier, including revision identifier.

   a. File name shall use project identifier and Specification Section number followed by a decimal point and then a sequential number (e.g., BR-061000.01 or MH-061000.01). Resubmittals shall include an alphabetic suffix after another decimal point (e.g., BR-061000.01.A or MH-061000.01.A).

3. Provide means for insertion to permanently record Contractor's review and approval markings and action taken by Architect.

4. Include the following information on an inserted cover sheet:

a. Project name.
b. Date.
c. Name and address of Architect.
d. Name of Contractor.
e. Name of firm or entity that prepared submittal.
f. Name of subcontractor.
g. Name of supplier.
h. Name of manufacturer.
i. Number and title of appropriate Specification Section.
j. Drawing number and detail references, as appropriate.
k. Location(s) where product is to be installed, as appropriate.
l. Related physical samples submitted directly.
m. Other necessary identification.

5. Include the following information as keywords in the electronic file metadata:

a. Project name.
b. Number and title of appropriate Specification Section.
c. Manufacturer name.
d. Product name.

E. Options: Identify options requiring selection by the Architect.

F. Deviations: Identify deviations from the Contract Documents on submittals.

G. Transmittal: Assemble each submittal individually and appropriately for transmittal and handling. Transmit each submittal using a transmittal form. Contracting Officer will return submittals, without review, received from sources other than Contractor.

1. Transmittal Form: Provide locations on form for the following information:

a. Project name.
b. Date.
c. Destination (To:).
d. Source (From:).
e. Names of subcontractor, manufacturer, and supplier.
f. Category and type of submittal.
g. Submittal purpose and description.
h. Specification Section number and title.
i. Indication of full or partial submittal.
j. Drawing number and detail references, as appropriate.
k. Transmittal number, numbered consecutively.
l. Submittal and transmittal distribution record.
m. Remarks.
n. Signature of transmitter.

2. 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.

H. 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 approval notation from Architect's action stamp.

I. Distribution: Furnish copies of final submittals to manufacturers, subcontractors, suppliers, fabricators, installers, authorities having jurisdiction, and others as necessary for performance of construction activities. Show distribution on transmittal forms.

J. Use for Construction: Use only final submittals that are marked with approval notation from Architect's action stamp.

PART 2 - PRODUCTS

2.1 SUBMITTAL PROCEDURES

A. General Submittal Procedure Requirements: Prepare and submit submittals required by individual Specification Sections. Types of submittals are indicated in individual Specification Sections.

1. Submit electronic submittals via email as PDF electronic files.

a. Architect, through Contracting Officer, will return annotated file. Annotate and retain one copy of file as an electronic Project record document file.

2. Closeout Submittals and Maintenance Material Submittals: Comply with requirements specified in Division 01 Section "Closeout Procedures."

3. Certificates and Certifications Submittals: Provide 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.

a. Provide a digital signature with digital certificate on electronically-submitted certificates and certifications where indicated.
b. Provide a notarized statement on original paper copy certificates and certifications where indicated.

4. Test and Inspection Reports Submittals: Comply with requirements specified in Division 01 Section "Quality Requirements."

B. Product Data: Collect information into a single submittal for each element of construction and type of product or equipment.

1. If information must be specially prepared for submittal because standard published data are not suitable 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.

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 showing 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 or concurrent with Samples.

6. Submit Product Data in the following format:

a. PDF electronic file.

C. Shop Drawings: Prepare Project-specific information, drawn accurately to scale. Do not base Shop Drawings on reproductions of the Contract Documents or standard printed data, unless submittal based upon 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. Seal and signature of professional engineer if specified.

2. Sheet Size: Except for templates, patterns, and similar full-size drawings, submit Shop Drawings on sheets at least 8-1/2 by 11 inches (215 by 280 mm) but no larger than 30 by 42 inches (750 by 1067 mm).

3. Submit Shop Drawings in the following format:

a. PDF electronic file.

D. Samples: Submit Samples for review of kind, color, pattern, and texture for a check of these characteristics with other elements and for a comparison of these characteristics between submittal and actual component as delivered and installed.

1. Transmit Samples that contain multiple, related components such as accessories together in one submittal package.

2. Identification: Attach label on unexposed side of Samples that includes the following:

a. Generic description of Sample.
b. Product name and name of manufacturer.
c. Sample source.

d. Number and title of applicable Specification Section.

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 Government'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. Architect, through Contracting Officer, 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 will retain one Sample set; 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.

E. Product Schedule: 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:

1. Type of product. Include unique identifier for each product indicated in the Contract Documents.

2. Manufacturer and product name, and model number if applicable.

3. Number and name of room or space.

4. Location within room or space.

5. Submit product schedule in the following format:

   a. PDF electronic file.

F. Contractor's Construction Schedule: Comply with requirements specified in Division 01 Section "Construction Progress Documentation."

G. Application for Payment: Comply with requirements specified in Division 01 Section "Payment Procedures."

H. Schedule of Values: Comply with requirements specified in Division 01 Section "Payment Procedures."

I. 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. 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.

4. Submit subcontract list in the following format:

    a. PDF electronic file.

J. 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.

K. 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 American Welding Society (AWS) forms. Include names of firms and personnel certified.

L. 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.

M. 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.

N. Product Certificates: Submit written statements on manufacturer's letterhead certifying that product complies with requirements in the Contract Documents.

O. Material Certificates: Submit written statements on manufacturer's letterhead certifying that material complies with requirements in the Contract Documents.

P. 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.

Q. Product Test Reports: Submit written reports indicating 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.

R. 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.

S. Schedule of Tests and Inspections: Comply with requirements specified in Division 01 Section "Quality Requirements."

T. Field Test Reports: Submit 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.

U. Maintenance Data: Comply with requirements specified in Division 01 Section "Operation and Maintenance Data."

PART 3 - EXECUTION

3.1 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 Contracting Officer.

B. Project Closeout and Maintenance/Material Submittals: Refer to requirements in Division 01 Section "Closeout Procedures."

C. Approval Stamp: Stamp each submittal with a uniform, approval stamp. Include Project name and location, submittal number, Specification Section title and number, name of reviewer, date of Contractor's approval, and statement certifying that submittal has been reviewed, checked, and approved for compliance with the Contract Documents.

3.2 ARCHITECT'S ACTION

A. General: Architect will not review submittals that do not bear Contractor's approval stamp and will return them without action.

B. Action Submittals: Architect will review each submittal, make marks to indicate corrections or modifications required, and return it. Architect will stamp each submittal with an action stamp and will mark stamp appropriately to indicate action, as follows:

1. Approved: Where the submittal is marked "Approved," the Work covered by the submittal may proceed provided it complies with the Contract Documents. Final acceptance will depend on that compliance.

2. Approved As Corrected (do not resubmit): Where the submittal is marked "Approved As Corrected" the work covered by the submittal may proceed provided it complies both with Architect's notations and corrections on the submittal and the Contract Documents. Final acceptance will depend on that compliance.

3. Revise and Resubmit (see notes): Where the submittal is marked “Revise and Resubmit” do not proceed with the Work covered by the submittal, including purchasing, fabrication, delivery, or other activity for the product submitted. Revise and prepare a new submittal according to Architect’s notations and corrections.

4. Rejected: Where the submittal is marked “Rejected”, do not proceed with the Work covered by the submittal. Prepare a new submittal for a product that complies with the Contract Documents.

C. Informational Submittals: Architect will review each submittal and will not return it, or will return it if it does not comply with requirements. Architect will forward each submittal to appropriate party.

5. Submit Specified Item: Where the submittal is marked “Submit Specified Item”, do not proceed with the Work covered by the submittal. Prepare a new submittal for a product that complies with the Contract Documents.

D. Partial submittals prepared for a portion of the Work will be reviewed when use of partial submittals has received prior approval from Architect.

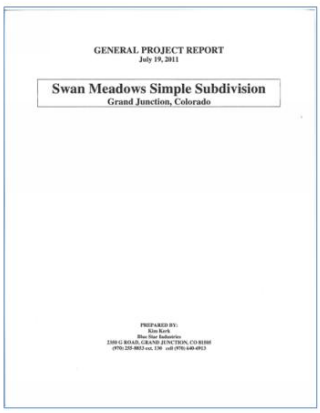
E. Incomplete submittals are not acceptable, will be considered nonresponsive, and will be returned without review.

F. Submittals not required by the Contract Documents may not be reviewed and may be discarded.

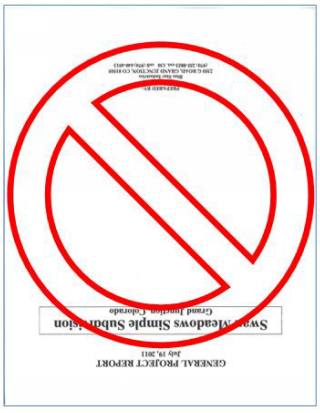
END OF SECTION 013300

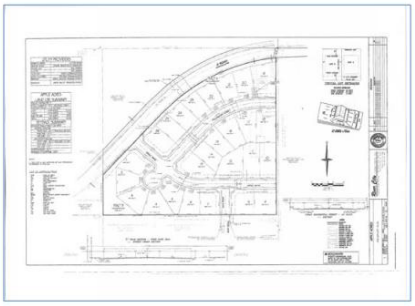
Document Orientation Guide

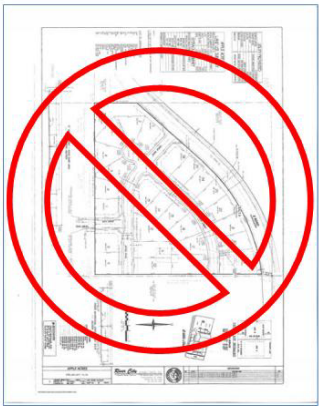
Correct Orientation:



Incorrect Orientation:







No: _____

SUBMITTAL COVERSHEET
Nanuet UFSD –Phase 5 Projects

Architect:
KSQ Architects
215 W 40th Street,15th Floor
New York, NY 10018

Owner:
Nanuet Union Free School District
101 Church Street
Nanuet, NY 10954

Construction Manager:
Jacobs
One Penn Plaza, 24th floor
New York, NY 10019

Contractor: _____ **Contract:** _____

Address: _____ **Telephone:** _____

_____ **Fax:** _____

School Name: _____

Type of Submittal: **Re-submittal: [ ] No [ ] Yes**

[ ] Shop Drawings **[ ]** Product Data **[ ]** Schedule **[ ]** Sample **[ ]** _____
[ ] Test Report **[ ]** Certificate **[ ]** Color Sample **[ ]** Warranty **[ ]** _____

Submittal Description:

Product Name: _____

Manufacturer: _____

Subcontractor/ Supplier: _____

References:

Spec. Section No.: _____ **Drawing No(s):** _____

Paragraph: _____ **Rm. or Detail No(s):** _____

Architect's/ Engineer's Review Stamp	Contractor Review Statement: These documents have been checked for accuracy and coordinated with job conditions and Contract requirements by this office and have been found to comply with the provisions of the Contract Documents. Name: Date: Company Name:

_____
_____
_____
_____
_____

Remarks:

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SECTION 01 50 00 – TEMPORARY FACILITIES AND CONTROLS

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. This Section includes requirements for temporary utilities, support facilities, and security and protection facilities.

B. Related Sections include the following:

1. Division 01 Section "Summary of Work" for limitations on utility interruptions and other work restrictions.
2. Division 01 Section "Submittal Procedures" for procedures for submitting copies of implementation and termination schedule and utility reports.
3. Division 01 Section "Execution" for progress cleaning requirements.

1.3 DEFINITIONS

A. Permanent Enclosure: As determined by Architect, exterior walls are insulated and weathertight; and all openings are closed with permanent construction or substantial temporary closures.

1.4 USE CHARGES

A. General: Cost or use charges for temporary facilities shall be included in the Contract Sum. Allow other entities to use temporary services and facilities without cost, including, but not limited to, Owner's construction forces, Architect, occupants of Project, testing agencies, and authorities having jurisdiction.

B. Water Service: 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.

C. Electric Power: Owner shall supply single-phase electric power from existing building distribution systems for use by all Prime Contracts, for each Phased building area.

1. EC shall install temporary facilities as outlined in their Scope of Work and related Division 01.
2. Owner shall not be responsible for supplying temporary three-phase power.
3. Staging Area Power: The Owner shall be responsible for all power use charges associated with this facility; the Prime Contract shall enforce power conservation measures with their facilities and those of their sub-contractors.

D. Telephone/Internet: Each Prime Contract shall be responsible for use charges associated with their respective telephone and internet access requirements.

1.5 SUBMITTALS

A. Site Plan: Show temporary facilities, egress plans, utility hookups, staging areas, and parking areas for construction personnel.

All contractors are required to provide "egress plans" for both interior and exterior work for locations where work will close off any exits, corridors, pathways, roads, and any access way. These plans are to be provided in advance at least 2 months before work commences in that area, no work shall be started in any manner without approval of such plan. The failure to provide such plan for coordinating and scheduling will result into back charges to the prime(s) involved. These plans must include all locations and details where scaffolding, fencing and all temporary construction barriers are required.

1.6 QUALITY ASSURANCE

A. Electric Service: Comply with NECA, NEMA, and UL standards and regulations for temporary electric service. Install service to comply with NFPA 70.

B. Tests and Inspections: Arrange for authorities having jurisdiction to test and inspect each temporary utility before use. Obtain required certifications and permits.

1.7 PROJECT CONDITIONS

A. A. Temporary Use of Permanent Facilities: Prime Contract, as 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 temporary facilities and controls responsibility.

B. Owner's Facilities: Contractors are <u>not</u> allowed to use the Owner's facilities (toilets, telephone, food service, etc.) for their own benefit. Prime Contract Superintendents shall enforce this policy with their respective work forces.

1. Parking will be restricted to an area determined by the Owner. Owner reserves the right to remove from their property, unauthorized vehicles occupying unauthorized areas, at respective Contractors' expense.

PART 2 - PRODUCTS

2.1 MATERIALS

A. 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.

1. Provide gate openings to accommodate vehicle delivery traffic or as noted. Install gateposts in sizes required for support gates.

2. All temp fencing is to receive privacy screening.

B. Yodock barriers may be provided by the contractor as substitution to fence with driven post. If site conditions or pace of work do not allow for typical fence with driven post, then the contractor is responsible to provide Yodock barriers. This is at the sole discretion of the construction manager.

C. Gypsum Board: Minimum 5/8 inch thick by 48 inches wide by maximum available lengths; regular-type panels with tapered edges. Comply with ASTM C 36/C 36M.

D. 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.

2.2 TEMPORARY FACILITIES

A. Storage and Fabrication Sheds: Provide sheds sized, furnished, and equipped to accommodate materials and equipment for construction operations.

1. Store combustible materials apart from building.

B. Porta-jons.: Contractors are not permitted to use the owners toilets facilities unless given permission by the construction manager. The contractor will be required to provide temporary toilet facilities as required for its workforce. Location to be determined by the construction manager.

2.3 EQUIPMENT

A. Fire Extinguishers: Portable, UL rated; with class and extinguishing agent as required by locations and classes of fire exposures. Comply with applicable codes for quantities required. Comply with NFPA for recommended classes for exposure; extinguishers shall be inspected and appropriately tagged prior to being brought on site. Provide stands, painted bright orange, sturdy enough to carry the extinguisher, and built as not to create a tipping hazard.

PART 3 - EXECUTION

3.1 INSTALLATION, GENERAL

A. Locate facilities where directed by site coordinator and where they will serve Project adequately and result in minimum interference with performance of the Work. Relocate and modify facilities as required by progress of the Work and when directed by the Construction Site Coordinator at no additional cost to the owner.

1. Locate facilities to limit site disturbance as specified in Division 01 Section "Summary of Work."

B. Provide each facility ready for use when needed to avoid delay. Do not remove until facilities are no longer needed or are replaced by authorized use of completed permanent facilities.

3.2 TEMPORARY UTILITY INSTALLATION

A. General: Install temporary service or connect to existing service.

1. Arrange with utility company, Owner, and existing users for time when service can be interrupted, if necessary, to make connections for temporary services.

B. Sewers and Drainage: Provide temporary utilities to remove effluent lawfully.

1. Connect temporary sewers to municipal system as directed by authorities having jurisdiction.

C. Water Service: Use of Owner's existing water service facilities will be permitted, as long as facilities are cleaned and maintained in a condition acceptable to Owner. At Substantial Completion, restore these facilities to condition existing before initial use.

1. Where installations below an outlet might be damaged by spillage or leakage, provide a drip pan of suitable size to minimize water damage. Drain accumulated water promptly from pans.

D. Heating: Provide temporary heating 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 equipment that will not have a harmful effect on completed installations or elements being installed.

E. Ventilation and Humidity Control: Provide temporary ventilation required by construction activities for curing or drying of completed installations or for protecting installed construction from adverse effects of high humidity. Select equipment that will not have a harmful effect on completed installations or elements being installed. Coordinate ventilation requirements to produce ambient condition required and minimize energy consumption.

F. Electric Power Service: Use of Owner's existing single phase electric power service will be permitted, as long as equipment is maintained in a condition acceptable to Owner.

1. See Section 011000 for additional requirements.

G. Lighting: Provide temporary lighting with local switching that provides adequate illumination for construction operations, observations, inspections, and traffic conditions.

1. Install and operate temporary lighting that fulfills security and protection requirements without operating entire system.
2. See Section 011000 for additional requirements.

3.3 SUPPORT FACILITIES INSTALLATION

A. General: Comply with the following:

1. Provide incombustible construction for offices, shops, and sheds located within construction area or within 30 feet of building lines. Comply with NFPA 241.
2. Maintain support facilities until near Substantial Completion. Remove before Substantial Completion. Personnel remaining after Substantial Completion will be permitted to use permanent facilities, under conditions acceptable to Owner.

B. 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.

C. Parking: Parking will be restricted to an area determined by the Owner. Owner reserves the right to remove from their property, unauthorized vehicles occupying unauthorized areas, at respective Contractors' expense.

D. Project Identification and Temporary Signs: Provide Project identification and other signs. Install signs where indicated to inform public and individuals seeking entrance to Project. Unauthorized signs are not permitted.

1. Provide temporary, directional signs for construction personnel and visitors.
2. Maintain and touchup signs so they are legible at all times.

E. Waste Disposal Facilities: Comply with requirements specified in Division 01 Section "Construction Waste Management and Disposal" and Section 011200, "Summary of Work."

F. Waste Disposal Facilities: Provide waste-collection containers in sizes adequate to handle waste from construction operations. Comply with requirements of authorities having jurisdiction. Comply with Division 01 Section "Execution" for progress cleaning requirements.

G. Lifts and Hoists: Provide facilities necessary for hoisting materials and personnel.

1. Truck cranes and similar devices used for hoisting materials are considered "tools and equipment" and not temporary facilities.

H. Existing Stair Usage: Use of Owner's existing stairs will be permitted, as long as stairs are protected, cleaned and maintained in a condition acceptable to Owner. At Substantial Completion, restore stairs to no less than 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.

3.4 SECURITY AND PROTECTION FACILITIES INSTALLATION

A. Environmental Protection: Provide protection, operate temporary facilities, and conduct construction in ways and by methods that comply with environmental regulations and that minimize possible air, waterway, and subsoil contamination or pollution or other undesirable effects.

1. Comply with work restrictions specified in Division 01 Section "Multiple Contract Summary."
2. Inspect, repair, and maintain erosion and sedimentation control measures during construction until permanent vegetation has been established.

B. Pest Control: Engage pest-control service to recommend practices to minimize attraction and harboring of rodents, roaches, and other pests and to perform extermination and control procedures at regular intervals so Project will be free of pests and their residues at Substantial Completion. Obtain extended warranty for Owner. Perform control operations lawfully, using environmentally safe materials.

C. Security Enclosure and Lockup: Install substantial temporary enclosure around partially completed areas of construction. Provide lockable entrances to prevent unauthorized entrance, vandalism, theft, and similar violations of security.

1. Refer to Section 011200, "Multiple Contract Summary" for additional information.
2. All site contractors are to have a 24hr available emergency contact person available to fix and correct areas that have been compromised after hours, weekends and holidays. Upon notification of such incident, the contractor is required to deploy workers as necessary within 1-2 hours maximum to be on site to correct such matter reported. Emergency personnel contact information shall be submitted within 2 weeks of Notice to Proceed.

D. Barricades, Warning Signs, and Lights: Comply with requirements of authorities having jurisdiction for erecting structurally adequate barricades, including warning signs and lighting.
1. Yodock barriers are to be furnished and installed around all site construction zones with chain link fencing panels, posts and signage. All entries to sites are to have lockable gates.
2. Contractor shall ensure that all chain link safety fencings around the work zone are closed off to any adjacent structure, building, etc. at all times.
3. All contractors storing any materials and/or equipment on site shall be fenced in with secured chain link fencing.

E. Temporary Enclosures: Provide temporary enclosures for protection of construction, in progress and completed, from exposure, foul weather, other construction operations, and similar activities. Provide temporary weathertight enclosure for building exterior.

1. Where heating or cooling is required and permanent enclosure is not complete, insulate temporary enclosures.

F. Temporary Partitions: Provide floor-to-ceiling dustproof partitions to limit dust and dirt migration and to separate areas occupied by Owner from fumes and noise.

1. Construct dustproof partitions with gypsum wallboard with joints taped on occupied side, and fire-retardant plywood on construction operations side.
2. Construct dustproof partitions with 2 layers of 3 mil polyethylene sheet on each side. Cover floor with 2 layers of 3 mil polyethylene sheet, extending sheets 18 inches up the sidewalls. Overlap and tape full length of joints. Cover floor with fire-retardant plywood.
    a. Construct vestibule and airlock at each entrance through temporary partition with not less than 48 inches between doors. Maintain water-dampened foot mats in vestibule.
3. Insulate partitions to provide noise protection to occupied areas.
4. Seal joints and perimeter. Equip partitions with dustproof doors with exit device, closer and security locks.
5. Protect air-handling equipment.
6. Weather strip openings.
7. Provide walk-off mats at each entrance through temporary partition.

G. Temporary Fire Protection: Install and maintain temporary fire-protection facilities of types needed to protect against reasonably predictable and controllable fire losses. Comply with NFPA 241.

1. Prohibit smoking within 50 feet of all school property.
2. Supervise welding operations, combustion-type temporary heating units, and similar sources of fire ignition according to requirements of authorities having jurisdiction.
3. Develop and supervise an overall fire-prevention and protection program for personnel at Project site. Review needs with local fire department and establish procedures to be followed. Instruct personnel in methods and procedures. Post warnings and information.
4. Provide temporary standpipes and hoses for fire protection. Hang hoses with a warning sign stating that hoses are for fire-protection purposes only and are not to be removed. Match hose size with outlet size and equip with suitable nozzles.

3.5 OPERATION, TERMINATION, AND REMOVAL

A. Supervision: Enforce strict discipline in use of temporary facilities. To minimize waste and abuse, limit availability of temporary facilities to essential and intended uses.

B. Maintenance: Maintain facilities in good operating condition until removal.

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.

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: Remove each temporary facility when need for its service has ended, when it has been 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 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 property of Contractor. Owner reserves right to take possession of Project identification signs.
2. Remove temporary paving not intended for or acceptable for integration into permanent paving. Where area is intended for landscape development, remove soil and aggregate fill that do not comply with requirements for fill or subsoil. Remove materials contaminated with road oil, asphalt and other petrochemical compounds, and other substances that might impair growth of plant materials or lawns. Repair or replace street paving, curbs, and sidewalks at temporary entrances, as required by authorities having jurisdiction.
3. At Substantial Completion, clean and renovate permanent facilities used during construction period. Comply with final cleaning requirements specified in Division 01 Section "Closeout Procedures."

END OF SECTION 015000

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SECTION 017329 - CUTTING AND PATCHING

PART 1 - GENERAL

1.1 SUMMARY

A. This Section includes administrative and procedural requirements for cutting and patching.

B. Definition: "Cutting and patching" includes cutting into existing construction to provide for the installation or performance of other work and subsequent fitting and patching required to restore surfaces to their original condition, and does not apply to new construction procedures, except when new construction is already completed and must be cut and patched due to incorrect sequencing of work and/or improper coordination.

C. Multiple Prime Contracts: Provisions of this Section apply to the construction activities of each prime Contractor.

D. Related Sections: The following Sections contain requirements that relate to this Section:
   1. Division 1 Section "Coordination" for procedures for coordinating cutting and patching with other construction activities.
   2. Refer to other Sections for specific requirements and limitations applicable to cutting and patching individual parts of the Work.
      a. Requirements of this Section apply to mechanical and electrical installations. Refer to Division 15 and 16 Sections for other requirements and limitations applicable to cutting and patching mechanical and electrical installations.

1.2 RESPONSIBILITIES

A. General: Each Prime Contractor is responsible to perform cutting and patching for their portion of the Work. Patching work shall restore surfaces to original condition including paint, ceramic, tile, masonry, EIFS, VCT flooring, terrazzo flooring, gypsum wallboard ceilings and walls, etc. The requirements of this section apply to all Prime Contractors, even though certain items of work may be applicable to a specific Prime Contractor.

B. Cutting and patching of completed new construction required due to out of sequence construction and/or improper coordination is the responsibility of the prime Contractor responsible for the out of sequence construction or improper coordination. Cutting and patching of new construction for these purposes shall be accomplished by the Contractor for General Work and shall be paid for by the prime Contractor responsible. The Architect shall be the sole judge of the responsibility for such cutting and patching, and shall prepare change orders to delete monies from the Contract of the responsible prime Contractor and credit those monies to the Contractor for General Work.
   1. Contractor for General Work shall cooperate with Architect and other Contractors to accomplish this cutting and patching with minimal disruption to construction and at reasonable costs.

1.3 SUBMITTALS:

A. Cutting and Patching Proposal: Submit a plan describing procedures well in advance of the time cutting and patching will be performed if the Owner requires approval of these procedures before proceeding. Request approval to proceed. Include the following information, as applicable, in the proposal:

1. Describe the extent of cutting and patching required. Show how it will be performed and indicate why it cannot be avoided.

2. Describe anticipated results in terms of changes to existing construction. Include changes to structural elements and operating components as well as changes in the building's appearance and other significant visual elements.

3. List products to be used and firms or entities that will perform Work.

4. Indicate dates 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. Where cutting and patching involves adding reinforcement to structural elements, submit details and engineering calculations showing integration of reinforcement with the original structure.

7. Approval by the Architect to proceed with cutting and patching does not waive the Architect's right to later require complete removal and replacement of unsatisfactory work.

1.4 QUALITY ASSURANCE:

A. Requirements for Structural Work: Do not cut and patch structural elements in a manner that would 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 Limitations: Do not cut and patch operating elements or related components in a manner that would result in reducing their capacity to perform as intended. Do not cut and patch operating elements or related components in a manner that would result 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.

C. Visual Requirements: Do not cut and patch construction exposed on the exterior or in occupied spaces in a manner that would, in the Architect's opinion, reduce the building's aesthetic qualities. Do not cut and patch construction in a manner that would result in visual evidence of cutting and patching. Remove and replace construction cut and patched in a visually unsatisfactory manner.

1. If possible retain the original Installer 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. Processed concrete finishes.
   b. Stonework and stone masonry.
   c. Ornamental metal.
   d. Matched-veneer woodwork.
   e. Preformed metal panels.
   f. Firestopping.
   g. Window wall system.
   h. Stucco and ornamental plaster.
   i. Acoustical ceilings.
   j. Terrazzo.
   k. Finished wood flooring.
   l. Fluid-applied flooring.
   m. Carpeting.
   n. Aggregate wall coating.
   o. Wall covering.
   p. Swimming pool finishes

1.5 WARRANTY:

A. Existing Warranties: Replace, patch, and repair material and surfaces cut or damaged by methods and with materials in such a manner as not to void any warranties required or existing.

PART 2 - PRODUCTS

2.1 MATERIALS, GENERAL:

A. Use materials identical to existing materials. For exposed surfaces, use materials that visually match existing adjacent surfaces to the fullest extent possible if identical materials are unavailable or cannot be used. Use materials whose installed performance will equal or surpass that of existing materials.

PART 3 - EXECUTION

3.1 INSPECTION:

A. Examine surfaces to be cut and patched and conditions under which cutting and patching is to be performed before cutting. If unsafe or unsatisfactory conditions are encountered, take corrective action before proceeding.

1. Before proceeding, meet at the Project Site with parties involved in cutting and patching, including mechanical and electrical trades. Review areas of potential interference and conflict. Coordinate procedures and resolve potential conflicts before proceeding.

3.2 PREPARATION:

A. Temporary Support: Provide temporary support of work to be cut, including shoring, lumber, plywood, etc.

B. Protection: Protect existing construction during cutting and patching to prevent damage. Provide protection from adverse weather conditions for portions of the Project that might be exposed during cutting and patching operations.

C. Avoid interference with use of adjoining areas or interruption of free passage to adjoining areas.

D. Avoid cutting existing pipe, conduit, or ductwork serving the building but scheduled to be removed or relocated until provisions have been made to bypass them.

3.3 PERFORMANCE:

A. General: Employ skilled workmen 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 activities and the subsequent fitting and patching required to restore surfaces to their original condition.

B. Cutting: Cut existing construction using methods least likely to damage elements retained or adjoining construction. Where possible, review proposed procedures with the original Installer; comply with the original Installer's recommendations.

1. In general, where cutting, use hand or small power tools designed for sawing or 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. To avoid marring existing finished surfaces, cut or drill from the exposed or finished side into concealed surfaces.

3. Cut through concrete and masonry using a cutting machine, such as a Carborundum saw or a diamond-core drill. (Do not overcut.)

4. Comply with requirements of applicable Division 2 Sections where cutting and patching requires excavating and backfilling.

5. Where services are required to be removed, relocated, or abandoned, by-pass utility services, such as pipe or conduit, before cutting. Cut-off pipe or conduit in walls or

partitions to be removed. Cap, valve, or plug and seal the remaining portion of pipe or conduit to prevent entrance of moisture or other foreign matter after by-passing and cutting.

6. Existing electric and plumbing lines are located beneath floor areas. Contractor will trace out these items and proceed with caution so that existing utilities are not damaged by cutting / demolition.

C. Patching: Patch with durable seams that are as invisible as possible. Comply with specified tolerances.

1. Where feasible, inspect and test patched areas to demonstrate integrity of the installation.

2. 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. Where removing walls or partitions extends one finished area into another, patch and repair floor and wall surfaces in the new space. Provide an even surface of uniform color 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 smooth painted surface, extend final paint coat over entire unbroken surface containing the patch after the area has received primer and second coat.

4. Patch, repair, or re-hang existing ceilings as necessary to provide an even-plane surface of uniform appearance.

3.4 CLEANING:

A. Clean areas and spaces where cutting and patching are performed. Completely remove paint, mortar, oils, putty, and similar items. Thoroughly clean piping, conduit, and similar features before applying paint or other finishing materials. Restore damaged pipe covering to its original condition.

END OF SECTION 017329

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SECTION 017423 – CLEANING UP

PART 1 - GENERAL

1.1 Description of Work:

A. The work of this section relates to the following:

1. Maintain premises and public properties and roadways free from accumulations of waste, debris, dirt, mud and rubbish caused by operations.
2. At completion of work, remove waste materials, rubbish tools, equipment, machinery and surplus materials, and clean all sight exposed surfaces; leave project clean and ready for occupancy.
3. Remove all overspray caused by construction operations from adjacent construction, surfaces and vehicles.

B. Related Requirements Specified Elsewhere

1. Summary of work: Section 01 10 00
2. Cutting and Patching: Section 01 73 29
3. Cleaning for Specific Products or Work: the respective sections of the specifications:

1.2 Safety Requirements

A. Standards: Maintain project in accord with safety and insurance standards.

B. Hazard Control

1. Store volatile waste in covered metal containers and remove from premises daily.
2. Prevent accumulations of waste which create hazardous conditions.
3. Provide adequate ventilation during use of volatile or noxious substances.

C. Conduct cleaning and disposal operations to comply with local ordinances and anti-pollution laws.

1. Do not burn or bury rubbish and waste materials on project site.
2. Do not dispose of volatile waste such as mineral spirits, oil, or paint thinner in storm or sanitary drains.
3. Do not dispose of waste into streams or waterways.

PART 2 - PRODUCTS

2.1 Materials: Use only cleaning materials recommended by manufacturer of surface to be cleaned.

PART 3 - EXECUTION

3.1 During Construction Each Contract Shall:

A. Execute daily cleaning to ensure that building, grounds, and public properties and roadways are maintained free from accumulations of waste materials, rubbish, dirt and mud.

B. Wet down dry materials and rubbish to lay dust and prevent blowing dust. Erect dustproof barriers to keep dust from drifting through the building.

C. Each day, all contractors shall affect the following:

1. Areas of intense activity, such as cutting and sawing must be swept clean and reorganized at the end of each day.
2. Areas of moderate activity such as installation of plumbing, ductwork, electrical work must be returned to good order at the end of each day.
3. Debris below scaffolds (and shoring/re-shoring) must at all time, be kept sufficiently consolidated to keep walkways free of tripping hazards. These work areas must also be swept clean immediately upon removal of scaffolds.
4. All swept up debris, waste materials, and packing must be removed and placed in the dumpster by noon of the following workday.
5. All sorted material must be kept in good order.
6. As portions of the work are completed, all used and excess materials must be removed promptly.
7. Daily Clean-up and good housekeeping is the responsibility of each contractor individually and will be monitored by the Construction Manager.
8. Contractors shall promptly comply with requests to organize scatted materials.

D. Each contractor is responsible for furnishing all dumpsters or other such containers as required for collection, storage and legal disposal of all debris and rubbish resultant from the construction operation. The Construction Manager shall locate, maintain and move such containers as necessary and legally dispose of waste as containers are filled. Separate and recycle as required authorities and regulations.

E. Vacuum clean interior building areas when ready to receive finish painting, and continue vacuum cleaning on an as needed basis until building is ready for Substantial Completion or occupancy.

F. Handle materials in a controlled manner with as few handlings as possible; do not drop or throw materials from heights.

G. Schedule cleaning operations so that dust and other containment resulting from cleaning process will not fall on wet, newly painted surfaces.

3.2 FINAL CLEANING

A. Each Contractor Shall:

1. Employ experienced workmen, or professional cleaners, for final cleaning.
2. In preparation for substantial completion or occupancy, conduct final inspection of sight exposed interior and exterior surfaces, and of concealed spaces.
3. Remove grease, dust, dirt, stains, labels, fingerprints, and other foreign materials form sight-exposed interior and exterior finished surfaces; polish surface so designated to shine finish.
4. Maintain cleaning until project, or portion thereof, is occupied by owner.
5. Repair, patch and touch up marred surfaces to specified finish, to match adjacent surfaces.

B. General Work Contractor shall complete the following cleaning operations before requesting inspection for certification of Substantial Completion for entire Project or portion of Project:

1. Wash all transparent materials including mirrors and glass in doors and windows (inside and out).
2. Vacuum clean carpeting and epoxy flooring.
3. Wash & wax resilient tile floors.
4. Wash and polish all terrazzo and ceramic tile.
5. Dust/ clean all finished surfaces including casework, window sills, toilet partitions/ accessories, hardware, specialties, etc.
6. Restoration of any lawn areas disturbed by construction operations.

C. Mechanical Work Contractor shall complete the following cleaning operations before requesting inspection for certification of Substantial Completion for entire Project or portion of Project:
1. Restoration of any lawn areas disturbed by construction operations.
2. Replace disposable filters on HVAC units. Clean permanent air filters.
3. Clean ducts, blowers and coils if dusty/ soiled during construction process
4. Final clean surfaces of all HVAC equipment including dust, paint, taping compound, mortar droppings, etc. (Unit ventilators, unit heaters, convectors, fintube, diffusers/ grills, etc).

D. Electrical Work Contractor shall complete the following cleaning operations before requesting inspection for certification of Substantial Completion for entire Project or portion of Project:

1. Clean light fixtures, lamps, globes & reflectors. Replace burned out bulbs, noisy starters, etc.
2. Clean surfaces of all electrical equipment.

3.3 RECYCLING DEMOLITION AND CONSTRUCTION WASTE, GENERAL

A. General: Recycle paper and beverage containers used by on-site workers.

B. Procedures: Separate recyclable waste from other waste materials, trash, and debris. Separate recyclable waste by type.

1. Provide appropriately marked containers or bins for controlling recyclable waste until removed from Project site. Include list of acceptable and unacceptable materials at each container and bin.

2. Remove recyclable waste from Owner's property and transport to recycling receiver or processor.

3.4 RECYCLING DEMOLITION AND CONSTRUCTION WASTE

A. Recycle demolition and construction waste at local recycling centers where reasonable.

3.5 DISPOSAL OF WASTE

A. General: Except for items or materials to be salvaged, recycled, or otherwise reused, remove waste materials from Project site and legally dispose of them in a landfill or incinerator acceptable to authorities having jurisdiction.

B. Disposal: Remove waste materials from Owner's property and legally dispose of them.

END OF SECTION 017423

SECTION 01 77 00 - EXECUTION AND CLOSEOUT REQUIREMENTS

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

A. Drawings and general provisions of the Contract, including General and Supplementary Conditions and other Division 1 Specification Sections, apply to this Section.

1.2 SUMMARY

A. This Section includes administrative and procedural requirements for contract closeout including, but not limited to, the following:

1. Inspection procedures.
2. Project record document submittal.
3. Operation and maintenance manual submittal.
4. Submittal of warranties.
5. Final cleaning.

B. Closeout requirements for specific construction activities are included in the appropriate Sections.

C. Multiple Prime Contracts: Provisions of this Section apply to the construction activities of each Prime Contractor.

1.3 SUBSTANTIAL COMPLETION

A. Preliminary Procedures: Before requesting inspection for certification of Substantial Completion, complete the following. List exceptions in the request.

1. In the Application for Payment that coincides with, or first follows, the date Substantial Completion is claimed, show 100 percent completion for the portion of the Work claimed as substantially complete.

    a. Include supporting documentation for completion as indicated in these Contract Documents and a statement showing an accounting of changes to the Contract Sum.
    b. If 100 percent completion cannot be shown, include a list of incomplete items, the value of incomplete construction, and reasons the Work is not complete.

2. Advise the Owner of pending insurance changeover requirements.
3. Submit specific warranties, workmanship bonds, maintenance agreements, final certifications, and similar documents.
4. Obtain and submit releases enabling the Owner unrestricted use of the Work and access to services and utilities. Include occupancy permits, operating certificates, and similar releases.

5. Submit record drawings, maintenance manuals, final project photographs, damage or settlement surveys, property surveys, and similar final record information.
6. Deliver tools, spare parts, extra stock, and similar items.
7. Make final changeover of permanent locks and transmit keys to the Owner. Advise the Owner's personnel of changeover in security provisions.
8. Complete startup testing of systems and instruction of the Owner's operation and maintenance personnel. Discontinue and remove temporary facilities from the site, along with mockups, construction tools, and similar elements.
9. Complete final cleanup requirements, including touchup painting.
10. Touch up and otherwise repair and restore marred, exposed finishes.

B. Inspection Procedures: On receipt of a request for inspection, the Architect will either proceed with inspection or advise the Contractor of unfilled requirements. The Architect will prepare the Certificate of Substantial Completion following inspection or advise the Contractor of construction that must be completed or corrected before the certificate will be issued.

1. The Architect will repeat inspection when requested and assured that the Work is substantially complete.
2. Results of the completed inspection will form the basis of requirements for final acceptance.

1.4 FINAL ACCEPTANCE

A. Preliminary Procedures: Before requesting final inspection for certification of final acceptance and final payment, complete the following. List exceptions in the request.

1. Submit the final payment request with releases and supporting documentation not previously submitted and accepted. Include insurance certificates for products and completed operations where required.
2. Submit an updated final statement, accounting for final additional changes to the Contract Sum.
3. Submit a certified copy of the Architect's final inspection list of items to be completed or corrected, endorsed and dated by the Architect. The certified copy of the list shall state that each item has been completed or otherwise resolved for acceptance and shall be endorsed and dated by the Architect.
4. Submit final meter readings for utilities, a measured record of stored fuel, and similar data as of the date of Substantial Completion or when the Owner took possession of and assumed responsibility for corresponding elements of the Work.
5. Submit consent of surety to final payment.
6. Submit a final liquidated damages settlement statement.
7. Submit evidence of final, continuing insurance coverage complying with insurance requirements.

B. Re-inspection Procedure: The Architect will re-inspect the Work upon receipt of notice that the Work, including inspection list items from earlier inspections, has been completed, except for items whose completion is delayed under circumstances acceptable to the Architect.

1. Upon completion of re-inspection, the Architect will prepare a certificate of final acceptance. If the Work is incomplete, the Architect will advise the Contractor of Work that is incomplete or of obligations that have not been fulfilled but are required for final acceptance.

2. If necessary, re-inspection will be repeated, but may be chargeable to the Owner and back-chargeable to the Contractor in conditions within his control.

1.5 RECORD DOCUMENT SUBMITTALS

A. General: Do not use record documents for construction purposes. Protect record documents from deterioration and loss in a secure, fire-resistant location. Provide access to record documents for the Architect's reference during normal working hours.

B. Record Drawings: Maintain a clean, undamaged set of blue or black line white-prints of Contract Drawings and Shop Drawings. Mark the set to show the actual installation where the installation varies substantially from the Work as originally shown. Mark which drawing is most capable of showing conditions fully and accurately. Where Shop Drawings are used, record a cross-reference at the corresponding location on the Contract Drawings. Give particular attention to concealed elements that would be difficult to measure and record at a later date.

1. Mark record sets with red erasable pencil. Use other colors to distinguish between variations in separate categories of the Work.
2. Mark new information that is important to the Owner but was not shown on Contract Drawings or Shop Drawings.
3. Note related change-order numbers where applicable.
4. Organize record drawing sheets into manageable sets. Bind sets with durable-paper cover sheets; print suitable titles, dates, and other identification on the cover of each set.

C. Record Specifications: Maintain one complete copy of the Project Manual, including addenda. Include with the Project Manual one copy of other written construction documents, such as Change Orders and modifications issued in printed form during construction.

1. Mark these documents to show substantial variations in actual Work performed in comparison with the text of the Specifications and modifications.
2. Give particular attention to substitutions and selection of options and information on concealed construction that cannot otherwise be readily discerned later by direct observation.
3. Note related record drawing information and Product Data.
4. Upon completion of the Work, submit record Specifications to the Architect for the Owner's records.

D. Record Product Data: Maintain one copy of each Product Data submittal. Note related Change Orders and markup of record drawings and Specifications.

1. Mark these documents to show significant variations in actual Work performed in comparison with information submitted. Include variations in products delivered to the site and from the manufacturer's installation instructions and recommendations.
2. Give particular attention to concealed products and portions of the Work that cannot otherwise be readily discerned later by direct observation.
3. Upon completion of markup, submit complete set of record Product Data to the Architect for the Owner's records.

E. Record Sample Submitted: Immediately prior to Substantial Completion, the Contractor shall meet with the Architect and the Owner's personnel at the Project Site to determine which Samples are to be transmitted to the Owner for record purposes. Comply with the Owner's instructions regarding delivery to the Owner's Sample storage area.

F. Miscellaneous Record Submittals: Refer to other Specification Sections for requirements of miscellaneous record keeping and submittals in connection with actual performance of the Work. Immediately prior to the date or dates of Substantial Completion, complete miscellaneous records and place in good order. Identify miscellaneous records properly and bind or file, ready for continued use and reference. Submit to the Architect for the Owner's records.

G. Maintenance Manuals: 3 copies required. Organize operation and maintenance data into suitable sets of manageable size. Bind properly indexed data in individual, heavy-duty, 2-3 inch, 3-ring, vinyl-covered binders, with pocket folders for folded sheet information. Mark appropriate identification on front and spine of each binder. Include the following types of information:

1. Emergency instructions.
2. Spare parts list.
3. Copies of warranties.
4. Wiring diagrams.
5. Recommended "turn-around" cycles.
6. Inspection procedures.
7. Shop Drawings and Product Data.
8. Fixture lamping schedule.

H. Waivers, guarantees, certification letters, AIA documents, etc.: See checklist attachment at the end of this section

PART 2 - PRODUCTS (Not Used)

PART 3 - EXECUTION

3.1 CLOSEOUT PROCEDURES

A. Operation and Maintenance Instructions: Arrange for each Installer of equipment that requires regular maintenance to meet with the Owner's personnel to provide instruction in proper operation and maintenance. Provide instruction by manufacturer's representatives if installers are not experienced in operation and maintenance procedures. Include a detailed review of the following items:

1. Maintenance manuals.
2. Record documents.
3. Spare parts and materials.

4. Tools.

5. Lubricants.

6. Fuels.

7. Identification systems.

8. Control sequences.

9. Hazards.

10. Cleaning.

11. Warranties and bonds.

12. Maintenance agreements and similar continuing commitments.

B. As part of instruction for operating equipment, demonstrate the following procedures:

1. Startup.

2. Shutdown.

3. Emergency operations.

4. Noise and vibration adjustments.

5. Safety procedures.

6. Economy and efficiency adjustments.

7. Effective energy utilization.

C. Record "As-Built" Drawings

1. Upon completion of the work, and review of the record drawings by the Architect, prepare a final set of record drawings using reproducible mylar or vellum. Submit final set of transparencies to Architect.

2. The cost of furnishing above prints and preparing these record drawings shall be included in the contract price

3.2 FINAL CLEANING

A. General: The General Conditions require general cleaning during construction. Regular site cleaning is included in Division 1 Section “Temporary Facilities and Controls."

B. Cleaning: Employ experienced workers or professional cleaners for final cleaning. Clean each surface or unit to the condition expected in a normal, commercial building cleaning and maintenance program. Comply with manufacturer's instructions.

1. Complete the following cleaning operations before requesting inspection for certification of Substantial Completion.

    a. Remove labels that are not permanent labels.

    b. Clean transparent materials, including mirrors and glass in doors and windows. Remove glazing compounds and other substances that are noticeable vision-obscuring materials. Replace chipped or broken glass and other damaged transparent materials.

    c. Clean exposed exterior and interior hard-surfaced finishes to a dust-free condition, free of stains, films, and similar foreign substances. Restore reflective surfaces to their original condition. Leave concrete floors broom clean. Vacuum carpeted surfaces.

    d. Wipe surfaces of mechanical and electrical equipment. Remove excess lubrication and other substances. Clean plumbing fixtures to a sanitary condition. Clean light fixtures and lamps.

    e. Clean the site, including landscape development areas, of rubbish, litter, and other foreign substances. Sweep paved areas broom clean; remove stains, spills, and other foreign deposits. Rake grounds that are neither paved nor planted to a smooth, even-textured surface.

C. Pest Control: Engage an experienced, licensed exterminator to make a final inspection and rid the Project of rodents, insects, and other pests.

D. Removal of Protection: Remove temporary protection and facilities installed for protection of the Work during construction.

E. Compliance: Comply with regulations of authorities having jurisdiction and safety standards for cleaning. Do not burn waste materials. Do not bury debris or excess materials on the Owner's property. Do not discharge volatile, harmful, or dangerous materials into drainage systems. Remove waste materials from the site and dispose of lawfully.

    1. Where extra materials of value remain after completion of associated Work, they become the Owner's property. Dispose of these materials as directed by the Owner.

3.3 DEMONSTRATION AND TRAINING

A. Engage qualified instructors to instruct Owner's personnel to adjust, operate, and maintain systems, subsystems, and equipment not part of a system. Arrange for three separate days of training, each separated by a minimum of two weeks covering all systems and equipment. Include a detailed review of the following:

    1. Include instruction for basis of system design and operational requirements, review of documentation, emergency procedures, operations, adjustments, troubleshooting, maintenance, and repairs.

    2. All owner training sessions to be recorded to DVD by the contractor and shall be of sufficient quality to allow the DVD to serve as a training guide for new employees. Contractor will provide 3 copies of each DVD in their closeout submittal.

3.4 CLOSEOUT CHECKLIST

A. See attached checklist for required wage & supplements, lien release, guarantee / warranties, etc.

END OF SECTION 017700

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SECTION 01 77 01 - CHECKLIST FOR PROJECT CLOSEOUT AND PROCESSING OF FINAL PAYMENT

PART 1 - GENERAL

1.1 Final payment will not be processed until all items indicated are received in accordance with Section 01 77 00 - EXECUTION AND CLOSEOUT REQUIREMENTS.

1.2 Close-Out Submittals:

1. [ ] Wage & Supplements Verification Form from prime and subcontractors (copy attached).
2. [ ] Three (3) bound, hard cover, 3-ring binder brochures of Operation and Maintenance. Manuals for all equipment installed on the project:
3. [ ] Typed or printed instructions covering the care and operations of equipment and systems furnished and installed.
4. [ ] Manufacturers instruction books, diagrams, spare parts lists covering all equipment.
5. [ ] Instruction of Owner's Representative in care and maintenance of new equipment.
6. [ ] All approved shop drawings.
7. [ ] Certificates of compliance and inspection. (Where applicable - electric, elevator, etc.)
8. [ ] Spare parts and Maintenance Materials.
9. [ ] Evidence of compliance with requirements of governing authorities (Certificates of Inspection for Electrical).
10. [ ] Certificates of insurance for products and completed operations.
11. [ ] Notarized statement that only non-asbestos materials were installed on this project.
12. [ ] Fully executed certificate of substantial completion: AIA G734.
13. [ ] Contractor's written Two-year warranty and extended warranties (if any required).
14. [ ] Project Record Documents: Section 01 7700.
15. [ ] As-Built Drawings.

1.3 Evidence of Payments and Release of Liens:

1. [ ] Contractor's Affidavit of Payment of Debts and Claims: AIA G706.
2. [ ] Contractor's Affidavit of Release of Liens - AIA G706A with:
3. [ ] Separate written releases of waivers and liens for subcontractors, suppliers, and others with lien rights against the property of owner, together with a list of those parties – AIA G706A.
4. [ ] Contractor's written release or waiver of lien upon payment to the Contractor pursuant to New York State lien law.
5. [ ] Consent of Surety to Final Payment: AIA G707.

END OF SECTION 017701

Contractor Wage and Supplement Certification

I _____ am an officer

of_____ (Prime Contractor)

and I am duly authorized to make this affidavit for the Public Contract for the Nanuet Union Free School District.

That I fully comprehend the terms and provisions of section 220-1 of the Labor Law.

That I have been issued a copy of the schedule of Wages and Supplements, as specified in the project manual.

That I agree to pay the applicable Prevailing Wage and will pay or provide the supplements specified.

_____
Contractor

_____
Signature

_____
Print Name

_____
President

ACKNOWLEDGMENT:

STATE OF NEW YORK
COUNTY OF _____:SS.:

On this _____ day of _____, 20___before me personally came _____ to me known and known to me to be the person described in and who executed the foregoing instrument and acknowledged that he executed the same.

_____
Notary Public

_____
County

Nanuet Union Free School District

Subcontractor Wage and Supplement Certification

That I am an officer of _____ and am duly authorized to make

this affidavit on behalf of the Subcontract to _____

(Prime Contractor) on Public Contract for the Nanuet Union Free School District.

That I fully comprehend the terms and provisions of section 220-1 of the Labor Law.

That I have been issued a copy of the schedule of Wages and Supplements, as specified in the project manual.

That I agree to pay the applicable Prevailing Wage and will pay or provide the supplements specified.

_____ _____
Subcontractor Signature

_____
Print Name

_____
President

ACKNOWLEDGMENT:

STATE OF NEW YORK
COUNTY OF _____:SS.:

On this _____ day of _____, 20___before me personally came _____ to me known and known to me to be the person described in and who executed the foregoing instrument and acknowledged that he executed the same.

_____
Notary Public

_____
County

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SECTION 01 78 23 - OPERATION AND MAINTENANCE DATA

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. This 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. Maintenance manuals for the care and maintenance of products, materials, and finishes and systems and equipment.

1.3 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.

1.4 SUBMITTALS

A. Initial Submittal: Submit 2 draft copies of each manual at least 15 days before requesting inspection for Substantial Completion. Include a complete operation and maintenance directory. Architect will return one copy of draft and mark whether general scope and content of manual are acceptable.

B. Final Submittal: Submit four of each manual in final form at least 15 days before final inspection. Architect will return copy with comments within 15 days after final inspection.

1.5 COORDINATION

A. Where operation and maintenance documentation includes information on installations by more than one factory-authorized service representative, assemble and coordinate information furnished by representatives and prepare manuals.

PART 2 - PRODUCTS

2.1 OPERATION AND MAINTENANCE DOCUMENTATION DIRECTORY

A. Organization: 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 MANUALS, GENERAL

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: Enclose title page in transparent plastic sleeve. 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, address, and telephone number of Contractor.
6. Name and address of Architect.
7. 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.

1. Binders: Heavy-duty, 3-ring, vinyl-covered, loose-leaf binders, in thickness necessary to accommodate contents, sized to hold 8-1/2 by11 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. Indicate volume number for multiple-volume sets.
2. Dividers: Heavy-paper dividers with plastic-covered tabs for each section. 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 diskettes 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.
2. Performance and design criteria if Contractor is 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.
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 MANUAL

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.

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 MANUAL

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.

C. Manufacturers' Maintenance Documentation: Manufacturers' maintenance documentation including the following information for each component part or piece of equipment:

1. Standard printed 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 videotape, 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 Division 01 Section "Project Record Documents."

G. Comply with Division 01 Section "Closeout Procedures" for schedule for submitting operation and maintenance documentation.

END OF SECTION 017823

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SECTION 017836 - WARRANTIES

PART 1 - GENERAL

1.1 SUMMARY

A. This Section includes administrative and procedural requirements for warranties required by the Contract Documents, including manufacturer's standard warranties on products and special warranties.
   1. Refer to the General Conditions for terms of the Contractor's period for correction of the Work.
B. Related Sections: The following Sections contain requirements that relate to this Section:
   1. Division 1 Section "Submittals" specifies procedures for submitting warranties.
   2. Division 1 Section "Execution and closeout requirements" specifies contract closeout procedures.
   3. Divisions 2 through 33 Sections for specific requirements for warranties on products and installations specified to be warranted.
   4. Certifications and other commitments and agreements for continuing services to Owner are specified elsewhere in the Contract Documents.
C. Disclaimers and Limitations: Manufacturer's disclaimers and limitations on product warranties do not relieve the Contractor of the warranty on the Work that incorporates the products. Manufacturer's disclaimers and limitations on product warranties do not relieve suppliers, manufacturers, and subcontractors required to countersign special warranties with the Contractor.
D. Separate Prime Contracts: Each prime contractor is responsible for warranties related to its own contract.

1.2 DEFINITIONS

A. Standard product warranties are preprinted written warranties published by individual manufacturers for particular products and are specifically endorsed by the manufacturer to the Owner.
B. Special warranties are written warranties required by or incorporated in the Contract Documents, either to extend time limits provided by standard warranties or to provide greater rights for the Owner.

1.3 WARRANTY REQUIREMENTS

A. Related Damages and Losses: When correcting failed or damaged warranted construction, remove and replace construction that has been damaged as a result of such failure or must be removed and replaced to provide access for correction of warranted construction.
B. Reinstatement of Warranty: When Work covered by a warranty has failed and been corrected by replacement or rebuilding, reinstate the warranty by written endorsement. The reinstated warranty shall be equal to the original warranty with an equitable adjustment for depreciation.
C. Replacement Cost: Upon determination that Work covered by a warranty has failed, replace or rebuild the Work to an acceptable condition complying with requirements of the Contract Documents. The Contractor is responsible for the cost of replacing or rebuilding defective Work regardless of whether the Owner has benefited from use of the Work through a portion of its anticipated useful service life.
D. Owner's Recourse: Expressed warranties made to the Owner are in addition to implied warranties and shall not limit the duties, obligations, rights, and remedies otherwise available under the law. Expressed warranty periods shall not be interpreted as limitations on the time in which the Owner can enforce such other duties, obligations, rights, or remedies.

1. Rejection of Warranties: The Owner reserves the right to reject warranties and to limit selection to products with warranties not in conflict with requirements of the Contract Documents.

E. Where the Contract Documents require a special warranty, or similar commitment on the Work or part of the Work, the Owner reserves the right to refuse to accept the Work, until the Contractor presents evidence that entities required to countersign such commitments are willing to do so.

1.4 SUBMITTALS

A. Submit written warranties to the Architect prior to the date certified for Substantial Completion. If the Architect's Certificate of Substantial Completion designates a commencement date for warranties other than the date of Substantial Completion for the Work, or a designated portion of the Work, submit written warranties upon request of the Architect.
   1. When a designated portion of the Work is completed and occupied or used by the Owner, by separate agreement with the Contractor during the construction period, submit properly executed warranties to the Architect within 15 days of completion of that designated portion of the Work.

B. When the Contract Documents require the Contractor, or the Contractor and a subcontractor, supplier or manufacturer to execute a special warranty, prepare a written document that contains appropriate terms and identification, ready for execution by the required parties. Submit a draft to the Owner, through the Architect, for approval prior to final execution.
   1. Refer to Divisions 2 through 16 Sections for specific content requirements and particular requirements for submitting special warranties.

C. Form of Submittal: At Final Completion compile 2 copies of each required warranty properly executed by the Contractor, or by the Contractor, subcontractor, supplier, or manufacturer. Organize the warranty documents into an orderly sequence based on the table of contents of the Project Manual.

D. Bind warranties and bonds in heavy-duty, commercial-quality, durable 3-ring, vinyl-covered loose-leaf binders, thickness as necessary to accommodate contents, and sized to receive 8-1/2-by-11-inch(115-by-280-mm) paper.
   1. Provide heavy paper dividers with celluloid covered tabs for each separate warranty. Mark the 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 the Installer.
   2. Identify each binder on the front and spine with the typed or printed title "WARRANTIES," Project title or name, and name of the Contractor.
   3. When warranted construction requires operation and maintenance manuals, provide additional copies of each required warranty, as necessary, for inclusion in each required manual.

PART 2 - PRODUCTS (Not used)

PART 3 - EXECUTION (Not used)

END OF SECTION 017836

Request for Shutdown

PROJECT	Nanuet Union Free School District – Phase 5 Projects	**DATE**	
		CONTRACT NO.	
KSQ PROJ. # 2411001.00		**CONTRACT FOR**	

CONTRACTOR REQUEST		
Contractor Name:		
Foreman:		Emergency Phone:
Type (electrical, etc.):		
Area Affected (room, building, etc.):		
Reason for Shutdown:		
1) Date Requested	From Time:	To Time:
2) Date Requested	From Time:	To Time:
3) Date Requested	From Time:	To Time:
4) Date Requested	From Time:	To Time:
Send to: Jacobs, ATTN:		

OWNER'S REMARKS

Owner's Remarks:

Owner's Signature of Approval: _____ Date: _____

PLEASE NOTIFY ALL AFFECTED!

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Daily Report Cover

PROJECT Nanuet Union Free School District –Phase 5 Projects	**DATE** **CONTRACT NO.**
KSQ PROJ. # 2411001.00	**CONTRACT FOR**

	7:00 AM	Noon	3:30 PM
Temperature			
Weather			

PERSONNEL (list by trade or attach daily time sheet)

SUBCONTRACTORS / PERSONNEL

EQUIPMENT

Send to: Jacobs

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Two Week Look-Ahead Schedule

PROJECT	DATE
Nanuet Union Free School District – Phase 5 Projects	CONTRACT #
KSQ PROJ. # 2411001.00	WORK AREA

MONTH/YEAR _____

DATES											COMMENTS/NOTES

Send to: Jacobs

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Submittal Schedule

PROJECT: NANUET UNION FREE SCHOOL DISTRICT PHASE 5 PROJECTS

KSQ PROJ. # 2411001.00

SECTION	SUBMITTAL TYPE												DATE SUBMIT	DATE RETURN	ACTION	COMMENT
	Product Data	Shop Drawings	Samples	Certificates	Qualification Data	Test Reports	Pre-Install conference	Maintenance Data	Warranty	Inspection Report	O&M Data	Demo & Training				

SECTION 02 4100 – SELECTIVE DEMOLITION

PART 1 - GENERAL

SECTION INCLUDES

A. Selective demolition of building elements for alteration purposes.

1.1 SUMMARY

A. Section 01 1000 - Summary: Limitations on Contractor's use of site and premises.

B. Section 01 7700 - Execution and Closeout Requirements: Project conditions; protection of bench marks, survey control points, and existing construction to remain; reinstallation of removed products; temporary bracing and shoring.

1.2 REFERENCE STANDARDS

A. 29 CFR 1926 - U.S. Occupational Safety and Health Standards; current edition.

B. NFPA 241 - Standard for Safeguarding Construction, Alteration, and Demolition Operations; 2013.

1.3 SUBMITTALS

A. See Section 01 3300 - Administrative Requirements, for submittal procedures.

1.4 QUALITY ASURRANCE

A. Demolition Firm Qualifications: Company specializing in the type of work required.

PART 2 PRODUCTS

2.1 REPAIR MATERIALS

A. Use repair materials identical to existing materials. Where identical materials are unavailable or cannot be used for exposed surfaces, use materials that visually match existing adjacent surfaces to the fullest extent possible.

B. Use materials whose installed performance equals or surpasses that of existing materials.

PART 3 EXECUTION

3.1 GENERAL PROCEDURES AND PROJECT CONDITIONS

A. Comply with applicable codes and regulations for demolition operations and safety of adjacent structures and the public.

1. Obtain required permits.
2. Comply with applicable requirements of NFPA 241.
3. Use of explosives is not permitted.
4. Take precautions to prevent catastrophic or uncontrolled collapse of structures to be removed; do not allow worker or public access within range of potential collapse of unstable structures.
5. Provide, erect, and maintain temporary barriers and security devices.
6. Use physical barriers to prevent access to areas that could be hazardous to workers or the public.
7. Conduct operations to minimize effects on and interference with adjacent structures and occupants.
8. Do not close or obstruct roadways or sidewalks without permit.
9. Conduct operations to minimize obstruction of public and private entrances and exits; do not obstruct required exits at any time; protect persons using entrances and exits from removal operations.

B. Do not begin removal until receipt of notification to proceed from Owner.

C. Do not begin removal until built elements to be salvaged or relocated have been removed.

D. Protect existing structures and other elements that are not to be removed.

1. Provide bracing and shoring.
2. Prevent movement or settlement of adjacent structures.
3. Stop work immediately if adjacent structures appear to be in danger.

E. Minimize production of dust due to demolition operations; do not use water if that will result in ice, flooding, sedimentation of public waterways or storm sewers, or other pollution.

F. If hazardous materials are discovered during removal operations, stop work and notify Architect and Owner; hazardous materials include regulated asbestos containing materials, lead, PCB's, and mercury.

G. Perform demolition in a manner that maximizes salvage and recycling of materials.

1. Comply with requirements of Section 01 7419 - Waste Management.
2. Dismantle existing construction and separate materials.
3. Set aside reusable, recyclable, and salvageable materials; store and deliver to collection point or point of reuse.

3.2 EXISTING UTILITIES

A. Coordinate work with utility companies; notify before starting work and comply with their requirements; obtain required permits.

B. Protect existing utilities to remain from damage.

C. Do not disrupt public utilities without permit from authority having jurisdiction.

D. Do not close, shut off, or disrupt existing life safety systems that are in use without at least 7 days prior written notification to Owner.

E. Do not close, shut off, or disrupt existing utility branches or take-offs that are in use without at least 3 days prior written notification to Owner.

F. Locate and mark utilities to remain; mark using highly visible tags or flags, with identification of utility type; protect from damage due to subsequent construction, using substantial barricades if necessary.

G. Remove exposed piping, valves, meters, equipment, supports, and foundations of disconnected and abandoned utilities.

H. Prepare building demolition areas by disconnecting and capping utilities outside the demolition zone; identify and mark utilities to be subsequently reconnected, in same manner as other utilities to remain.

3.3 SELECTIVE DEMOLITION FOR ALTERATIONS

A. Drawings showing existing construction and utilities are based on casual field observation and existing record documents only.

1. Verify that construction and utility arrangements are as shown.
2. Report discrepancies to Architect before disturbing existing installation.
3. Beginning of demolition work constitutes acceptance of existing conditions that would be apparent upon examination prior to starting demolition.

B. Separate areas in which demolition is being conducted from other areas that are still occupied.

1. Provide, erect, and maintain temporary dustproof partitions of construction specified in Section 01 5000 in locations indicated on drawings.

C. Remove existing work as indicated and as required to accomplish new work.

1. Remove items indicated on drawings.

D. Services (Including but not limited to HVAC, Plumbing, Fire Protection, Electrical, and Telecommunications): Remove existing systems and equipment as indicated.

1. Maintain existing active systems that are to remain in operation; maintain access to equipment and operational components.
2. Where existing active systems serve occupied facilities but are to be replaced with new services, maintain existing systems in service until new systems are complete and ready for service.
3. Verify that abandoned services serve only abandoned facilities before removal.
4. Remove abandoned pipe, ducts, conduits, and equipment, including those above accessible ceilings; remove back to source of supply where possible, otherwise cap stub and tag with identification.

E. Protect existing work to remain.

1. Prevent movement of structure; provide shoring and bracing if necessary.
2. Perform cutting to accomplish removals neatly and as specified for cutting new work.
3. Repair adjacent construction and finishes damaged during removal work.
4. Patch as specified for patching new work.

3.4 DEBRIS AND WASTE REMOVAL

A. Remove debris, junk, and trash from site.

B. Remove from site all materials not to be reused on site; comply with requirements of Section 01 7419 - Waste Management.

C. Leave site in clean condition, ready for subsequent work.

D. Clean up spillage and wind-blown debris from public and private lands.

END OF SECTION

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SECTION 03 30 01 – CAST-IN-PLACE CONCRETE

PART 1 - GENERAL

1.1 SUMMARY

A. This Section includes:

1. Concrete formwork, reinforcing steel, and cast-in-place concrete, for concrete foundation walls and footings.

1.2 SUBMITTALS

A. Product Data: Manufacturer's name, specifications, and installation instructions, for each item specified.

B. Steel Reinforcement Shop Drawings: Details of fabrication, bending, and placement, prepared according to ACI 315, "Details and Detailing of Concrete Reinforcement." Include material, grade, bar schedules, stirrup spacing, bent bar diagrams, arrangement, and supports of concrete reinforcement. Include special reinforcement required for openings through concrete structures.

C. Construction Joint Layout: Indicate proposed construction joints required to construct the structure.

D. Location of construction joints is subject to approval of the Engineer.

E. Design Mixes: For each concrete mix. Include alternate mix designs when characteristics of materials, project conditions, weather, test results, or other circumstances warrant adjustments.

1. Indicate amounts of mix water to be withheld for later addition at Project site.

F. Material Certificates: Signed by manufacturers certifying that each of the following items complies with requirements:

1. Cementitious materials and aggregates.
2. Admixtures.
3. Curing materials.

4. Bonding agents.
5. Adhesives.
6. Repair materials.

1.3 REFERENCES

A. Comply with ACI 301-89 for all Work of this Section, unless otherwise indicated on the Contract Drawings or herein specified.

B. New York State Department of Transportation Standard Specifications for Construction and Materials, Latest Edition.

1.4 QUALITY ASSURANCE

A. Installer Qualifications: An experienced installer who has completed concrete Work similar in material, design, and extent to that indicated for this Project and whose work has resulted in construction with a record of successful in-service performance.

B. Manufacturer Qualifications: A firm experienced in manufacturing ready-mixed concrete products complying with ASTM C 94 requirements for production facilities and equipment.

1. Testing Agency Qualifications: An independent agency, acceptable to authorities having jurisdiction, qualified according to ASTM C 1077 and ASTM E 329 for testing indicated.
2. Personnel conducting field tests shall be qualified as ACI Concrete Field Testing Technician, Grade 1, according to ACI CP-1 or an equivalent certification program.
3. Personnel performing laboratory tests shall be ACI-certified Concrete Strength Testing Technician and Concrete Laboratory Testing Technician, Grade I. Testing agency laboratory supervisor shall be an ACI-certified Concrete Laboratory Testing Technician, Grade II.

C. Source Limitations: Obtain each type or class of cementitious material of the same brand from the same manufacturer's plant, each aggregate from one source, and each admixture from the same manufacturer.

1.5 FIELD CONDITIONS

A. Cold-Weather Placement: Comply with ACI 306.1 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.

B. Hot-Weather Placement: Comply with ACI 301 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.

PART 2 - PRODUCTS

2.1 MATERIALS

A. Prefabricated metal-framed plywood matched, tight fitting, stiffened to support weight of concrete.

B. Reinforcing Steel: ASTM A615, Grade60; deformed billet steel bars.

1. Joint Dowel Bars: ASTM A 615, Grade 60 plain-steel bars. Cut bars true to length with ends square and free of burrs.

C. Chairs, Bolsters, Bar Supports, and Spacers: Sized and shaped for support of reinforcing.

D. Cast-In-Place Concrete: Normal weight, air entrained concrete with a minimum compressive strength of 4,000 PSI at the end of 28 days.

1. Design Air Content: ASTM C-260, and on the NYSDOT's current "Approved List"; 6% by volume, 1.5% +/-. Entrained air shall be provided by use of an approved air-entraining admixture.
2. Cement: ASTM C-150 Type I or II Portland cement.
3. Normal-Weight Aggregates: ASTM C 33, uniformly graded. Provide aggregates from a single source.
    a. Maximum Coarse-Aggregate Size: 3/4 inches nominal.
    b. Fine Aggregate: Free of materials with deleterious reactivity to alkali in cement
4. Water: Potable.
5. Slump: Between 2 and 4 inches; except when a water-reducing admixture is used maximum slump shall be 6 inches and when a high range water reducing admixture is used maximum slump shall be 8 inches.
6. Water-reducing Admixture: ASTM C-494 Type A and on the NYSDOT's current "Approved List".
7. High Range Water-reducing Admixture: ASTM C-494 Type F and on the NYSDOT's current "Approved List".

E. Concrete Sealer:

1. Surebond/Safebond SB-7000 clear concrete sealer or equivalent for sidewalks.
2. Non-water based penetrating type protective sealer which is on the NYSDOT Material List for concrete pavement.

F. Concrete Hardener and Dustproofer: Magnesium-flurosilicate concrete hardener and dustproofer that bonds chemically with the concrete.

1. Lapidolith by Sonneborn Building Products, Chemrex, Inc., 889 Valley Park Dr., Shakopee, MN 55379, (800) 433-9517, or approved equivalent.

G. Fabric Reinforcement: 6 inch x 6 inch – W2.9 x W2.9, ASTM A-185, welded wire fabric, fabricated into flat sheets.

H. Closed Cell Polyethylene Foam Joint Filler: For use around penetrations. Flexible, chemical resistant, non-bleeding, non-staining, “strip-off” edge, by A.H. Harris & Sons, Inc. or approved equivalent.

I. Fiber Expansion Joint Filler: Resilient, flexible, non-extruding joint compound composed of cellular fibers securely bonded together and uniformly saturated with asphalt, by A.H. Harris & Sons, Inc. or approved equivalent.

J. Bedding: NYSDOT Subbase Course Type 2. See Section 312000 – “Excavation and Fill.”

K. Chamfer Strips: Wood, metal, PVC or rubber; one inch chamfer, unless stated otherwise in Construction Documents.

L. Epoxy Bonding Agent (Adhesive): 100 percent solids epoxy-resin-base bonding compound, complying with ASTM C 881, Types I, II, IV and V, Grade 2 (horizontal areas) or Grade 3 (overhead/vertical areas), and Class B (40-60 degrees Fahrenheit) or Class C (60 degree Fahrenheit and above).

1. SurePoxy HM Series by Kaufman Products, Inc., 3811 Curtis Avenue, Baltimore, MD 21226, (800) 637-6372.
2. Sikadur Hi-Mod 32 by Sika Corporation, 201 Polito Avenue, Lyndhurst, NJ 07071, (800) 933-7452.
3. Epogrip by Sonneborn/ BASF Building Systems, 889 Valley Park Drive, Shakopee, MN 55379, (800) 433-9517.
4. Approved Equal.

2.2 PRODUCTION (Amendments to ACI 301, Chapter 7):

A. Provide ready-mixed concrete, either central-mixed or truck-mixed.

PART 3 - EXECUTION

3.1 FORMWORK INSTALLATION

A. Design, construct, erect, brace, and maintain formwork according to ACI 301.

3.2 EMBEDDED ITEM INSTALLATION

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.

3.3 STEEL REINFORCEMENT INSTALLATION

A. Comply with CRSI's "Manual of Standard Practice" for fabricating, placing, and supporting reinforcement.

3.4 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 Engineer.

3.5 CONCRETE PLACEMENT

A. Comply with ACI 301 for placing concrete.

B. Before test sampling and placing concrete, water may be added at Project site, subject to limitations of ACI 301.

C. Consolidate concrete with mechanical vibrating equipment according to ACI 301.

3.6 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 exceeding 1/2 inch.

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 defective areas. Remove fins and other projections exceeding 1/8 inch.

1. Apply to concrete surfaces exposed to public view, to receive a rubbed finish.

C. Rubbed Finish: Apply the following rubbed finish, defined in ACI 301, to smooth-formed-finished as-cast concrete where indicated:

1. Smooth-rubbed finish.
2. Grout-cleaned finish.
3. Cork-floated finish.

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.

3.7 FINISHING UNFORMED SURFACES

A. General: Comply with ACI 302.1R for screening, restraightening, and finishing operations for concrete surfaces. Do not wet concrete surfaces.

3.8 CONCRETE PROTECTING AND CURING

A. General: Protect freshly placed concrete from premature drying and excessive cold or hot temperatures. Comply with ACI 306.1 for cold-weather protection and with ACI 301 for hot-weather protection during curing.

B. Evaporation Retarder: Apply evaporation retarder to 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. Begin curing after finishing concrete but not before free water has disappeared from concrete surface.

D. Curing Methods: Cure formed and unformed concrete for at least seven days 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.
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.

3.9 FIELD QUALITY CONTROL

A. Testing Agency: Owner will engage a qualified testing agency to perform tests and inspections.

B. Inspections:

1. Steel reinforcement placement in accordance with ACI 318 Sections 3.5 and 7.1-7.7.
2. Verification of use of required design mixture.
3. Concrete placement, including conveying and depositing in accordance with ACI 318 Sections 5.9 and 5.10
4. Curing procedures and maintenance of curing temperature.
5. Verification of concrete strength before removal of shores and forms in accordance with ASTM C39.

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.
   a. When frequency of testing provides fewer than five compressive-strength tests for each concrete mixture, testing shall be conducted from at least five randomly selected batches or from each batch if fewer than five are used.

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; 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 or 80 deg F and above, and one test for each composite sample.
5. Compression Test Specimens: ASTM C 31.
   a. Cast and laboratory cure cylinder specimens for each composite sample.

6. Compressive-Strength Tests: ASTM C 39; at a minimum 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.

7. 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.

8. Test results shall be reported in writing to Owner and Engineer, 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.
9. Nondestructive Testing: Impact hammer, sonoscope, or other nondestructive device may be permitted by Engineer but will not be used as sole basis for approval or rejection of concrete.
10. 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 Engineer. The cost for the additional testing shall be borne by the Contractor. 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 Engineer.
11. Additional testing and inspecting, at Contractor's expense, will be performed to determine compliance of replaced or additional work with specified requirements.
12. Correct deficiencies in the Work that test reports and inspections indicate do not comply with the Contract Documents.

D.

END OF SECTION

SECTION 03 54 00 - SELF-LEVELING TOPPINGS

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

A. Drawings and general provisions of Contract, including General and Supplementary Conditions and Division 1 General Requirments, apply to this Section.

1.2 SUMMARY

A. This Section includes floor patching / leveling over existing substrates to provide a smooth floor surface on interior surfaces only.

1.3 REFERENCES

A. ASTM C 109M, Compressive Strength Air-Cure Only

B. ASTM C348, Flexural Strength of Hydraulic-Cement Mortars

C. ASTM E84, Surface Burning Characteristics of Building Materials

D. ASTM F2170, Relative Humidity in Concrete Floor Slabs Using in situ Probes

E. ASTM F1869, Moisture Vapor Emission Rate of Concrete Subfloor Using Anhydrous Calcium Chloride

F. ASTM 710 - Standard Practice for Preparing Concrete Floors to Receive Resilient Flooring

1.4 SUBMITTALS

A. Furnish product data, samples, laboratory test reports, and materials certificates as specified in Section "Resilient Tile Flooring."

1.5 QUALITY ASSURANCE

A. Perform work in accordance with ACI 301.

B. Maintain copy of manufacturer’s installation instructions on site, with criteria for preparation and application.

PART 2 - PRODUCTS

3.1 MANUFACTURERS

A. Available Manufacturers: Subject to compliance with requirements, manufacturers offering pre-packaged topping mixes that may be incorporated in the Work include, but are not limited to, the following:

1. K-15, Ardex Inc.
2. Mapei Novaplan II .
3. Other products equal to above.

B. Design mix to produce topping material with the following characteristics:

1. Compressive strength: Minimum 4000 psi at 28 days.

C. Absolutely no gypsum based products will be allowed on the project.

3.2 MIXING

A. Site-mix per-packaged materials in accordance with manufacturer's instructions.

B. Mix to a consistency to achieve self-leveling.

C. Do not add water unless otherwise instructed, in writing, in the manufacturer's installation instructions and approved by the Architect.

D. Do not add additional aggregate unless otherwise instructed, in writing, in the manufacturer's installation instructions for extending.

PART 3 - EXECUTION

3.1 CONDITION OF SURFACES

A. Topping Applied to Hardened Concrete: Remove exiting floor finishes as required. Remove dirt, loose material, oil, grease, paint, or other contaminants, leaving a clean surface. Remove high points and projections from concrete.

B. Non-porous subfloors such as ceramic and quarry tile as well as terrazzo should be clean and free of all waxes and sealers.

C. Joints: Mark locations of joints in base slab so that joints in top course will be placed directly over them.

3.2 PLACING AND FINISHING

A. Apply products in accordance with manufacturer's instructions on floor surfaces. Do not proceed with installation until unsatisfactory conditions are corrected. Screed level in accordance with following tolerances:

1. Tolerances: Maximum variation of surface flatness shall not exceed 1/8 inch in 10 feet.

B. Steel trowel any surfaces which are scheduled to receive ceramic tile or to be exposed.

C. Coordinate installation with adjacent work to ensure proper sequence of construction. Protect adjacent areas from contact due to mixing and handling of materials.

3.3 CURING AND PROTECTION

A. Cure and protect topping applications and finishes in accordance with manufacturer's recommendations.

3.4 PERFORMANCE

A. Failure of concrete topping to bond to substrate (as evidenced by a hollow sound when tapped), or disintegration or other failure of topping to perform as a floor finish, will be considered failure of materials and workmanship. Repair or replace toppings in areas of such failures, as directed.

3.5 WASTE MANAGEMENT

A. Coordinate with Section 017423.

1. Separate and recycle cut-offs and waste materials and material packaging in accordance with Waste Management Plan and to the maximum extent economically feasible and place in designated areas for recycling.
2. Set aside and protect materials suitable for reuse and/or remanufacturing.
3. Separate and fold up metal banding; flatten and place along with other metal scrap for recycling in designated area.

END OF SECTION 03 54 00

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SECTION 04 01 20 - MAINTENANCE AND RESTORATION OF BRICK 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. The work of this Section consists of the provision of all plant, materials, labor and equipment and the like necessary and/or required for the complete execution of all maintenance and restoration of unit masonry consisting of brick masonry restoration, re-pointing and cleaning as required by this section, schedules, keynotes and drawings, including, but not limited to the following:

1. Unused anchor removal.
2. Repair cracked brickwork in which cracks extend more than three courses by removing cracked brick, all mortar from around cracked brick, and mortar from joints in which mortar is cracked and providing salvaged brick set in new mortar.
3. Repair cracked brickwork in which cracks extend no more than three courses by filling cracks with composite patching mortar.
4. Painting steel uncovered during the work.
5. Restoration mortars and re-pointing joints.
6. Rake cracks through mortal' joints and brick units and provide sealant.
7. Preliminary cleaning, including removing plant growth.
8. Anti-graffiti coating.
9. Cleaning exposed unit masonry surfaces.

B. Related Sections:
1. Division 04 Section “Restoration Mortars.”
2. Division 07 Section “Joint Sealants.”

1.3 DEFINITIONS

A. Very Low-Pressure Spray: Under 100 psi.

B. Low-Pressure Spray: 100 to 400 psi; 4 to 6 gpm.

C. Medium-Pressure Spray: 400 to 800 psi; 4 to 6 gpm.

D. High-Pressure Spray: 800 to 1200 psi; 4 to 6 gpm.

E. Saturation Coefficient: Ratio of the weight of water absorbed during immersion in cold water to weight absorbed during immersion in boiling water; used as an indication of resistance of masonry units to freezing and thawing.

1.4 ACTION SUBMITTALS

A. Product Data: For each type of product indicated. Include recommendations for application and use. Include test data substantiating that products comply with requirements.

B. Shop Drawings: For the following:

1. Provisions for expansion joints or other sealant joints.
2. Provisions for flashing, lighting fixtures, conduits, and weep holes as required.
3. Replacement and repair anchors. Include details of anchors within individual masonry units, with locations of anchors and dimensions of holes and recesses in units required for anchors.

C. Samples for Initial Selection: For the following:

1. Pointing Mortar: Submit sets of mortar for pointing in the form of sample mortar strips, 6 inches long by 1/4 inch wide, set in aluminum or plastic channels.
    a. Submit with precise measurements on ingredients, proportions, gradations, and sources of colored sands from which each Sample was made.
2. Patching Compound: Submit sets of patching compound Samples in the form of plugs (patches in drilled holes) in sample units of masonry representative of the range of masonry colors on the building.
3. Sealant Materials: See Division 07 Section "Joint Sealants."
4. Include similar Samples of accessories involving color selection.

D. Samples for Verification: For the following:

1. Each type of sand used for pointing mortar; minimum 1 lb of each in plastic screw-top jars.
    a. For blended sands, provide Samples of each component and blend.
    b. Identify sources, both supplier and quarry, of each type of sand.
2. Each type, color, and texture of pointing mortar in the form of sample mortar strips, 6 inches long by 3/8” wide, set in aluminum or plastic channels.
    a. Include with each Sample a list of ingredients with proportions of each. Identify sources, both supplier and quarry, of each type of sand and brand names of cementitious materials and pigments if any.
3. Each type of masonry patching compound in the form of briquettes, at least 3 inches long by 1-1/2 inches wide. Document each Sample with manufacturer and stock number or other information necessary to order additional material.
4. Sealant Materials: See Division 07 Section "Joint Sealants."
5. Accessories: Each type of anchor, accessory, and miscellaneous support.

1.5 INFORMATIONAL SUBMITTALS

A. Qualification Data: Qualification data for firm and personnel specified in “Quality Assurance” Article that demonstrates that both firm and personnel have capabilities and experience complying with requirements specified. For firm and foreman, provide a list of at least five completed projects similar in size and scope to the work required on this Project. For each project list project name, address, architect, conservator (if applicable), scope of contractor’s work, and other relevant information. Submit this information with the bid.

B. Quality-Control Program.

C. Restoration Program.

D. Cleaning Program.

1.6 QUALITY ASSURANCE

A. Restoration Specialist Qualifications: Award brick masonry restoration to a firm regularly engaged in restoration of brick masonry that can demonstrate to Owner's satisfaction that, within previous ten years, firm has successfully performed and completed in a timely manner at least five projects similar in scope and type to work required on this Project Retain first subparagraph below if required or customary in Project area. Firms often specialize in and compete for either masonry repair or cleaning work, and they typically have different crews for each.

1. Field Supervision: Brick masonry restoration shall be directly supervised by a full-time foreman with experience equal to or greater than that required of Masonry Restoration Specialist. Foreman shall read and speak English fluently. Foreman shall be on site daily for duration of work of this Section. Same foreman shall remain on Project throughout work unless his performance is deemed unacceptable. Restoration specialist firms shall maintain experienced full-time supervisors on Project site during times that clay masonry restoration and cleaning work is in progress.
2. Restoration Worker Qualifications: Brick masonry restoration shall be carried out by a steady crew of skilled mechanics who are thoroughly experienced with restoration of brick masonry and materials and methods specified and have a minimum of three years' experience with work on buildings similar to that required by this Section. In acceptance or rejection of work of this Section, no allowance will be made for workers' incompetence or lack of skill.
    a. When masonry units are being patched, assign at least one worker among those performing patching work who is trained and certified by manufacturer of patching compound to apply its products.

B. Source Limitations: Obtain each type of material for masonry restoration (face brick, cement, sand, etc.) from one source with resources to provide materials of consistent quality in appearance and physical properties.

C. Quality-Control Program: Prepare a written quality-control program for this Project to systematically demonstrate the ability of personnel to properly follow methods and use materials and tools without damaging masonry. Include provisions for supervising performance and preventing damage due to worker fatigue.

D. Restoration Program: Prepare a written, detailed description of materials, methods, equipment, and sequence of operations to be used for each phase of restoration work including protection of surrounding materials and Project site.

1. Include methods for keeping pointing mortar damp during curing period.
2. If materials and methods other than those indicated are proposed for any phase of restoration work, add to the Quality-Control Program a written description of such materials and methods, including evidence of successful use on comparable projects, and demonstrations to show their effectiveness for this Project and worker's ability to use such materials and methods properly.

E. Cleaning Program: Prepare a written cleaning program that describes cleaning process in detail, including materials, methods, and equipment to be used, protection of surrounding materials, and control of runoff during operations.

1. If materials and methods other than those indicated are proposed for any phase of restoration work, add to the Quality-Control Program a written description of such materials and methods, including evidence of successful use on comparable projects, and demonstrations to show their effectiveness for this Project and worker's ability to use such materials and methods properly.

F. Cleaning and Repair Appearance Standard: Cleaned and repaired surfaces are to have a uniform appearance as viewed from 20 feet away by Architect. Perform additional paint and stain removal, general cleaning, and spot cleaning of small areas that are noticeably different, so that surface blends smoothly into surrounding areas.

G. Mockups: Prepare mockups of restoration and cleaning to demonstrate aesthetic effects and set quality standards for materials and execution and for fabrication and installation.

1. Masonry Repair: Prepare sample areas for each type of masonry material indicated to have repair work performed. If not otherwise indicated, size each mockup not smaller than 2 adjacent whole units or approximately 48 inches in least dimension. Demonstrate quality of materials, workmanship, and ability to blend with existing work. Include the following as a minimum:

   a. Replacement:
      1) Four brick units replaced.
   b. Patching: Three small holes at least 1 inch in diameter as directed for each type of masonry material indicated to be patched, so as to leave no evidence of repair.
2. Re-pointing: Rake out joints in 2 separate areas, each approximately 36 inches by 48 inches wide for each type of re-pointing required and re-point one of the areas.
3. Cleaning: Clean an area approximately 25 sq. ft. as indicated for each type of masonry and surface condition.
4. Approval of mockups does not constitute approval of deviations from the Contract Documents contained in mockups unless Architect specifically approves such deviations in writing.
5. Approved mockups may become part of the completed Work if undisturbed at time of Substantial Completion.

H. Pre-installation Conference: Conduct conference at Project site.

1. Review methods and procedures related to masonry restoration and cleaning including, but not limited to, the following:
   a. Construction schedule. Verify availability of materials, Restoration Specialist's personnel, equipment, and facilities needed to make progress and avoid delays.
   b. Materials, material application, sequencing, tolerances, and required clearances.

1.7 REFERENCE STANDARDS

A. Work of this Section shall comply with applicable requirements and recommendations of latest editions of the documents listed herein, except as modified by more stringent requirements of the Contract Documents and of applicable laws, codes, and regulations of authorities having jurisdiction. Where the language in any of the documents referred to herein is in the form of a recommendation or suggestion, such recommendations or suggestions shall be deemed to be mandatory under this Contract unless specifically indicated otherwise in Contract Documents. Provide a reference copy of each of the following standards at Project site during all periods when work of this Section is being performed. In each case in which there is a conflict between requirements of referenced standards; requirements of laws, codes, and regulations; and requirements of this Section, the most stringent or restrictive requirement shall govern.

1. ASTM International (ASTM)

a. ASTM A 276, Standard Specification for Stainless Steel Bars and Shapes.
b. ASTM A 580, Standard Specification for Stainless Steel Wire.
c. ASTM A 666, Standard Specification for Annealed or Cold' Worked Austenitic Stainless Steel Sheet, Strip, Plate, and Flat Bar.
d. ASTM A 780, Standard Practice for Repair of Damaged and Uncoated Areas of Hot-Dip Galvanized Coatings.
e. ASTM A 951, Standard Specification for Masonry Joint Reinforcement.
f. ASTM C 62, Standard Specification for Building Brick.
g. ASTM C 67, Standard Test Methods for Sampling and Testing Brick and Structural Clay Tile.
h. ASTM C 216, Standard Specification for Facing Brick.

1.8 DELIVERY, STORAGE, AND HANDLING

A. Deliver materials to Project site in manufacturer's original and unopened containers, labeled with manufacturer's name and type of products.

B. Store cementitious materials on elevated platforms, under cover, and in a dry location. Do not use cementitious materials that have become damp.

C. Store hydrated lime in manufacturer's original and unopened containers. Discard lime if containers have been damaged or have been opened for more than two days.

D. Store lime putty covered with water in sealed containers.

E. Store sand where grading and other required characteristics can be maintained and contamination avoided.

1.9 PROJECT CONDITIONS

A. Weather Limitations: Proceed with installation only when existing and forecasted weather conditions permit masonry restoration and cleaning work to be performed according to manufacturers' written instructions and specified requirements.

B. Repair masonry units and re-point mortar joints only when air temperature is between 40 and 90 deg F and is predicted to remain so for at least 7 days after completion of the Work unless otherwise indicated. Do not use any material in brick masonry restoration work unless air and masonry temperatures arc within range recommended by material manufacturer or specified herein. In case of conflict, the most restrictive requirement shall govern.

C. Cold-Weather Requirements: Comply with the following procedures for masonry repair and mortar-joint pointing unless otherwise indicated:
1. When air temperature is below 40 deg F heat mortar ingredients, masonry repair materials, and existing masonry walls to produce temperatures between 40 and 120 deg F
2. When mean daily air temperature is below 40 deg F provide enclosure and heat to maintain temperatures above 32 deg F within the enclosure for 7 days after repair and pointing.
3. Damage Caused by Freezing: Remove brick masonry restoration work determined by
4. Architect to have been damaged by freezing conditions. Replace work to comply with requirements of this Section.

D. Hot-Weather Requirements: Protect masonry repair and mortar-joint pointing when temperature and humidity conditions produce excessive evaporation of water from mortar and repair materials. Provide artificial shade and wind breaks and use cooled materials as required

to minimize evaporation. Do not apply mortar to substrates with temperatures of 90 deg F and above unless otherwise indicated.

E. Use of Epoxy Patching Adhesive: Apply epoxy patching adhesive only when temperature of brick to be patched, temperature of air, and temperature of patching adhesive are between 50 deg F and 85 deg F or range recommended for use by adhesive manufacturer, whichever is more restrictive.

F. Contract Drawings

1. The Drawings are two-dimensional representations of three-dimensional objects and do not show all surfaces. Perform work on all surfaces of projections, reveals, returns, and other elements and surfaces associated with areas on which work is indicated.
2. Where elements interface with existing work or work that is in place, field measure dimensions of existing and in-place elements before preparing shop drawings or beginning work.

G. For manufactured repair materials, perform work within the environmental limits set by each manufacturer.

H. Clean masonry surfaces only when air temperature is 40 deg F and above and is predicted to remain so for at least 7 days after completion of cleaning.

1.10 COORDINATION

A. Coordinate masonry restoration and cleaning with public circulation patterns at Project site. Some work is near public circulation patterns Public circulation patterns cannot be closed off entirely, and in places can be only temporarily redirected around small areas of work. Plan and execute the Work accordingly.

B. Access for Observation and Approvals: Provide Architect access on a continuing basis to locations on which mock-ups are being carried out, on which work is ongoing, and where work has been completed to allow for observation and approvals. Provide pipe scaffolding and manpower to move, alter, and reconfigure scaffolding and planking; personnel lift and manpower to operate lift; or other means of access complying with all laws and regulations regarding safety and acceptable to Architect. Provide manpower and equipment to facilitate observation and approvals.

1. Extent of Access: Provide Architect hands-on access to each and every area of brick masonry that is restored as work of this Section. No approval of brick masonry restoration will be given before Architect is provided hands-on access to areas of brick masonry affected. Provide access for re-inspection of areas where work was not approved on first or subsequent inspections until Architect approves work.
2. Relocation of Means of Access: If Contractor moves scaffolding, lift, or other means of access before providing Architect with hands-on access to each and every surface of restored brick masonry and each and every surface of brick masonry that has been restored after previous work was rejected, Contractor shall reinstall means of access to provide for close-up inspection by Architect at no additional cost.

C. Knowledge of Site and Project Conditions: Before submitting bid, Bidders shall make themselves thoroughly familiar with the Drawings and Specifications, with the scope of this Project, and with all conditions at the Project site relating to requirements of this Section and limitations under which the work will be performed and shall determine or verify dimensions and quantities. Submission of a bid shall be considered conclusive evidence that Contractor is thoroughly familial' with Project requirements and site conditions and limitations.

D. Restoration of Damaged Masonry Units: Repair or replace all broken, lost, and damaged masonry units resulting from work of this Section to Architect's satisfaction at no additional cost.

E. Protection of Building: Protect building elements and finishes from damage and from deterioration caused by work of this Section. Repair damage to materials and damage to finishes to Architect's satisfaction at no additional cost.

1. Exclusion of Water: Cover open joints and areas from which units have been removed during periods when work is suspended to ensure materials and finishes are not damaged by water penetration.
2. Prevention of Staining: Prevent grout, mortar, and patching materials from staining exposed faces of masonry.
3. Protection from Fire: Take all necessary precautions to prevent fire and spread of fire.

F. Restoration and Replacement of Damaged and Removed Interior Finishes: Repair, restore, or replace as required all interior finishes that are damaged or deteriorated due to exterior rehabilitation work. At the completion of the Work, all interior finishes shall be in a condition at least as good as or better than they were before work began. Comply with the requirements of Division 01 -"Execution and Closeout."

1.11 SEQUENCING AND SCHEDULING

A. Order replacement materials at earliest possible date to avoid delaying completion of the Work.

B. Order sand and portland cement for pointing mortar (based on testing) immediately after approval of mockups. Take delivery of and store at Project site a sufficient quantity to complete Project.

C. Perform masonry restoration work in the following sequence:

1. Remove plant growth.
2. Inspect for open mortar joints and repair before cleaning to prevent the intrusion of water and other cleaning materials into the wall.
3. Remove paint.
4. Clean masonry surfaces.
5. Where water repellents, specified in Division 07, are to be used on or near masonry work, delay application of these chemicals until after pointing.
6. Rake out mortar from joints surrounding masonry to be replaced and from joints adjacent to masonry repairs along joints.
7. Repair masonry, including replacing existing masonry with new masonry materials.
8. Rake out mortar from joints to be repointed.
9. Point mortar and sealant joints.
10. After repairs and repointing have been completed and cured, perform a final cleaning to remove residues from this work.
11. Inspect for open mortar joints and repair before cleaning to prevent the intrusion of water and other cleaning materials into the wall.

D. As scaffolding or other devices are removed, patch anchor holes used to attach scaffolding or other devices. Patch holes in masonry units to comply with "Masonry Unit Patching" Article. Patch holes in mortar joints to comply with "Repointing Masonry" Article.

PART 2 - PRODUCTS

2.1 MASONRY MATERIALS

A. Salvage Face Brick and Common Brick: Salvaged face brick and common brick if removal is necessary. Salvaged brick will be used including cut, or sawed shapes where required to complete masonry restoration work. Sound existing brick salvaged during removal of brick masonry, cleaned of mortar, grout, and other contaminants, and thoroughly washed using clean water and fiber bristle brushes. Salvaged face brick as required.

1. Utilize salvaged brick for infill and repair.
2. Special Shapes:
   a. Mechanical chopping or breaking brick, or bonding pieces of brick together by adhesive, are not acceptable procedures for fabricating special shapes.

B. New Face Brick: If replacement face brick is required it shall comply with requirements of ASTM C 216, Grade SW, and shall match existing original face brick in hardness and weatherability, size, color, and surface texture and reflectance. Use new face brick matching existing original brick in work on all areas not on street facades.

1. Efflorescence: Provide brick that has been tested according to ASTM C 67 and is rated "not effloresced."

C. Common Brick: If replacement brick tor back-up construction is required it shall match existing brick in size and shall comply with requirements of ASTM C 62, Grade SW.

1. Efflorescence: Provide brick that has been tested according to ASTM C 67 and is rated "not effloresced."

2.2 MORTAR MATERIALS

A. Comply with requirements of Division 04 -"Restoration Mortars."

2.3 MANUFACTURED REPAIR MATERIALS

A. Masonry Patching Compound: Factory-mixed cementitious product that is custom manufactured for patching masonry.

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. Cathedral Stone Products, Inc.; Jahn M100 Terra Cotta and Brick Repair Mortar.
   b. Conproco Corporation; Mimic.
   c. Edison Coatings, Inc.; Custom System 45.
2. Use formulation that is vapor- and water permeable (equal to or more than the masonry unit), exhibits low shrinkage, has lower modulus of elasticity than the masonry units being repaired, and develops high bond strength to all types of masonry.
3. Use formulation having working qualities and retardation control to permit forming and sculpturing where necessary.
4. Formulate patching compound used for patching brick in colors and textures to match each masonry unit being patched. Provide not less than three colors to enable matching the color, texture, and variation of each unit.

2.4 TIES AND ANCHORS

A. Wire Anchors: 1I4-inch-diameter wire of AISI Type 302 stainless steel.

B. Brick Ties: 12 gage, 2-1/2-inch wide, crimped, Type 304 stainless steel buck anchors. Provide anchors of length to extend to a location 1-112 inches behind the outer face of the masonry unit in the outer wythe.

C. Brick Tie Anchors: I14-inch-diameter, 1-1/2 inch long nail drive anchor with Zamac body and Type 304 stainless steel drive screws. Provide "Zamac Hammer-Screw"® by Powers Fasteners, 2 Powers Lane, Brewster, NY 10509 (914-235-6300), or approved equal.

D. Miscellaneous Ties, Anchors, and Reinforcing: Of material indicated below and of size and configuration appropriate for use intended and approved by Architect.

1. Units That Are Not Welded: Type 302, Type 304, Type 304L, Type 316, or Type 316L stainless steel.
2. Units That Are Welded: Type 316L stainless steel.

2.5 REINFORCEMENT

A. General: Provide joint reinforcement as specified herein.

B. Joint Reinforcement: Complying with ASTM A 951 and as follows:

1. Material: AISI Type 304 stainless steel conforming to ASTM A 580.
2. Form: Welded truss design of9 gauge deformed stainless steel wire, consisting of two deformed longitudinal wires welded to a continuous diagonal cross wire at 16 inches o.c. Provide reinforcement with out-to-out spacing 1-112 to 2 inches less than the nominal thickness of the wall.
3. Corners: Provide special formed prefabricated pieces at comers.
4. Manufacturer: Subject to compliance with requirements, provide joint reinforcing by Dur-O-Wall, Hohmann & Barnard, Inc., or approved equal.

2.6 FLASHING

A. General: Refer to Sections flashings for Clay Tile, Copper Roofs, and Membrane Roofing requirements where intersecting masonry units.

B. Adhesives, Primers, and Seam Tapes for Flashings: Flashing manufacturer's standard products or products recommended by flashing manufacturer for priming substrates, bonding flashing sheets to each other and to substrates, terminating flashing at edges, and other uses as required to provide complete, watertight system.

2.7 MISCELLANEOUS MATERIALS

A. Injection Grout: Comply with requirements of Section 041 05 -"Restoration Mortars."

B. Sealant: Comply with requirements of Section 07900 -"Joint Sealants."

2.8 CLEANING MATERIALS

A. Water: Potable.

B. Hot Water: Water heated to a temperature of 140 to 160 deg F.

C. Job-Mixed Detergent Solution: Solution prepared by mixing 2 cups of tetrasodium polyphosphate, 1/2 cup of laundry detergent, and 20 quarts of hot water for every 5 gal. of solution required.

2.9 ACCESSORY MATERIALS

A. Liquid Strippable Masking Agent: Manufacturer's standard liquid, film-forming, strippable masking material for protecting glass, metal, and polished stone surfaces from damaging effects of acidic and alkaline masonry cleaners.

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. ABR Products, Inc.; Rubber Mask.
   b. Price Research, Ltd.; Price Mask.
   c. PROSOCO; Sure Klean Strippable Masking.

B. Masking Tape: Nonstaining, nonabsorbent material, compatible with pointing mortar, joint primers, sealants, and surfaces adjacent to joints; that will easily come off entirely, including adhesive.

C. Antirust Coating: Fast-curing, lead- and chromate-free, self-curing, universal modified-alkyd primer complying with MPI #79, Alkyd Anticorrosive Metal Primer or SSPC-Paint 20 or SSPC-Paint 29 zinc-rich coating.

1. Use coating requiring no better than SSPC-SP 2, "Hand Tool Cleaning surface preparation according to manufacturer's literature or certified statement.
2. Use coating with a VOC content of 420 g/L (3.5 lb/gal.) or less when calculated according to 40 CFR 59, Subpart D (EPA Method 24).

2.10 ANTI- GRAFFITI COATING -**NOT USED**

A. Coat all existing and newly installed brick as shown on drawings with anti-graffiti coating.

B. Product: Edison Coating Inc. Spray – Block 40 strippable/sacrificial coating for hard surfaces, or equal as judged by the Architect.

2.11 MISCELLANEOUS PRODUCTS

A. Select materials and methods of use based on the following, subject to approval of a mockup:

1. Previous effectiveness in performing the work involved.
2. Little possibility of damaging exposed surfaces.
3. Consistency of each application.
4. Uniformity of the resulting overall appearance.
5. Do not use products or tools that could do the following:
   a. Remove, alter, or in any way harm the present condition or future preservation of existing surfaces, including surrounding surfaces not in contract.
   b. Leave a residue on surfaces.

PART 3 - EXECUTION

3.1 GENERAL

A. Restoration Specialist Firms: Subject to compliance with requirements 1.9 “Quality Assurance”.

B. Protection: Before leaving fresh or unfinished work, fully cover and protect wall against rain and wind in an approved manner. Before continuing, brush clean previously laid work.

C. Welting Bricks and Existing Masonry: Thoroughly wet brick and existing masonry prior to installation to ensure that brick and masonry are nearly saturated but free of surface water (saturated, surface dry) when mortar is applied.

D. Full Shoved Joints: Ensure that all bed, head, and collar joints in masonry are shoved full so that mortar fully contacts all surfaces of masonry units in joints and there are no voids in brickwork. Do not slush joints.

3.2 PROTECTION

A. Protect persons, motor vehicles, surrounding surfaces of building being restored, building site, plants, and surrounding buildings from harm resulting from masonry restoration work.

1. Erect temporary protective covers over walkways and at points of pedestrian and vehicular entrance and exit that must remain in service during course of restoration and cleaning work.

B. Prevent mortar from staining face of surrounding masonry and other surfaces.

1. Cover sills, ledges, and projections to protect from mortar droppings.
2. Keep wall area wet below rebuilding and pointing work to discourage mortar from adhering.
3. Immediately remove mortar in contact with exposed masonry and other surfaces.
4. Clean mortar splatters from scaffolding at end of each day.

C. Remove gutters**,** downspouts and metal fascias adjacent to masonry and store where indicated during masonry restoration and cleaning. Reinstall when masonry restoration and cleaning are complete.

1. Provide temporary rain drainage during work to direct water away from building.

3.3 UNUSED ANCHOR REMOVAL

A. Remove masonry anchors, brackets, wood nailers, and other extraneous items no longer in use unless identified as historically significant or indicated to remain.

1. Remove items carefully to avoid spalling or cracking masonry.
2. Where directed, if an item cannot be removed without damaging surrounding masonry, do the following:

a. Cut or grind off item approximately 3/4 inch beneath surface and core drill a recess of same depth in surrounding masonry as close around item as practical.

b. Immediately paint exposed end of item with two coats of antirust coating, following coating manufacturer's written instructions and without exceeding manufacturer's recommended dry film thickness per coat. Keep paint off sides of recess.

3. Patch the hole where each item was removed unless directed to remove and replace the masonry unit.

3.4 BRICK REMOVAL AND REPLACEMENT

A. Remove bricks that are damaged, spalled, or deteriorated. Carefully demolish or remove entire units from joint to joint, without damaging surrounding masonry, in a manner that permits replacement with full-size units.

1. When removing single bricks, remove material from center of brick and work toward outside edges.

B. Support and protect remaining masonry that surrounds removal area. Maintain flashing, reinforcement, lintels, and adjoining construction in an undamaged condition.

C. Notify Architect of unforeseen detrimental conditions including voids, cracks, bulges, and loose units in existing masonry backup, rotted wood, rusted metal, and other deteriorated items.

D. Remove in an undamaged condition as many whole bricks as possible.

1. Remove mortar, loose particles, and soil from brick by cleaning with hand chisels, brushes, and water.
2. Remove sealants by cutting close to brick with utility knife and cleaning with solvents.
3. Store brick for reuse. Store off ground, on skids, and protected from weather.
4. Deliver cleaned brick not required for reuse to Owner unless otherwise indicated.

E. Clean bricks surrounding removal areas by removing mortar, dust, and loose particles in preparation for replacement.

F. Replace removed damaged brick with other removed brick and salvaged brick in good quality, where possible, or with new brick matching existing brick, including size. Do not use broken units unless they can be cut to usable size.

G. Install replacement brick into bonding and coursing pattern of existing brick. If cutting is required, use a motor-driven saw designed to cut masonry with clean, sharp, unchipped edges.

1. Maintain joint width for replacement units to match existing joints.

H. Lay replacement brick with completely filled bed, head, and collar joints. Butter ends with sufficient mortar to fill head joints and shove into place. Wet both replacement and surrounding bricks that have ASTM C 67 initial rates of absorption (suction) of more than 30 g/30 sq. in. per min. Use wetting methods that ensure that units are nearly saturated but surface is dry when laid.

1. Tool exposed mortar joints in repaired areas to match joints of surrounding existing brickwork.
2. Rake out mortar used for laying brick before mortar sets and point new mortar joints in repaired area to comply with requirements for repointing existing masonry, and at same time as re-pointing of surrounding area.

3. When mortar is sufficiently hard to support units, remove shims and other devices interfering with pointing of joints.

3.5 PAINTING STEEL UNCOVERED DURING THE WORK

A. Inspect steel exposed during masonry removal. Where Architect determines that it is structural, or for other reasons cannot be totally removed, prepare and paint it as follows:

1. Remove paint, rust, and other contaminants according to SSPC-SP 2, "Hand Tool Cleaning, as applicable to meet paint manufacturer's recommended preparation.
2. Immediately paint exposed steel with two coats of antirust coating, following coating manufacturer's written instructions and without exceeding manufacturer's recommended rate of application (dry film thickness per coat).

B. If on inspection and rust removal, the cross section of a steel member is found to be reduced from rust by more than 1/16 inch, notify Architect before proceeding.

3.6 BRICK MASONRY UNIT RESTORATION

A. General: Lay salvaged face brick, new face brick, and common brick plumb, level, and true to line in full beds of mortar with bond pattern matching original bond pattern and courses and joints meeting those of original brickwork and adjacent remaining masonry as applicable. Provide supports, anchors, and reinforcing to ensure solid, stable construction and flashing and weep holes to ensure that water is directed to exterior of wall above openings and penetrations.

B. Patch the following masonry units unless another type of replacement or repair is indicated:

1. Units indicated to be patched.
2. Units with holes.
3. Units with chipped edges or corners.
4. Units with small areas of deep deterioration.

C. Remove and replace existing patches unless otherwise indicated or approved by Architect.

D. Cutting Masonry Units: Where brick are to be cut to size, make cuts neatly with a power-driven saw. Do not expose cut face to weather.

E. Jointing: Jointing of rebuilt masonry shall match that of existing masonry. Each course shall align with and be flush with existing work. Joints shall be uniform, matching widths of existing joints.

F. Joints: Fill all joints in brick masonry completely full with mortar as each course is laid.

1. Bed Joints: Form bed joints in one of the following ways:

   a. Apply a thick layer of smooth or slightly furrowed mortar on top of units previously laid and shove brick in place.
   b. Apply a full coat of mortar to boltom of brick and shove it into place.
2. Head and Collar Joints: Form head and collar joints by applying a full coat of mortal' to entire end or entire side as case requires and then shoving mortar covered end andlor side of brick tightly against bricks previously laid. Apply 3/8- inch-thick coat of mortar to back of facing brick before brick is installed.

3. Preparation for Pointing Joints in Brick Masonry: Rake joints in exposed brick masonry to prepare for pointing as specified in Division 04 -"Masonry Pointing. "

G. Supports, Anchors, and Fasteners: Build in supports, anchors, and fasteners as shown on approved shop drawings. Anchor fasteners solidly into sound masonry.

H. Joint Reinforcement: Provide continuous joint reinforcing in bed joints as indicated on Drawings but at a spacing not to exceed 16 inches o.c. vertically.

I. Flashing: Install flashing and as specified and as shown on approved shop drawings.
1. Install embedded flashing in masonry at shelf angles, lintels, ledges, other obstructions to downward flow of water in wall, and where indicated.
2. Prime masonry substrates and substrates of other materials as recommended by flashing membrane manufacturer for optimum installation and adhesion of flashing membrane.
3. Allow masonry to cure as recommended by flashing membrane manufacturer before priming or applying adhesive or self-adhesive membrane.
4. Prepare masonry surfaces so they are smooth and free from projections that could puncture flashing. Unless otherwise indicated, place 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.
5. Install metal flashing termination beneath flashing at exterior face of wall where sealant joints are indicated.

J. Disturbed Masonry Units: Remove masonry units disturbed after laying and relay in fresh mortar. If adjustments are required, remove masonry units and reset in fresh mortar; do not pound or tap masonry units to adjust.

K. Damaged Masonry Units: Remove and replace brick that are loose, chipped, broken, stained or damaged by freezing or for any other reason, or if units do not match adjoining units as intended. Furnish new units to match adjoining units and install in fresh mortar, pointed to eliminate evidence of replacement.

3.7 REPAIRING CRACKED BRICK MASONRY WHERE CRACKS EXTEND MORE THAN THREE COURSES

A. General: Remove cracked brick and mortar from joints around cracked brick and from all joints in which mortar is cracked and provide new brick matching existing brick set in new mortar.

B. Carefully remove brick to be replaced and mortar from joints around it and from joints in which mortar is cracked. Do not disturb adjacent brick. If bond of any brick is broken, remove brick and mortar around brick and reset brick.

C. Remove dirt and dust from hole using stiff bristle brush followed by clean compressed air.

D. Thoroughly wet brick to be inserted and surfaces at hole in masonry to receive brick to ensure that masol1l'Y is nearly saturated but surface dry at time of installation.

E. Ensure that all voids are filled with mortar by spreading mortal' on surfaces adjacent to hole and on surfaces of brick to be inserted so that excess mortal' is squeezed out of joints around brick as it is inserted.

F. Point joints to comply with requirements of Division 04 -"Masonry Pointing."

3.8 REPAIRING CRACKED BRICK MASONRY WHERE CRACKS EXTEND NO MORE THAN THREE COURSES

A. General: Rout out cracks in brick and fill with custom patching mortal' to match color and texture of adjacent surface.

B. Rout out cracks to a depth of 1/2 inch and a width of 1/4 inch. Do not damage brick surfaces.

C. Clean cracks thoroughly using fine brush followed by clean, oil-free compressed ail' to remove granular particles and dust.

D. Protect masonry at sides of crack from contact with sealant with masking tape or other approved method.

E. Provide backer rod to ensure sealant is of profile recommended by sealant manufacturer.

F. Install sealant to fully wet joint substrates and to completely fill top portion of joint.

G. Tool sealant flush with surface of adjacent masonry units.

H. Remove protection and clean away any sealant on masonry surfaces using solvent recommended by sealant manufacturer.

3.9 ROUTING AND FILLING CRACKS IN BRICK

A. General: Rout out cracks in brick and fill with custom patching mortal' to match color and texture of adjacent surface.

B. Rout out cracks to a depth of5/8 inch and a width of 1/8 inch. Do not damage brick surfaces.

C. Clean cracks thoroughly using fine brush followed by clean, oil-free compressed ail' to remove granular particles and dust.

D. Thoroughly rinse surfaces to ensure that substrate will not rapidly absorb water from patching mortar.

E. Brush crack with a mortar slurry coat and fill with specified composite mortal' matching color of adjacent cleaned brick.

F. Strike surface of repaired crack flush with face of brick. Finish surface off filled crack to match texture and finish of adjacent cleaned brick.

G. Protect installed mortar from too rapid drying to provide optimum conditions for mortar to cure.

3.10 POINTING

A. Point mortar joints in brick masonry to comply with the requirements of Division 04 -"Masonry Pointing.”

3.11 PRELIMINARY CLEANING

A. Removing Plant Growth: Completely remove visible plant, moss, and shrub growth from masonry surfaces. Carefully remove plants, creepers, and vegetation by cutting at roots and allowing to dry as long as possible before removal. Remove loose soil and debris from open masonry joints to whatever depth they occur.

B. Preliminary Cleaning: Before beginning general cleaning, remove extraneous substances that are resistant to cleaning methods being used. Extraneous substances include paint, calking, asphalt, and tar.

1. Carefully remove heavy accumulations of material from surface of masonry with a sharp chisel. Do not scratch or chip masonry surface.
2. Remove paint and calking with alkaline paint remover.
    a. Comply with requirements in "Paint Removal" Article.
    b. Repeat application up to two times if needed.
3. Remove asphalt and tar with solvent-type paint remover.
    a. Comply with requirements in "Paint Removal" Article.
    b. Apply paint remover only to asphalt and tar by brush without prewetting.
    c. Allow paint remover to remain on surface for 10 to 30 minutes.
    d. Repeat application if needed.

3.12 CLEANING MASONRY, GENERAL

A. Proceed with cleaning in an orderly manner; work from top to bottom of each scaffold width and from one end of each elevation to the other. Ensure that dirty residues and rinse water will not wash over cleaned, dry surfaces.

B. Use only those cleaning methods indicated for each masonry material and location.

1. Do not use wire brushes or brushes that are not resistant to chemical cleaner being used. Do not use plastic-bristle brushes if natural-fiber brushes will resist chemical cleaner being used.
2. Use spray equipment that provides controlled application at volume and pressure indicated, measured at spray tip. Adjust pressure and volume to ensure that cleaning methods do not damage masonry.
    a. Equip units with pressure gages.
3. For water-spray application, use fan-shaped spray tip that disperses water at an angle of 25 to 50 degrees.
4. For heated water-spray application, use equipment capable of maintaining temperature between 140 and 160 deg F at flow rates indicated.
5. For steam application, use steam generator capable of delivering live steam at nozzle.

C. Perform each cleaning method indicated in a manner that results in uniform coverage of all surfaces, including corners, moldings, and interstices, and that produces an even effect without streaking or damaging masonry surfaces.

D. Water Application Methods:

1. Water-Soak Application: Soak masonry surfaces by applying water continuously and uniformly to limited area for time indicated. Apply water at low pressures and low

volumes in multiple fine sprays using perforated hoses or multiple spray nozzles. Erect a protective enclosure constructed of polyethylene sheeting to cover area being sprayed.

2. Water-Spray Applications: Unless otherwise indicated, hold spray nozzle at least 6 inches from surface of masonry and apply water in horizontal back and forth sweeping motion, overlapping previous strokes to produce uniform coverage.

E. Steam Cleaning: Apply steam to masonry surfaces at the very low pressures indicated for each type of masonry material. Hold nozzle at least 6 inches from surface of masonry and apply steam in horizontal back and forth sweeping motion, overlapping previous strokes to produce uniform coverage.

F. After cleaning is complete, remove protection no longer required. Remove tape and adhesive marks.

3.13 FINAL CLEANING

A. After mortar has fully hardened, thoroughly clean exposed masonry surfaces of excess mortar and foreign matter; use wood scrapers, stiff-nylon or -fiber brushes, and clean water, spray applied at low pressure.

1. Do not use metal scrapers or brushes.
2. Do not use acidic or alkaline cleaners.

B. Wash adjacent woodwork and other non-masonry surfaces. Use detergent and soft brushes or cloths.

C. Clean mortar and debris from roof; remove debris from gutters and downspouts. Rinse off roof and flush gutters and downspouts.

D. Sweep and rake adjacent pavement and grounds to remove mortar and debris. Where necessary, pressure wash pavement surfaces to remove mortar, dust, dirt, and stains.

3.14 FIELD QUALITY CONTROL

A. Notify Owner’s and Architect's Project representatives in advance of times when lift devices and scaffolding will be relocated. Do not relocate lift devices and scaffolding until Owner’s and Architect’s Project representatives have had reasonable opportunity to make observations of work areas at lift device or scaffold location.

3.15 WASTE MANAGEMENT

A. Coordinate with Division 01.

1. Separate and recycle cut-offs and waste materials and material packaging in accordance with Waste Management Plan and to the maximum extent economically feasible and place in designated areas for recycling.
2. Set aside and protect materials suitable for reuse and/or remanufacturing.
3. Separate and fold up metal banding; flatten and place along with other metal scrap for recycling in designated area.

END OF SECTION 04 01 20

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SECTION 04 03 05.13 – RESTORATION MORTARS

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. The work performed under this Section includes the performance criteria, labor, materials, equipment, and services necessary for the complete execution work of restoration mortars and grout as called for on the Drawings, as specified herein and as required by schedules, keynotes and drawings, as specified herein, and as may be required by conditions and authorities having jurisdiction, including, but not limited to, the following:

1. Mortars for setting and pointing brick masonry.

1.3 QUALITY ASSURANCE

A. Restoration Specialist Qualifications: Award brick masonry restoration to a firm regularly engaged in restoration of brick masonry that can demonstrate to Owner's satisfaction that, within previous ten years, firm has successfully performed and completed in a timely manner at least five projects similar in scope and type to work required on this Project.

1. Field Supervision: Brick masonry restoration shall be directly supervised by a full-time foreman with experience equal to or greater than that required of Masonry Restoration Specialist. Foreman shall be on site daily for duration of work of this Section. Same foreman shall remain on Project throughout work unless his performance is deemed unacceptable. Restoration specialist firms shall maintain experienced full-time supervisors on Project site during times that clay masonry restoration and cleaning work is in progress.
2. Brick masonry restoration shall be carried out by a steady crew of skilled mechanics who are thoroughly experienced with restoration of materials and methods specified and have a minimum of three years' experience with work on buildings similar to that required by this Section. In acceptance or rejection of work of this Section, no allowance will be made for workers' incompetence or lack of skill.
    a. When masonry units are being patched, assign at least one worker among those performing patching work who is trained and certified by manufacturer of patching compound to apply its products.

B. Referenced Standards: Work of this Section shall comply with applicable requirements and recommendations of latest editions of the documents listed herein, except as modified by more stringent requirements of the Contract Documents and of applicable laws, codes, and regulations of authorities having jurisdiction. Where the language in any of the documents referred to herein is in the form of a recommendation or suggestion, such recommendations or suggestions shall be deemed to be mandatory under this Contract unless specifically indicated otherwise in Contract Documents. Provide a reference copy of each of the following standards

at Project site during all periods when work of this Section is being performed. In each case in which there is a conflict between requirements of referenced standards; requirements of laws, codes, and regulations; and requirements of this Section, the most stringent or restrictive requirement shall govern.

1. ASTM International (ASTM)
    a. ASTM C 144, Standard Specification for Aggregate for Masonry Mortar.
    b. ASTM C 150, Standard Specification for Portland Cement.
    c. ASTM C 207, Standard Specification for Hydrated Lime for Masonry Purposes.
    d. ASTM C 270, Standard Specification for Mortar' for Unit Masonry.

C. Source of Materials: Obtain each type of material required for restoration mortars from a single source to ensure a match in quality, performance, and appearance,

D. Knowledge of Site and Project Conditions: Before submitting bid, Bidders shall make themselves thoroughly familiar with the Drawings and Specifications, with the scope of this Project, and with all conditions at the Project site relating to requirements of this Section and limitations under which the work will be performed and shall determine or verify dimensions and quantities. Submission of a bid shall be considered conclusive evidence that Contractor is thoroughly familiar with Project requirements and site conditions and limitations.

E. Laboratory for Mortar Analysis: Laboratory regularly engaged in analysis of mortar used in historic buildings and accepted in writing by Architect.

1.4 ACTION SUBMITTALS

A. Product Data: Manufacturer's published technical data for each product to be used in work of this Section including material description, chemical composition (ingredients and proportions), physical properties, recommendations for application and use, test reports and certificates verifying that product complies with specified requirements, and Material Safety Data Sheets (MSDS).

B. Samples:

1. Existing Mortar: Samples of existing mortars from stone masonry, brick masonry, specific masonry to each project, to total one cubic inch taken from a minimum of three areas or as recommended by testing agency.

2. Aggregate from Existing Mortar: Samples of aggregate from analysis of existing mortars from masonry, each to total two cubic inches from a minimum of three areas or as recommended by testing agency. Provide sieve analysis (ASTM C 144) with samples.

3. Pointing Mortar: Cured mortar samples set in 1/2-inch by 6-inch plastic or aluminum channels for approval of color and texture. Samples shall match existing mortar. Provide the following:
    a. Mortar for each type of masonry.
4. Grouts: Cured samples of grouts for anchoring pins and patching cracked masonry units matching each masonry substrate requiring grout, minimum 3 inch diameter x 1/2 inch thick.
    a. Grout for each masonry type.
5. Sand for Pointing Mortars: Two-pound sample of each type of sand proposed for use in pointing mortars. Include sieve analysis (ASTM C 144).
6. Custom Patching Mortar for Patching Stone: 4-inch x 4-inch x I -inch cured samples of each type and color of mortar required for approval of color and texture. Samples shall match clean existing cast stone.

7. Custom Patching Mortar for Patching Brick: 4-inch x 4-inch x I -inch cured samples for approval of color and texture. Samples shall match clean existing brick.
8. Custom Mortar for Installing Stone Dutchmen: 4-inch x 4-inch x I -inch cured samples for approval of color and texture. Samples shall match clean existing cast stone.

1.5 INFORMATIONAL SUBMITTALS

A. Qualification Data: Qualification data for firm and personnel specified in “Quality Assurance” Article that demonstrates that both firm and personnel have capabilities and experience complying with requirements specified. For firm and foreman, provide a list of at least three completed projects similar in size and scope to the work required on this Project. For each project list project name, address, architect, conservator, supervising preservation agency, scope of contractor's work, and other relevant information.

1. Submit certification from composite patching mortar manufacturers that technicians proposed to perform the work have been trained and are certified in the application of the patching mortar.

1.6 PRODUCT DELIVERY, STORAGE, AND HANDLING

A. Deliver, store, and handle products and materials to prevent damage, deterioration, or degradation and intrusion of foreign material.

B. Discard and remove from site deteriorated materials, contaminated materials, and products that have exceeded their expiration dates. Replace with fresh materials.

1.7 PROJECT CONDITIONS

A. General: Perform work only when temperature of products being used and all temperature and humidity comply with manufacturer's requirements and requirements of this Section. In case of conflict, the most stringent requirements shall govern.

B. Prohibited Materials: Masonry cements, masonry mortars, and ingredients not specifically specified in this Section and approved by Architect are strictly prohibited.

C. Proprietary Materials: Do not use proprietary patching mortars and adhesives unless temperatures are between 50 deg F and 80 deg F and will remain within that range for at least 48 hours after work has been completed unless work at other temperatures is specifically approved by manufacturer of patching mortar and by Architect.

D. Mortars: Do not mix or use mortars when either or both air temperature or masonry temperature is below 40 deg F or when either temperature is expected to drop below 40 deg F within 48 hours of mortar application unless Architect has approved both Contractor's work proposal for cold-weather masonry work and also specific masonry work to be done in each instance.

1. Masonry work in temperatures below 40 deg F shall comply with requirements of this Section, with requirements of sections in which mortar is used to set and point masonry, and with work proposal specifically approved by Architect.

2. Remove masonry work determined by Architect to have been damaged by freezing conditions and replace following requirements of this Section.

PART 2 - PRODUCTS

2.1 MORTAR AND GROUT PRODUCTS

A. White Portland Cement: ASTM C 150, Type I.

B. Portland Cement: ASTM C 150, Type I or Type II, non-staining. Do not use masonry cement.

C. Hydrated Lime: ASTM C 207, Type S.

D. Sand: Clean sharp sand, free of loam, silt, soluble salts, organic matter, and other deleterious substances and graded in compliance with ASTM C 144. Where mortar is to match existing original mortar, sand or other aggregate shall be selected to provide mortar matching color and texture of original mortar insofar as possible to ensure that a minimum amount of pigment is required to provide a color match. Sieve and mix sand and aggregates to provide mortar matching original mortar.

E. Water: Clean and free of substances deleterious to mortar, masonry, and embedded elements.

F. Pigments: Stable, non-fading, alkali-resistant, inorganic oxide pigments with a history of satisfactory performance in mortars containing lime.

G. Grout and Slurry for Restoration of Cracked, Broken, or Previously Grouted Masonry: Two-component, latex-modified cementitious compound, specifically manufactured for masonry restoration. Provide Custom System 45, available from Edison Chemical Systems, Inc., 25 Grant Street, Waterbury, CT 06704 (203-597-9727). Provide colors to match color of clean existing material being reinforced.

H. Composite Patching Mortar for Stone: Two-component, latex-modified cementitious compounds, specifically manufactured for masonry restoration. Provide Custom System 45, available from Edison Chemical Systems, Inc., 25 Grant Street, Waterbury, CT 06704 (203-597-9727). Provide color to match color of clean cast stone being patched.

I. Composite Patching Mortar for Brick: Two-component, latex-modified cementitious compounds, specifically manufactured for masonry restoration. Provide Custom System 45, available from Edison Chemical Systems, Inc., 25 Grant Street, Waterbury, CT 06704 (203-597-9727). Provide custom color to match color of cleaned brick being patched.

J. Admixture for Mortar for Setting Stone Dutchmen: Laticrete 4237 Grout and Mortar Admixture for "thin set" mortar as manufactured by Laticrete International Inc., or approved equal.

K. Prohibited Materials: No additives or admixtures other than those specified shall be used. No chlorides or aggressive corrosive chemicals shall be used.

2.2 MORTAR MIXES

1. Type "O" Mortar for Pointing Outer 3/4-Inch Depth of Joints in Brick and Stone Masonry ***if*** confirmed by mortar testing agency of historic mortars for the project.
    a. 1 part by volume white Portland cement, gray Portland cement, or a combination of white and gray Portland cement (Type I) as required to produce color of original mortar in masonry being pointed with no addition of pigment or with minimum addition of pigment.
    b. 2 parts by volume hydrated lime (Type S)

c. 7 parts by volume sand (selected to match sand in original mortar of masonry being pointed)
d. Oxide pigments as required to adjust color of mortar mix to as close a match to original mortar as possible using appropriate colored cements and aggregates to match original color of mortar in masonry being pointed but not to exceed 7 percent of the weight of the cement.
e. Do not use modern additives unless permitted in writing by Architect.

B. Mortars for Setting Dutchmen: Mortars specified hereinafter shall comply with ASTM C 270, "Standard Specification for Mortar for Unit Masonry." Mortar mixes may change and may require adjustment before and during construction in accordance with pre-construction conformance testing, field testing, and Architect's evaluation of testing and test results.
1. Slurry for Pre-treating Masonry to be Repaired: Grout and Slurry for Restoration of Cracked, Broken, or Previously Grouted Masonry as specified above.
2. "Thin Set" Mortar for Setting Stone Dutchmen: Use when mortar bed is less than 3/8-inch-thick to produce an initially tacky mortar exhibiting high strength properties when set.
a. 1 part by volume white Portland cement (Type I)
b. 3 parts by volume tine "00" sand (selected to match color of existing clean stone)
c. Temper to workable consistency with Laticrete 4237 polymer admixture mixed in accordance with manufacturer's recommendations for high strength I "thin set" mortar.

2.3 MIXING OF MORTAR

A. Measure mortar ingredients carefully using containers with fixed volumes so that proportions are controlled and maintained throughout all work periods.

B. Mix mortar in an approved type of power-operated batch mixer. Mix for time required to produce a homogeneous plastic mortal' but not less than five minutes: approximately two minutes for mixing dry materials and not less than three minutes for mixing after water has been added.

C. Use minimum amount of water to produce a workable consistency for mortar's intended purpose.
1. Mortar for Pointing: As dry a consistency as will produce a mortal' sufficiently plastic to be worked into joints.
2. Mortar for Slurry: Consistency as will be brushable.

D. Where mortar or grout is required in small batches of less than one cubic yard and Architect specifically approves, mortar may be mixed by hand in clean wooden or metal boxes prepared for that purpose provided that Architect approves mixing boxes and methods of mixing and transferring mortar.

E. After mixing, mortars for pointing or setting shall sit for 20 minutes prior to use to allow for initial shrinkage. Mortar shall be placed in final position within two hours of mixing. Re-tempering of partially hardened material is not permitted.

F. Mortar for grout shall be placed in final position within two hours of mixing. Re-tempering of partially hardened material is not permitted.

G. Custom Patching Mortars, Grouts, and Adhesives: Mix in strict accordance with manufacturer's written instructions.

PART 3 - EXECUTION

3.1 INSTALLATION

A. Install mortars, grouts, and patching mixtures as part of the work of the following

1. Divisions 04: Masonry Pointing, Maintenance of Stone Masonry, Cast Stone, Maintenance of Brick Masonry, Architectural Terra Cotta.

3.2 WASTE MANAGEMENT

A. Coordinate with Division 01.
1. Separate and recycle cut-offs and waste materials and material packaging in accordance with Waste Management Plan and to the maximum extent economically feasible and place in designated areas for recycling.
2. Set aside and protect materials suitable for reuse and/or remanufacturing.
3. Separate and fold up metal banding; flatten and place along with other metal scrap for recycling in designated area.

END OF SECTION 04 03 05.13

SECTION 04 03 05.16 – RESTORATION MASONRY REPOINTING

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. The work performed under this Section includes the performance criteria, labor, materials, equipment, and services necessary for the complete work of masonry re-pointing as shown on the Drawings, as specified herein and as required by schedules, keynotes and drawings, as specified herein, and as may be required by conditions and authorities having jurisdiction, including, but not limited to, the following:

1. Preparing and pointing joints in masonry.
2. Types of approved mortar removal tools
3. Required approvals for use of power tools on retooling.
4. Preparing and pointing rear portions of joints (deep pointing) in masonry.

B. Related Work Specified Elsewhere

1. Division 04: Restoration Mortars
2. Division 09: Joint sealants.

1.3 QUALITY ASSURANCE

A. Restoration Specialist Qualifications: Award brick masonry restoration to a firm regularly engaged in restoration of brick masonry that can demonstrate to Owner's satisfaction that, within previous ten years, firm has successfully performed and completed in a timely manner at least five projects similar in scope and type to work required on this Project.

1. Field Supervision: Brick masonry restoration shall be directly supervised by a full-time foreman with experience equal to or greater than that required of Masonry Restoration Specialist. Foreman shall be on site daily for duration of work of this Section. Same foreman shall remain on Project throughout work unless his performance is deemed unacceptable. Restoration specialist firms shall maintain experienced full-time supervisors on Project site during times that clay masonry restoration and cleaning work is in progress.
2. Brick masonry restoration shall be carried out by a steady crew of skilled mechanics who are thoroughly experienced with restoration of materials and methods specified and have a minimum of three years' experience with work on buildings similar to that required by this Section. In acceptance or rejection of work of this Section, no allowance will be made for workers' incompetence or lack of skill.
    a. When masonry units are being patched, assign at least one worker among those performing patching work who is trained and certified by manufacturer of patching compound to apply its products.

1.4 ACTION SUBMITTALS

A. Samples
   1. Mortar and grout.

B. Prepare mock-ups as specified in Article "Mock-Ups," below.

C. Work Description: Provide detailed description of proposed procedures for joint preparation and pointing of each masonry material and condition (including installation of lead joint covers). Work description for each condition shall include:
   1. Materials and methods: Proposed materials, methods, tools, and equipment to be used.
   2. Protection: Description, including drawings, outlining methods and procedures for protection of personnel, public, and existing construction during work of this Section.
   3. Alternate Methods and Materials (If Any): Description of proposed alternate methods and materials (if any) to those specified for any phase of masonry pointing work. Provide evidence of successful use on comparable projects and demonstrate effectiveness for use on this Project.

1.5 INFORMATIONAL SUBMITTALS

A. Qualification Data: Qualification data for firm and personnel specified in “Quality Assurance” Article that demonstrates that both firm and personnel have capabilities and experience complying with requirements specified. For firm and foreman, provide a list of at least three completed historic projects similar in size and scope to the work required on this Project. For each project list project name, address, architect and or conservator, supervising preservation agency, scope of contractor's work, and other relevant information.

1.6 MOCK-UPS

A. General: Before beginning general masonry pointing, prepare mock-ups to provide standards for work of this Section. Do not proceed with masonry pointing until Architect has approved mock-ups.
   1. Locate mock-ups as directed by Architect
   2. Notify Architect 48 hours prior to start of each mock-up.
   3. Architect will monitor mock-ups. Mock-ups not performed in presence of Architect will be rejected.
   4. Use crew that will execute the work and follow requirements of this Section.
   5. Allow mock-ups using mortar to dry for seven days to allow mortar to reach final color and allow potential problems to appear. Notify Architect when mock-ups are ready for review.
   6. Repeat mock-ups as necessary to obtain Architect’s approval.
   7. Protect approved mock-ups to ensure that they are without damage, deterioration, or alteration at time of Substantial Completion.
   8. Approved mock-ups in undamaged condition at time of Substantial Completion may be incorporated into the Work.
   9. Approved mock-ups will represent minimum standards for masonry pointing. Subsequent masonry pointing work that does not meet standards of approved mock-ups will be rejected and will require repointing.

B. Prepare the Following Mock-Ups
   1. Joint Preparation in each type of Masonry: One panel including at least 25 square feet plus 12 linear feet of joint.

2. Pointing of Joints in each type of Masonry: One panel including at least 25 square feet plus 12 linear feet of joint.

C. Approval of mockups does not constitute approval of deviations from the Contract Documents contained in mockups unless Architect specifically approves such deviations in writing.

D. Approved mockups may become part of the completed Work if undisturbed at time of Substantial Completion.

1.7 PRODUCT DELIVERY, STORAGE, AND HANDLING

A. Deliver, store, and handle products and materials to prevent damage, deterioration, or degradation and intrusion of foreign material.

B. Discard and remove from site deteriorated materials, contaminated materials, and products that have exceeded their expiration dates. Replace with fresh materials.

1.8 PROJECT CONDITIONS

A. General: Perform work only when temperature of products being used and air temperature and humidity comply with manufacturer's requirements and requirements of this Section. In case of conflict, the most stringent requirements shall govern.

B. Safety: Use all means necessary to protect all persons, whether or not involved in the work of this Section, from harm caused by or resulting from work of this Section.

C. Protection of Building and Property
1. Provide all protection and procedures necessary to protect masonry not being pointed and all other elements and materials from damage and from deterioration during work of this Section.
2. Repair damage to elements and materials caused by masonry pointing work, using mechanics experienced in the respective type of work, to Architect’s satisfaction at no additional cost.
3. Protect components of storm drainage systems against damage and blockage caused or accelerated by work of this Section.

D. Protection from Fire: Take all necessary precautions to prevent fire and to prevent spread of fire.

E. Dust: Minimize dissemination of dust to greatest extent possible.
1. Contractor shall hold Owner, Architect, and their consultants harmless from all claims relating to dust resulting from work of this Section.

F. Protection of Masonry Being Pointed: Use all necessary care to protect existing masonry from damage during work of this Section. Take special care in removing existing mortar to ensure that no arrises are damaged, chipped, or broken. Contractor shall replace or repair masonry units damaged by work of this Section as directed by and to complete satisfaction of the Architect at no additional cost to the Owner.

G. Staining: Prevent grout or mortar from staining face of masonry to be left exposed. Protect sills, ledges, and projections from mortar droppings. Immediately remove grout or mortar in contact with such masonry.

H. Protection from Rain: Protect pointed joints with heavy waterproof sheeting from direct attack by rain or other precipitation for at least 24 hours after mortar has been applied.

I. Contract Drawings: Drawings are two-dimensional representations of three- dimensional objects and do not show all surfaces. Perform work on all surfaces of projections, reveals, ornament, and other elements associated with areas on which work is indicated.

J. Prohibited Materials: Masonry cements, masonry mortars, and ingredients not specifically specified in this Section and approved by Architect are strictly prohibited.

K. Cold-Weather Requirements: Comply with the following procedures for masonry repair and mortar-joint pointing unless otherwise indicated:
1. When air temperature is below 40 deg F heat mortar ingredients, masonry repair materials, and existing masonry walls to produce temperatures between 40 and 120 deg F
2. When mean daily air temperature is below 40 deg F provide enclosure and heat to maintain temperatures above 32 deg F within the enclosure for 7 days after repair and pointing.
3. Damage Caused by Freezing: Remove brick masonry restoration work determined by
4. Architect to have been damaged by freezing conditions. Replace work to comply with requirements of this Section.

L. Hot-Weather Requirements: Protect masonry repair and mortar-joint pointing when temperature and humidity conditions produce excessive evaporation of water from mortar and repair materials. Provide artificial shade and wind breaks and use cooled materials as required to minimize evaporation. Do not apply mortar to substrates with temperatures of 90 deg F and above unless otherwise indicated.

PART 2 - PRODUCTS

2.1 TOOLS

A. Hand Tools for Joint Preparation: Chisels, hammers, and mallets.
1. Thickness of Chisels: Chisels used in masonry joints shall have a maximum thickness of 5/8 times joint width extending back from tip of chisel at least two times depth at which chisel will be inserted into joint.
2. Special Tools: Provide special knives or special thin cutter blades for use in joints less than 1/8-inch wide.

B. Power Tools for Joint Preparation: Standard tools and equipment, modified tools and equipment, and custom designed and fabricated tools and equipment as required to remove mortar from narrow joints without damaging masonry and masonry units. Use power tools only under conditions described in Part 3, below and only if specifically approved by Architect in writing. Failure to demonstrate that use of selected power tools removes mortar without damaging masonry units will result in prohibition of use of power tools and requirement that mortar be removed using hand tools only. If, after approval of power tool use for mortar removal, masonry, or masonry units are damaged through use of power tools, the further use of power tools will be prohibited and mortar shall be removed using hand tools only.

1. Electric Grinders: Small, hand-held electric grinders with thin diamond or abrasive blades no greater than 1/16-inch-thick and a maximum of 4-1/2-inch diameter.
2. Pneumatic Grinders: Specially modified pneumatic die grinders with thin abrasive blades (0.060 inch thick).
3. Custom Pneumatic Head and Chisels Designed for Mortar Removal: Pneumatic head and thin carbide-tipped chisels specifically designed for removal of mortar from joints in historic masonry with air compressor, hoses, valves, and other equipment required to provide complete mortar removal system. Pneumatic head shall not have a retainer to hold chisels in place. Provide pneumatic head and chisels by Trow and Holden, Barre, VT (800-451-4349), or approved equal.

C. Brushes: Stiff, natural bristle brushes.

D. Pointing Trowels: Long, thin pointing trowels narrower than joints being pointed.
1. Fabricate special trowels for masonry pointing if necessary to ensure proper insertion and optimum compaction of mortar.

2.2 MORTAR

A. Comply with requirements of Division 04 -"Restoration Mortars." Mortar for each type of masonry shall match existing original mortar (in clean condition) in color, texture, and other visual qualities.

2.3 Miscellaneous materials

A. Joint Sealants: Comply with requirements of Division 07 -"Joint Sealants."

PART 3 - EXECUTION

3.1 GENERAL PREPARATION

A. Examine areas and conditions under which work of this Section will be performed. Correct conditions detrimental to timely and proper completion of work. Do not proceed until unsatisfactory conditions have been corrected.

B. Erect dust impervious barriers and take other measures necessary to prevent dust from traveling beyond work platform before using power grinders, pneumatic chisels, or hand methods that generate airborne dust.

3.2 JOINT PREPARATION

A. General: Remove mortar from joints to a depth of 3/4 inch or to sound mortar, whichever is greater. In all cases remove all deteriorated, weathered, and loose material.
1. Completely remove mortar from surfaces of masonry units adjacent to joint to ensure that new mortar bonds directly with masonry units.
2. Cut surface of mortar at rear of joint at a uniform depth from and parallel to wall surface.
3. Do not damage faces or arrises of masonry units during joint preparation. Cease joint preparation work if, in Architect’s judgment, masonry units are damaged. Do not resume

work until tools, workers, and methodology have been corrected to ensure that masonry units are not damaged and that work meets standard set by approved mock-up.

B. Mortar Removal Using Hand Tools: Use hand tools for removal of mortar from head joints in masonry work, all joints less than 6 inches long, and from other joints in which use of power tools might damage masonry units. Use hand tools to complete mortar removal from joints where power tools have been used to partially remove mortar.
   1. Joints 1/8-Inch or Less in Width: Rake mortar from joints manually with a sharp knife blade or cutter made for this purpose. Cutter may be used with or without aid of a hammer.
   2. Sharpening Tools: Sharpen chisels as required to maintain sharp edges that cut mortar and prevent damage to masonry units, but not less frequently than hourly.

C. Mortar Removal Using Power Tools
   1. Demonstrated Ability of Mechanics: Prior to beginning work, demonstrate that workers using power tools are proficient in use of power tools for joint preparation. Failure to demonstrate to Architect's satisfaction that each worker is proficient, and that power tool joint preparation does not result in damage to masonry units shall result in prohibition of use of power tools for joint preparation. If proficiency is not demonstrated, or if work in progress results in damage to masonry to remain, *all power tool work shall cease, and joints shall be prepared for pointing using only hand-powered tools*.
   2. Rotary Power Tools: With Architect's specific, prior written approval following successful demonstrations of skill by mechanics, power grinders and / or pneumatic grinders may be used to partially remove mortar from horizontal (bed) joints in masonry and from joints longer than 6 inches in masonry where there is no danger of cutting into adjacent masonry units.
      a. Limitations on Use of Electric Power Grinders: Do not use electric power grinders on joints less than 3/16-inch wide or less than 6 inches long or where ornament, elaborate profile, or other surface irregularity might make damage to masonry units likely.
      b. Limitations on Use of Modified Pneumatic Die Grinders: Do not use modified pneumatic die grinders with custom thin blades on joints less than1-1/2 times the width of the grinder blade.
      c. Extent of Mortar Removal Using Power Grinders: Use power grinder only to score one kerf cut in center of each joint to depth of mortar removal required. Remove remaining mortar using hand tools or, if approved, pneumatically powered chisels.
         1) Stop kerf at least 4 inches from inside corners and projecting elements. Remove remaining mortar using hand tools or pneumatically powered chisels.
      d. Jigs: Construct jigs to guide and limit power tools as required to prevent damage to masonry units.
   3. Pneumatic Heads with Chisels: With Architect's specific, prior written approval following successful demonstrations of skill by mechanics, pneumatically powered chisels may be used to remove mortar from joints in lieu of hand tools. If work using pneumatically powered chisels results in damage to masonry to remain, work using pneumatic chisels shall cease, and joints shall be prepared using only hand tools.

D. Cleaning: Remove loose mortar and foreign material from raked joints using a fine, stiff natural bristle brush. Remove remaining particles, dust, and dirt using filtered, oil- free compressed air. Ensure that dust and dirt are not blown back into previously cleaned joints.

E. Restoration of Damaged Masonry Units: Repair or replace masonry units damaged during joint preparation to Architect's satisfaction at no additional cost.

3.3 MORTAR APPLICATION

A. Wetting: Thoroughly wet masonry 24 hours prior to and again immediately before masonry pointing. Let surfaces dry slightly. At time of masonry pointing, surfaces shall be damp, so that they do not rapidly absorb moisture, but free of standing water (saturated, surface dry).
   1. Failure to Properly Wet Substrate: Evidence that masonry to be pointed has not been properly dampened to prevent water in the mortar from being too rapidly absorbed by the masonry will be cause for Restoration Consultant to reject pointing work. Remove and replace rejected pointing, including proper joint preparation, to meet requirements of this Section at no additional cost.

B. Masonry Pointing: Point joints as follows.
   1. Using a long, thin masonry pointing trowel, tightly pack mortar into joints in layers not exceeding 1/4-inch thick to fill joint to match original sound joints.
   2. Begin by filling areas from which mortar is missing to a depth greater than 3/4 inch in 1/4-inch-thick layers to within 3/4 inch of masonry surface to provide a uniform substrate for final masonry pointing. Fill final 3/4-inch depth continuously and uniformly in 1/4-inch-thick layers.
   3. Firmly iron each layer to compact mortar and ensure full bond between mortar and masonry units and a firm, solid joint.
   4. Allow each layer to reach thumbprint hardness before applying succeeding layer. Do not let previous layer dry out before applying succeeding layer. Construct uniform joints.
   5. Do not spread mortar over edges onto exposed surfaces of masonry units. Do not featheredge mortar.
   6. When stopping work at end of each day or for other reasons, stagger layers of mortar so that there will be no through joints in masonry pointing. Stagger joints in layers so that they are at least 3 inches from each other.
   7. Where applying new work to that of a prior day, dampen previous work as well as existing masonry to ensure good bond.

3.4 JOINT TOOLING

A. Tooling: After final layer of mortar is "leather hard," tool joints with a flat rule jointer, or as directed by Architect.

B. Profile: Tool joints to profile to match original joint profiles. Solidly compress mortar so that it adheres well to masonry on both sides of joints and forms a dense surface. Premature or late tooling will result in unacceptable finishes, which will be rejected.

3.5 CURING

A. Keep newly pointed joints damp for at least 48 hours after mortar has been inserted. Do not apply a direct stream of water to joints for at least 24 hours after mortar has been placed.

B. Ensure masonry temperature remains as required by specifications until mortar is thoroughly cured.

3.6 CLEANING AND REPAIR OF MORTAR JOINTS

A. Water Washing: Wash pointed masonry with clean filtered water and nonabrasive hand tools to remove mortar debris from masonry surfaces. Do not use chemical cleaners.

1. Wash within 48 hours following completion of masonry pointing.
2. Use blunt-edged wood scrapers, stiff natural bristle brushes, and rough towels along with water to remove mortar debris. Do not use wire brushes.

B. Repair of Pointed Joints: As cleaning progresses, examine joints to locate cracks, holes, and other defects. Carefully point up and fill such defects with mortar. Where joints are defective in opinion of Architect, cut out joints and refill with pointing mortar exercising extreme care to ensure that color matches that of adjacent masonry pointing work. Exposed joint surfaces shall be free from protruding mortar, holes, pits, depressions, and other defects.

3.7 DEEP POINT JOINTS IN MASONRY

A. General: Remove mortar to depth of masonry using wedges, shims, and/or other approved methods to prevent displacement of masonry during removal. Clean joints. Install mortar to fill deep portion of joints (portion of joint behind 3/4 inches from the plane of the wall). Point outer 3/4-inch depth of joint as specified above.

3.8 CORRECTIVE MEASURES

A. Defective Joints: Should a crack occur in any joint surface, should mortar fail to adhere to or pull away from masonry unit, or should there be other defects in pointed joints, remove mortar and repaint following requirements of this Section to Architect's satisfaction.

B. Should Architect determine that any masonry pointing work does not equal or exceed minimum standard established by approved mock-up, cut out mortar to a depth of 34 inch and repoint following requirements of this Section to Architect's satisfaction at no additional cost to Owner.

3.9 WASTE MANAGEMENT

A. Coordinate with Division 01.
1. Separate and recycle cut-offs and waste materials and material packaging in accordance with Waste Management Plan and to the maximum extent economically feasible and place in designated areas for recycling.
2. Set aside and protect materials suitable for reuse and/or remanufacturing.
3. Separate and fold up metal banding; flatten and place along with other metal scrap for recycling in designated area.

END OF SECTION 04 03 05.16

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SECTION 042200 - CONCRETE UNIT MASONRY

PART 1 - GENERAL

SCHEDULE 0 - SUMMARY

A. Section Includes:
   1. Concrete masonry units.
   2. Mortar and grout.
   3. Steel reinforcing bars.
   4. Masonry-joint reinforcement.
   5. Embedded flashing.
   6. Miscellaneous masonry accessories.
   7. Masonry-cell fill.

B. Related Requirements:
   1. Section 03 10 00 "Concrete Forms and Accessories" for installing dovetail slots for masonry anchors.
   2. Section 05 12 00 "Structural Steel Framing" for installing anchor sections of adjustable masonry anchors for connecting to structural steel frame.
   3. Section 07 19 00 "Water Repellents" for water repellents applied to unit masonry assemblies.
   4. Section 07 62 00 "Sheet Metal Flashing and Trim" for exposed sheet metal flashing and for furnishing manufactured reglets installed in masonry joints.
   5. Section 08 95 16 "Wall Vents" for wall vents (brick vents).

1.2 DEFINITIONS

A. CMU(s): Concrete masonry unit(s).

B. Reinforced Masonry: Masonry containing reinforcing steel in grouted cells.

1.3 ACTION SUBMITTALS

A. Product Data: For each type of product.

B. Shop Drawings: For the following:
   1. Masonry Units: Show sizes, profiles, coursing, and locations of special shapes.
   2. Reinforcing Steel: Detail bending, lap lengths, and placement of unit masonry reinforcing bars. Comply with ACI 315. Show elevations of all reinforced walls at ¼” per ft scale.
   3. Fabricated Flashing: Detail corner units, end-dam units, and other special applications.

C. Samples for Initial Selection:
   1. Colored mortar.
   2. Weep holes/vents.

D. Samples for Verification: For each type and color of the following:
   1. Pigmented and colored-aggregate mortar. Make Samples using same sand and mortar ingredients to be used on Project.

1.4 INFORMATIONAL SUBMITTALS

A. Qualification Data: For testing agency.

B. Material Certificates: For each type and size of the following:
   1. Masonry units.
      a. Include data on material properties and material test reports substantiating compliance with requirements.
   2. Cementitious materials. Include name of manufacturer, brand name, and type.
   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.

C. 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/C 91M for air content.
   2. Include test reports, according to ASTM C 1019, for grout mixes required to comply with compressive strength requirement.

1.5 QUALITY ASSURANCE

A. Testing Agency Qualifications: Qualified according to ASTM C 1093 for testing indicated.

B. Mockups: Build mockups to verify selections made under Sample submittals, to demonstrate aesthetic effects, and to set quality standards for materials and execution.

1.6 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. Store cementitious materials on elevated platforms, under cover, and in a dry location. Do not use cementitious materials that have become damp.

C. Store aggregates where grading and other required characteristics can be maintained and contamination avoided.

D. Deliver preblended, dry mortar mix in moisture-resistant containers. Store preblended, dry mortar mix in delivery containers on elevated platforms in a dry location or in covered weatherproof dispensing silos.

1.7 FIELD 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.

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.

PART 2 - PRODUCTS

2.1 MANUFACTURERS

A. 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.

B. 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.

2.2 PERFORMANCE REQUIREMENTS

A. Provide 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 TMS 602/ACI 530.1/ASCE 6.

2.3 UNIT MASONRY, GENERAL

A. Masonry Standard: Comply with TMS 602/ACI 530.1/ASCE 6 except as modified by requirements in the Contract Documents.

B. Defective Units: Referenced masonry unit standards may allow a certain percentage of units to contain chips, cracks, or other defects exceeding limits stated. Do not use units where such

defects are exposed in the completed Work and will be within 20 feet vertically and horizontally of a walking surface.

2.4 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-edged units for outside corners unless otherwise indicated.

B. CMUs: ASTM C 90.
   1. Unit Compressive Strength: Provide units with minimum average net-area compressive strength of 2800 psi.
   2. Density Classification: Lightweight except at exposed units at exterior walls.
   3. Size (Width): Manufactured to dimensions 3/8 inch less-than-nominal dimensions.
   4. Exposed Faces: Provide color and texture matching the range represented by Architect's sample.

2.5 CONCRETE AND MASONRY LINTELS

A. General: Provide one of the following:

B. Masonry Lintels: Prefabricated or built-in-place masonry lintels made from bond beam CMUs matching adjacent CMUs in color, texture, and density classification, with reinforcing bars placed as indicated and filled with coarse grout. Cure precast lintels before handling and installing. Temporarily support built-in-place lintels until cured.

2.6 MORTAR AND GROUT MATERIALS

A. Portland Cement: ASTM C 150/C 150M, 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.
   1. Alkali content shall not be more than 0.1 percent when tested according to ASTM C 114.

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. 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.

E. Aggregate for Grout: ASTM C 404.

F. Water: Potable.

2.7 REINFORCEMENT

A. Uncoated Steel Reinforcing Bars: ASTM A 615/A 615M or ASTM A 996/A 996M, Grade 60.

B. Reinforcing Bar Positioners: Wire units designed to fit into mortar bed joints spanning masonry unit cells and to 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.

C. Masonry-Joint Reinforcement, General: Ladder type complying with 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: 0.148-inch diameter.
   4. Wire Size for Cross Rods: 0.148-inch diameter.
   5. Spacing of Cross Rods: Not more than 16 inches o.c.
   6. Provide in lengths of not less than 10 feet, with prefabricated corner and tee units.

2.8 TIES AND ANCHORS

A. General: Ties and anchors shall extend at least 1-1/2 inches into masonry but with at least a 5/8-inch cover on outside face.

B. 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.

C. 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 made from 0.187-inch- diameter, hot-dip galvanized steel wire.

2.9 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 unless otherwise indicated.

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, Proportion Specification. Provide the following types of mortar for applications stated unless another type is indicated.

1. For reinforced masonry, use Type S.
2. For interior nonload-bearing partitions, use Type N.

D. 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 TMS 602/ACI 530.1/ASCE 6 for dimensions of grout spaces and pour height.
2. Proportion grout in accordance with ASTM C 476, Table 1 or paragraph 4.2.2 for specified 28-day compressive strength indicated, but not less than 2500 psi.
3. 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 the Work.
2. Verify that foundations are within tolerances specified.
3. Verify that reinforcing dowels are properly placed.
4. Verify that substrates are free of substances that would impair mortar bond.

B. Before installation, examine rough-in and built-in construction for piping systems to verify actual locations of piping.

C. Proceed with installation only after unsatisfactory conditions have been corrected.

3.2 INSTALLATION, GENERAL

A. Build chases and recesses to accommodate items specified in this and other Sections.

B. Leave openings for equipment to be installed before completing masonry. After installing equipment, complete masonry to match construction immediately adjacent to opening.

C. 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.

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.

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.

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 stepping 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 solid grout 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.

3.5 MORTAR BEDDING AND JOINTING

A. Lay hollow CMUs as follows:
   1. Bed face shells in mortar and make head joints of depth equal to bed joints.
   2. Bed webs in mortar in all courses of piers, columns, and pilasters.
   3. Bed webs in mortar in grouted masonry, including starting course on footings.
   4. Fully bed entire units, including areas under cells, at starting course on footings where cells are not grouted.

B. Tool exposed joints slightly concave when thumbprint hard, using a jointer larger than joint thickness unless otherwise indicated.

C. Cut joints flush where indicated to receive waterproofing unless otherwise indicated.

3.6 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 8 inches o.c. in foundation walls and parapet walls.
   2. Provide reinforcement not more than 8 inches above and below wall openings and extending 12 inches beyond openings in addition to continuous reinforcement.

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.

3.7 ANCHORING MASONRY TO STRUCTURAL STEEL AND CONCRETE

A. Anchor masonry to structural steel and concrete, where masonry abuts or faces structural steel or concrete, to comply with the following:
   1. Anchor masonry with anchors embedded in masonry joints and attached to structure as detailed on the drawngs.

3.8 LINTELS

A. Provide 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.

B. Provide concrete or masonry lintels where indicated. Provide loose steel lintels, concrete, or masonry lintels where lintel no type is specified.

C. Provide minimum bearing of 8 inches at each jamb unless otherwise indicated.

3.9 REINFORCED UNIT MASONRY INSTALLATION

A. Temporary Formwork and Shores: Construct formwork and shores as needed to support reinforced masonry elements during construction.
   1. Construct formwork to provide shape, line, and dimensions of completed masonry as indicated. Make forms sufficiently tight to prevent leakage of mortar and grout. Brace, tie, and support forms to maintain position and shape during construction and curing of reinforced masonry.
   2. Do not remove forms and shores until reinforced masonry members have hardened sufficiently to carry their own weight and other loads that may be placed on them during construction.

B. Placing Reinforcement: Comply with requirements in TMS 602/ACI 530.1/ASCE 6.

C. 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 TMS 602/ACI 530.1/ASCE 6 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. Do not use mortar to fill cmu cores. Use of mortar is cause for immediate rejection and replacement of the work.

3.10 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.

B. Inspections: Special inspections according to Level [**B**] [**C**] in TMS 402/ACI 530/ASCE 5.
   1. Begin masonry construction only after inspectors have verified proportions of site-prepared mortar.
   2. Place grout only after inspectors have verified compliance of grout spaces and of grades, sizes, and locations of reinforcement.
   3. Place grout only after inspectors have verified proportions of site-prepared grout.

C. Testing Prior to Construction: One set of tests.

D. Testing Frequency: One set of tests for each 5000 sq. ft. of wall area or portion thereof.

E. Concrete Masonry Unit Test: For each type of unit provided, according to ASTM C 140 for compressive strength.

F. Mortar Aggregate Ratio Test (Proportion Specification): For each mix provided, according to ASTM C 780.

G. Grout Test (Compressive Strength): For each mix provided, according to ASTM C 1019.

H. Prism Test: For each type of construction provided, according to ASTM C 1314 at 28 days.

3.11 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 nonmasonry 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 concrete masonry by applicable cleaning methods indicated in NCMA TEK 8-4A.

END OF SECTION 042200

SECTION 05 12 00 – STRUCTURAL STEEL

PART 1 - GENERAL

1.1 SCOPE

A. The extent of Structural Steel is as shown on the Contract Documents and as herein specified. The General and Supplementary Conditions and Division 1 Specification sections apply to work of this section.

1.2 ENERAL PROVISIONS

A. Standard Specifications and Codes issued by professional organizations and governmental agencies are specified hereinafter by basic designations and only the latest editions and revisions thereto shall apply to the work of this Section.

B. Applicable Standard Specifications and Codes:

1. The 2015 International Building Code with Current New York State Supplement.

2. Specifications for the Design, Fabrication and Erection of Structural Steel for Buildings issued by the American Institute of Steel Construction. (AISC).

3. AWS D1.1 “Structural Welding Code – Steel” issued by the American Welding Society (AWS).

4. “Specification for Structural Joints Using ASTM A325 or A490 Bolts” issued by the AISC.

5. Painting Manual, Volume 2, “Systems and Specifications”, as issued by the Steel Structures Painting Council (SSPC).

6. "Code of Standard Practice for Steel Buildings and Bridges" as issued by the AISC.

C. In case of any conflict between the referenced standards and these specifications, the one having more stringent requirements shall prevail.

D. Coordination: Carry out the work of this Section in coordination and cooperation with contiguous work of other trades and/or Contracts involved.

1.3 SHOP DRAWINGS

Retain "Preinstallation Conference" Paragraph below if Work of this Section is extensive or complex enough to justify a preinstallation conference.

A. Submit Shop Drawings for the Architect's approval in accordance with the provisions of Section 013300.

B. The submittals shall include the following:

1. Erection plans: Shall be submitted for approval as early as possible.

2. Standard and special details: Submit standard and special details for approval as soon as possible.

3. Shop drawings shall indicate type, size and dimensions of all welds, and shall include details of the surface preparation and shop painting.

4. The details shall be made in such a way as to avoid having steel connections, bracing, etc. interfere with architectural details or in any way reduce the areas of shafts, openings, clearances, etc.

5. Shop drawings submitted electronically shall follow proper channels of submission as established with the owner and the design team. In addition, provisions of the General Conditions, as well as Section 013300 shall be followed as established for hard copy submissions. Shop drawings shall be submitted under a separate cover, include the title block and clearly identify the project on each drawing. Provide all other pertinent information and include the general contractor's review comments and review status on the electronic submission.

C. No fabrication shall be undertaken until respective shop drawings are marked "No Exception Taken" or "No Exception Except as Noted".

1.4 ALTERATIONS AND ADDITIONS TO EXISTING STEEL STRUCTURE

A. The Contractor shall verify existing conditions before submitting shop drawings for approval, including:

1. Dimensions and elevations.

2. Sizes.

3. Acceptable condition (not deteriorated or damaged).

B. The Contractor shall notify the Architect of any varying or interfering conditions affecting the alterations or additions so that the design may be adjusted to suit.

C. The Contractor shall carefully fit new connections to safe and acceptable tolerances.

D. Cutting of existing steel shall be done with extreme care. Do not over cut. Shore and brace whenever safety is questionable.

Verify available warranties and warranty periods for fire extinguishers with manufacturers.

PART 2 - PRODUCTS

See Editing Instruction No. 1 in the Evaluations for cautions about named manufacturers and products. For an explanation of options and Contractor's product selection procedures, see Section 01 60 00 "Product Requirements."

2.1 MATERIALS

A. Structural Steel shall conform to the following unless otherwise noted:

1. Channels, angles, plates and bars – ASTM A36

2. Round HSS – ASTM A53, Grade B

3. Square and rectangular HSS - ASTM A500, Grade B

4. HP shapes – ASTM A572, Grade 50

5. All others – ASTM A992, Grade 50

B. Bolts shall be ASTM A325, or A490. A307 may be used, if approved by the Structural Engineer of Record.

C. High Strength Bolts:

1. Bolts: Use ASTM A325 or A490 bolts manufactured by Infasco or approved equal. ASTM F1852 twist-off type tension control bolts produced by manufacturer may be used if approved by the Structural Engineer of Record.

2. Hardened washers: Use ASTM F436 washers manufactured by Infasco or approved equal.

3. Heavy hex nuts: Use only ASTM A563 heavy hex nuts manufactured by Infasco or Unytite Inc.

4. Galvanized Bolts: Where shown or noted as galvanized, bolts nuts and washers shall be hot-dip galvanized in compliance with ASTM A153. Nuts shall be lubricated in accordance with ASTM A563. Rotational capacity tests shall be performed on each assembly lot.

D. Filler Metal:

1. Electrodes: As required for matching base metal as specified in AWS “Structural Welding Code-Steel”.

2. The electrodes and flux used for submerged arc welding shall be provided by the same manufacturer. The flux shall be free of contamination from dirt, mill scale and other foreign material. Fused flux used in welding shall not be reused.

3. Filler metal for welding of new to existing steel shall be determined based on the test results conducted by a testing laboratory approved by the Structural Engineer of Record.

E. Paint for Shop Coat, except as otherwise required for compatibility with finish paints as specified in Section 099000, shall be “Azeron H.S. Primer No. 88-555” by Tnemec, or a comparable suitable product by DuPont or Glidden.

PART 3 - EXECUTION

3.1 DESIGN AND WORKMANSHIP

A. Unless otherwise specified or indicated, the design, fabrication and erection of steel work included in this Contract shall conform to the Specifications for the Design, Fabrication and Erection of Structural Steel for Buildings, by the American Institute of Steel Construction, and the regulations of the Building Code, including all amendments made thereto, whichever is the more restrictive.

B. Existing Conditions:

1. Visit the project site and advise the Architect of any discrepancy or conflict. Field verify existing construction requirements, existing conditions, restrictions and clearances which may affect structural steel erection.

2. Examine the substrates, adjoining construction and the conditions under which the work is to be installed. Do not proceed until unsuitable conditions have been corrected. Consider all conditions which will affect satisfactory erection of the structural steel.

C. Erection:

1. Check the alignment and elevations of all column supports and location of all anchor bolts with transit and level instruments before starting erection. Notify and obtain Structural Engineer of Record’s approval of methods proposed for correcting errors prior to proceeding with corrections.

2. Drift pins may be used only to align the erected parts. They shall not be used in such manner as to distort or damage the steel.

3. Make all necessary provisions for temporary shoring and bracing with connections of sufficient strength to sustain the imposed loads and for completion of erection where structural members are temporarily left out for erection at a later date.

4. Base and Bearing Plates:
   a. Clean concrete and masonry bearing surfaces of deleterious materials and roughen as necessary to provide adequate bond. Clean bottom surface of base and bearing plates immediately prior to erection.
   b. Set loose and attached base plates and bearing plates for structural members on wedges or other adjusting devices.
   c. Tighten anchor bolts after supported members have been positioned and plumbed. Do not remove wedges or shims. Cut off protruding parts flush with edges of base or bearing plates prior to packing with grout.
   d. Pack grout solidly between bearing surfaces and steel or plates. Ensure that no voids remain. Finish exposed surfaces, protect installed materials, and allow to cure as per manufacturer’s specifications.

3.2 HIGH STRENGTH BOLTING

A. High Strength Bolts shall be installed as per "Specification for Structural Joints using ASTM A325 or A490 Bolts".

3.3 WELDING

A. Materials and Workmanship:

1. Welding shall be done in accordance with the Building Department and Fire Department Regulations and the requirements of the AWS "Structural Welding Code-Steel", referenced herein.

2. Peening: Used only after permission for its use is obtained from the Architect.

3. Protection, storage and drying of welding electrodes shall be as specified in AWS "Structural Welding Code-Steel".

4. Groove welds shall be complete penetration welds unless otherwise shown.

B. Welders and Welding Operators:

1. Welders and welding operators to be employed for this work must be qualified as prescribed in AWS "Structural Welding Code-Steel" and carry current certification as required by the Department of Buildings.

2. All costs for qualifying welders will be borne by the Contractor.

3.4 SURFACE PRAPARATION AND PAINTING

A. All steel shall be cleaned in accordance with SSPC SP-2 "Hand Tool Cleaning", except as specified below for "Architectural Steel".

B. After fabrication, steel shall receive a shop coat of paint to provide 2.0 - 4.0 mils dry film thickness, except for the following:

1. Members to be encased in concrete.

2. Areas within 2" of field welds.

3. Contact surfaces of high-strength bolted connections.

4. Surfaces receiving shear studs rebar dowels, etc.

5. Milled surfaces (protect with an approved rust- inhibitive coating readily removable prior to erection, or of a type not requiring removal).

6. Members which will receive cementitious fireproofing.

7. Members to be galvanized.

C. After erection all damaged areas in the shop-coat, loosened scale, rust, exposed surfaces of bolts, nuts and washers, and all field welds and unpainted areas shall be cleaned to the same standards as for the shop coat and spot painted with the same paint used for the shop coat, at same film thickness.

D. Steel surfaces which will be inaccessible after erection and are not concrete encased shall be painted prior to erection with an additional coat of shop paint.

END OF SECTION 05 12 00

SECTION 05 31 00 – STEEL DECKING

PART 1 - GENERAL

1.1 REQUIREMENTS

A. Provide metal decking in accordance with the Contract Documents.

1.2 SCOPE

A. The extent of Steel Decking is as shown on the Contract Documents and as herein specified. The General and Supplementary Conditions and Division 1 Specification sections apply to work of this section.

B. Work included but not limited to:

1. Metal deck shown on drawings, including required shoring.

2. Steel flashing between metal deck and adjacent construction, and all other miscellaneous items and accessories required for the completion of metal deck work.

3. Cutting and reinforcing of openings in metal deck.

1.3 GENERAL PROVISIONS

A. Standard Specifications and Codes issued by professional organizations and governmental agencies are specified hereinafter by basic designations and only the latest editions and revisions thereto shall apply to the work of this Section.

B. Applicable Standard Specifications and Codes:

1. The Building Code of New York State, latest edition.

2. "Specification for the Design of Cold-Formed Steel Structural Members" issued by the American Iron and Steel Institute.

3. "Code for Welding in Building Construction" issued by the American Welding Society.

C. In case of any conflict between the referenced standards and these specifications, the one having more stringent requirements shall prevail.

D. Tests of weight of zinc coating shall conform to ASTM A90. Test panels shall be not less than 3” x 6” cut from fabricated deck units equivalent to those to be furnished. A sample of the zinc-coated accessories shall be tested by the same method. Contractor shall submit copies of test reports to Architect for approval.

E. Coordination: Carry out the work of this Section in coordination and cooperation with contiguous work of other trades and/or Contracts involved.

F. Inspection in Mill, Shop and Field: The material to be furnished shall be subject to inspection and tests in the mill, shop, and field by the Owner's inspectors, at no cost to the Contractor. However, inspection in the mill, shop or field will not relieve the Contractor of the responsibility to furnish satisfactory materials.

PART 2 - PRODUCTS

2.1 MATERIALS

A. Metal Deck: Depths and gages are shown on the drawings. The types, design and function of metal decks shown are specified to products as manufactured by Canam USA (manufacturers of United Steel Deck products). Equivalent products meeting design requirements will be accepted if approved by the Architect prior to the award of the Contract.

B. Finish Flashing: Of not less than 18 gauge galvanized sheet steel, except as approved for a particular use, to close openings between floor units and columns, beams and girders where required.

C. Finishes: Composite metal deck shall be phosphatized / painted only on the side that will not be in contact with concrete. All other deck, closures, etc. shall be galvanized.

2.2 ACCESSORIES

A. Provide minimum 18 gauge galvanized end closures and change of direction plates, minimum 18 gauge side closure plates.

B. Include hanger tabs to be suspended from bottom of metal deck units. The hanger tabs shall be spaced 4'-0” on center, each way, designed to support maximum allowable load of 40 lbs. per hanger.

C. Surface Finishes: Accessories shall receive, before being formed, a zinc coating conforming to ASTM A525, wiped coating designation G90.

D. Where bottom of deck is above top flange of beam, provide permanent supporting seat or filler, 18 gage minimum.

PART 3 - EXECUTION

3.1 DELIVERY, STORAGE, AND HANDLING

A. Metal deck, miscellaneous items and accessories shall be delivered, stored, handled and installed, so as not to be damaged or deformed. Failure to wire brush and paint rusted areas immediately upon detection shall be cause for rejection. Decking stored at the site before erection shall be stacked on platforms or pallets and covered with tarpaulins or other suitable covering to provide weather tight enclosure while affording proper air circulation. The decking shall not be used for storage or as a working platform until the sheets have been securely fastened in position and shall not be damaged or overloaded during the entire construction period.

3.2 ERECTION

A. Metal deck shall be installed according to the manufacturer's recommendations. Deck units shall be in lengths to span over three or more supports wherever possible.

B. The deck shall be fastened to supporting steel by electric arc welding. Care shall be exercised in the selection of electrodes and amperage to provide positive welds and prevent high amperage blow holes. Welds shall be made from the top side of the deck with the welder following close behind the placement crew.

C. Puddle welds shall be at least 3/4" diameter or an elongated weld having an equal perimeter. Fillet welds, when used, shall be approximately 1" long. Weld metal shall penetrate all layers of deck material at end laps and side joints and have good fusion to the supporting members.

D. The minimum weld spacing shall be such as to hold the deck against a 30psf gross uplift and to provide lateral stability to the top flange of the supporting structural members. The weld spacing between the adjacent attachment points shall not exceed 12" on center. The adjacent sheets shall be fastened together at maximum spacing of 24” on center.

E. All portions of Metal Deck omitted due to the installation of hoists or for future installation of mechanical equipment, chutes or other requirements shall be installed or patched and be repaired by this Contractor as directed by the Contractor at no additional cost to the Owner.

F. Closures and Flashings:

1. Furnish, install and weld into position, flashings of not less than No. 18 gauge sheet steel except as approved for a particular use, to close openings between floor units and columns, beams and girders where required.

2. Provide where required, minimum 18 gauge galvanized end closure, side closure and change of direction plates. The appropriate gage shall be designed by a structural engineer in contractor’s employ and shown on the shop drawings submitted for Architect’s approval.

3.3 CUTTING AND PATCHING

A. Do all cutting and fitting as may be necessary to provide openings around columns, ducts and other penetrations required in connection with decking. All cutting and fitting shall be performed in accordance with the design drawings and approved shop drawings.

B. In addition to the above, cut out and notch for pipes, conduits, etc. which will penetrate the metal deck and which are indicated on the Heating, Ventilating, Air Conditioning, Plumbing, Drainage, and Electrical drawings.

C. Reinforce all openings to produce rigid installations in conformance with required design loads in the installed work.

3.4 HANGER TABS

A. Provide hanger tabs or tab extenders in such numbers and locations as required for ceiling suspension systems and mechanical and electrical requirements. Contractor shall carefully coordinate number and location of hanger tabs with the respective trades of the ceiling

construction. Unless otherwise directed, hanger tabs or tab extenders shall be spaced at 4'-0" on center, each way.

B. END OF SECTION 05 31 00

SECTION 05 40 00 - COLD FORMED METAL FRAMING

PART 1 - GENERAL

1.1 SCOPE

A. All light gage steel studs, track, joists, trusses, bridging and related accessories as indicated on the Contract Drawings and specified herein, plus all supplementary parts necessary to complete light gage metal work, whether or not definitely shown on drawings or specified herein.

1.2 QUALITY ASSURANCE

A. Inspection and Quality Control:
   1. Contractor shall provide effective full-time quality control over all fabrication and erection activities.
   2. As directed by Architect, Owner's testing agency may inspect the maintenance of a quality control program, including spot checking weldments and welding procedure in accordance with A.W.S. standards.
   3. Steel framing manufacturer shall provide a qualified representative for periodic on-site review of fabrication and installation in accordance with manufacturer's recommendations.
   4. Inspection by Owner's testing agency is not intended to be comprehensive or complete.
   5. Full responsibility for quality control shall remain with Contractor.

B. Standards:
   1. Work shall meet the requirements of the latest edition of the following standards.
      a. The Building Code of State of New York.
      b. American Iron and Steel Institute (A.I.S.I.) Design and Cold Formed Steel Structural Members.
      c. American Welding Society (A.W.S. D.1.3, Structural Welding Code -- Sheet Steel).
      d. American Society for Testing and Materials (A.S.T.M.).
      e. American Institute of Steel Construction (A.I.S.C.) Manual of Steel Construction.
      f. All pertinent Federal, State and Local codes.
   2. The most stringent requirements shall govern in conflicts between specified codes and standards.
      a. Erection plans showing locations and marks of members. Fabrication drawings showing details at every member.
      b. Member gages, spacings and sizes.
      c. Shop and field assembly details including cuts and connections.
      d. Type and location of welds, bolts and other fastening devices.

1.3 PRODUCT HANDLING

A. Protection:
   1. Upon delivery, material shall be protected from rain and snow by impervious covering or shelter.

PART 2 - PRODUCTS

2.1 MANUFACTURERS

A. Framing members shall be manufactured and supplied by Marino Ware or approved equal and be of the type and size as shown on the plans.

2.2 MATERIAL

A. Members:
1. Members shall be formed from steel having a G-60 galvanized coating meeting the requirements of ASTM C-955.
2. Studs and Joists of 12,14 and 16 gage thicknesses shall be formed from steel conforming to ASTM A653 HSLAS Type A, with a minimum yield of 50,000 psi.
3. Except as specified above, all steel shall conform to ASTM A653 SS Grade with a minimum yield of 33,000 psi.

B. Properties:
1. The physical and structural properties listed Marino Ware shall be considered the minimum permitted for framing members. Specifically, the following minimum properties, calculated in accordance with the latest A.I.S.I. Specification shall be provided: Ix (in.4), Area (in.2), rx (in.), Fy (KSI), Resisting Moment (in.-lb.).

C. Substitutions:
1. Any substitutions must be approved in writing ten days prior to bid date by the Architect.

2.3 FABRICATION

A. Framing components may be preassembled into panels prior to erecting. Prefabricated panels shall be square, with components attached in a manner as to prevent racking.

B. Framing components shall be cut squarely for attachment to perpendicular members, or as required for an angular fit against abutting members. Members shall be held positively in place until properly fastened.

C. Provide insulation equal to that specified elsewhere in double jamb studs and double header members which will not be accessible to the insulation contractor.

D. Axially Loaded Studs:
1. Studs shall have full bearing against inside track web, prior to stud and track attachment.
2. Splices in axially loaded studs shall not be permitted.

PART 3 - EXECUTION

3.1 SURFACE CONDITIONS

A. Inspection:
1. Prior to installation inspect work of all other trades. Verify that all such work is complete an accurate to the point where this installation may properly commence in strict accordance with framing shop drawings.

B. Discrepancies:
   1. Immediately notify Architect of all discrepancies.
   2. Do not proceed with installation in areas of discrepancies until such discrepancy has been fully resolved.

3.2 ERECTION

A. Walls:
   1. Erect framing and panels plumb, level and square in strict accordance with the approved shop drawings.
   2. Handling and lifting of prefabricated panels shall be done in a manner as to not cause distortion in any member.
   3. Track shall be securely anchored to the supporting structure as shown on the fabrication and erection drawings.
   4. At track butt joints, abutting pieces of track shall be securely anchored to a common structural element or they shall be butt-welded or spliced together.
   5. Studs shall be plumbed, aligned and securely attached to the flange or webs of both upper and lower tracks.
   6. Wall stud bridging shall be attached in a manner to prevent stud rotation. Bridging rows shall be spaced according to the manufacturer's recommendation. Without supportive data, the minimum bridging shall be at mid-height of walls. Installation of bridging must be completed before any loads are applied to the system.
   7. Temporary bracing shall be provided until erection is completed.

B. Cold Formed Steel Joists:
   1. Joists shall be located directly over bearing studs or a load distribution member shall be provided at the top track.
   2. Provide web stiffeners at reaction points where indicated by plans.
   3. Joist bridging shall be installed at 3'-0" o.c. maximum intervals.
   4. Proper attachments of diaphragm rated products, such as plywood or metal deck, will prevent rotation of the compression flange of the joists. These may be used in lieu of the top flat strap. Installation of these products and the balance of the mechanical bridging components must be completed before any loads are applied to the joists.
   5. Install 16 gage solid bridging in first two and last two joist spaces. Starting at third joist space, install V-bar bridging at bottom, extending for 10'-0" run. Follow with solid bridging in one space. Repeat to completion, with each 10'-0" run of strap bridging followed by one space of solid bridging.
   6. Solid bridging shall not be less than 2" maximum reduction to section depth.
   7. End blocking shall be provided where joist ends are not otherwise restrained from rotation.

3.3 CONNECTIONS

A. Provide close fitting joints cut flush with adjacent structural steel supports, cut, drill, punch and tap for the installation and attachment of other work to miscellaneous metal work as follows:
   1. Joints:
      Make joints as strong and rigid as adjoining sections. Make welds continuous along entire line of contract, except where spot welding is indicated. Grind exposed weld flush and smooth. Where bolted or riveted connections are indicated, such connection may be welded. Seat studs squarely in track with stud web and flange abutting track web.
   2. Welding:
      Perform welding in accordance with AWS D1.1 and AWS D1.3.

3. Screws: Screws and screwed connections shall conform to the AISI Cold-formed Steel Specification.

B. Anchorage:
Except where otherwise specified, members shall be fastened to structural steel by welded or bolted connections and to masonry with toggle bolts. Fastening to wood plugs in concrete or masonry will not be permitted. Drill holes for toggle bolts to the exact diameter of the bolt, using a rotary drill for concrete and a percussion drill for other masonry. Screws shall be threaded full length to the head of the screw.

3.4 WASTE MANAGEMENT

A. Coordinate with Division 01.

1. Separate and recycle cut-offs and waste materials and material packaging in accordance with Waste Management Plan and to the maximum extent economically feasible and place in designated areas for recycling.
2. Set aside and protect materials suitable for reuse and/or remanufacturing.
3. Separate and fold up metal banding; flatten and place along with other metal scrap for recycling in designated area.

END OF SECTION 05 40 00

SECTION 05 50 00 - 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. The Work of this Section consists of the provision of all plant, labor, materials, equipment, testing and services necessary to complete the work of metal fabrications as shown on the schedules, keynotes, drawings, as specified herein, and as may be required by conditions and authorities having jurisdiction, including, but not limited to, the following (NOT ALL USED):

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. Prefabricated non-penetrating metal roof railings.

B. Products furnished, but not installed, under this Section include the following:

1. Loose steel lintels.
2. Anchor bolts, steel pipe sleeves, slotted-channel inserts, and wedge-type inserts indicated to be cast into concrete or built into unit masonry.
3. Steel weld plates and angles for casting into concrete for applications where they are not specified in other Sections.

C. Related Requirements:

1. Division 03 "Cast-in-Place Concrete" for installing anchor bolts, steel pipe sleeves, slotted-channel inserts, wedge-type inserts, and other items cast into concrete.
2. Division 04 "Unit Masonry" for installing loose lintels, anchor bolts, and other items built into unit masonry.
3. Division 05 "Structural Steel Framing," "Metal Stairs" for cast and extruded treads and nosings, "Pipe and Tube Railings," "Decorative Metal," "Decorative Metal Railings."

1.3 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 metal fabrications that are anchored to or that receive other work. 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.

1.4 ACTION SUBMITTALS

A. Product Data: For each type of product indicated.

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.

1.5 INFORMATIONAL SUBMITTALS

A. Qualification Data: For professional engineer.

B. Mill Certificates: Signed by stainless-steel manufacturers, certifying that products furnished comply with requirements.

C. Welding certificates.

D. Paint Compatibility Certificates: From manufacturers of topcoats applied over shop primers, certifying that shop primers are compatible with topcoats.

E. Research/Evaluation Reports: For post-installed anchors, from ICC-ES.

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."

1.7 FIELD CONDITIONS

A. Field Measurements: Verify actual locations of walls and other construction contiguous with metal fabrications by field measurements before fabrication.

B. Field Measurements: Verify actual locations of walls and other construction contiguous with metal fabrications by field measurements before fabrication and indicate measurements on Shop Drawings.
1. Established Dimensions: Where field measurements cannot be made without delaying the Work, establish dimensions and proceed with fabricating metal fabrications without field measurements. Coordinate wall and other contiguous construction to ensure that actual dimensions correspond to established dimensions.
2. Provide allowance for trimming and fitting at site.

PART 2 - PRODUCTS

2.1 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.

2.2 METALS

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/A 36M.

C. Stainless-Steel Sheet, Strip, and Plate: ASTM A 240/A 240M or ASTM A 666, Type 304 and Type 316L (exterior).

D. Stainless-Steel Bars and Shapes: ASTM A 276, Type 304, Type 316L (exterior).

E. Rolled-Steel Floor Plate: ASTM A 786/A 786M, rolled from plate complying with ASTM A 36/A 36M or ASTM A 283/A 283M, Grade C or D.

F. Rolled-Stainless-Steel Floor Plate: ASTM A 793.

2.3 FASTENERS

A. General: Unless otherwise indicated, provide Type 304 (interior) Type 316 (exterior) stainless-steel fasteners for exterior use and zinc-plated fasteners with coating complying with ASTM B 633 or ASTM F 1941 (ASTM F 1941M), Class Fe/Zn 5, at exterior walls. Select fasteners for type, grade, and class required.

1. Provide stainless-steel fasteners for fastening aluminum.
2. Provide stainless-steel fasteners for fastening stainless steel.

B. Steel Bolts and Nuts: Regular hexagon-head bolts, ASTM A 325, Type 3 (ASTM A 325M, Type 3); with hex nuts, ASTM A 563, Grade C3 (ASTM A 563M, Class 8S3); and, where indicated, flat washers.

C. Anchor Bolts: ASTM F 1554, Grade 36, of dimensions indicated; with nuts, ASTM A 563 (ASTM A 563M); and, where indicated, flat washers.

1. Hot-dip galvanize or provide mechanically deposited, zinc coating where item being fastened is indicated to be galvanized.

D. 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/E 488M, conducted by a qualified independent testing agency.

E. Cast-in-Place Anchors in Concrete: Either threaded type or wedge type unless otherwise indicated; galvanized ferrous castings, either ASTM A 47/A 47M malleable iron or ASTM A 27/A 27M cast steel. Provide bolts, washers, and shims as needed, all hot-dip galvanized per ASTM F 2329.

F. Post-Installed Anchors: Torque-controlled expansion anchors or chemical anchors.

1. Material for Interior Locations: Carbon-steel components zinc plated to comply with ASTM B 633 or ASTM F 1941 (ASTM F 1941M), Class Fe/Zn 5, unless otherwise indicated.
2. Material for Exterior Locations and Where Stainless Steel Is Indicated: Alloy Group 1 (A1) and Group 2 (A4) stainless-steel bolts, ASTM F 593 (ASTM F 738M), and nuts, ASTM F 594 (ASTM F 836M).

2.4 MISCELLANEOUS MATERIALS

A. Shop Primers: Provide primers that comply with Division 09 "Painting." `

B. Universal Shop Primer: Fast-curing, lead- and chromate-free, universal modified-alkyd primer complying with MPI#79 and compatible with topcoat.

1. Use primer containing pigments that make it easily distinguishable from zinc-rich primer.

C. Water-Based Primer: Emulsion type, anticorrosive primer for mildly corrosive environments that is resistant to flash rusting when applied to cleaned steel, complying with MPI#107 and compatible with topcoat.

D. Epoxy Zinc-Rich Primer: Complying with MPI#20 and compatible with topcoat.

E. Shop Primer for Galvanized Steel: Primer formulated for exterior use over zinc-coated metal and compatible with finish paint systems indicated.

F. Galvanizing Repair Paint: High-zinc-dust-content paint complying with SSPC-Paint 20 and compatible with paints specified to be used over it.

G. Bituminous Paint: Cold-applied asphalt emulsion complying with ASTM D 1187/D 1187M.

H. Nonshrink, Nonmetallic Grout: Factory-packaged, nonstaining, noncorrosive, nongaseous grout complying with ASTM C 1107/C 1107M. Provide grout specifically recommended by manufacturer for interior and exterior applications.

I. Concrete: Comply with requirements in Section 033000 "Cast-in-Place Concrete" for normal-weight, air-entrained, concrete with a minimum 28-day compressive strength of 3000 psi (20 MPa).

2.5 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 (1 mm) 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 are 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.

J. 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 (3.2 by 38 mm), with a minimum 6-inch (150-mm) embedment and 2-inch (50-mm) hook, not less than 8 inches (200 mm) from ends and corners of units and 24 inches (600 mm) o.c., unless otherwise indicated.

2.6 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. Fabricate supports for operable partitions from continuous steel beams of sizes indicated with attached bearing plates, anchors, and braces as indicated. Drill or punch bottom flanges of beams to receive partition track hanger rods; locate holes where indicated on operable partition Shop Drawings.

D. Galvanize miscellaneous framing and supports where indicated.

E. Prime miscellaneous framing and supports with zinc-rich primer where indicated.

2.7 SHELF ANGLES

A. Fabricate shelf angles from steel angles of sizes indicated and for attachment to concrete framing. Provide horizontally slotted holes to receive 3/4-inch (19-mm) bolts, spaced not more than 6 inches (150 mm) from ends and 24 inches (600 mm) o.c., unless otherwise indicated.

1. Provide mitered and welded units at corners.
2. Provide open joints in shelf angles at expansion and control joints. Make open joint approximately 2 inches (50 mm) larger than expansion or control joint.

B. For cavity walls, provide vertical channel brackets to support angles from backup masonry and concrete.

C. Galvanize and prime shelf angles located in exterior walls.

D. Prime shelf angles located in exterior walls with zinc-rich primer.

E. Furnish wedge-type concrete inserts, complete with fasteners, to attach shelf angles to cast-in-place concrete.

2.8 LOOSE STEEL LINTELS

A. Fabricate loose steel lintels from steel angles and shapes of size indicated for openings and recesses in masonry walls and partitions at locations indicated. Fabricate in single lengths for each opening unless otherwise indicated. Weld adjoining members together to form a single unit where indicated.

B. Galvanize and prime loose steel lintels located in exterior walls.

C. Prime loose steel lintels located in exterior walls with zinc-rich primer.

D. Shop paint galvanized lintels.

2.9 FINISHES, GENERAL

A. Finish metal fabrications after assembly.

B. Finish exposed surfaces to remove tool and die marks and stretch lines, and to blend into surrounding surface.

2.10 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. Preparation for Shop Priming Galvanized Items: After galvanizing, thoroughly clean railings of grease, dirt, oil, flux, and other foreign matter, and treat with metallic phosphate process.

C. 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 zinc-rich primer is indicated.

D. 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. Items Indicated to Receive Zinc-Rich Primer: SSPC-SP 6/NACE No. 3, "Commercial Blast Cleaning."
3. Items Indicated to Receive Primers Specified in Section 099600 "High-Performance Coatings": SSPC-SP 6/NACE No. 3, "Commercial Blast Cleaning."
4. Other Items: SSPC-SP 3, "Power Tool Cleaning."

E. 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.

2.11 PREFABRICATED NON-PENETRATING METAL ROOF RAILINGS

A. Manufacturers: Subject to compliance with requirements, provide products by on of the following:
1. Kee Safety, (Basis of Design: KeeGuard Safety Rail-Safety Guardrail)
2. Tractel Ltd
3. FIXFAST USA

B. Substitutions: Requests for substitutions will be considered in accordance with provisions of Section 01 60 00 – Product Requirements.

C. Systems
1. Non-penetrating metal roof railing.
   a. Standards: System shall have top and mid rail in accordance with OSHA Standards - 29 CFR 1910.29 (b)(1)(2).
   b. Structural Load: 200 lb (90.7 kg), minimum, in any direction to all components in accordance with OSHA Regulation 29 CFR 1926.502.

c. Height: 42 inches (1067 mm), minimum.
d. Railings: 1-5/8 inch (41 mm) O.D. hot rolled pickled electric weld tubing, free of sharp edges and snag points.
e. Mounting Bases: Class 30 gray iron material cast with four receiver posts. Provide rubber pads on bottom of bases.
f. Receiver Posts: Shall have a positive locking system into slots that allow rails to be mounted in any direction. Friction locking systems are not allowed. Receiver posts shall have drain holes.
g. Accessories:
1) Roof Pads: Provide the following pad under each base to protect roof membrane:
a) Approved Product: BUR Pad.

D. Finishes
1. Finish: Factory finished powder coat paint.
2. Color: Black

E. Warranty
1. Warranty: Provide manufacturer's two (2) year warranty.

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. 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.

D. 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.

E. Provide temporary bracing or anchors in formwork for items that are to be built into concrete, masonry, or similar construction.

F. Corrosion Protection: Coat concealed surfaces of aluminum that come into contact with grout, concrete, masonry, wood, or dissimilar metals with the following:

1. Cast Aluminum: Heavy coat of bituminous paint.
2. 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 and overhead grilles securely to, and rigidly brace from, building structure.

C. Support steel girders on solid grouted masonry, concrete, or steel pipe columns. Secure girders with anchor bolts embedded in grouted masonry or concrete or with bolts through top plates of pipe columns.

1. Where grout space under bearing plates is indicated for girders supported on concrete or masonry, install as specified in "Installing Bearing and Leveling Plates" Article.

D. Install pipe columns on concrete footings with grouted baseplates. Position and grout column baseplates as specified in "Installing Bearing and Leveling Plates" Article.

1. Grout baseplates of columns supporting steel girders after girders are installed and leveled.

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 (0.05-mm) dry film thickness.

B. Touchup Painting: Cleaning and touchup painting of field welds, bolted connections, and abraded areas of shop paint are specified in Division 09.

C. Galvanized Surfaces: Clean field welds, bolted connections, and abraded areas and repair galvanizing to comply with ASTM A 780/A 780M.

3.4 WASTE MANAGEMENT

A. Coordinate with Section 01 74 19.

1. Separate and recycle cut-offs and waste materials and material packaging in accordance with Waste Management Plan and to the maximum extent economically feasible and place in designated areas for recycling.
2. Set aside and protect materials suitable for reuse and/or remanufacturing.

3. Separate and fold up metal banding; flatten and place along with other metal scrap for recycling in designated area.

END OF SECTION 05 50 00

SECTION 05 52 13 - PIPE AND TUBE RAILINGS

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. The Work of this Section consists of the provision of all plant, labor, materials, equipment, testing and services necessary to complete the work of pipe and tube railings at interior egress stairs and exterior areas as shown on the schedules, keynotes, drawings, as specified herein, and as may be required by conditions and authorities having jurisdiction, including, but not limited to, the following:

1. Steel pipe and tube railings.

2. Aluminum pipe and tube railings – Aluminum handrails, guard rails

B. Related Sections:

1. Division 05 "Metal Stairs" for steel tube railings attachments associated with metal stairs,
2. Division 09 “Non-Structural Metal Framing" for metal backing for anchoring railings.

1.3 PERFORMANCE REQUIREMENTS

A. Delegated Design: Design railings, including comprehensive engineering analysis by a qualified professional engineer, using performance requirements and design criteria indicated.

B. General: In engineering railings to withstand structural loads indicated, determine allowable design working stresses of railing materials based on the following:

1. Steel: 72 percent of minimum yield strength.
2. Aluminum: The lesser of minimum yield strength divided by 1.65 or minimum ultimate tensile strength divided by 1.95.

C. Structural Performance: Railings shall withstand the effects of gravity loads and the following loads and stresses within limits and under conditions indicated:

1. Handrails and Top Rails of Guards:

a. Uniform load of 50 lbf/ ft. (0.73 kN/m) applied in any direction.
b. Concentrated load of 200 lbf (0.89 kN) applied in any direction.
c. Uniform and concentrated loads need not be assumed to act concurrently.

2. Infill of Guards:

   a. Concentrated load of 50 lbf (0.22 kN) applied horizontally on an area of 1 sq. ft. (0.093 sq. m).
   b. Infill load and other loads need not be assumed to act concurrently.

D. 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.

E. Control of Corrosion: Prevent galvanic action and other forms of corrosion by insulating metals and other materials from direct contact with incompatible materials.

1.4 ACTION SUBMITTALS

A. Product Data: For the following:

1. Manufacturer's product lines of mechanically connected railings.
2. Railing brackets.
3. Grout, anchoring cement, and paint products.

B. Shop Drawings: Include plans, elevations, sections, details, and attachments to other work.

C. Samples for Verification: For each type of exposed finish required.

1. Sections of each distinctly different linear railing member, including handrails, top rails, posts, and balusters.
2. Fittings and brackets.

D. Delegated-Design Submittal: For installed products indicated to comply with performance requirements and design criteria, including analysis data signed and sealed by the qualified professional engineer responsible for their preparation.

1.5 INFORMATIONAL SUBMITTALS

A. Qualification Data: For qualified professional engineer and testing agency.

B. Welding certificates.

C. Paint Compatibility Certificates: From manufacturers of topcoats applied over shop primers certifying that shop primers are compatible with topcoats.

D. Product Test Reports: Based on evaluation of comprehensive tests performed by a qualified testing agency, according to ASTM E 894 and ASTM E 935.

1.6 QUALITY ASSURANCE

A. Source Limitations: Obtain each type of railing from single source from single manufacturer.

B. Welding Qualifications: Qualify procedures and personnel according to AWS D1.1/D1.1M, "Structural Welding Code - Steel."

C. Welding Qualifications: Qualify procedures and personnel according to the following:

1. AWS D1.1/D1.1M, "Structural Welding Code - Steel."

1.7 PROJECT CONDITIONS

A. Field Measurements: Verify actual locations of walls and other construction contiguous with metal fabrications by field measurements before fabrication.

1.8 COORDINATION AND SCHEDULING

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 for railings. 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.

C. Schedule installation so wall attachments are made only to completed walls. Do not support railings temporarily by any means that do not satisfy structural performance requirements.

PART 2 - PRODUCTS

2.1 MANUFACTURERS

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. Steel Pipe and Tube Railings:

a. King Architectural Metals
b. Pisor Industries, Inc.
c. Wagner, R & B, Inc.; a division of the Wagner Companies.

2. Aluminum Pipe and Tube Railings:
a. Pleasant Mount Welding, Inc.

2.2 METALS, GENERAL

A. Metal Surfaces, General: Provide materials with smooth surfaces, without seam marks, roller marks, rolled trade names, stains, discolorations, or blemishes.

B. Brackets, Flanges, and Anchors: Cast or formed metal of same type of material and finish as supported rails unless otherwise indicated.

C. Adapters for mechanical attachment of aluminum pipe railing to steel metal stairs for protection of dissimilar metals.

2.3 STEEL AND IRON

A. Tubing: ASTM A 500 (cold formed) or ASTM A 513.

B. Pipe: ASTM A 53/A 53M, Type F or Type S, Grade A, Standard Weight (Schedule 40), unless another grade and weight are required by structural loads.

C. Plates, Shapes, and Bars: ASTM A 36/A 36M.

D. Cast Iron: Either gray iron, ASTM A 48/A 48M, or malleable iron, ASTM A 47/A 47M, unless otherwise indicated.

2.4 ALUMINUM

A. Aluminum, General: Provide alloy and temper recommended by aluminum producer and finisher for type of use and finish indicated, and with not less than the strength and durability properties of alloy and temper designated below for each aluminum form required.

B. Extruded Structural Pipe and Round Tubing: ASTM B 429, Alloy 6063-T6.
1. Provide Standard Weight (Schedule 40) pipe, unless otherwise indicated.

C. Plate and Sheet: ASTM B 209, Alloy 6061-T6.

D. Die and Hand Forgings: ASTM B 247, Alloy 6061-T6.

E. Castings: ASTM B 26/B 26M, Alloy A356.0-T6.

2.5 FASTENERS

A. General: Provide the following:

1. Ungalvanized-Steel Railings: Plated steel fasteners complying with ASTM B 633 or ASTM F 1941 (ASTM F 1941M), Class Fe/Zn 5 for zinc coating.
2. Aluminum Railings: Type 316 stainless-steel fasteners.

B. Fasteners for Anchoring Railings to Other Construction: Select fasteners of type, grade, and class required to produce connections suitable for anchoring railings to other types of construction indicated and capable of withstanding design loads.

C. Anchor pipe and tube railing to concrete with fascia flanges.

D. Fasteners for Interconnecting Railing Components:

1. Provide concealed fasteners for interconnecting railing components and for attaching them to other work, unless otherwise indicated.
2. Provide concealed fasteners for interconnecting railing components and for attaching them to other work, unless exposed fasteners are unavoidable.
3. Provide tamper-resistant flat-head machine screws for exposed fasteners unless otherwise indicated.

E. Post-Installed Anchors: Torque-controlled expansion anchors or chemical 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.

1. Material for Exterior Locations and Where Stainless Steel is Indicated: Group 2 (A4) stainless-steel bolts, ASTM F 593 (ASTM F 738M), and nuts, ASTM F 594 (ASTM F 836M).

2.6 MISCELLANEOUS MATERIALS

A. Welding Rods and Bare Electrodes: Select according to AWS specifications for metal alloy welded.
1. For aluminum railings, provide type and alloy as recommended by producer of metal to be welded and as required for color match, strength, and compatibility in fabricated items.

B. Etching Cleaner for Galvanized Metal: Complying with MPI#25.

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. Shop Primers: Universal Shop Paint. Note: Do not paint aluminum rails.

E. Universal Shop Primer: Fast-curing, lead- and chromate-free, universal modified-alkyd primer complying with MPI#79 and compatible with topcoat.

1. Use primer containing pigments that make it easily distinguishable from zinc-rich primer.

F. Epoxy Zinc-Rich Primer: Complying with MPI#20 and compatible with topcoat.

G. Shop Primer for Galvanized Steel: Water based galvanized metal primer complying with MPI#134.

H. Intermediate Coats and Topcoats: Provide products that comply with Division 09.

I. Epoxy Intermediate Coat: Complying with MPI #77 and compatible with primer and topcoat.

1. Products: Subject to compliance with requirements, provide the following:

a. ICI Devoe Coatings

b. Benjamin Moore & Co.
c. PPG Architectural Finishes Inc.

J. Polyurethane Topcoat: Complying with MPI #72 and compatible with undercoat.

K. 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.

L. Anchoring Cement: Factory-packaged, nonshrink, nonstaining, hydraulic-controlled expansion cement formulation for mixing with water at Project site to create pourable anchoring, patching, and grouting compound.

1. Water-Resistant Product: At exterior locations and where indicated provide formulation that is resistant to erosion from water exposure without needing protection by a sealer or waterproof coating and that is recommended by manufacturer for exterior use.
2. At exterior rails provide as required sealant, base plate and weep holes to address migration and discharge of water penetration.

2.7 FABRICATION

A. General: Fabricate railings to comply with requirements indicated for design, dimensions, member sizes and spacing, details, finish, and anchorage**,** but not less than that required to support structural loads.

B. Assemble railings in the 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. Use connections that maintain structural value of joined pieces.

C. Cut, drill, and punch metals cleanly and accurately. Remove burrs and ease edges to a radius of approximately 1/32 inch (1 mm) unless otherwise indicated. Remove sharp or rough areas on exposed surfaces.

D. Form work true to line and level with accurate angles and surfaces.

E. Fabricate connections that will be exposed to weather in a manner to exclude water. Provide weep holes where water may accumulate.

F. Cut, reinforce, drill, and tap as indicated to receive finish hardware, screws, and similar items.

G. Connections: Fabricate railings with welded connections unless otherwise indicated.

H. Welded Connections: Cope components at connections to provide close fit, or use fittings designed for this purpose. Weld all around at connections, including at fittings.

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 flux immediately.
4. At exposed connections, finish exposed surfaces smooth and blended so no roughness shows after finishing and welded surface matches contours of adjoining surfaces.

I. Welded Connections for Aluminum Pipe: Fabricate railings to interconnect members with concealed internal welds that eliminate surface grinding, using manufacturer's standard system of sleeve and socket fittings.

J. Nonwelded Connections: Connect members with concealed mechanical fasteners and fittings. Fabricate members and fittings to produce flush, smooth, rigid, hairline joints.
   1. Fabricate splice joints for field connection using an epoxy structural adhesive if this is manufacturer's standard splicing method.

K. Form changes in direction as follows:

   1. By bending or by inserting prefabricated elbow fittings.

L. Bend members in jigs to produce uniform curvature for each configuration required; maintain cross section of member throughout entire bend without buckling, twisting, cracking, or otherwise deforming exposed surfaces of components.

M. Close exposed ends of railing members with prefabricated end fittings.

N. Provide wall returns at ends of wall-mounted handrails unless otherwise indicated. Close ends of returns unless clearance between end of rail and wall is 1/4 inch (6 mm) or less.

O. Brackets, Flanges, Fittings, and Anchors: Provide wall brackets, flanges, miscellaneous fittings, and anchors to interconnect railing members to other work unless otherwise indicated.

   1. At brackets and fittings fastened to plaster or gypsum board partitions, provide crush-resistant fillers, or other means to transfer loads through wall finishes to structural supports and prevent bracket or fitting rotation and crushing of substrate.

P. Provide inserts and other anchorage devices for connecting railings to concrete or masonry work. Fabricate anchorage devices capable of withstanding loads imposed by railings. Coordinate anchorage devices with supporting structure.

Q. For railing posts set in concrete, provide stainless-steel sleeves not less than 6 inches (150 mm) long with inside dimensions not less than 1/2 inch (13 mm) greater than outside dimensions of post, with metal plate forming bottom closure.

R. For removable railing posts, fabricate slip-fit sockets from stainless-steel tube or pipe whose ID is sized for a close fit with posts; limit movement of post without lateral load, measured at top, to not more than one-fortieth of post height. Provide socket covers designed and fabricated to resist being dislodged.

   1. Provide chain with eye, snap hook, and staple across gaps formed by removable railing sections at locations indicated. Fabricate from same metal as railings.

S. Toe Boards: Where indicated, provide toe boards at railings around openings and at edge of open-sided floors and platforms. Fabricate to dimensions and details indicated.

2.8 FINISHES, GENERAL

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: 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.

D. Provide exposed fasteners with finish matching appearance, including color and texture, of railings.

2.9 STEEL AND IRON FINISHES

A. For Interior nongalvanized steel railings, provide nongalvanized ferrous-metal fittings, brackets, fasteners, and sleeves, except galvanize anchors to be embedded in exterior concrete or masonry.

B. Preparation for Shop Priming: Prepare uncoated ferrous-metal surfaces to comply with [SSPC-SP 6/NACE No. 3, "Commercial Blast Cleaning."

C. Primer Application: Apply shop primer to prepared surfaces of railings unless otherwise indicated. Comply with requirements in SSPC-PA 1, "Paint Application Specification No. 1: Shop, Field, and Maintenance Painting of Steel," for shop painting. Primer need not be applied to surfaces to be embedded in concrete or masonry.

1. Shop prime uncoated railings with universal shop primer unless otherwise indicated.
2. Do not apply primer to galvanized surfaces.

D. Shop-Painted Finish: Comply with Division 09 “Painting.”

1. Color: As selected by Architect from manufacturer's full range.

2.10 ALUMINUM FINISHES

A. Finish designations prefixed by AA comply with the system established by the Aluminum Association for designating aluminum finishes.

B. Class II, Clear Anodic Finish: AA-M12C22A31 (Mechanical Finish: nonspecular as fabricated; Chemical Finish: etched, medium matte; Anodic Coating: Architectural Class II, clear coating 0.010 mm or thicker) complying with AAMA 611.

C. When polishing is completed, passivate and rinse surfaces. Remove embedded foreign matter and leave surfaces chemically clean.

PART 3 - EXECUTION

3.1 EXAMINATION

A. Examine plaster and gypsum board assemblies, where reinforced to receive anchors, to verify that locations of concealed reinforcements have been clearly marked for Installer. Locate reinforcements and mark locations if not already done.

3.2 INSTALLATION, GENERAL

A. Fit exposed connections together to form tight, hairline joints.

B. Perform cutting, drilling, and fitting required for installing railings. Set railings accurately in location, alignment, and elevation; measured from established lines and levels and free of rack.

1. Do not weld, cut, or abrade surfaces of railing components that have been coated or finished after fabrication and that are intended for field connection by mechanical or other means without further cutting or fitting.
2. Set posts plumb within a tolerance of 1/16 inch in 3 feet (2 mm in 1 m).
3. Align rails so variations from level for horizontal members and variations from parallel with rake of steps and ramps for sloping members do not exceed 1/4 inch in 12 feet (5 mm in 3 m).

C. Corrosion Protection: Coat concealed surfaces of aluminum that will be in contact with grout, concrete, masonry, wood, or dissimilar metals, with a heavy coat of bituminous paint.

D. Adjust railings before anchoring to ensure matching alignment at abutting joints.

E. Fastening to In-Place Construction: Use anchorage devices and fasteners where necessary for securing railings and for properly transferring loads to in-place construction.

3.3 RAILING CONNECTIONS

A. Welded Connections: Use fully welded joints for permanently connecting railing components. Comply with requirements for welded connections in "Fabrication" Article whether welding is performed in the shop or in the field.

B. Nonwelded Connections: Use mechanical or adhesive joints for permanently connecting railing components. Use wood blocks and padding to prevent damage to railing members and fittings. Seal recessed holes of exposed locking screws using plastic cement filler colored to match finish of railings.

C. Expansion Joints: Install expansion joints at locations indicated but not farther apart than required to accommodate thermal movement. Provide slip-joint internal sleeve extending 2 inches (50 mm) beyond joint on either side, fasten internal sleeve securely to one side, and locate joint within 6 inches (150 mm) of post.

3.4 ANCHORING POSTS

A. Use metal sleeves preset and anchored into concrete for installing posts. After posts have been inserted into sleeves, fill annular space between post and sleeve with nonshrink, nonmetallic grout or anchoring cement, mixed and placed to comply with anchoring material manufacturer's written instructions.

B. Form or core-drill holes not less than 5 inches (125 mm) deep and 3/4 inch (20 mm) larger than OD of post for installing posts in concrete. Clean holes of loose material, insert posts, and fill annular space between post and concrete with nonshrink, nonmetallic grout or anchoring cement, mixed and placed to comply with anchoring material manufacturer's written instructions.

C. Cover anchorage joint with flange of same metal as post, welded to post after placing anchoring material.

D. Anchor posts to metal surfaces with oval flanges, angle type, or floor type as required by conditions, connected to posts and to metal supporting members as follows:

1. For aluminum pipe railings, attach posts using fittings designed and engineered for this purpose.
2. For stainless-steel pipe railings, weld flanges to post and bolt to supporting surfaces.
3. For steel pipe railings, weld flanges to post and bolt to metal supporting surfaces.

E. Install brackets and adapters to mechanically secure aluminum guardrail posts to steel stair framing to provide separation between dissimilar metals.

3.5 ATTACHING RAILINGS

A. Anchor railing ends at walls with round flanges anchored to wall construction and welded to railing ends.

B. Anchor railing ends to metal surfaces with flanges bolted to metal surfaces and welded to railing ends.

C. Attach railings to wall with wall brackets, except where end flanges are used. Provide brackets with 1-1/2-inch (38-mm) clearance from inside face of handrail and finished wall surface. Locate brackets as indicated or, if not indicated, at spacing required to support structural loads.

1. Use type of bracket with flange tapped for concealed anchorage to threaded hanger bolt.
2. Locate brackets as indicated or, if not indicated, at spacing required to support structural loads.

D. Secure wall brackets and railing end flanges to building construction as follows:

1. For concrete and solid masonry anchorage, use drilled-in expansion shields and hanger or lag bolts.
2. For hollow masonry anchorage, use toggle bolts.
3. For wood stud partitions, use hanger or lag bolts set into studs or wood backing between studs. Coordinate with carpentry work to locate backing members.
4. For steel-framed partitions, use self-tapping screws fastened to steel framing or to concealed steel reinforcements.

5. For steel-framed partitions, use toggle bolts installed through flanges of steel framing or through concealed steel reinforcements.

3.6 ADJUSTING AND CLEANING

A. Clean aluminum and stainless steel by washing thoroughly with clean water and soap and rinsing with clean water.

B. Touchup Painting: Immediately after erection, clean field welds, bolted connections, and abraded areas of shop paint, and paint exposed 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 (0.05-mm) dry film thickness.

C. Touchup Painting: Cleaning and touchup painting of field welds, bolted connections, and abraded areas of shop paint are specified in Division 09 “Painting.”

D. Galvanized Surfaces: Clean field welds, bolted connections, and abraded areas and repair galvanizing to comply with ASTM A 780.

3.7 PROTECTION

A. Protect finishes of railings from damage during construction period with temporary protective coverings approved by railing manufacturer. Remove protective coverings at time of Substantial Completion.

B. 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.

3.8 WASTE MANAGEMENT

A. Coordinate with Section 01 74 19.

1. Separate and recycle cut-offs and waste materials and material packaging in accordance with Waste Management Plan and to the maximum extent economically feasible and place in designated areas for recycling.
2. Set aside and protect materials suitable for reuse and/or remanufacturing.
3. Separate and fold up metal banding; flatten and place along with other metal scrap for recycling in designated area.

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SECTION 06 10 00 - ROUGH CARPENTRY

PART 1 - GENERAL

1.1 SUMMARY

A. The Work of this Section consists of the provision of all plant, labor, materials, equipment, testing and services necessary to complete the work of rough carpentry as shown on the schedules, keynotes, drawings, as specified herein, and as may be required by conditions and authorities having jurisdiction, including, but not limited to, the following:

1. Wood Preservative Treated Lumber.
2. Fire Retardant Treated Lumber.
3. Misc. Lumber.
4. Plywood backing panels.
5. Un-Treated roof related solid blocking, beveled siding, and plywood.

1.2 ACTION SUBMITTALS

A. Product Data: For each type of process and factory-fabricated product.

1. Include data for wood-preservative treatment from chemical treatment manufacturer and certification by treating plant that treated materials comply with requirements.
2. Include data for fire-retardant treatment from chemical treatment manufacturer and certification by treating plant that treated materials comply with requirements.
3. Data for each type of fastener and anchor.

B. Mockups:

1. Construct 4 foot long mockups of each roof blocking assembly, to show how it will fit, get fastened to, and relate to adjoining building components.

2. Obtain the Architect’s approval of each mock up before proceeding with the work. Remove and replace mockups that are rejected; approved mockups may be left in place and incorporated into the finished project.

1.3 INFORMATIONAL SUBMITTALS

A. Material Certificates: For dimension lumber specified to comply with minimum allowable unit stresses. Indicate species and grade selected for each use and design values approved by the ALSC Board of Review.

B. Evaluation Reports: For the following, from ICC-ES:

1. Wood-preservative-treated wood.
2. Fire-retardant-treated wood.
3. Powder-actuated fasteners.
4. Expansion anchors.
5. Metal framing anchors.

1.4 QUALITY ASSURANCE

A. Testing Agency Qualifications: For testing agency providing classification marking for fire-retardant treated material, an inspection agency acceptable to authorities having jurisdiction that periodically performs inspections to verify that the material bearing the classification marking is representative of the material tested.

PART 2 - PRODUCTS

2.1 WOOD PRODUCTS, GENERAL

A. Certified Wood: Materials shall be produced from wood obtained from forests certified by an FSC-accredited certification body to comply with FSC STD-01-001, "FSC Principles and Criteria for Forest Stewardship".

B. 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. For exposed lumber indicated to receive a stained or natural finish, mark grade stamp on end or back of each piece or omit grade stamp and provide certificates of grade compliance issued by grading agency.
3. Provide dressed lumber, S4S, unless otherwise indicated.

C. Maximum Moisture Content of Lumber: 15 percent for 2-inch nominal thickness or less, 19 percent for more than 2-inch nominal thickness unless otherwise indicated.

D. Roof blocking:
1. Construction grade Douglas Fir, kiln dried to 15%
2. Utility grade beveled cedar or redwood siding, or equivalent synthetic lumber products.
3. APA rated CDX plywood panels, assembled with exterior glue.

2.2 WOOD-PRESERVATIVE-TREATED LUMBER

A. Preservative Treatment by Pressure Process: AWPA 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. Do not use inorganic boron (SBX) for sill plates.

B. Kiln-dry lumber after treatment to a maximum moisture content of 19 percent. Do not use material that is warped or that 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 all rough carpentry unless otherwise indicated.

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, stripping, 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 framing members that are less than 18 inches above the ground in crawlspaces or unexcavated areas.
5. Do not treat roof related blocking or plywood.

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. Exterior Type: Treated materials shall comply with requirements specified above for fire-retardant-treated lumber and plywood by pressure process after being subjected to accelerated weathering according to ASTM D 2898. Use for exterior locations and where indicated.
3. Interior Type A: Treated materials shall have a moisture content of 28 percent or less when tested according to ASTM D 3201 at 92 percent relative humidity. Use where exterior type is not 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 qualified testing agency.

E. Application: Treat all rough carpentry items indicated on Drawings, and the following:

1. Concealed blocking.
2. Plywood backing panels.

F. Allowable Design Loads: Provide products with allowable design loads, as published by manufacturer, which meet or exceed those of basis-of-design products. Manufacturer's published values shall be determined from empirical data or by rational engineering analysis and demonstrated by comprehensive testing performed by a qualified independent testing agency.

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

B. Provide miscellaneous lumber for support or attachment of other construction in the following locations **(whether indicated on the plans or not):**

1. All wall mounted counters, shelf millwork units of any kind, and items furnished by the owner requiring wood blocking.
2. Any recessed items requiring wood blocking for attachment and or leveling.
3. Any and all construction elements requiring anchoring to walls and or structure.

C. For items of dimension lumber size, provide Construction or No. 2 grade lumber of any species.

D. For concealed boards, provide lumber with 15 percent maximum moisture content and any of the following species and grades:

1. Mixed southern pine; No. 2 grade; SPIB.
2. Eastern softwoods; No. 2 Common grade; NeLMA.
3. Northern species; No. 2 Common grade; NLGA

2.5 PLYWOOD BACKING PANELS

A. Equipment Backing Panels: DOC PS 1, fire-retardant treated, in thickness indicated or, if not indicated, not less than 3/4-inch nominal thickness.

2.6 FASTENERS

A. General: Provide fasteners of size and type indicated that comply with requirements specified in this article for material and manufacture.

1. Where rough carpentry is exposed to weather, in ground contact, pressure-preservative treated, or in area of high relative humidity, provide fasteners with hot-dip zinc coating complying with ASTM A 153/A 153M.

B. Power-Driven Fasteners: NES NER-272.

C. Bolts: Steel bolts complying with ASTM A 307, Grade A; with ASTM A 563 hex nuts and, where indicated, flat washers.

D. Fasteners for roof related blocking shall be hot dipped galvanized steel; or steel with a proprietary rust inhibiting coating. Utilize minimum #12 diameter screws where ever possible; nails if used, shall have annular ring shanks. Do not use “dry-wall” screws to assemble roof related wood blocking. Anchors bolts shall have be formed of 1/2 inch diameter steel. Drilled anchors shall have 1/4 inch diameter shanks.

2.7 METAL FRAMING ANCHORS

A. Manufacturers: Subject to compliance with requirements, provide products by the following provide products by one of the following available manufacturers offering products that may be incorporated into the Work include, but are not limited to, the following:

1. Cleveland Steel Specialty Co.
2. KC Metals Products, Inc.
3. Phoenix Metal products, Inc.
4. Simpson Strong-Tie Co., Inc.
5. USP Structural Connectors.

B. Allowable Design Loads: Provide products with allowable design loads, as published by manufacturer that meet or exceed those indicated. Manufacturer's published values shall be determined from empirical data or by rational engineering analysis and demonstrated by comprehensive testing performed by a qualified independent testing agency.

C. Galvanized-Steel Sheet: Hot-dip, zinc-coated steel sheet complying with ASTM A 653/A 653M, G60 coating designation.

1. Use for interior locations unless otherwise indicated.

D. Hot-Dip, Heavy-Galvanized Steel Sheet: ASTM A 653/A 653M; structural steel (SS), high-strength low-alloy steel Type A (HSLAS Type A), or high-strength low-alloy steel Type B (HSLAS Type B); G185 coating designation; and not less than 0.036 inch thick.

1. Use for wood-preservative-treated lumber and where indicated.

2.8 MISCELLANEOUS MATERIALS

A. Sill-Sealer Gaskets: Glass-fiber-resilient insulation, fabricated in strip form, for use as a sill sealer; 1-inch nominal thickness, compressible to 1/32 inch; selected from manufacturer's standard widths to suit width of sill members indicated.

B. Sill-Sealer Gaskets: Closed-cell neoprene foam, 1/4 inch thick, selected from manufacturer's standard widths to suit width of sill members indicated.

C. Flexible Flashing: Composite, self-adhesive, flashing product consisting of a pliable, butyl rubber or 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 (0.6 mm).

D. 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.

1. Adhesives shall have a VOC content of 70 g/L or less when calculated according to 40 CFR 59, Subpart D (EPA Method 24).

PART 3 - EXECUTION

3.1 INSTALLATION, GENERAL

A. Set rough carpentry to required levels and lines, with members plumb, true to line, cut, and fitted. Fit rough carpentry to other construction; scribe and cope as needed for accurate fit. Locate furring, nailers, blocking, grounds, and similar supports to comply with requirements for attaching other construction.

B. Framing Standard: Comply with AF&PA's WCD 1, "Details for Conventional Wood Frame Construction," unless otherwise indicated.

C. Framing with Engineered Wood Products: Install engineered wood products to comply with manufacturer's written instructions.

D. Install fire-retardant treated plywood backing panels with classification marking of testing agency exposed to view.

E. Metal Framing Anchors: Install metal framing anchors to comply with manufacturer's written instructions. Install fasteners through each fastener hole.

F. Do not splice structural members between supports unless otherwise indicated.

G. Comply with AWPA M4 for applying field treatment to cut surfaces of preservative-treated lumber.

H. Where wood-preservative-treated lumber is installed adjacent to metal decking, install continuous flexible flashing separator between wood and metal decking.

I. Securely attach rough carpentry work to substrate by anchoring and fastening as indicated, complying with the following:

1. NES NER-272 for power-driven fasteners.

2. Table 2304.9.1, "Fastening Schedule," in ICC's International Building Code.

J. Roof Blocking:

1. Stagger joints in built up assemblies at least 2 feet to obtain maximum strength. Provide the appropriate shapes needed and adjust wood members to suit existing conditions for full bearing and secure attachment. Discard defective material, and pieces which are too small, and fabricate the work with a minimum of joints and an optimum joint arrangement.

2. Securely attach roof blocking to resist a pull of 275 pounds per lineal foot in any direction. Countersink all fasteners flush.

3. Space fasteners to achieve adequate holding power, generally as follows:
   a. Anchor bolts embedded in concrete, anchors drilled into concrete or masonry, screws into a steel deck or structural steel member, or screws into wood framing: 12 inches on center.
   b. Nails into wood: 8 inches on center.
   c. Install two rows of fasteners on blocking wider than 5 inches.
4. Install blocking neatly scribed and cut to fit within 1/4 inch of adjoining materials. Install blocking, shims and similar supports for the proper attachment of subsequent work.

3.2 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 rough carpentry from weather. If, despite protection, rough carpentry becomes sufficiently wet that moisture content exceeds that specified, apply EPA-registered borate treatment. Apply borate solution by spraying to comply with EPA-registered label.

C. Do not allow roof blocking to get wet while stored or during installation; remove and replace any roof related blocking that gets wet.

3.3 WASTE MANAGEMENT

A. Coordinate with Section 01 74 19.

1. Separate and recycle cut-offs and waste materials and material packaging in accordance with Waste Management Plan and to the maximum extent economically feasible and place in designated areas for recycling.
2. Set aside and protect materials suitable for reuse and/or remanufacturing.
3. Separate and fold up metal banding; flatten and place along with other metal scrap for recycling in designated area.

END OF SECTION 06 10 00

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SECTION 06 16 00 - SHEATHING

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. The Work of this Section consists of the provision of all plant, labor, materials, equipment, testing and services necessary to complete the work of sheathing as shown on the schedules, keynotes, drawings, as specified herein, and as may be required by conditions and authorities having jurisdiction, including, but not limited to, the following:

1. Wall sheathing.
2. Roof sheathing.
3. Fasteners.
4. Sheathing joint and penetration treatment.

B. Related Requirements:

1. Division 06 "Rough Carpentry".
2. Division 07 “Thermal and Moisture Protection”
3. Division 07 “EPDM Roofing”

C. **FOR ROOF SHEATHING, REFER TO SPECIFICATION SECTION 07 53 23**.

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 plywood complies 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 plywood complies with requirements. Include physical properties of treated materials.
3. For fire-retardant treatments, include physical properties of treated plywood both before and after exposure to elevated temperatures, based on testing by a qualified independent testing agency according to ASTM D 5516.
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 following products, from ICC-ES:

1. Preservative-treated plywood.
2. Fire-retardant-treated plywood.

1.5 QUALITY ASSURANCE

A. Testing Agency Qualifications: For testing agency providing classification marking for fire-retardant-treated material, an inspection agency acceptable to authorities having jurisdiction that periodically performs inspections to verify that the material bearing the classification marking is representative of the material tested.

1.6 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. Certified Wood: For the following wood products, provide materials produced from wood obtained from forests certified by an FSC-accredited certification body to comply with FSC STD-01-001, "FSC Principles and Criteria for Forest Stewardship":

1. Plywood.
2. Particleboard underlayment.
3. Hardboard underlayment.

B. Plywood: Either DOC PS 1 or DOC PS 2 unless otherwise indicated.

C. Thickness: As needed to comply with requirements specified, but not less than thickness indicated.

D. Factory mark panels to indicate compliance with applicable standard.

2.3 PRESERVATIVE-TREATED PLYWOOD

A. Preservative Treatment by Pressure Process: AWPA U1; Use Category UC2for 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. Mark plywood with appropriate classification marking of an inspection agency acceptable to authorities having jurisdiction.

C. Application: Treat items indicated on Drawings and plywood in contact with masonry or concrete or used with roofing, flashing, vapor barriers, and waterproofing.

2.4 FIRE-RETARDANT-TREATED PLYWOOD

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 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 (3.2 m) beyond the centerline of the burners at any time during the test.

1. Use treatment that does not promote corrosion of metal fasteners.
2. Exterior Type: Treated materials shall comply with requirements specified above for fire-retardant-treated plywood by pressure process after being subjected to accelerated weathering according to ASTM D 2898. Use for exterior locations and where indicated.
3. Interior Type A: Treated materials shall have a moisture content of 28 percent or less when tested according to ASTM D 3201 at 92 percent relative humidity. Use where exterior type is not indicated.
4. Design Value Adjustment Factors: Treated lumber plywood shall be tested according ASTM D 5516 and design value adjustment factors shall be calculated according to ASTM D 6305. Span ratings after treatment shall be not less than span ratings specified. For roof sheathing and where high-temperature fire-retardant treatment is indicated, span ratings for temperatures up to 170 deg F (76 deg C) shall be not less than span ratings specified.

C. Kiln-dry material after treatment to a maximum moisture content of 15 percent. Do not use material that is warped or does not comply with requirements for untreated material.

D. Identify fire-retardant-treated plywood with appropriate classification marking of qualified testing agency.

E. Application: Treat plywood indicated on Drawings, and the following:

1. Roof and wall sheathing within 48 inches (1220 mm) of fire walls.
2. Roof sheathing.
   a. Refer to Specification Section 07 53 23 for Gypsum Roof Sheathing. Plywood sheathing may be considered by Architect's Roofing Consultant. Acceptance will depend on condition.

2.5 WALL SHEATHING

A. Glass-Mat Gypsum Wall Sheathing: ASTM C 1177/1177M.

1. Products: Subject to compliance with requirements, provide the following:

   a. CertainTeed Corporation; GlasRoc.
   b. G-P Gypsum Corporation; Dens-Glass Gold.
   c. National Gypsum Company; Gold Bond e(2)XP.
   d. Temple-Inland Inc.; GreenGlass
   e. United States Gypsum Co.; Securock.

2. Type and Thickness: Type X, 5/8 inch (15.9 mm) thick.
3. Size: 48 by 96 inches (1219 by 2438 mm) for vertical installation.

2.6 FASTENERS

A. General: Provide fasteners of size and type indicated that comply with requirements specified in this article for material and manufacture.

1. For roof and wall sheathing, provide fasteners with hot-dip zinc coating complying with ASTM A 153/A 153M.

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 Wood Structural Panels to Cold-Formed Metal Framing: ASTM C 954, except with wafer heads and reamer wings, length as recommended by screw manufacturer for material being fastened.

1. For wall and roof sheathing panels, provide screws with organic-polymer or other corrosion-protective coating having a salt-spray resistance of more than 800 hours according to ASTM B 117.

F. Screws for Fastening Gypsum Sheathing to Cold-Formed Metal Framing: Steel drill screws, in length recommended by sheathing manufacturer for thickness of sheathing to be attached, with organic-polymer or other corrosion-protective coating having a salt-spray resistance of more than 800 hours according to ASTM B 117.

1. For steel framing less than 0.0329 inch (0.835 mm) thick, use screws that comply with ASTM C 1002.

2. For steel framing from 0.033 to 0.112 inch (0.84 to 2.84 mm) thick, use screws that comply with ASTM C 954.

2.7 SHEATHING JOINT-AND-PENETRATION TREATMENT MATERIALS

A. Sealant for Glass-Mat Gypsum Sheathing: Elastomeric, medium-modulus, neutral-curing silicone joint sealant compatible with joint substrates formed by gypsum sheathing and other materials, recommended by sheathing manufacturer for application indicated and complying with requirements for elastomeric sealants specified in Section 079200 "Joint Sealants."

2.8 MISCELLANEOUS MATERIALS

A. Adhesives for Field Gluing Panels to Framing: Formulation complying with APA AFG-01 or ASTM D 3498 that is approved for use with type of construction panel indicated by manufacturers of both adhesives and panels.

1. Adhesives shall have a VOC content of 70 g/L or less when calculated according to 40 CFR 59, Subpart D (EPA Method 24).

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. NES NER-272 for power-driven fasteners.
2. Table 2304.9.1, "Fastening Schedule," in ICC's "International Building Code."

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 GYPSUM SHEATHING INSTALLATION

A. Comply with GA-253 and with manufacturer's written instructions.

1. Fasten gypsum sheathing to cold-formed metal framing with screws.
2. Install boards with a 3/8-inch (9.5-mm) gap where non-load-bearing construction abuts structural elements.
3. Install boards with a 1/4-inch (6.4-mm) gap where they abut masonry or similar materials that might retain moisture, to prevent wicking.

B. Apply fasteners so heads bear tightly against face of sheathing, but do not cut into facing.

C. Horizontal Installation: Install sheathing with V-grooved edge down and tongue edge up. Interlock tongue with groove to bring long edges in contact with edges of adjacent boards without forcing. Abut ends of boards over centers of studs, and stagger end joints of adjacent boards not less than one stud spacing. Attach boards at perimeter and within field of board to each steel stud.

1. Space fasteners approximately 8 inches (200 mm) o.c. and set back a minimum of 3/8 inch (9.5 mm) from edges and ends of boards.

D. Vertical Installation: Install board vertical edges centered over studs. Abut ends and edges of each board with those of adjacent boards. Attach boards at perimeter and within field of board to each stud.

1. Space fasteners approximately 8 inches (200 mm) o.c. and set back a minimum of 3/8 inch (9.5 mm) from edges and ends of boards.

E. Seal sheathing joints according to sheathing manufacturer's written instructions.

1. Apply elastomeric sealant to joints and fasteners and trowel flat. Apply sufficient amount of sealant to completely cover joints and fasteners after troweling. Seal other penetrations and openings.
2. Apply glass-fiber sheathing tape to glass-mat gypsum sheathing joints and apply and trowel silicone emulsion sealant to embed entire face of tape in sealant. Apply sealant to exposed fasteners with a trowel so fasteners are completely covered. Seal other penetrations and openings.

3.3 WASTE MANAGEMENT

A. Coordinate with Section 01 74 19.
1. Separate and recycle cut-offs and waste materials and material packaging in accordance with Waste Management Plan and to the maximum extent economically feasible and place in designated areas for recycling.
2. Set aside and protect materials suitable for reuse and/or remanufacturing.
3. Separate and fold up metal banding; flatten and place along with other metal scrap for recycling in designated area.

END OF SECTION 06 16 00

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SECTION 06 40 23 - INTERIOR ARCHITECTURAL WOODWORK

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. A. This Section includes the following:
   1. Custom built wood cabinets (casework).
   2. Custom built plastic-laminate-covered cabinets (plastic-covered casework).
   3. Plastic laminate countertops.

B. Related Sections: The following Sections contain requirements that relate to this Section:
   1. Division 6 Section "Rough Carpentry" for exposed framing and for furring, blocking, shims, and miscellaneous concealed interior woodwork.
   2. Division 6 Section "Finish Carpentry" for interior carpentry exposed to view that is not specified in this Section.
   3. Division 9 Section "Painting" for field finishing of installed interior architectural woodwork.
   4. Division 12 Section “Special Casework and Laboratory Equipment” for special casework and epoxy resin countertops. (NOT USED)

1.3 DEFINITIONS

A. Interior architectural woodwork includes wood furring, blocking, shims, and hanging strips for installing woodwork items unless concealed within other construction prior to woodwork installation.

1.4 SUBMITTALS

A. General: Submit each item in this Article according to the Conditions of the Contract and Division 1 Specification Sections.

B. Product data for each type of product and process specified and incorporated into items of architectural woodwork during fabrication, finishing, and installation.

C. Shop drawings showing location of each item, dimensioned plans and elevations, large-scale details, attachment devices, and other components.
   1. Show locations and sizes of furring, blocking, and hanging strips, including concealed blocking and reinforcing specified in other Sections.
   2. Show locations and sizes of cutouts and holes for plumbing fixtures, faucets, soap dispensers, and other items installed in architectural woodwork.

D. Samples for initial selection of the following in the form of manufacturer's color charts consisting of actual units or sections of units showing the full range of colors, textures, and patterns available for each type of material indicated.
   1. Shop-applied transparent finishes.
   2. Plastic laminates.

E. Samples for verification of the following:
   1. Lumber with transparent finish, 50 sq. in., for each species and cut, finished on one side and one edge.
   2. Laminate-clad panel products, 8 by 10 inches, for each type, color, pattern, and surface finish, with separate samples of unfaced panel product used for core.
   3. Solid laboratory countertop materials, 6 inches square.
   4. Exposed cabinet hardware, one unit for each type and finish.

F. Product certificates signed by woodwork fabricator certifying that products comply with specified requirements.

G. Qualification data for firms and persons specified in the "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.

1.5 QUALITY ASSURANCE

A. Fabricator Qualifications: Firm experienced in producing architectural woodwork 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 without delaying the Work.

B. Installer Qualifications: Arrange for interior architectural woodwork installation by a firm that can demonstrate successful experience in installing architectural woodwork items similar in type and quality to those required for this Project.

C. Quality Standard: Except as otherwise indicated, comply with the following standard:
   1. AWI Quality Standard: "Architectural Woodwork Quality Standards" of the Architectural Woodwork Institute for grades of interior architectural woodwork, construction, finishes, and other requirements.

      a. Provide AWI Certification Labels or Certificates of Compliance indicating that woodwork meets requirements of grades specified.
   2. The Contract Documents contain selections chosen from options in the Quality Standard as well as additional requirements beyond those of the Quality Standard. Comply with such selections and requirements in addition to the Quality Standard.

1.6 DELIVERY, STORAGE, AND HANDLING

A. Protect woodwork during transit, delivery, storage, and handling to prevent damage, soilage, and deterioration.

B. Do not deliver woodwork until painting and similar operations that could damage, soil, or deteriorate woodwork have been completed in installation areas. If woodwork must be stored in other than installation areas, store only in areas whose environmental conditions meet requirements specified in "Project Conditions."

1.7 PROJECT CONDITIONS

A. Environmental Limitations: Do not deliver or install woodwork until building is enclosed, wet-work is completed, and HVAC system is operating and will maintain temperature and relative humidity at occupancy levels during the remainder of the construction period.

B. Field Measurements: Where woodwork is indicated to be fitted to other construction, check actual dimensions of other construction by accurate field measurements before fabrication, and show recorded measurements on final shop drawings. Coordinate fabrication schedule with construction progress to avoid delaying the Work.
   1. Verify locations of concealed framing, blocking, reinforcements, and furring that support woodwork by accurate field measurements before being enclosed. Record measurements on final shop drawings.
   2. Where field measurements cannot be made without delaying the Work, guarantee dimensions and proceed with fabricating woodwork without field measurements. Provide allowance for trimming at site and coordinate construction to ensure that actual dimensions correspond to guaranteed dimensions.

1.8 COORDINATION

A. Coordinate sizes and locations of framing, blocking, furring, reinforcements, and other related units of Work specified in other Sections to ensure that interior architectural woodwork can be supported and installed as indicated.

PART 2 - PRODUCTS

2.1 MATERIALS

A. General: Provide materials that comply with requirements of the AWI quality standard for each type of woodwork and quality grade indicated and, where the following products are part of interior woodwork, with requirements of the referenced product standards that apply to product characteristics indicated:

B. Lumber: DOC PS 20 and the following grading rules:
   1. NeLMA: Northeastern Lumber Manufacturers' Association, "Standard Grading Rules for Northeastern Lumber."
   2. NLGA: National Lumber Grades Authority, "Standard Grading Rules for Canadian Lumber."

C. Factory mark each piece of lumber with grade stamp of inspection agency indicating grade, species, moisture content at time of surfacing, and mill.
   1. For exposed lumber, mark grade stamp on end or back of each piece, or omit grade stamp and provide certificates of grade compliance issued by inspection agency.

D. Hardboard: AHA A135.4.

E. MDF: ANSI A208.2, Grade 130 made with binder containing no urea-formaldehyde resin.

F. Particleboard: ANSI A208.1, Grade M-2, made with binder containing no urea-formaldehyde resin.

G. Melamine-Faced Particleboard: Particleboard complying with ANSI A208.1, Grade M-2, finished on both faces with thermally fused, melamine-impregnated decorative paper and complying with requirements of NEMA LD3, Grade VGL, for test methods 3.3, 3.4, 3.6, 3.8, and 3.10.
   1. Color: White.

H. High-Pressure Decorative Laminate: NEMA LD 3, grades as indicated, or if not indicated, as required by woodwork quality standard.
   1. Available Manufacturers: Subject to compliance with requirements, manufacturers offering high-pressure decorative laminates that may be incorporated in the Work include, but are not limited to, the following:
      a. Wilsonart
      b. Formica Corporation.
      c. Laminart.
      d. Nevamar Corp.
      e. Pioneer Plastics Corp.
      f. Westinghouse Electric Corp.; Specialty Products Div.
      g. Ralph Wilson Plastics Co.

I. Adhesive for Bonding Plastic Laminate: Contact cement.

J. Adhesive for Bonding Plastic Laminate: Aliphatic resin.

2.2 CABINET HARDWARE AND ACCESSORY MATERIALS

A. General: Manufacturer's standard units complying with ANSI A156.9, of type, material, size, and finish as selected from manufacturer's standard choices.
   1. Exposed Hardware Finishes: For exposed hardware, provide manufacturer’s standard satin finished or brushed aluminum.

B. Hardware Standard: Comply with BHMA A156.9 for items indicated by reference to BHMA numbers or referenced to this standard.

C. For concealed hardware provide manufacturer's standard finish that complies with product class requirements of BHMA A156.9.

D. Clear, Tempered Float Glass for Doors: ASTM C 1048, Kind FT, Condition A, Type I, Class 1, Quality q3; manufactured by horizontal (roller hearth) process, with exposed edges seamed before tempering, 6 mm thick, unless otherwise indicated.

E. Clear, Tempered Float Glass for Shelves: ASTM C 1048, Kind FT, Condition A, Type I, Class 1, Quality q3; with exposed edges seamed before tempering, 6 mm thick, unless otherwise indicated.

2.3 INSTALLATION MATERIALS

A. Furring, Blocking, Shims, and Hanging Strips: Softwood or hardwood lumber, kiln dried to less than 15 percent moisture content.

B. Screws: Select material, type, size, and finish required for each use. Comply with ASME B18.6.1 for applicable requirements.

   1. For metal framing supports, provide screws as recommended by metal-framing manufacturer.

C. Nails: Select material, type, size, and finish required for each use. Comply with FS FF-N-105 for applicable requirements.

D. Anchors: Select material, type, size, and finish required for each substrate for secure anchorage. Provide nonferrous metal or hot-dip galvanized anchors and inserts on inside face of exterior walls and elsewhere as required for corrosion resistance. Provide toothed steel or lead expansion bolt devices for drilled-in-place anchors.

2.4 FABRICATION, GENERAL

A. Interior Woodwork Grade: Provide interior woodwork complying with the referenced quality standard and of the following grade:
1. Grade: Custom.

B. Wood Moisture Content: Comply with requirements of referenced quality standard for wood moisture content in relation to relative humidity conditions existing during time of fabrication and in installation areas.

C. Fabricate woodwork to dimensions, profiles, and details indicated. Ease edges to radius indicated for the following:

1. Corners of cabinets and edges of solid-wood (lumber) members 3/4 inch thick or less: 1/16 inch.
2. Edges of rails and similar members more than 3/4 inch thick: 1/8 inch.
3. Corners of cabinets and edges of solid-wood (lumber) members and rails: 1/16 inch.

D. Complete fabrication, including assembly, finishing, and hardware application, before shipment to Project site to maximum extent possible. Disassemble components only as necessary for shipment and installation. Where necessary for fitting at site, provide ample allowance for scribing, trimming, and fitting.

E. Shop-cut openings, to maximum extent possible, to receive hardware, appliances, plumbing fixtures, electrical work, and similar items. Locate openings accurately and use templates or roughing-in diagrams to produce accurately sized and shaped openings. Smooth edges of cutouts and, where located in countertops and similar exposures, seal edges with a water-resistant coating.

F. Install glass to comply with applicable requirements of Division 8 Section "Glazing" and of FGMA "Glazing Manual." For glass in wood frames, secure glass with removable stops.

2.5 WOOD CABINETS (CASEWORK) WITH TRANSPARENT FINISH

A. Quality Standard: Comply with AWI Section 400 requirements for wood cabinets. Joints of cabinets shall be multiple doweled, glued and screwed, with full frame top and solid bottom.

1. Grade: Custom.

B. AWI Type of Cabinet Construction: Reveal overlay.

C. Wood Species for Exposed Surfaces: Red oak, rift sawn/cut, unless noted otherwise.
1. Matching of Veneer Leaves: Slip match.
2. Veneer Matching Within Panel Face: Balance match.

D. Semiexposed Surfaces: Provide surface materials indicated below:

1. Surfaces Other than Drawer Bodies: Match species and cut indicated for exposed surfaces.
2. Drawer Sides and Backs: Solid hardwood lumber, same species indicated for exposed surfaces, shop finished.
3. Drawer Bottoms: ¼ inch tempered hardboard.

2.6 PLASTIC LAMINATE FACE CASEWORK

A. Face Style: Reveal overlay.

B. Face Frame: 1-by-1-5/8-inch solid wood frame rails and stiles with glued mortise and tenon joints.

C. Concealed Surfaces: Sound and dry solid wood, plywood, or particleboard without defects affecting strength, utility, or stability.

D. Sides, Dividers, Tops, Bottoms, Shelves, and Stretchers: Plastic laminate GP 28 on 1/2-inch-thick particleboard. Provide stretchers for top of base cabinet.

E. Back Panels: 1/4-inch-thick hardboard with thermoset decorative panels on interior surfaces fastened to rear edge of end panels and to top and bottom rails.

F. Exposed Edge Treatment: Edge doors and drawer fronts with 3mm PVC edge banding. Color and finish to match plastic laminate of exposed faces.

G. Semi-Exposed Edge Treatment: Edge top of drawer body with high-impact plastic tee edging. Edge remaining casework surfaces with plastic laminate GP 28 matching adjoining plastic laminate in color, pattern, and finish.

H. Doors, Drawer Fronts, Fixed Panels, Toeboards, and Ends: Plastic laminate meeting NEMA GP 28 standard for vertical grade on 3/4-inch-thick particleboard.

I. Drawers: Fabricate with front, bottom, and back rabbeted in sides and secured with glue and mechanical fasteners as follows:
   1. Subfronts, Sides, and Backs: 1/2-inch-thick particleboard.
   2. Bottoms: Not less than 1/2-inch-thick particleboard.
   3. Drawer Suspension: Provide for a minimum capacity of 75 lbf, with twin-track, side-mounted, drawer-glide suspension with nylon rollers. Provide self-closing feature and positive stop.

J. Joinery: Rabbet backs flush into end panels and secure with concealed mechanical fasteners. Connect tops and bottoms of wall cabinets and bottoms and stretchers of base cabinets to ends and dividers with mechanical fasteners. Rabbet tops, bottoms, and backs into end panels.

2.7 COUNTERTOPS, PLASTIC LAMINATE

A. General: Comply with ANSI A161.2.

   1. Solid color plastic laminate.

B. Plastic Laminate Substrate: Comply with ASTM D 1037.

   1. Particleboard: Comply with ANSI A208.1, 45-lb/cu. ft. density, not less than 3/4 inch thick.
   2. Medium-Density Fiberboard: Comply with ANSI A208.2, not less than 3/4 inch thick.

C. Plastic Laminate Substrate for Countertop with Sink: Exterior grade plywood or phenolic resin particleboard complying with ASTM D 1037.

D. Backer Sheet: Provide BK 20 backer sheet wherever the unsupported countertop area exceeds 4 sq. ft. and substrate is 3/4 inch thick; 6 sq. ft. and substrate is 1 inch thick; 8 sq. ft. and substrate is 1-1/8 inch or thicker.

E. Countertop, Backsplash, and Endsplash Plastic Laminate: NEMA GP 50 standard.

F. Configuration: Provide countertops with the following front style, cove, and backsplash style:

1. Front Style: Self-edge.
2. Cove: Applied.
3. Backsplash and Endsplash Style: Square edge without scribe.

2.8 SHOP FINISHING OF WOOD CABINETS FOR TRANSPARENT FINISH

A. Quality Standard: Comply with AWI Section 1500, unless otherwise indicated.

1. Grade: Provide finishes of same grades as items to be finished.

B. General: The entire finish of wood cabinets is specified in this Section, regardless of whether shop applied or applied after installation.
1. Shop Finishing: To the greatest extent possible, finish cabinets at the fabrication shop. Defer only final touch up, cleaning, and polishing until after installation.

C. Preparations for Finishing: Comply with referenced quality standard for sanding, filling countersunk fasteners, sealing concealed surfaces, and similar preparations for finishing architectural woodwork, as applicable to each unit of work.

1. Backpriming: Apply one coat of sealer or primer compatible with finish coats to concealed surfaces of woodwork, including backs of trim, cabinets, paneling, and ornamental work and the underside of countertops. Apply 2 coats to back of paneling. Concealed surfaces of plastic laminate-clad woodwork do not require backpriming when surfaced with plastic laminate or thermoset decorative overlay.

D. Open Finish for Open-Grain Woods: Do not apply filler to open-grain woods.

E. Transparent Finish: Comply with requirements indicated below for grade, finish system, staining, and sheen, with sheen measured on 60-degree gloss meter per ASTM D 523.

1. Grade: Custom.
2. AWI Finish System TR-4: Conversion varnish.
3. Staining: None required.
4. Sheen: Semigloss 55-75 gloss units.

PART 3 - EXECUTION

3.1 PREPARATION

A. Condition woodwork to average prevailing humidity conditions in installation areas before installing.

B. Before installing architectural woodwork, examine shop-fabricated work for completion and complete work as required, including back priming and removal of packing.

3.2 INSTALLATION

A. Quality Standard: Install woodwork to comply with AWI Section 1700 for the same grade specified in Part 2 of this Section for type of woodwork involved.

B. Install woodwork plumb, level, true, and straight with no distortions. Shim as required with concealed shims. Install to a tolerance of 1/8 inch in 96 inches

C. Scribe and cut woodwork to fit adjoining work and refinish cut surfaces or repair damaged finish at cuts.

D. Anchor woodwork to anchors or blocking built in or directly attached to substrates. Secure to grounds, stripping and blocking with countersunk, concealed fasteners and blind nailing as required for complete installation. Use fine finishing nails for exposed nailing, countersunk and filled flush with woodwork and matching final finish where transparent finish is indicated.

E. Cabinets: Install without distortion so that 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 the 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. Maintain veneer sequence matching of cabinets with transparent finish.

F. Tops: Anchor securely to base units and other support systems as indicated. Calk space between backsplash and wall with specified sealant.
   1. Install countertops with no more than 1/8 inch in 96-inch sag, bow, or other variation from a straight line.

G. Complete the finishing work specified in this Section to the extent not completed at shop or before installation of woodwork. Fill nail holes with matching filler where exposed. Apply specified finish coats, including stains and paste fillers if any, to exposed surfaces where only sealer/prime coats were applied in the shop.

H. Refer to Division 9 Sections for final finishing of installed architectural woodwork.

3.3 ADJUSTING AND CLEANING

A. Repair damaged and defective woodwork where possible to eliminate functional and visual defects; where not possible to repair, replace woodwork. Adjust joinery for uniform appearance.

B. Clean, lubricate, and adjust hardware.

C. Clean woodwork on exposed and semiexposed surfaces. Touch up shop-applied finishes to restore damaged or soiled areas.

3.4 PROTECTION

A. Provide final protection and maintain conditions in a manner acceptable to fabricator and Installer that ensures that woodwork is without damage or deterioration at the time of Substantial Completion.

3.5 WASTE MANAGEMENT

A. Coordinate with Division 01.
   1. Separate and recycle cut-offs and waste materials and material packaging in accordance with Waste Management Plan and to the maximum extent economically feasible and place in designated areas for recycling.
   2. Set aside and protect materials suitable for reuse and/or remanufacturing.
   3. Separate and fold up metal banding; flatten and place along with other metal scrap for recycling in designated area.

3.6 CABINET HARDWARE AND ACCESSORY SCHEDULE

A. BHMA numbers are used below to designate hardware requirements, except as otherwise indicated.

B. Butt Hinges: 2-3/4-inch, 5-knuckle steel hinges made from 0.095-inch-thick metal, and as follows:
   1. Semiconcealed Hinges for Overlay Doors: B01521.
   2. Rockford Process Control- #IH-375-26D
   3. Dull Chrome

C. Pulls: Contemporary Aluminum Edge Pull.
   1. Richelieu Hardware-Contemporary Edge Pull, 9595 -7 9/16”
   2. Stainless steel

D. Catches: As follows:
   1. Magnetic Catches: B03141.
   2. Push-in Magnetic Catches: B03131.
   3. Friction Catches: B03033.
   4. Ball Friction Catches: B03013.

E. Adjustable Shelf Standards: B04071.
   1. Shelf Rests for Standards: B04081.
   2. KV or equal -Heavy-duty stainless-steel single slotted adjustable shelf brackets and fasteners and shelf rests

F. Drawer Suspension: Epoxy coated self-closing drawer slides with nylon rollers, 2 stage positive stops, and rated for the following loads:
   1. Drawer Slides: 75 lbf.
   2. Self-closing

G. Door Locks: E07121. (ALL DOORS)

H. Drawer Locks: E07041. (ALL DRAWERS)

END OF SECTION 06 40 23

SECTION 070150.02 - PRECONSTRUCTION TESTING FOR REROOFING

PART 1 - GENERAL

1.1 SUMMARY

A. Section Includes: Preconstruction testing of existing roofing system prior to roofing rehabilitation, including:

1. Thermographic survey and analysis.

B. Perform tests and inspections specified in this Section and in individual specification sections to demonstrate compliance with performance requirements.

C. Related Requirements:

1. Division 07 roofing rehabilitation section for patching and other requirements for preparation of existing roofing to receive roofing rehabilitation, and application of roofing rehabilitation materials.

1.2 INFORMATIONAL SUBMITTALS

A. Test Reports: Submit certified written report from inspection and testing agency of each inspection, test, or similar service to the Contractor with duplicate copies to Owner, Architect and roofing system manufacturer, not later than 14 days after each test.

1. Verify that test results comply with manufacturer's requirements before proceding with work specified in other Division 07 roofing section(s).

1.3 QUALITY ASSURANCE

A. Testing Agency Qualifications: NVLAP-accredited testing agency capable of coordinating testing procedures, analysis, recommendations, and reporting, with a minimum 3 years' experience in specified testing and analysis, and a minimum of 5 successful projects of similar type and scope in the previous 3 years using the specified testing standard and employing qualified test technicians.

1.4 PRECONSTRUCTION TESTING

A. Field Survey Visual Observation

1. Perform visual observations of roof surface conditions. Note condition of parapets and adjacent structure, flashings, copings and roof edge metal, curbs, roof mounted equipment, and other roof accessories and penetrations. Record locations suspected of wet insulation and mark in place with marking paint.

B. Photographic Documentation

1. Record observations with photographs providing documentation of typical and exceptional roof conditions and selected deficient areas.

C. Roof Drawing: Prepare detailed CAD drawing keying areas of visual and photographic observations, as necessitated by survey results.

D. Roof Moisture Survey: Perform thermography testing in accordance with ASTM C1060, instrument manufacturer's instructions, and the following:

1. Supplement thermography test of roof conditions with requirements of ASTM C1153 as applicable.

2. Reporting: Report results of testing in accordance with cited test standards. Present thermograms (images) and key drawings of building surfaces. Indicate missing insulation, defective insulation, and other anomalies. Provide written interpretation of thermal images. Include estimate of total area of each construction type and of total area with missing insulation and with defective insulation.

3. Mark locations of wet insulation with marking paint.

E. Report Data: Written reports of each inspection, test, or similar service include, but are not limited to, 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 and qualifications of individuals making the inspection or test.

6. Designation of the Work and test method.

7. Complete inspection or test data. Summary of findings.

8. Infrared Photographs.

1.5 PROJECT / FIELD CONDITIONS

A. Owner may occupy portions of building immediately below roof area to be tested. Conduct operations so Owner's operations are not disrupted. Provide Owner with not less than 72 hours' notice of activities that may affect Owner's operations.

B. Protect building to be tested, adjacent buildings, walkways, site improvements, exterior plantings, and landscaping from damage or soiling from testing operations.

C. Maintain access to existing walkways, corridors, and other adjacent occupied or used facilities.

D. Perform testing under conditions stipulated in test standards, instrument manufacturer's instructions, and as required by this Section.

E. Thermography Test: Perform testing on dry building surfaces after sunset and prior to sunrise under the following environmental conditions:

1. Windspeed: Not greater than 15 mph (6.7 m/s).

2. Outside Air Temperature: At level to present differential with building interior temperature of 18 deg. F (10 deg. C) minimum, for minimum of 4 hours prior to test, and not varying more than 30 percent during duration of testing.

3. Indoor Air Temperature: At constant temperature varying not more than 4 deg. F (2.2 deg. C).

4. Direct Solar Exposure of Surfaces: No direct solar radiation on inspected surfaces during and for minimum 4 hours prior to inspection, at acceptable outside air temperature.

PART 2 - PRODUCTS (Not Used)

PART 3 - EXECUTION

3.1 EXAMINATION

A. Examine building exterior for compliance with conditions stipulated in cited test standards and as required by this Section. Report non-complying conditions in writing. Correct non-complying conditions prior to performing testing.

END OF SECTION 070150.02

SECTION 070150.16 - MAINTENANCE CLEANING OF MEMBRANE ROOFING

PART 1 - GENERAL

1.1 SUMMARY

A. Section Includes:

1. Pressure washing of roof membrane including membrane flashings, with full water reclamation.

B. Related Requirements:

1. Division 07 roofing rehabilitation section for repair and restoration coating of single ply membrane roofing.

1.2 ACTION SUBMITTALS

A. Product Data: For cleaning compounds.

1.3 INFORMATIONAL SUBMITTALS

A. Work Plan: For maintenance cleaning, including description of means and methods for water reclamation.

1.4 QUALITY ASSURANCE

A. Operator Qualifications: Trained and approved by manufacturer of cleaning equipment, with a record of successful roofing membrane cleaning.

B. Regulatory Requirements: Comply with governing EPA regulations. Comply with hauling and disposal regulations of authorities having jurisdiction.

1.5 PROJECT / FIELD CONDITIONS

A. Owner will occupy portions of building immediately below roof area to be maintained. Conduct operations so Owner's operations are not disrupted. Provide Owner with not less than 72 hours' notice of activities that may affect Owner's operations.

B. Protect building to be cleaned, adjacent buildings, walkways, site improvements, exterior plantings, and landscaping from damage or soiling from maintenance operations.

C. Maintain access to existing walkways, corridors, and other adjacent occupied or used facilities.

PART 2 - PRODUCTS

2.1 CLEANING SYSTEM OPERATORS

A. Source Limitations: Engage a qualified roofing maintenance cleaning firm to perform cleaning of membrane roofing.

B. Approved Operators: RoofTec Cleaning Systems, Tremco CPG Inc., Beachwood OH, (800) 562-2728.

1. Or-Equal cleaning system approved by Architect prior to bid.

2.2 PERFORMANCE REQUIREMENTS

A. Water Reclamation: Provide maintenance cleaning of membrane roofing that provides 100 percent reclamation of cleaning water and complies with applicable provisions of the US EPA National Pollutant Discharge Elimination System (NPDES) program and requirements of local authorities having jurisdiction.

2.3 MATERIALS

A. Pre-cleaning Treatment: Detergent-free.

1. Product: Tremco, RoofTec PREKLEEN.

B. Pressure Wash Cleaning Solution: VOC, detergent, phosphate, and surfactant free.

1. Product: Tremco, RoofTec RENEW Cleaner.

PART 3 - EXECUTION

3.1 PREPARATION

A. Comply with warranty requirements of existing roof membrane manufacturer.

B. Shut off rooftop utilities and service piping before beginning the Work.

C. Test existing roof drains to verify that they are not blocked or restricted. Immediately notify Owner of any blockages or restrictions.

D. Coordinate with Owner to shut down air-intake equipment in the vicinity of the Work. Cover air-intake louvers before proceeding with maintenance cleaning work that could affect indoor air quality or activate smoke detectors in the ductwork.

E. Maintain roof drains in functioning condition to ensure roof drainage at end of each workday. Prevent debris from entering or blocking roof drains and conductors.

3.2 MAINTENANCE CLEANING OF ROOF MEMBRANE

A. Pretreat membrane and flashings when recommended by cleaning equipment manufacturer based upon site assessment of membrane condition.

B. Apply pressure wash cleaning solution onto membrane and flashing surfaces.

C. Pressure wash membrane and flashings using equipment and methods recommended in writing by cleaning equipment manufacturer for specific application. Utilize rotating wash head equipment operated at not less than 2,000 psi (13,800 kPa). Use equipment utilizing vacuum removal of wash water and residues.Only retain article below when existing membrane has been examined and tested to determine that it will comply with performance requirement once cleaned.

3.3 DISPOSAL

A. Collect cleaning water and associated cleaning compounds and residual material and process to meet US EPA and local environmental requirements for legal discharge.

END OF SECTION 070150.16

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SECTION 070150.71 - REHABILITATION OF METAL ROOFING

PART 1 - GENERAL

1.1 SUMMARY

A. This Section includes the following:

1. Roof coating preparation including restoration of metal roof panel joints, fasteners, and flashing, and cleaning preparation for coating.

2. Application of coating on metal roofing.

1.2 MATERIALS OWNERSHIP

A. Demolished materials shall become Contractor's property and shall be removed from Project site.

1.3 DEFINITIONS

A. Roofing Terminology: Refer to ASTM D1079 "Standard Terminology Relating to Roofing and Waterproofing" and glossary in applicable edition of NRCA's "The NRCA Roofing Manual: Membrane Roof Systems" for definition of terms related to roofing work in this Section.

B. Existing Roofing System: Metal roofing, and components and accessories between deck and metal roofing.

C. Roofing Coating Preparation: Existing roofing that is to remain and be prepared to accept restorative coating application.

D. Patching: Removal of a portion of existing metal roofing system from deck or removal of selected components and accessories from existing metal roofing system and replacement with similar materials.

E. Remove: Detach items from existing construction and legally dispose of them off-site unless indicated to be removed and reinstalled.

F. Existing to Remain: Existing items of construction that are not indicated to be removed.

G. Manufacturer/Roofing Manufacturer: Manufacturer of roofing restoration products, unless otherwise indicated.

1.4 ROOFING CONFERENCES

A. Roofing Rehabilitation Preinstallation Conference: Conduct conference at Project site to review methods and procedures related to roofing system.

1. Meet with Owner; Architect; roofing coating materials manufacturer's representative; roofing coating Installer including project manager and foreman; and installers whose work interfaces with or affects rehabilitation including installers of roof accessories and roof-mounted equipment requiring removal and replacement as part of the Work.

2. Review methods and procedures related to coating preparation, including metal roofing coating system manufacturer's written instructions.

3. Review temporary protection requirements for existing roofing system that is to remain uncoated, during and after installation.

4. Review roof drainage during each stage of coating and review roof drain plugging and plug removal procedures.

5. Review and finalize construction schedule, and verify availability of materials, Installer's personnel, equipment, and facilities needed to make progress and avoid delays.

6. Review base flashings, special roofing details, drainage, penetrations, equipment curbs, and condition of other construction that will affect coating.

7. Review HVAC shutdown and sealing of air intakes.

8. Review shutdown of fire-suppression, -protection, and -alarm and -detection systems.

9. Review governing regulations and requirements for insurance and certificates if applicable.

10. Review existing conditions that may require notification of Owner before proceeding.

1.5 ACTION SUBMITTALS

A. Product Data: For each type of product specified.

1.6 INFORMATIONAL SUBMITTALS

A. Qualification Data: For Installer.

B. Contractor's Product Certificate: Submit notarized certificate, indicating products intended for Work of this Section, including product names and numbers and manufacturers' names, with statement indicating that products to be provided meet the requirements of the Contract Documents.

C. Manufacturer Certificates: Signed by roofing manufacturer certifying that roofing system complies with requirements specified in "Performance Requirements" Article.

1. Indicate that proposed system components are compatible.

D. Warranties: Unexecuted sample copies of special warranties.

1.7 CLOSEOUT SUBMITTALS

A. Maintenance Data: To include in maintenance manuals.

B. Warranties: Executed copies of approved warranty forms.

1.8 QUALITY ASSURANCE

A. Installer Qualifications: An employer of workers trained and certified by manufacturer, including a full-time on-site supervisor with a minimum of five years' experience installing products comparable to those specified, able to communicate verbally with Contractor, Architect, and employees, and the following:

1. Qualified by the manufacturer to install manufacturer's product and furnish warranty of type specified.

B. Manufacturer Qualifications: Primary product manufacturer with minimum five years' experience in manufacture of comparable products in successful use in similar applications, and able to furnish warranty with provisions matching specified requirements.

C. Approval of Other Manufacturers and Comparable Products: Submit the following in accordance with project substitution requirements, within time allowed for substitution review:

1. Product data, including certified independent test data indicating compliance with requirements.

2. Samples of each component.

3. Sample submittal from similar project.

4. Project references: Minimum of five installations of specified products with Owner and Architect/Owner's Consultant contact information.

5. Sample warranty.

6. Approved manufacturers must meet separate requirements of Submittals Article.

D. Substitutions following award of contract are not allowed except as stipulated in Division 01 General Requirements.

E. Roofing Inspector Qualifications: A technical representative of manufacturer not engaged in the sale of products and experienced in the installation and maintenance of the specified roofing system, qualified to perform roofing observation and inspection specified in Field Quality Control Article, to determine Installer's compliance with the requirements of this Project, and approved by the manufacturer to issue warranty certification. The Roofing Inspector shall be one of the following:

1. An authorized full-time technical employee of the manufacturer.

2. An independent party certified as a Registered Roof Observer by the International Institute of Building Enclosure Consultants (formerly the Roof Consultants Institute) retained by the Contractor or the Manufacturer and approved by the Manufacturer.

F. Manufacturer's Installation Instructions: Obtain and maintain on-site access to manufacturer's written recommendations and instructions for installation of products.

1.9 PROJECT / FIELD CONDITIONS

A. Weather Limitations: Proceed with rehabilitation work only when existing and forecasted weather conditions permit Work to proceed without water entering into existing roofing system or building.

1. Store all materials prior to application at temperatures recommended by manufacturer.

2. Apply coatings within range of ambient and substrate temperatures recommended by manufacturer.

3. Do not apply roofing in snow, rain, fog, or mist.

B. Protect building to be rehabilitated, adjacent buildings, walkways, site improvements, exterior plantings, and landscaping from damage or soiling from rehabilitation operations.

C. Maintain access to existing walkways, corridors, and other adjacent occupied or used facilities.

D. Daily Protection: Coordinate installation of roofing so insulation and other components of roofing system not permanently exposed are not subjected to precipitation or left uncovered at the end of the workday or when rain is forecast.

E. Owner will occupy portions of building immediately below re-coating area. Conduct re-coating so Owner's operations will not be disrupted. Provide Owner with not less than 72 hours' notice of activities that may affect Owner's operations.

1.10 WARRANTY

A. Manufacturer's Warranty: Roof System Manufacturer's standard form in which Manufacturer agrees to repair or replace components of roofing system that fail in materials or workmanship within warranty period, as follows.

1. Form of Warranty: Manufacturer's standard warranty form.

2. Scope of Warranty: Work of this Section and including sheet metal details and termination details installed by the roof system Installer and approved by the Roof System Manufacturer.

3. Warranty Period: 12 years from date of completion.

B. Manufacturer Inspection Services: By manufacturer's technical representative, to report maintenance responsibilities to Owner necessary for preservation of Owner's warranty rights. The cost of manufacturer's inspections is included in the Contract Sum.

1. Inspections to occur in following years: 2, 5 and10 following completion.

C. Installer Warranty: Installer's warranty signed by Installer, as follows.

1. Form of Warranty: Form acceptable to Roofing Manufacturer and Owner.

2. Scope of Warranty: Work of this Section.

3. Warranty Period: 3 years from date of completion.

PART 2 - PRODUCTS

2.1 MANUFACTURERS

A. Basis of Design: The roof system specified in this Section is based upon products of Tremco CPG Inc, Beachwood, OH, (800) 562-2728, www.tremcoroofing.com that are named in other Part 2 articles. Provide specified products or comparable products of one of the following.

1. Tremco CPG Inc., Basis-of-Design.

2. Kemper.

B. Source Limitations: Obtain components for roofing system from same manufacturer as membrane roofing or manufacturer approved by membrane roofing manufacture

2.2 PERFORMANCE REQUIREMENTS

A. General: Provide coated metal roofing system that remains weathertight; does not permit the passage of water; and resists specified uplift pressures, thermally induced movement, and exposure to weather without failure.

B. Material Compatibility: Provide roofing materials that are compatible with one another under conditions of service and application required, as demonstrated by roofing manufacturer based on testing and field experience.

C. Exterior Fire-Test Exposure: Roofing system exterior fire-test exposure performance following application of rehabilitation coating shall not be less than that of the pre-rehabilitated roof performance when tested in accordance with ASTM E108, based upon manufacturer's tests of identical applications.

D. Energy Performance: Provide roof coating with initial solar reflectance index not less than 39 when calculated according to ASTM E1980, based upon testing of identical products by a qualified testing agency.

2.3 MATERIALS, GENERAL

A. General: Restoration materials recommended by roof coating manufacturer for intended use and compatible with components of existing metal roofing system.

2.4 METAL COATING MATERIALS

A. Metal Restoration Coating:

1. Acrylic Roof Coating, Elastomeric: ASTM D6083, applied as base coat plus finish coat over prepared and primed roof surfaces.

a. Basis of design product: Tremco, Solargard 6083 Base and Top Coat.

b. Volatile Organic Compounds (VOC), maximum, ASTM D3960: 50 g/L.

c. Tensile Strength at 73 deg. F (23 deg. C), minimum, ASTM D2370: 250 psi (1700 kPa).

d. Elongation at 73 deg. F (23 deg. C), minimum, ASTM D2370: 350 percent.

e. Flexibility at -15 deg F (-26 deg C), ASTM D522: Pass 1/2 inch mandrel bend after 1000 hrs. accelerated weathering.

f. Solids by weight, minimum ASTM D1644: 60 percent.

g. Solids by volume, minimum ASTM D2697: 50 percent.

h. Color, Top Coat: As selected from manufacturer's available colors.

i. Minimum Thickness over Metal: 32 mils (0.80 mm) wet total. 16 mils (0.40 mm) wet each coat for base and finish coats.

B. Metal Primer:

1. Acrylic primer formulated for use with acrylic coatings on PVDF-coated metal.

a. Basis of design product: Tremco, SOLARGARD Fluoro-Prime.

b. Volatile Organic Compounds (VOC), maximum, ASTM D3960: 50 g/L.

c. Solids by volume, minimum: 5 percent.

d. Application: 6 to 8 wet mils; (0.15 to 0.20 mm) wet.

2. Acrylic corrosion-resistant primer formulated for use with acrylic emulsion metal coatings.

a. Basis of design product: Tremco, Solargard Rust Primer WB.

b. Volatile Organic Compounds (VOC), maximum, ASTM D3960: 3 g/L.

c. Solids, by weight: 50 percent.

d. Application; 100 to 200 sq. ft per gal: 8 to 16 wet mils, (0.20 - 0.40 mm) wet.

C. Metal Rust Primer:

1. Acrylic corrosion-resistant primer formulated for use with acrylic emulsion metal coatings.

a. Basis of design product: Tremco, Solargard Rust Primer WB.

b. Volatile Organic Compounds (VOC), maximum, ASTM D3960: 3 g/L.

c. Solids, by weight: 50 percent.

d. Application; 100 to 200 sq. ft per gal: 8 to 16 wet mils, (0.20 - 0.40 mm) wet.

2.5 AUXILIARY MATERIALS

A. General: Auxiliary materials recommended by roofing system manufacturer for intended use and compatible with existing roofing system and roofing coating system.

B. Seam Sealer: Waterproof seam and fastener patching material.

1. Seam Sealer: Aliphatic polyurethane sealer, single-component, moisture curing, high solids, low-VOC, formulated for compatibility and use with specified roofing substrates.

a. Basis of design product: Tremco, SOLARGARD Seam Sealer.

b. Volatile Organic Compounds (VOC), maximum, ASTM D3960: 75 g/L.

c. Tensile Strength, ASTM D412: 270 psi (1860 kPa).

d. Tear Strength, ASTM D412: 35 pli (6 kN/m).

e. Elongation, ASTM D412: 700 percent.

f. Color: White.

C. Seam Reinforcing Fabric: Polyester Reinforcing Fabric: 100 percent stitch-bonded mildew-resistant polyester fabric intended for reinforcement of compatible fluid-applied membranes and flashings.

1. Basis of design product: Tremco, Permafab.

2. Tensile Strength, Minimum, ASTM D5034 (2-inch): MD - 110 lbs (49.8 kg); XMD - 60 lbs (27.2 kg) avg.

3. Elongation, Minimum, ASTM D5034 (1-inch): MD - 25 percent; XMD - 100 percent.

4. Tear Strength, Minimum, ASTM D5587: MD - 20 lbs (9.0 kg) avg; XMD - 20 lbs (9.0 kg) avg.

5. Weight: 3 oz./sq. yd (102 g/sq. m).

D. Joint Sealant: Elastomeric joint sealant compatible with applied coating, with movement capability appropriate for application.

1. Joint Sealant, Polyurethane: ASTM C920, Type S, Grade NS, Class 50 single-component moisture curing sealant, formulated for compatibility and use in dynamic and static joints; paintable.

a. Basis of design product: Tremco, TremSEAL Pro.

b. Volatile Organic Compounds (VOC), maximum, ASTM D3960: 40 g/L.

c. Hardness, Shore A, ASTM C661: 40.

d. Adhesion to Concrete, ASTM C794: 35 pli.

e. Tensile Strength, ASTM D412: 350 psi (2410 kPa).

f. Color: Closest match to substrate.

PART 3 - EXECUTION

3.1 EXISTING WARRANTIES

A. Notify warrantor of extent of work. Do not proceed with work that will diminish Owner's protection under existing warranties unless directed by Owner.

3.2 EXAMINATION

A. Examine existing roofing substrates, with Installer present, for compliance with requirements and for other conditions affecting application and performance of roof coatings.

1. For the record, prepare written report, endorsed by Installer, listing conditions detrimental to performance.

2. Verify compatibility with and suitability of substrates.

3. Verify that substrates are visibly dry and free of moisture.

4. Verify that metal roofing is free of rust affecting structural integrity of roofing, or other indications of impending metal roof system failure.

5. Application of coatings indicates acceptance of surfaces and conditions.

3.3 PREPARATION

A. Protect existing roofing system that is indicated not to be coated, and adjacent portions of building and building equipment.

1. Comply with warranty requirements of existing roofing manufacturer.

2. Maintain temporary protection and leave in place until roofing rehabilitation has been completed.

B. Shut down air intake equipment in the vicinity of the Work in coordination with the Owner. Cover air intake louvers before proceeding with rehabilitation work that could affect indoor air quality or activate smoke detectors in the ductwork.

1. Verify that rooftop utilities and service piping affected by the Work have been shut off before commencing Work.

C. Maintain roof drains in functioning condition to ensure roof drainage at end of each workday. Prevent debris from entering or blocking roof drains and conductors.

1. Do not permit water to enter into or under existing metal roofing system components that are to remain.

3.4 ROOFING COATING PREPARATION

A. Metal Roofing Surface Preparation:

1. Remove ridges, buckles, failed or loose roofing fasteners, and other substrate irregularities from existing metal roofing that would inhibit application of uniform, weathertight coating.

2. Repair metal roofing at locations where irregularities have been removed.

3. Provide replacement fasteners where required.

4. Clean substrate of contaminants such as dirt, debris, oil, and grease that can affect adhesion of coating by power washing at minimum 2,000 psi (13,800 kPa). Remove existing coatings if any. Allow to dry thoroughly.

5. Verify that existing substrate is dry before proceeding with application of coating.

6. Perform adhesion testing before proceeding with application of coating.

3.5 FLASHING REPAIR

A. Do not damage metal counterflashings that are to remain. Replace metal counterflashings damaged during removal with counterflashings of same metal, weight or thickness, and finish.

B. Repair flashings, copings, and other roof-related sheet metal and trim elements. Reseal joints, replace loose or missing fasteners, and replace components where required to leave in a watertight condition.

3.6 ROOF COATING APPLICATION

A. Primer: Spot prime cleaned rusted or bare areas with metal primer at manufacturer's recommended application rate and allow to dry.

B. Metal Roofing Seam Reinforcement Plies: Coat horizontal (end-lap) and faulty vertical (side-lap) seams with detail course of seam sealer according to manufacturer's written instructions. Embed seam reinforcement fabric in seam sealer.

1. Reinforce seams with openings greater than 1/8 inch (3 mm).

a. Where seams have openings greater than 1/4 inch (6 mm), draw seams together and secure with self-tapping sheet metal screw and neoprene washer.

C. Coating: Apply number of coats and thickness of coats indicated in Part 2 product listing and as required in manufacturer's written instructions. Apply minimum of two coats.

D. Joint Sealant: Apply joint sealant at exposed movement joints, terminations, and where required for complete weathertight application.

3.7 PROTECTING AND CLEANING

A. Protect roofing system from damage and wear during remainder of construction period.

B. Correct deficiencies in or remove coating that does not comply with requirements, repair substrates, and reapply coating.

C. Clean overspray and spillage from adjacent construction using cleaning agents and procedures recommended by manufacturer of affected construction.

END OF SECTION 070150.71

SECTION 070150.73 - REHABILITATION OF MODIFIED BITUMINOUS MEMBRANE ROOFING

PART 1 - GENERAL

1.1 SUMMARY

A. This Section includes the following:

1. Roof re-coating preparation.

2. Application of fluid-applied roof membrane and flashings over existing granule-surfaced modified bituminous membrane roofing and smaller area of EPDM single ply membrane roofing.

B. Related Information:

1. Division 07 Section "Preconstruction Testing for Re-Roofing" for Contractor's responsibilities for performance of preconstruction testing of existing roof.

2. Division 07 Section "Maintenance Cleaning of Membrane Roofing" for reclaimed water cleaning system for preparation of existing roof substrate.

C. Unit Prices: Refer to Division 01 Section "Unit Prices" for description of Work in this Section affected by unit prices.

1.2 ROOFING CONFERENCES

A. Roofing Rehabilitation Preinstallation Conference: Conduct conference at Project site to review methods and procedures related to roofing system.

1. Meet with Owner; Architect; roofing re-coating materials manufacturer's representative; roofing re-coating Installer including project manager and foreman; and installers whose work interfaces with or affects re-coating including installers of roof accessories and roof-mounted equipment requiring removal and replacement as part of the Work.

2. Review methods and procedures related to re-coating preparation, including membrane roofing system manufacturer's written instructions.

3. Procedures for salvaging and recycling of demolition and construction waste

4. Review temporary protection requirements for existing roofing system that is to remain, during and after installation.

5. Review roof drainage during each stage of re-coating and review roof drain plugging and plug removal procedures.

6. Review and finalize construction schedule, and verify availability of materials, Installer's personnel, equipment, and facilities needed to make progress and avoid delays.

7. Review base flashings, special roofing details, drainage, penetrations, equipment curbs, and condition of other construction that will affect re-coating.

8. Review HVAC shutdown and sealing of air intakes.

9. Review shutdown of fire-suppression, -protection, and -alarm and -detection systems.

10. Review procedures for asbestos removal or unexpected discovery of asbestos-containing materials.

11. Review governing regulations and requirements for insurance and certificates if applicable.

12. Review existing conditions that may require notification of Owner before proceeding.

1.3 MATERIALS OWNERSHIP

A. Demolished materials shall become Contractor's property and shall be removed from Project site.

1.4 DEFINITIONS

A. Roofing Terminology: Refer to ASTM D1079 "Standard Terminology Relating to Roofing and Waterproofing" and glossary in NRCA's "The NRCA Roofing Manual: Membrane Roof Systems" for definition of terms related to roofing work in this Section.

B. Roofing Coating Preparation: Existing roofing that is to remain and be prepared to accept restorative coating application.

C. Patching: Removal of a portion of existing membrane roofing system from deck or removal of selected components and accessories from existing membrane roofing system and replacement with compatible similar materials.

D. Remove: Detach items from existing construction and legally dispose of them off-site unless indicated to be removed and reinstalled.

E. Existing to Remain: Existing items of construction that are not indicated to be removed.

F. Construction Waste: Building and site improvement materials and other solid waste resulting from construction, remodeling, renovation, or repair operations. Construction waste includes packaging.

G. Demolition Waste: Building and site improvement materials resulting from re-roofing preparation, demolition, or selective demolition operations.

H. Disposal: Removal off-site of demolition and construction waste and subsequent sale, recycling, reuse, or deposit in landfill or incinerator acceptable to authorities having jurisdiction.

1.5 ACTION SUBMITTALS

A. Product Data: For each type of product specified.

B. Sustainable Design Submittals:

1. Indicate CRRC Compliance.

1.6 INFORMATIONAL SUBMITTALS

A. Qualification Data: For Installer, Manufacturer, and Roofing Inspector.

1. Letter written for this Project indicating manufacturer approval of Installer to apply specified products and provide specified warranty.

B. Contractor's Product Certificate: Submit certificate, indicating products intended for Work of this Section, including product names and numbers and manufacturers' names, with statement indicating that products to be provided meet the requirements of the Contract Documents.

1. Provide manufacturer's UL listing certificate for roofing system.

C. Proposed Protection Measures: Submit report, including Drawings, which indicates the measures proposed for protecting individuals and property, for environmental protection, and for dust control. Indicate proposed locations and construction of barriers.

D. Warranties: Unexecuted sample copies of special warranties.

E. Existing Conditions Photographs: Show existing conditions of adjoining construction and site improvements, including exterior and interior finish surfaces, which might be misconstrued as having been damaged by re-coating operations. Submit before Work begins.

F. Inspection Reports: Reports of Roofing Inspector. Include description of work performed, tests performed, defective work observed, and corrective actions required and carried out.

1.7 CLOSEOUT SUBMITTALS

A. Maintenance Data: To include in maintenance manuals.

B. Warranties: Executed copies of approved warranty forms.

1.8 QUALITY ASSURANCE

A. Installer Qualifications: An employer of workers trained and certified by manufacturer, including a full-time on-site supervisor with a minimum of three years' experience installing products comparable to those specified, able to communicate verbally with Contractor, and employees, and the following:

1. Qualified by the manufacturer to install manufacturer's product and furnish warranty of type specified.

B. Manufacturer Qualifications: Primary product manufacturer that is UL listed for roofing system identical to that specified for this Project with minimum five years' experience in manufacture of comparable products in successful use in similar applications, and able to furnish warranty with provisions matching specified requirements.

1. Approval of Other Manufacturers and Comparable Products: Submit the following in accordance with project substitution requirements, within time allowed for substitution review:

a. Product data, including certified independent test data indicating compliance with requirements.

b. Samples of each component.

c. Sample submittal from similar project.

d. Project references: Minimum of five installations of specified products with Owner and Architect/Owner's Consultant contact information.

e. Sample warranty.

C. Roofing Inspector Qualifications: A technical representative of manufacturer not engaged in the sale of products and experienced in the installation and maintenance of the specified roofing system, qualified to perform roofing observation and inspection specified in Field Quality Control Article, to determine Installer's compliance with the requirements of this Project, and approved by the manufacturer to issue warranty certification. The Roofing Inspector shall be one of the following:

1. An authorized full-time technical employee of the manufacturer.

2. An independent party certified as a Registered Roof Observer by the International Institute of Building Enclosure Consultants (formerly the Roof Consultants Institute) retained by the Contractor or the Manufacturer and approved by the Manufacturer.

1.9 FIELD CONDITIONS

A. Weather Limitations: Proceed with rehabilitation work only when existing and forecasted weather conditions permit Work to proceed without water entering into existing roofing system or building.

1. Store all materials prior to application at temperatures recommended by manufacturer.

2. Apply coatings within range of ambient and substrate temperatures recommended by manufacturer.

3. Do not apply roofing in snow, rain, fog, or mist.

B. Protect building to be rehabilitated, adjacent buildings, walkways, site improvements, exterior plantings, and landscaping from damage or soiling from rehabilitation operations.

C. Maintain access to existing walkways, corridors, and other adjacent occupied or used facilities.

D. Daily Protection: Coordinate installation of roofing so insulation and other components of roofing system not permanently exposed are not subjected to precipitation or left uncovered at the end of the workday or when rain is forecast.

E. Owner will occupy portions of building immediately below re-coating area. Conduct re-coating so Owner's operations will not be disrupted. Provide Owner with not less than 72 hours' notice of activities that may affect Owner's operations.

1.10 WARRANTY

A. Manufacturer's Warranty: Roof System Manufacturer's standard form in which Manufacturer agrees to repair or replace components of roofing system that fail in materials or workmanship within warranty period, as follows.

1. Form of Warranty: Manufacturer's standard warranty form.

2. Scope of Warranty: Work of this Section and including sheet metal details and termination details installed by the roof system Installer and approved by the Roof System Manufacturer.

3. Warranty Period: 20 years from date of completion.

B. Manufacturer Inspection Services: By manufacturer's technical representative, to report maintenance responsibilities to Owner necessary for preservation of Owner's warranty rights. The cost of manufacturer's inspections is included in the Contract Sum.

1. Inspections to occur in following years: 2, 5, 10 and 15 following completion.

C. Installer Warranty: Installer's warranty signed by Installer, as follows.

1. Form of Warranty: Form acceptable to Roofing Manufacturer and Owner.

2. Scope of Warranty: Work of this Section.

3. Warranty Period: 2 years from date of completion.

PART 2 - PRODUCTS

2.1 MANUFACTURERS

A. Basis of Design: The roof system specified in this Section is based upon products of Tremco CPG Inc, www.tremcoroofing.com that are named in other Part 2 articles. Provide specified products or comparable products of one of the following.

1. Tremco CPG Inc., Basis-of-Design.

2. Kemper.

3. Pacific Polymers.

B. Source Limitations: Obtain components for roofing system from same manufacturer as membrane roofing or manufacturer approved by membrane roofing manufacturer.

2.2 PERFORMANCE REQUIREMENTS

A. General Performance: Rehabilitated roofing shall withstand exposure to weather without failure or leaks due to defective manufacture or installation.

1. Accelerated Weathering: Roofing system shall withstand 5000 hours of exposure when tested according to ASTM G152, ASTM G154, or ASTM G155.

B. Material Compatibility: Provide roofing materials that are compatible with one another under conditions of service and application required, as demonstrated by roofing manufacturer based on testing and field experience.

C. Exterior Fire-Test Exposure: Roofing system exterior fire-test exposure performance following application of rehabilitation coating shall not be less than that of the pre-rehabilitated roof performance when tested in accordance with ASTM E108, based upon manufacturer's tests of identical applications.

D. Energy Performance: Provide roof coating with initial solar reflectance index not less than 78 when calculated according to ASTM E1980, based upon testing of identical products by a qualified testing agency.

2.3 MATERIALS

A. General: Re-coating materials recommended by roofing system manufacturer for intended use and compatible with components of existing membrane roofing system.

B. Infill Roof Repair Materials: Where required to replace test cores and to patch existing roofing, use infill materials matching existing membrane roofing system materials, unless otherwise indicated.

1. Cap Ply: SBS-Modified Bitumen, fiberglass reinforced, ASTM D 6163, Type I, Grade G. 120 mils minimum thickness.

2. Base Ply: SBS-Modified Bitumen, fiberglass reinforced, ASTM D6163, Type III, Grade S, 120 mils minimum thickness.

3. Adhesive: Polyurethane, two-part, Zero VOC adhesive.

C. Temporary Roof Drainage: Design and selection of materials for temporary roof drainage are responsibilities of the Contractor.

2.4 FLUID-APPLIED ROOFING MEMBRANE

A. Polyurethane Elastomeric Fluid-Applied System: Two-coat fluid-applied roofing membrane formulated for application over prepared existing roofing substrate.

1. Polyurethane Roof Coating System Base Coat: Bio-based, low-odor low-VOC two-part, for use with a compatible top coat.

a. Basis of design product: Tremco, AlphaGuard BIO Base Coat.

b. Combustion Characteristics, UL 790: Maintains combustion characteristics of existing roof system.

c. Volatile Organic Compounds (VOC), maximum, ASTM D3960: 1 g/L.

d. Accelerated Weathering, 5000 hours, ASTM G154: Pass.

e. Hardness, Shore A, minimum, ASTM D2240: 80.

f. Solids, by volume, ASTM D2697: 100 percent.

g. Bio-Based Content, Minimum: 70 percent.

h. Minimum Thickness, Base Coat reinforced over Smooth Single-Ply: 48 mils (1.22 mm) wet.

i. Minimum Thickness, Base Coat reinforced over Granular Surfaced MB: 64 mils (1.62 mm) wet.

2. Polyurethane roof coating system top coat, bio-based low-odor low-VOC two-part, for application over compatible base coat.

    a. Basis of design product: Tremco, AlphaGuard BIO Top Coat.

    b. Combustion Characteristics, UL790: Maintains combustion characteristics of existing roof system.

    c. Volatile Organic Compounds (VOC), maximum, ASTM D3960: 6 g/L.

    d. Solar Reflectance Index (SRI), ASTM E1980: For white, not less than 103.

    e. Accelerated Weathering, 5000 hours, ASTM G 154: Pass.

    f. Hardness, Shore A, minimum, ASTM D2240: 81.

    g. Solids, by volume, ASTM D2697: 100 percent.

    h. Bio-Based Content, Minimum: 60 percent.

    i. Minimum Thickness, reinforced system: 32 mils (0.81 mm) wet.

    j. Minimum Thickness, Slip-Resistant Coat: 24 mils (0.60 mm) wet.

    k. Color: White.

B. Primers:

1. Primer for Asphaltic and Single-Ply Membranes: Water-based, polymer-modified quick-dry low odor primer.

    a. Volatile Organic Compounds (VOC), maximum, ASTM D3960: 1 g/L.

    b. Solids, by weight: 70 percent.

2. Primer for Masonry Surfaces: Two-part high-solids epoxy-penetrating low-odor primer for masonry and concrete surfaces.

    a. Volatile Organic Compounds (VOC), maximum, ASTM D3960: 0 g/L.

    b. Solids, by weight: 100 percent.

3. Primer for Non-Porous Surfaces: Single-part, water based primer to promote adhesion of urethanes to metals, PVC and other non-porous surfaces.

    a. Volatile Organic Compounds (VOC), maximum, ASTM D3960: 22 g/L.

    b. Nonvolatile Content, minimum, ASTM D2369: 5 percent.

c. Density at 77 deg F (25 deg C): 8.3 lb./gal (1kg/L).

4. Single-component reactivating primer used to prepare aged bio-based urethane products.

a. Coverage Rate: 1/4 gal / 100 sq. ft. (0.1 L/m2) (4 wet mils) minimum.

C. Fluid-Applied Membrane Reinforcing Fabric:

1. Polyester Reinforcing Fabric: 100 percent stitch-bonded mildew-resistant polyester fabric intended for reinforcement of compatible fluid-applied membranes and flashings.

a. Basis of design product: Tremco, Permafab.

b. Tensile Strength, Minimum, ASTM D5034 (2-inch): MD - 110 lbs. (49.8 kg); XMD - 60 lbs. (27.2 kg) avg.

c. Elongation, Minimum, ASTM D5034 (1-inch): MD - 25 percent; XMD - 100 percent.

d. Tear Strength, Minimum, ASTM D5587: MD - 20 lbs. (9.0 kg) avg; XMD - 20 lbs. (9.0 kg) avg.

e. Weight: 3 oz./sq. yd (102 g/sq. m).

2.5 AUXILIARY MATERIALS

A. General: Auxiliary materials recommended by roofing system manufacturer for intended use and compatible with existing roofing system and fluid-applied roofing system.

B. Seam Sealer: Waterproof seam and patching material compatible with applied coating.

1. Seam Sealer: Aromatic polyurethane sealer, single-component, high solids, moisture curing, formulated for compatibility and use with a variety of roofing and flashing substrates.

a. Basis of design product: Tremco, GEOGARD Seam Sealer.

b. Volatile Organic Compounds (VOC), maximum, ASTM D3960: 189 g/L.

c. Tensile Strength, ASTM D412: 270 psi (1860 kPa).

d. Tear Strength, ASTM D412: 35 pli (6.13 kNm).

e. Elongation, ASTM D412: 220 percent.

f. Color: Gray.

C. Joint Sealant: Elastomeric joint sealant compatible with applied coating, with movement capability appropriate for application.

1. Joint Sealant, Polyurethane: ASTM C920, Type S, Grade NS, Class 50 single-component moisture curing sealant, formulated for compatibility and use in dynamic and static joints; paintable.

a. Volatile Organic Compounds (VOC), maximum, ASTM D3960: 40 g/L.

b. Hardness, Shore A, ASTM C661: 40.

c. Tensile Strength, ASTM D412: 350 psi (2410 kPa).

d. Color: White.

D. Fasteners: Factory-coated steel fasteners and metal or plastic plates meeting corrosion-resistance provisions in FM 4470; designed for fastening roofing membrane components to substrate; tested by manufacturer for required pullout strength; and acceptable to roofing system manufacturer.

E. Metal Flashing Sheet: Provide metal flashing sheet matching type, thickness, finish, and profile of existing metal flashing and trim.

F. Miscellaneous Accessories: Provide miscellaneous accessories recommended by roofing system manufacturer.

2.6 SLIP RESISTANT WALKWAY TOP COAT

A. Fluid-Applied Walkway Top Coat, Slip-Resistant: Second top coat with broadcast slip-resistant aggregate.

1. Color: White.

B. Granular Roofing Surfacing: Ceramic-coated roofing granules, No. 11 screen size with 100 percent passing No. 8 (2.36-mm) sieve and 98 percent of mass retained on No. 40 (0.425-mm) sieve.

1. Basis of design product: Granular Roofing Surfacing, Colored.

2. Aggregate application rate, average: 10 - 15 lb./100 sq ft (0.5 - 0.75 k/m2).

3. Color: As selected by Architect from manufacturer's standard colors from manufacturer's standard colors.

PART 3 - EXECUTION

3.1 EXAMINATION

A. Examine existing roofing substrates, with Installer present, for compliance with requirements and for other conditions affecting application and performance of roof coatings.

1. For the record, prepare written report, endorsed by Installer, listing conditions detrimental to performance.

2. Verify compatibility of approved re-coating system with and suitability of substrates.

3. Verify that substrates are visibly dry and free of moisture.

4. Verify that roofing membrane surfaces have adequately aged to enable proper bond with re-coating system base coat.

5. Verify that existing roofing membrane is free of blisters, splits, open laps, indications of shrinkage, and puncture damage or other indications of impending roof system failure.

6. Commencing application of fluid-applied re-coating membrane indicates acceptance of surfaces and conditions.

3.2 PREPARATION

A. Protect existing roofing system that is indicated not to be rehabilitated, and adjacent portions of building and building equipment.

1. Mask surfaces to be protected. Seal joints subject to infiltration by coating materials.

2. Limit traffic and material storage to areas of existing roofing membrane that have been protected.

3. Maintain temporary protection and leave in place until replacement roofing has been completed.

B. Pollution Control: Comply with environmental regulations of authorities having jurisdiction. Limit spread of dust and debris.

1. Remove and transport debris in a manner that will prevent spillage on adjacent surfaces and areas.

2. Remove debris from building roof by chute, hoist, or other device that will convey debris to grade.

C. Shut down air intake equipment in the vicinity of the Work in coordination with the Owner. Cover air intake louvers before proceeding with re-coating work that could affect indoor air quality or activate smoke detectors in the ductwork.

1. Verify that rooftop utilities and service piping affected by the Work have been shut off before commencing Work.

D. Maintain roof drains in functioning condition to ensure roof drainage at end of each workday. Prevent debris from entering or blocking roof drains and conductors. Use roof-drain plugs specifically designed for this purpose. Remove roof-drain plugs at end of each workday, when no work is taking place, or when rain is forecast.

1. Do not permit water to enter into or under existing membrane roofing system components that are to remain.

3.3 ROOFING COATING PREPARATION

A. Removal of Wet Insulation: Remove portions of roofing membrane with underlying wet insulation. Remove wet insulation, fill in tear-off areas to match existing insulation and membrane, and prepare patched membrane for roof coating application specified below.

1. Adhere infill insulation in low rise foam insulation adhesive beads spaced 12 inches on center for each infill layer. Adhere repair base ply and cap ply in polyurethane adhesive at 2.0 gallons per 100 square feet, per ply. Tie-in repair patch to existing primed roof with a three course seal of seam sealer and polyester reinforcing fabric.

B. Repair of Ponding Areas: Repair areas indicated as ponding areas or areas of inadequate drainage by removing roof membrane, adding additional insulation as required to provide minimum slopes to drain required by roofing rehabilitation coating manufacturer, and replace membrane with material matching existing. Submit photographic report indicating compliance.

C. Membrane Surface Preparation:

1. Remove loose granular aggregate from granular aggregate-surfaced built-up bituminous roofing with a power broom.

2. Remove pavers and walkway pads from roofing membrane.

3. Remove blisters, ridges, buckles, roofing membrane fastener buttons projecting above the membrane, and other substrate irregularities from existing roofing membrane that would inhibit application of uniform, waterproof coating.

4. Broom clean existing substrate.

5. Substrate Cleaning: Clean substrate in accordance with requirements of Division 07 Section "Maintenance Cleaning of Membrane Roofing."

6. Verify that existing substrate is dry before proceeding with application of coating. Spot check substrates with an electrical capacitance moisture-detection meter.

7. Verify adhesion of new products.

D. Existing Flashing and Detail Preparation: Repair flashings, gravel stops, copings, and other roof-related sheet metal and trim elements. Reseal joints, replace loose or missing fasteners, and replace components where required to leave in a watertight condition.

1. Do not damage metal counter flashings that are to remain. Replace metal counter flashings damaged during removal with counter flashings of same metal, weight or thickness, and finish.

2. Roof Drains: Remove drain strainer and clamping ring. Grind metal surfaces down to clean, bare, metal.

E. Surface Priming: Prime surfaces to receive fluid-applied coating using coating manufacturer's recommended product for surface material. Apply at application rate recommended by manufacturer.

1. Ensure primer does not puddle and substrate has complete coverage.

2. Allow to cure completely prior to application of coating.

3.4 FLUID-APPLIED FLASHING APPLICATION

A. Fluid-Applied Flashing and Detail Base Coat Application: Complete base coat and fabric reinforcement at parapets, curbs, penetrations, and drains prior to application of field of fluid-applied membrane. Apply base coat in accordance with manufacturer's written instructions.

1. Apply base coat on prepared and primed surfaces and spread coating evenly. Extend coating minimum of 8 inches (200 mm) up vertical surfaces and 4 inches (100 mm) onto horizontal surfaces.

2. Back roll to achieve not less than minimum coating thickness indicated in Part 2 product listing unless greater thickness is recommended by manufacturer. Verify thickness as work progresses.

3. Fabric Reinforcement: Embed fabric reinforcement into wet base coat. Lap adjacent flashing pieces of fabric minimum 3 inches (75 mm) along edges and 6 inches (150 mm) at end laps.

a. Roll surface of fabric reinforcing to completely embed and saturate fabric. Leave finished base coat with fabric free of pin holes, voids, or openings.

4. Roof Drains: Install base coat onto surrounding membrane surface and metal drain bowl flange. Install target piece of fabric reinforcement immediately into wet base coat and roll to fully embed and saturate fabric. Reinstall clamping ring and strainer following application of top coat. Replace broken drain ring clamping bolts.

5. Allow base coat to cure prior to application of top coat.

3.5 FLUID-APPLIED MEMBRANE APPLICATION

A. Fluid-Applied Membrane Base Coat: Apply base coat to field of membrane in accordance with manufacturer's written instructions.

1. Apply base coat on prepared and primed surfaces and spread coating evenly.

2. Back roll to achieve not less than minimum coating thickness indicated in Part 2 product listing unless greater thickness is recommended by manufacturer. Verify thickness as work progresses.

3. Fabric Reinforcement: Embed fabric reinforcement into wet base coat. Lap adjacent flashing pieces of fabric minimum 3 inches (75 mm) along edges and 6 inches (150 mm) at end laps.

a. Roll surface of fabric reinforcing to completely embed and saturate fabric. Leave finished base coat with fabric free of pin holes, voids, or openings.

b. Following curing of base coat and prior to application of top coat, sand raised or exposed edges of fabric reinforcement.

B. Top Coat Application: Apply top coat to field of membrane and flashings uniformly in a complete, continuous installation.

1. Allow base coat to cure prior to application of top coat.

2. Following curing of base coat and prior to application of top coat, sand raised or exposed edges of fabric reinforcement.

3. Prime base coat prior to application of top coat if top coat is not applied within 72 hours of the base coat application, using manufacturer's recommended primer.

4. Apply top coat extending coating up vertical surfaces and out onto horizontal surfaces. Install top coat over field base coat and spread coating evenly.

5. Back roll to achieve not less than minimum coating thickness indicated in Part 2 product listing unless greater thickness is recommended by manufacturer. Verify thickness as work progresses.

6. Avoid foot traffic on new fluid-applied membrane for a minimum of 24 hours.

3.6 SLIP RESISTANT WALKWAY TOP COAT INSTALLATION

A. Install slip resistant walkway top coat following cure of initial top coat.

1. Locate on all horizontal roofing surfaces.

B. Slip-Resistant Walkway Topcoat: Apply walkway second topcoat following application and curing of top coat.

1. Mask walkway location with tape.

2. Prime first top coat prior to application of walkway top coat if walkway top coat is not applied within 72 hours of the first top coat application, using manufacturer's recommended primer.

3. Broadcast Slip-Resistant Top Coat Aggregate in wet top coat at rate indicated in Part 2 product listing or as otherwise recommended by coating manufacturer.

a. Back roll aggregate filled top coat creating even dispersal of aggregate. Remove masking immediately.

3.7 FIELD QUALITY CONTROL

A. Roofing Inspector: Contractor shall engage a qualified roofing inspector to perform roof tests and inspections and to prepare test reports.

1. Roofing Inspector: Contractor shall engage a qualified roofing inspector for a minimum of twice per week on site, to perform roof tests and inspections and to prepare start up, interim, and final reports. Roofing Inspector's quality assurance inspections shall comply with criteria established in Quality Control and Quality-assurance Guidelines for the Application of Membrane Roof Systems."

B. Roof Inspection: Engage roofing system manufacturer's technical personnel to inspect roofing installation and submit report. Notify Architect 24 hours in advance of dates and times of inspections. Inspect work as follows:

1. Upon completion of preparation of roof coating substrate, prior to application of coating materials.

2. Following application of coating to flashings and application of base coat to field of roof.

3. Upon completion of coating but prior to re-installation of other roofing components.

C. Repair fluid-applied membrane where test inspections indicate that they do not comply with specified requirements.

D. Arrange for additional inspections, at Contractor's expense, to verify compliance of replaced or additional work with specified requirements.

3.8 DISPOSAL

A. Collect demolished materials and place in containers. Promptly dispose of demolished materials. Do not allow demolished materials to accumulate on-site.

1. Storage or sale of demolished items or materials on-site is not permitted.

B. Transport and legally dispose of demolished materials off Owner's property.

3.9 PROTECTING AND CLEANING

A. Protect roofing system from damage and wear during remainder of construction period.

B. Correct deficiencies in or remove coating that does not comply with requirements, repair substrates, and reapply coating.

C. Clean overspray and spillage from adjacent construction using cleaning agents and procedures recommended by manufacturer of affected construction.

END OF SECTION 070150.73

SECTION 070150.73 - REHABILITATION OF MODIFIED BITUMINOUS MEMBRANE ROOFING

PART 1 - GENERAL

1.1 SUMMARY

A. This Section includes the following:

1. Roof re-coating preparation.

2. Application of fluid-applied roof membrane and flashings over existing granule-surfaced modified bituminous membrane roofing and smaller area of EPDM single ply membrane roofing.

B. Related Information:

1. Division 07 Section "Preconstruction Testing for Re-Roofing" for Contractor's responsibilities for performance of preconstruction testing of existing roof.

2. Division 07 Section "Maintenance Cleaning of Membrane Roofing" for reclaimed water cleaning system for preparation of existing roof substrate.

C. Unit Prices: Refer to Division 01 Section "Unit Prices" for description of Work in this Section affected by unit prices.

1.2 ROOFING CONFERENCES

A. Roofing Rehabilitation Preinstallation Conference: Conduct conference at Project site to review methods and procedures related to roofing system.

1. Meet with Owner; Architect; roofing re-coating materials manufacturer's representative; roofing re-coating Installer including project manager and foreman; and installers whose work interfaces with or affects re-coating including installers of roof accessories and roof-mounted equipment requiring removal and replacement as part of the Work.

2. Review methods and procedures related to re-coating preparation, including membrane roofing system manufacturer's written instructions.

3. Procedures for salvaging and recycling of demolition and construction waste

4. Review temporary protection requirements for existing roofing system that is to remain, during and after installation.

5. Review roof drainage during each stage of re-coating and review roof drain plugging and plug removal procedures.

6. Review and finalize construction schedule, and verify availability of materials, Installer's personnel, equipment, and facilities needed to make progress and avoid delays.

7. Review base flashings, special roofing details, drainage, penetrations, equipment curbs, and condition of other construction that will affect re-coating.

8. Review HVAC shutdown and sealing of air intakes.

9. Review shutdown of fire-suppression, -protection, and -alarm and -detection systems.

10. Review procedures for asbestos removal or unexpected discovery of asbestos-containing materials.

11. Review governing regulations and requirements for insurance and certificates if applicable.

12. Review existing conditions that may require notification of Owner before proceeding.

1.3 MATERIALS OWNERSHIP

A. Demolished materials shall become Contractor's property and shall be removed from Project site.

1.4 DEFINITIONS

A. Roofing Terminology: Refer to ASTM D1079 "Standard Terminology Relating to Roofing and Waterproofing" and glossary in NRCA's "The NRCA Roofing Manual: Membrane Roof Systems" for definition of terms related to roofing work in this Section.

B. Roofing Coating Preparation: Existing roofing that is to remain and be prepared to accept restorative coating application.

C. Patching: Removal of a portion of existing membrane roofing system from deck or removal of selected components and accessories from existing membrane roofing system and replacement with compatible similar materials.

D. Remove: Detach items from existing construction and legally dispose of them off-site unless indicated to be removed and reinstalled.

E. Existing to Remain: Existing items of construction that are not indicated to be removed.

F. Construction Waste: Building and site improvement materials and other solid waste resulting from construction, remodeling, renovation, or repair operations. Construction waste includes packaging.

G. Demolition Waste: Building and site improvement materials resulting from re-roofing preparation, demolition, or selective demolition operations.

H. Disposal: Removal off-site of demolition and construction waste and subsequent sale, recycling, reuse, or deposit in landfill or incinerator acceptable to authorities having jurisdiction.

1.5 ACTION SUBMITTALS

A. Product Data: For each type of product specified.

B. Sustainable Design Submittals:

1. Indicate CRRC Compliance.

1.6 INFORMATIONAL SUBMITTALS

A. Qualification Data: For Installer, Manufacturer, and Roofing Inspector.

1. Letter written for this Project indicating manufacturer approval of Installer to apply specified products and provide specified warranty.

B. Contractor's Product Certificate: Submit certificate, indicating products intended for Work of this Section, including product names and numbers and manufacturers' names, with statement indicating that products to be provided meet the requirements of the Contract Documents.

1. Provide manufacturer's UL listing certificate for roofing system.

C. Proposed Protection Measures: Submit report, including Drawings, which indicates the measures proposed for protecting individuals and property, for environmental protection, and for dust control. Indicate proposed locations and construction of barriers.

D. Warranties: Unexecuted sample copies of special warranties.

E. Existing Conditions Photographs: Show existing conditions of adjoining construction and site improvements, including exterior and interior finish surfaces, which might be misconstrued as having been damaged by re-coating operations. Submit before Work begins.

F. Inspection Reports: Reports of Roofing Inspector. Include description of work performed, tests performed, defective work observed, and corrective actions required and carried out.

1.7 CLOSEOUT SUBMITTALS

A. Maintenance Data: To include in maintenance manuals.

B. Warranties: Executed copies of approved warranty forms.

1.8 QUALITY ASSURANCE

A. Installer Qualifications: An employer of workers trained and certified by manufacturer, including a full-time on-site supervisor with a minimum of three years' experience installing products comparable to those specified, able to communicate verbally with Contractor, and employees, and the following:

1. Qualified by the manufacturer to install manufacturer's product and furnish warranty of type specified.

B. Manufacturer Qualifications: Primary product manufacturer that is UL listed for roofing system identical to that specified for this Project with minimum five years' experience in manufacture of comparable products in successful use in similar applications, and able to furnish warranty with provisions matching specified requirements.

1. Approval of Other Manufacturers and Comparable Products: Submit the following in accordance with project substitution requirements, within time allowed for substitution review:

a. Product data, including certified independent test data indicating compliance with requirements.

b. Samples of each component.

c. Sample submittal from similar project.

d. Project references: Minimum of five installations of specified products with Owner and Architect/Owner's Consultant contact information.

e. Sample warranty.

C. Roofing Inspector Qualifications: A technical representative of manufacturer not engaged in the sale of products and experienced in the installation and maintenance of the specified roofing system, qualified to perform roofing observation and inspection specified in Field Quality Control Article, to determine Installer's compliance with the requirements of this Project, and approved by the manufacturer to issue warranty certification. The Roofing Inspector shall be one of the following:

1. An authorized full-time technical employee of the manufacturer.

2. An independent party certified as a Registered Roof Observer by the International Institute of Building Enclosure Consultants (formerly the Roof Consultants Institute) retained by the Contractor or the Manufacturer and approved by the Manufacturer.

1.9 FIELD CONDITIONS

A. Weather Limitations: Proceed with rehabilitation work only when existing and forecasted weather conditions permit Work to proceed without water entering into existing roofing system or building.

1. Store all materials prior to application at temperatures recommended by manufacturer.

2. Apply coatings within range of ambient and substrate temperatures recommended by manufacturer.

3. Do not apply roofing in snow, rain, fog, or mist.

B. Protect building to be rehabilitated, adjacent buildings, walkways, site improvements, exterior plantings, and landscaping from damage or soiling from rehabilitation operations.

C. Maintain access to existing walkways, corridors, and other adjacent occupied or used facilities.

D. Daily Protection: Coordinate installation of roofing so insulation and other components of roofing system not permanently exposed are not subjected to precipitation or left uncovered at the end of the workday or when rain is forecast.

E. Owner will occupy portions of building immediately below re-coating area. Conduct re-coating so Owner's operations will not be disrupted. Provide Owner with not less than 72 hours' notice of activities that may affect Owner's operations.

1.10 WARRANTY

A. Manufacturer's Warranty: Roof System Manufacturer's standard form in which Manufacturer agrees to repair or replace components of roofing system that fail in materials or workmanship within warranty period, as follows.

1. Form of Warranty: Manufacturer's standard warranty form.

2. Scope of Warranty: Work of this Section and including sheet metal details and termination details installed by the roof system Installer and approved by the Roof System Manufacturer.

3. Warranty Period: 20 years from date of completion.

B. Manufacturer Inspection Services: By manufacturer's technical representative, to report maintenance responsibilities to Owner necessary for preservation of Owner's warranty rights. The cost of manufacturer's inspections is included in the Contract Sum.

1. Inspections to occur in following years: 2, 5, 10 and 15 following completion.

C. Installer Warranty: Installer's warranty signed by Installer, as follows.

1. Form of Warranty: Form acceptable to Roofing Manufacturer and Owner.

2. Scope of Warranty: Work of this Section.

3. Warranty Period: 2 years from date of completion.

PART 2 - PRODUCTS

2.1 MANUFACTURERS

A. Basis of Design: The roof system specified in this Section is based upon products of Tremco CPG Inc, www.tremcoroofing.com that are named in other Part 2 articles. Provide specified products or comparable products of one of the following.

1. Tremco CPG Inc., Basis-of-Design.

2. Kemper.

3. Pacific Polymers.

B. Source Limitations: Obtain components for roofing system from same manufacturer as membrane roofing or manufacturer approved by membrane roofing manufacturer.

2.2 PERFORMANCE REQUIREMENTS

A. General Performance: Rehabilitated roofing shall withstand exposure to weather without failure or leaks due to defective manufacture or installation.

1. Accelerated Weathering: Roofing system shall withstand 5000 hours of exposure when tested according to ASTM G152, ASTM G154, or ASTM G155.

B. Material Compatibility: Provide roofing materials that are compatible with one another under conditions of service and application required, as demonstrated by roofing manufacturer based on testing and field experience.

C. Exterior Fire-Test Exposure: Roofing system exterior fire-test exposure performance following application of rehabilitation coating shall not be less than that of the pre-

rehabilitated roof performance when tested in accordance with ASTM E108, based upon manufacturer's tests of identical applications.

D. Energy Performance: Provide roof coating with initial solar reflectance index not less than 78 when calculated according to ASTM E1980, based upon testing of identical products by a qualified testing agency.

2.3 MATERIALS

A. General: Re-coating materials recommended by roofing system manufacturer for intended use and compatible with components of existing membrane roofing system.

B. Infill Roof Repair Materials: Where required to replace test cores and to patch existing roofing, use infill materials matching existing membrane roofing system materials, unless otherwise indicated.

1. Cap Ply: SBS-Modified Bitumen, fiberglass reinforced, ASTM D 6163, Type I, Grade G. 120 mils minimum thickness.

2. Base Ply: SBS-Modified Bitumen, fiberglass reinforced, ASTM D6163, Type III, Grade S, 120 mils minimum thickness.

3. Adhesive: Polyurethane, two-part, Zero VOC adhesive.

C. Temporary Roof Drainage: Design and selection of materials for temporary roof drainage are responsibilities of the Contractor.

2.4 FLUID-APPLIED ROOFING MEMBRANE

A. Polyurethane Elastomeric Fluid-Applied System: Two-coat fluid-applied roofing membrane formulated for application over prepared existing roofing substrate.

1. Polyurethane Roof Coating System Base Coat: Bio-based, low-odor low-VOC two-part, for use with a compatible top coat.

a. Basis of design product: Tremco, AlphaGuard BIO Base Coat.

b. Combustion Characteristics, UL 790: Maintains combustion characteristics of existing roof system.

c. Volatile Organic Compounds (VOC), maximum, ASTM D3960: 1 g/L.

d. Accelerated Weathering, 5000 hours, ASTM G154: Pass.

e. Hardness, Shore A, minimum, ASTM D2240: 80.

f. Solids, by volume, ASTM D2697: 100 percent.

g. Bio-Based Content, Minimum: 70 percent.

h. Minimum Thickness, Base Coat reinforced over Smooth Single-Ply: 48 mils (1.22 mm) wet.

i. Minimum Thickness, Base Coat reinforced over Granular Surfaced MB: 64 mils (1.62 mm) wet.

2. Polyurethane roof coating system top coat, bio-based low-odor low-VOC two-part, for application over compatible base coat.

a. Basis of design product: Tremco, AlphaGuard BIO Top Coat.

b. Combustion Characteristics, UL790: Maintains combustion characteristics of existing roof system.

c. Volatile Organic Compounds (VOC), maximum, ASTM D3960: 6 g/L.

d. Solar Reflectance Index (SRI), ASTM E1980: For white, not less than 103.

e. Accelerated Weathering, 5000 hours, ASTM G 154: Pass.

f. Hardness, Shore A, minimum, ASTM D2240: 81.

g. Solids, by volume, ASTM D2697: 100 percent.

h. Bio-Based Content, Minimum: 60 percent.

i. Minimum Thickness, reinforced system: 32 mils (0.81 mm) wet.

j. Minimum Thickness, Slip-Resistant Coat: 24 mils (0.60 mm) wet.

k. Color: White.

B. Primers:

1. Primer for Asphaltic and Single-Ply Membranes: Water-based, polymer-modified quick-dry low odor primer.

a. Volatile Organic Compounds (VOC), maximum, ASTM D3960: 1 g/L.

b. Solids, by weight: 70 percent.

2. Primer for Masonry Surfaces: Two-part high-solids epoxy-penetrating low-odor primer for masonry and concrete surfaces.

a. Volatile Organic Compounds (VOC), maximum, ASTM D3960: 0 g/L.

b. Solids, by weight: 100 percent.

3. Primer for Non-Porous Surfaces: Single-part, water based primer to promote adhesion of urethanes to metals, PVC and other non-porous surfaces.

a. Volatile Organic Compounds (VOC), maximum, ASTM D3960: 22 g/L.

b. Nonvolatile Content, minimum, ASTM D2369: 5 percent.

c. Density at 77 deg F (25 deg C): 8.3 lb./gal (1kg/L).

4. Single-component reactivating primer used to prepare aged bio-based urethane products.

a. Coverage Rate: 1/4 gal / 100 sq. ft. (0.1 L/m2) (4 wet mils) minimum.

C. Fluid-Applied Membrane Reinforcing Fabric:

1. Polyester Reinforcing Fabric: 100 percent stitch-bonded mildew-resistant polyester fabric intended for reinforcement of compatible fluid-applied membranes and flashings.

a. Basis of design product: Tremco, Permafab.

b. Tensile Strength, Minimum, ASTM D5034 (2-inch): MD - 110 lbs. (49.8 kg); XMD - 60 lbs. (27.2 kg) avg.

c. Elongation, Minimum, ASTM D5034 (1-inch): MD - 25 percent; XMD - 100 percent.

d. Tear Strength, Minimum, ASTM D5587: MD - 20 lbs. (9.0 kg) avg; XMD - 20 lbs. (9.0 kg) avg.

e. Weight: 3 oz./sq. yd (102 g/sq. m).

2.5 AUXILIARY MATERIALS

A. General: Auxiliary materials recommended by roofing system manufacturer for intended use and compatible with existing roofing system and fluid-applied roofing system.

B. Seam Sealer: Waterproof seam and patching material compatible with applied coating.

1. Seam Sealer: Aromatic polyurethane sealer, single-component, high solids, moisture curing, formulated for compatibility and use with a variety of roofing and flashing substrates.

a. Basis of design product: Tremco, GEOGARD Seam Sealer.

b. Volatile Organic Compounds (VOC), maximum, ASTM D3960: 189 g/L.

c. Tensile Strength, ASTM D412: 270 psi (1860 kPa).

d. Tear Strength, ASTM D412: 35 pli (6.13 kNm).

e. Elongation, ASTM D412: 220 percent.

f. Color: Gray.

C. Joint Sealant: Elastomeric joint sealant compatible with applied coating, with movement capability appropriate for application.

1. Joint Sealant, Polyurethane: ASTM C920, Type S, Grade NS, Class 50 single-component moisture curing sealant, formulated for compatibility and use in dynamic and static joints; paintable.

a. Volatile Organic Compounds (VOC), maximum, ASTM D3960: 40 g/L.

b. Hardness, Shore A, ASTM C661: 40.

c. Tensile Strength, ASTM D412: 350 psi (2410 kPa).

d. Color: White.

D. Fasteners: Factory-coated steel fasteners and metal or plastic plates meeting corrosion-resistance provisions in FM 4470; designed for fastening roofing membrane components to substrate; tested by manufacturer for required pullout strength; and acceptable to roofing system manufacturer.

E. Metal Flashing Sheet: Provide metal flashing sheet matching type, thickness, finish, and profile of existing metal flashing and trim.

F. Miscellaneous Accessories: Provide miscellaneous accessories recommended by roofing system manufacturer.

2.6 SLIP RESISTANT WALKWAY TOP COAT

A. Fluid-Applied Walkway Top Coat, Slip-Resistant: Second top coat with broadcast slip-resistant aggregate.

1. Color: White.

B. Granular Roofing Surfacing: Ceramic-coated roofing granules, No. 11 screen size with 100 percent passing No. 8 (2.36-mm) sieve and 98 percent of mass retained on No. 40 (0.425-mm) sieve.

1. Basis of design product: Granular Roofing Surfacing, Colored.

2. Aggregate application rate, average: 10 - 15 lb./100 sq ft (0.5 - 0.75 k/m2).

3. Color: As selected by Architect from manufacturer's standard colors from manufacturer's standard colors.

PART 3 - EXECUTION

3.1 EXAMINATION

A. Examine existing roofing substrates, with Installer present, for compliance with requirements and for other conditions affecting application and performance of roof coatings.

1. For the record, prepare written report, endorsed by Installer, listing conditions detrimental to performance.

2. Verify compatibility of approved re-coating system with and suitability of substrates.

3. Verify that substrates are visibly dry and free of moisture.

4. Verify that roofing membrane surfaces have adequately aged to enable proper bond with re-coating system base coat.

5. Verify that existing roofing membrane is free of blisters, splits, open laps, indications of shrinkage, and puncture damage or other indications of impending roof system failure.

6. Commencing application of fluid-applied re-coating membrane indicates acceptance of surfaces and conditions.

3.2 PREPARATION

A. Protect existing roofing system that is indicated not to be rehabilitated, and adjacent portions of building and building equipment.

1. Mask surfaces to be protected. Seal joints subject to infiltration by coating materials.

2. Limit traffic and material storage to areas of existing roofing membrane that have been protected.

3. Maintain temporary protection and leave in place until replacement roofing has been completed.

B. Pollution Control: Comply with environmental regulations of authorities having jurisdiction. Limit spread of dust and debris.

1. Remove and transport debris in a manner that will prevent spillage on adjacent surfaces and areas.

2. Remove debris from building roof by chute, hoist, or other device that will convey debris to grade.

C. Shut down air intake equipment in the vicinity of the Work in coordination with the Owner. Cover air intake louvers before proceeding with re-coating work that could affect indoor air quality or activate smoke detectors in the ductwork.

1. Verify that rooftop utilities and service piping affected by the Work have been shut off before commencing Work.

D. Maintain roof drains in functioning condition to ensure roof drainage at end of each workday. Prevent debris from entering or blocking roof drains and conductors. Use roof-drain plugs specifically designed for this purpose. Remove roof-drain plugs at end of each workday, when no work is taking place, or when rain is forecast.

1. Do not permit water to enter into or under existing membrane roofing system components that are to remain.

3.3 ROOFING COATING PREPARATION

A. Removal of Wet Insulation: Remove portions of roofing membrane with underlying wet insulation. Remove wet insulation, fill in tear-off areas to match existing insulation and membrane, and prepare patched membrane for roof coating application specified below.

1. Adhere infill insulation in low rise foam insulation adhesive beads spaced 12 inches on center for each infill layer. Adhere repair base ply and cap ply in polyurethane adhesive at 2.0 gallons per 100 square feet, per ply. Tie-in repair patch to existing primed roof with a three course seal of seam sealer and polyester reinforcing fabric.

B. Repair of Ponding Areas: Repair areas indicated as ponding areas or areas of inadequate drainage by removing roof membrane, adding additional insulation as required to provide minimum slopes to drain required by roofing rehabilitation coating manufacturer, and replace membrane with material matching existing. Submit photographic report indicating compliance.

C. Membrane Surface Preparation:

1. Remove loose granular aggregate from granular aggregate-surfaced built-up bituminous roofing with a power broom.

2. Remove pavers and walkway pads from roofing membrane.

3. Remove blisters, ridges, buckles, roofing membrane fastener buttons projecting above the membrane, and other substrate irregularities from existing roofing membrane that would inhibit application of uniform, waterproof coating.

4. Broom clean existing substrate.

5. Substrate Cleaning: Clean substrate in accordance with requirements of Division 07 Section "Maintenance Cleaning of Membrane Roofing."

6. Verify that existing substrate is dry before proceeding with application of coating. Spot check substrates with an electrical capacitance moisture-detection meter.

7. Verify adhesion of new products.

D. Existing Flashing and Detail Preparation: Repair flashings, gravel stops, copings, and other roof-related sheet metal and trim elements. Reseal joints, replace loose or missing fasteners, and replace components where required to leave in a watertight condition.

1. Do not damage metal counter flashings that are to remain. Replace metal counter flashings damaged during removal with counter flashings of same metal, weight or thickness, and finish.

2. Roof Drains: Remove drain strainer and clamping ring. Grind metal surfaces down to clean, bare, metal.

E. Surface Priming: Prime surfaces to receive fluid-applied coating using coating manufacturer's recommended product for surface material. Apply at application rate recommended by manufacturer.

1. Ensure primer does not puddle and substrate has complete coverage.

2. Allow to cure completely prior to application of coating.

3.4 FLUID-APPLIED FLASHING APPLICATION

A. Fluid-Applied Flashing and Detail Base Coat Application: Complete base coat and fabric reinforcement at parapets, curbs, penetrations, and drains prior to application of field of fluid-applied membrane. Apply base coat in accordance with manufacturer's written instructions.

1. Apply base coat on prepared and primed surfaces and spread coating evenly. Extend coating minimum of 8 inches (200 mm) up vertical surfaces and 4 inches (100 mm) onto horizontal surfaces.

2. Back roll to achieve not less than minimum coating thickness indicated in Part 2 product listing unless greater thickness is recommended by manufacturer. Verify thickness as work progresses.

3. Fabric Reinforcement: Embed fabric reinforcement into wet base coat. Lap adjacent flashing pieces of fabric minimum 3 inches (75 mm) along edges and 6 inches (150 mm) at end laps.

    a. Roll surface of fabric reinforcing to completely embed and saturate fabric. Leave finished base coat with fabric free of pin holes, voids, or openings.

4. Roof Drains: Install base coat onto surrounding membrane surface and metal drain bowl flange. Install target piece of fabric reinforcement immediately into wet base coat and roll to fully embed and saturate fabric. Reinstall clamping ring and strainer following application of top coat. Replace broken drain ring clamping bolts.

5. Allow base coat to cure prior to application of top coat.

3.5 FLUID-APPLIED MEMBRANE APPLICATION

A. Fluid-Applied Membrane Base Coat: Apply base coat to field of membrane in accordance with manufacturer's written instructions.

1. Apply base coat on prepared and primed surfaces and spread coating evenly.

2. Back roll to achieve not less than minimum coating thickness indicated in Part 2 product listing unless greater thickness is recommended by manufacturer. Verify thickness as work progresses.

3. Fabric Reinforcement: Embed fabric reinforcement into wet base coat. Lap adjacent flashing pieces of fabric minimum 3 inches (75 mm) along edges and 6 inches (150 mm) at end laps.

    a. Roll surface of fabric reinforcing to completely embed and saturate fabric. Leave finished base coat with fabric free of pin holes, voids, or openings.

    b. Following curing of base coat and prior to application of top coat, sand raised or exposed edges of fabric reinforcement.

B. Top Coat Application: Apply top coat to field of membrane and flashings uniformly in a complete, continuous installation.

1. Allow base coat to cure prior to application of top coat.

2. Following curing of base coat and prior to application of top coat, sand raised or exposed edges of fabric reinforcement.

3. Prime base coat prior to application of top coat if top coat is not applied within 72 hours of the base coat application, using manufacturer's recommended primer.

4. Apply top coat extending coating up vertical surfaces and out onto horizontal surfaces. Install top coat over field base coat and spread coating evenly.

5. Back roll to achieve not less than minimum coating thickness indicated in Part 2 product listing unless greater thickness is recommended by manufacturer. Verify thickness as work progresses.

6. Avoid foot traffic on new fluid-applied membrane for a minimum of 24 hours.

3.6 SLIP RESISTANT WALKWAY TOP COAT INSTALLATION

A. Install slip resistant walkway top coat following cure of initial top coat.

1. Locate on all horizontal roofing surfaces.

B. Slip-Resistant Walkway Topcoat: Apply walkway second topcoat following application and curing of top coat.

1. Mask walkway location with tape.

2. Prime first top coat prior to application of walkway top coat if walkway top coat is not applied within 72 hours of the first top coat application, using manufacturer's recommended primer.

3. Broadcast Slip-Resistant Top Coat Aggregate in wet top coat at rate indicated in Part 2 product listing or as otherwise recommended by coating manufacturer.

a. Back roll aggregate filled top coat creating even dispersal of aggregate. Remove masking immediately.

3.7 FIELD QUALITY CONTROL

A. Roofing Inspector: Contractor shall engage a qualified roofing inspector to perform roof tests and inspections and to prepare test reports.

1. Roofing Inspector: Contractor shall engage a qualified roofing inspector for a minimum of twice per week on site, to perform roof tests and inspections and to prepare start up, interim, and final reports. Roofing Inspector's quality assurance inspections shall comply with criteria established in Quality Control and Quality-assurance Guidelines for the Application of Membrane Roof Systems."

B. Roof Inspection: Engage roofing system manufacturer's technical personnel to inspect roofing installation and submit report. Notify Architect 24 hours in advance of dates and times of inspections. Inspect work as follows:

1. Upon completion of preparation of roof coating substrate, prior to application of coating materials.

2. Following application of coating to flashings and application of base coat to field of roof.

3. Upon completion of coating but prior to re-installation of other roofing components.

C. Repair fluid-applied membrane where test inspections indicate that they do not comply with specified requirements.

D. Arrange for additional inspections, at Contractor's expense, to verify compliance of replaced or additional work with specified requirements.

3.8 DISPOSAL

A. Collect demolished materials and place in containers. Promptly dispose of demolished materials. Do not allow demolished materials to accumulate on-site.

1. Storage or sale of demolished items or materials on-site is not permitted.

B. Transport and legally dispose of demolished materials off Owner's property.

3.9 PROTECTING AND CLEANING

A. Protect roofing system from damage and wear during remainder of construction period.

B. Correct deficiencies in or remove coating that does not comply with requirements, repair substrates, and reapply coating.

C. Clean overspray and spillage from adjacent construction using cleaning agents and procedures recommended by manufacturer of affected construction.

END OF SECTION 070150.73

SECTION 07 13 26 SELF-ADHERING SHEET WATERPROOFING

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. The work performed under this Section includes the performance criteria, materials, production, and erection of Self-Adhering Sheet Waterproofing for the project and consists of the provision of all plant, materials, labor and equipment and the like necessary and/or required for the complete execution of all Self-Adhering Sheet Waterproofing as required by schedules, keynotes and drawings, as specified herein, and as may be required by conditions and authorities having jurisdiction including, but not limited to the following:

1. Modified bituminous sheet (below grade at outside face of foundations walls),
2. Bonded HDPE sheet for vertical applications.
3. Synthetic plastic hydrophilic expanding concrete water-stop.

B. Related Requirements:
1. Division 03 Concrete
2. Division 04 Masonry
3. Division 07 Thermal and Moisture Protection
4. Division 08 Openings

1.3 PREINSTALLATION MEETINGS

A. Pre-installation Conference: Conduct conference at Project site.

1. Review weather barrier requirements including surface preparation, substrate condition and pretreatment, minimum curing period, forecasted weather conditions, special details and sheet flashings, installation procedures, testing and inspection procedures, and protection and repairs.

1.4 ACTION SUBMITTALS

A. Product Data: For each type of product.

1. Include construction details, material descriptions, and tested physical and performance properties.
2. Include manufacturer's written instructions for evaluating, preparing, and treating substrate.

B. Shop Drawings: Show locations and extent of sheet waterproofing and details of substrate joints and cracks, sheet flashings, penetrations, inside and outside corners, tie-ins with adjoining waterproofing, and other termination conditions.

C. Samples: For each exposed product and for each color and texture specified, including the following products:

1. Mockup for each type of sheet waterproofing.

1.5 INFORMATIONAL SUBMITTALS

A. Qualification Data: For Installer.

B. Field quality-control reports.

C. Sample Warranties: For special warranties.

1.6 QUALITY ASSURANCE

A. Installer Qualifications: An entity that employs installers and supervisors who are trained and approved by waterproofing manufacturer.

B. Mockups: Build mockups to verify selections made under Sample submittals and to set quality standards for installation.

1. Build for each typical waterproofing installation including accessories to demonstrate surface preparation, crack and joint treatment, corner treatment, and protection.
2. Approval of mockups does not constitute approval of deviations from the Contract Documents contained in mockups unless Architect specifically approves such deviations in writing.
3. Subject to compliance with requirements, approved mockups may become part of the completed Work if undisturbed at time of Substantial Completion.

1.7 FIELD CONDITIONS

A. Environmental Limitations: Apply waterproofing within the range of ambient and substrate temperatures recommended by waterproofing manufacturer. Do not apply waterproofing to a damp or wet substrate.

1. Do not apply waterproofing in snow, rain, fog, or mist.

B. Maintain adequate ventilation during preparation and application of waterproofing materials.

1.8 WARRANTY

A. Manufacturer's Warranty: Manufacturer's standard materials-only warranty in which manufacturer agrees to furnish replacement waterproofing material for waterproofing that does not comply with requirements or that fails to remain watertight within specified warranty period.

1. Warranty Period: Five years from date of Substantial Completion.

PART 2 - PRODUCTS

2.1 MATERIALS, GENERAL

A. Source Limitations for Waterproofing System: Obtain waterproofing materials an protection course, and molded-sheet drainage panels from single source from single manufacturer.

2.2 MANUFACTURERS

A. Basis of Design: CCW MiraDRI 860/861 Sheet Membrane Waterproofing as manufactured by Carlisle Coatings and Waterproofing Incorporated, 900 Hensley Lane, Wylie, Texas 75098, Phone: (800) 527-7092 Fax: (972) 442-0076.

B. Other products, as approved by Architect

1. CETCO Building Materials Group, a subsidiary of AMCOL International Corp;

2. Envirosheet., Meadows, W.R.,Inc; SealTight Mel-Rol.

2.3 PRODUCTS

A. Self-Adhesive Sheet Membrane Waterproofing: Shall be CCW MiraDRI 860/861consisting of a 56 mil rubberized asphalt membrane laminated to 4 mil cross-laminated polyethylene film, and shall meet or exceed the following requirements:

1. Tensile Strength: 325 psi minimum, ASTM D 412
2. Ultimate Elongation: 350% minimum, ASTM D 412
3. Puncture Resistance: 60 lbs. minimum, ASTM E 154
4. Permeance: 0.05 Perm maximum, ASTM E 96 (B)
5. Low Temperature Flexibility: Unaffected at -45^{O}F, ASTM D 1970, 1" mandrel
6. Tensile to Film: 5000 psi, ASTM D 882
7. Thickness: 60 mils, ASTM D 3767
8. Hydrostatic Head: 230 ft., ASTM D 751
9. Water Absorption: 0.1% by wt., ASTM D 570

B. For application temperatures between 25 and 65^{O}F, use CCW-861 Sheet Membrane and CCW-
702. For application temperatures above 40°F use CCW MiraDRI 860 sheet membrane and
CCW-702, CCW-714 primer, or CCW-AWP.

2.4 ACCESSORY PRODUCTS

A. Surface Primer: Shall be CCW-702LV Solvent-Based Contact Adhesive, 702WB or Cav-Grip. B.

B. Mastic: Shall be CCW-704 Mastic.

C. Sealants: Shall be CCW-703 Vertical Grade Liquiseal^{7} Membrane, one component approved sealant by CCW, CCW-201 two-component Polyurethane Sealant or CCW LM-800XL

D. Backing Rod: Shall be closed-cell polyethylene foam rod.

E. Protection Course: Shall be CCW Protection Board-H or CCW 300H for horizontal surfaces or CCW Protection Board-V or CCW 200V for vertical surfaces.

F. Drainage Composite: Shall be CCW MiraDRAIN 6200 as recommended by the manufacturer for each condition.

G. Perimeter Drainage System: Where required shall be CCW QuickDRAIN™.

PART 3 - EXECUTION

3.1 EXAMINATION

A. Before any waterproofing work is started the waterproofing applicator shall thoroughly examine all surfaces for any deficiencies. Should any deficiencies exist, the architect, owner, or general contractor shall be notified in writing and corrections made.

B. Condition of Concrete Surfaces:
1. The concrete surfaces shall be of sound structural grade and shall have a smooth finish, free of fins, ridges, protrusions, rough spalled areas, loose aggregate, exposed course aggregate, voids or entrained air holes. Rough surfaces shall receive a well-adhered parget coat.
2. Concrete shall be cured by water curing method. Any curing compounds must be of the pure sodium silicate type and be approved by the Carlisle representative.
3. Concrete shall be cured at least 7 days and shall be sloped for proper drainage.
4. Voids, rock pockets and excessively rough surfaces shall be repaired with approved non- shrink grout or ground to match the unrepaired areas.
5. Two-stage drains shall have a minimum 3 inch flange and be installed with the flange flush and level with the concrete surface.
6. Surfaces at cold joints shall be on the same plane.

3.2 SURFACE PREPARATION

A. Clean, prepare, and treat substrates according to manufacturer's written instructions. Provide clean, dust-free, and dry substrates for waterproofing application. The concrete surface must be thoroughly clean, dry and free from any surface contaminates or cleaning residue that may harmfully affect the adhesion of the membrane.

B. Install a 3/4" face, 45 degree cant of CCW-201 Polyurethane Sealant or CCW LM-800XL at all angle changes and inside corners including penetrations through the deck, walls, curbs, etc.

C. All cracks over 1/16" in width and all moving cracks under 1/16" in width shall be routed out to 1/4" minimum in width and depth and filled flush with an approved sealant by CCW or CCW-201 polyurethane sealant.

D. All expansion joints less than 1" wide shall be cleaned, primed, fitted with a backing rod and caulked with CCW-201 Polyurethane Sealant. For larger joints, contact Carlisle representative.

E. Allow all sealant to cure at least overnight.

F. Stir Primer. Apply a thin film of primer 10" wide, centered over sealed cracks and joints, hairline cracks, and cold joints. Apply primer 8" on each side of all corners. Prime concrete around drain flanges. Allow primer to dry per manufacturer=s recommendations.

G. Install an 8" wide strip of CCW MiraDRI 860/861centered over joints and cracks. Install a 12" wide strip of CCW MiraDRI 860/861centered over the axis of all corners.

H. Terminate membrane around drains per CCW MiraDRI 860 series details. Terminate the membrane under the clamping ring. Seal all edges with CCW-704 Mastic. Do not interfere with weep holes.

3.3 MODIFIED BITUMINOUS SHEET-WATERPROOFING APPLICATION

A. Priming: Clean surfaces to remove residual dust before priming. Stir primer. Apply by spray or roller at a rate recommended by manufacturer. Allow to dry per manufacturer=s recommendation.

B. Horizontal surfaces: Install sheet membrane from low to high point, so that laps will shed water. Overlap edge seams 2½”, end laps 5". Stagger end seams. Roll in place with an 18 to 24" wide, 100 lb. (min.) resilient roller. Ensure that all laps are firmly adhered and that there are no gaps or fishmouths.

C. Vertical Surfaces: Apply in lengths of 8' or less. Overlap edge seams 2½”. On walls over 8' high, apply in 8' sections, starting at the lowest point with the higher section overlapping the lower section 5". Roll in place using firm pressure with a hand roller.

D. Terminations: Consult Carlisle 860-9 Details for proper terminations. Roll terminating edges firmly. Apply CCW-704 mastic to all terminations and >T= joints. Apply CCW-704 Mastic or CCW-703-V Liquiseal to laps at angle changes, extending 9" in each direction.

3.4 INTEGRITY TESTING

A. Test is required for all expanded warranties beyond the standard material warranty of horizontal applications.

B. The test can be done with Electronic Vector Mapping or flood testing. Flood testing requires 2” minimum head of water for a period of 24 hours

3.5 PROTECTION COURSE

A. VERTICAL APPLICATION: Install CCW QuickDRAIN Perimeter Drainage System as the first course of drainage composite immediately after membrane has been installed on vertical surfaces. Install CCW MiraDRAIN Drainage Composite (consult CCW for recommendation), CCW Protection Board-V Protection Course or CCW 200V on remainder. Stop drainage composite 6" below final grade level.

B. HORIZONTAL APPLICATION: Install CCW MiraDRAIN Drainage Composite (consult CCW for recommendation) or CCW Protection Board-H Protection Course or CCW 300HV immediately after flood testing on horizontal surfaces. If flood testing is delayed, install a temporary covering to protect the CCW MiraDRI 860/861membrane from damage by other trades.

3.6 PROTECTION, REPAIR, AND CLEANING

A. Do not permit foot or vehicular traffic on unprotected membrane.

B. Protect waterproofing from damage and wear during remainder of construction period from damage due to UV light, harmful weather exposures, physical abuse, and other causes. Provide temporary coverings where insulation is subject to abuse and cannot be concealed and protected by permanent construction immediately after installation.

C. Correct deficiencies in or remove waterproofing that does not comply with requirements; repair substrates, reapply waterproofing, and repair sheet flashings.

D. Clean spillage and soiling from adjacent construction using cleaning agents and procedures recommended by manufacturer of affected construction.

3.7 WASTE MANAGEMENT

A. Coordinate with Section 01 74 19.

1. Separate and recycle cut-offs and waste materials and material packaging in accordance with Waste Management Plan and to the maximum extent economically feasible and place in designated areas for recycling.
2. Set aside and protect materials suitable for reuse and/or remanufacturing.
3. Separate and fold up metal banding; flatten and place along with other metal scrap for recycling in designated area.

END OF SECTION 07 13 26

SECTION 07 21 00 - THERMAL 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. This section includes the performance criteria, materials, production, and erection of Thermal Insulation for the project. The work performed under this Section consists of the provision of all plant, materials, labor and equipment and the like necessary and/or required for the complete execution of all Thermal Insulation as required by the this section, schedules, keynotes and drawings including, but not limited to the following:

1. Foam-plastic board insulation.
2. Mineral-wool blanket insulation.
3. Glass fiber blanket insulation.
4. Sprayed polyurethane foam insulation

B. Related Requirements:

1. Division 04 “Masonry”
2. Division 07 “Thermal and Moisture Protection”
3. Division 09 “Finishes”

1.3 ACTION SUBMITTALS

A. Product Data: For each type of product indicated.

1.4 INFORMATIONAL SUBMITTALS

A. Product test reports.

B. Research/evaluation reports.

PART 2 - PRODUCTS

2.1 MATERIAL, GENERAL

A. Source Limitations: Obtain insulation materials from single source from single manufacturer.

B. Must meet NYS Energy Code requirements.

2.2 FOAM-PLASTIC BOARD INSULATION – ABOVE GRADE

A. **FOR USE ON ABOVE GRADE CAVITY WALLS**: Exterior Insulation: Glass-fiber-reinforced enhanced polyisocyanurate foam core sheathing faced with nominal 4 mil embossed blue acrylic-coated aluminum on one side and 1.25 mil embossed aluminum on the other side, complying with ASTM C1289 and meeting the following physical properties:
1. ASTM C1289 Type 1, Class 2
2. Compressive Strength (ASTM D1621): 25 psi, minimum.
3. Aged Thermal Resistance (ASTM C518, measured at Mean Temp of 75F): [R-6.5 at 1 inch] [RSI 1.06 per 25 mm] of thickness [with 15 year thermal warranty]
4. Flexural Strength (ASTM C203): Minimum 55 psi.
5. Water Absorption (ASTM C209): Maximum.0.1 percent by volume.
6. Water Vapor Permeance (ASTM E96): <0.03 perms.
7. Maximum Use Temperature: 250 degrees F.
8. Panel Size: 4'-0" wide x 8'-0" long, square edge, shiplap
9. Thickness and Stabilized R-Value: Nominal 2 inch thickness, R-13.0
10. Wall assembly must comply with NFPA 285 - 2012

B. Manufacturers subject to compliance with requirements, provide products by one of the following:
1. Basis of Design: Dow Chemical Company "THERMAX ci Exterior Insulation.
2. Other comparable products as approved by Architect

C. Accessories:
1. Fasteners: Provide insulated sheathing manufacturer's recommended polymer or other corrosion protective coated steel screw fasteners for anchoring sheathing to metal wall framing. Fastener length and size based on wall sheathing thickness.
a. Basis of Design: Rodenhouse, Inc. 2 inch diameter "Thermal-Grip" CI prong washer with "Grip-Deck" ceramic- coated, self-drilling screw.
b.Use the Grip-Lok auto-feed fastening system for high speed application

D. Flashing: Provide insulation manufacturer's recommended board treatment for sealing joints, seams, and veneer tie penetrations through the insulation layer.
a. Acceptable Products:
1) Dow Chemical Company LIQUIDARMOR-CM commercial liquid flashing and sealant.
2) Dow Chemical Company "WEATHERMATE Straight Flashing 4 inch"width with butyl rubber adhesive

E. Wall Opening Flashing: Provide insulated sheathing manufacturer's recommended flashing sealing window and door wall openings.
a. Acceptable Products:
1) Dow Chemical Company LIQUIDARMOR-CM commercial liquid flashing and sealant
2) Dow Chemical Company "WEATHERMATE Straight Flashing 6 inch and 9 inch", with butyl rubber adhesive, at straight opening heads, jambs and sills
3) When greater widths are required for through wall flashings butyl rubber adhesive is recommended.

F. Penetration Filler: Provide insulated sheathing manufacturer's recommended polyurethane foam for sealing penetrations of insulated sheathing.

a. Acceptable Products:
1) Dow Chemical Company “GREAT STUFF PRO Gaps & Cracks” single Component polyurethane insulating foam sealant.
2) Dow Chemical Company “GREAT STUFF PRO Window & Door” single-component polyurethane low-pressure foam sealant

G. Gap Air Infiltration Filler: Two Component, Quick Cure Polyurethane Foam:
1. Acceptable Products:
a) Dow Chemical Company FROTH-PAK Foam Insulation two component, quick-cure polyurethane foam
i) NFPA 286 Approval for Exposed use to the interior of the building without the need for a15-min thermal barrier
ii) ASTM E-84 Class A

H. Flexible polyethylene foam gasket strip to reduce air infiltration between a concrete foundation and sill plate.
a. Acceptable Products: The Dow Chemical Company “STYROFOAM Sill Seal Foam Gasket

2.3 FOAM -PLASTIC BOARD INSULATION – BELOW GRADE

A. **FOR USE BELOW GRADE AND UNDER SLAB:** Rigid closed-cell Extruded-Polystyrene Board Insulation for Perimeter Foundation Wall Installations

1. Manufacturers: Subject to compliance with requirements, provide products by one of the following:
   a. Basis of Design: Dow Chemical Company Perimate Square Edge
   b. DiversiFoam Products.
   c. Owens Corning.
   d. Pactiv Building Products.
2. Wall assembly must comply with NFPA 285 - 2012.
3. ASTM C578-92 Type IV, 25 psi (ASTM D 1621-73)
4. Density 1.6 lb/cu. Ft. min
5. Thickness 2” unless otherwise indicated
6. UL classification: D369.
7. Thermal resistance: 5-year aged R-values of 5.4 and 5.0 min., $^{o}F\text{-}ft^2\text{-}h/Btu^2$/inch at 40^{o}F and 75^{o}F respectively (ASTM C 518-91).
8. Water absorption: Max. 0.3% by volume (ASTM C 272-91).

2.4 MINERAL-WOOL BOARD INSULATION

A. Manufacturers: Subject to compliance with requirements, provide products by one of the following:

1. Fibrex Insulations Inc.
2. Isolatek International.
3. Owens Corning.
4. Roxul Inc.
5. Thermafiber.

B. Unfaced, Mineral-Wool Board Insulation (at cavity wall edge of slab, fire-safing conditions): ASTM C 612; with maximum flame-spread and smoke-developed indexes of 15 and zero, respectively, per ASTM E 84; passing ASTM E 136 for combustion characteristics.

C. Foil-faced, Mineral-Wool Board Insulation (at storefront wall edge of slab and spandrel panel locations): ASTM C612; faced on one side with foil-scrim or foil-scrim-polyethylene vapor retarder; with maximum flame-spread and smoke – developed indexes of 25 and 5, respectively, per ASTM E84.

2.5 GLASS-FIBER BLANKET INSULATION

A. Manufacturers: Subject to compliance with requirements, provide products by one of the following:

1. CertainTeed Corporation.
2. Guardian Building Products, Inc.
3. Johns Manville.
4. Knauf Insulation.
5. Owens Corning.

B. Unfaced, Glass-Fiber Blanket Insulation: ASTM C 665, Type I; with maximum flame-spread and smoke-developed indexes of 25 and 50, respectively, per ASTM E 84; passing ASTM E 136 for combustion characteristics.

2.6 MINERAL-WOOL BLANKET INSULATION

A. Manufacturers: Subject to compliance with requirements, provide products by one of the following:

1. Fibrex Insulations Inc.
2. Owens Corning.
3. Roxul Inc.
4. Thermafiber.

B. Unfaced, Mineral-Wool Blanket Insulation: ASTM C 665, Type I (blankets without membrane facing); consisting of fibers; with maximum flame-spread and smoke-developed indexes of 25 and 50, respectively, per ASTM E 84; passing ASTM E 136 for combustion characteristics.

2.7 SPRAYED POLYURETHANE FOAM INSULATION

A. Spray Polyurethane Foam Installer shall be certified by spray foam manufacturer.

B. Pre-Installation Meeting to review spray polyurethane foam methods and procedures related to application, including manufacturer’s installation guidelines.

C. Mock-up illustrating typical conditions. Conduct the following tests on the mockup panel:
1. Core density
2. Adhesion between transition sheet membrane and substrate
3. Cohesion or adhesion between sprayed insulation and substrate

D. Ventilate area to receive insulation by introducing fresh air and exhausting air continuously during any 24 hours after application to maintain non-toxic, unpolluted, safe working condition.

E. Protect workers as recommended by insulation manufacturer.

F. Protect adjacent surfaces and equipment from damage by overspray, fall-out and dusting of insulation materials.

G. Manufacturers: Subject to compliance with requirements, provide products by one of the following:
1. Basis of Design: Dow Chemical Styrofoam Spray Polyurethane Foam Insulation (MX Series)
2. Certa Spray Closed Cell Foam Insulation by CertainTeed
3. Icynene ProSeal MD-C-200v3
4. Substitutions: Approved equal

H. Spray Polyurethane Foam: Two-component spray polyurethane cellular plastic foam, complying with the following methods and meeting the following physical properties:

1. Core Density (ASTM D1622): Minimum 2pcf
2. Thermal Resistance (ASTM C518): 140degreeF/90day Aged R-Value, measured at 75F mean Temp: Minimum R6.0/inch.
3. Flame Spread (ASTM E84, Class A): 25 or less.
4. Smoke Developed (ASTM E84, Class A): 450 or less.
5. Compressive Strength minimum (ASTM D1621, 10% parallel to rise): (20 psi)(182 kPa).
6. Closed Cell Content (ASTM D2856): minimum 95 percent.
7. Water Absorption by Volume maximum. (ASTM D2842): 2.5 percent.
8. Wall assembly must comply with NFPA 285 - 2012

I. For oily steel surface like Z-bar, roof deck, curtain wall pan, aluminum tube or PVC pipes cleaning, etching or a primer may be needed before spraying polyurethane foam. Water Vapor Permeability maximum. (ASTM E96): [2.5 perm-inches] [3.6 ng/(Pa.s.m)].

PART 3 - EXECUTION

3.1 INSTALLATION, GENERAL

A. Comply with insulation manufacturer's written instructions applicable to products and applications indicated.

B. Install insulation that is undamaged, dry, and unsoiled and that has not been left exposed to ice, rain, or snow at any time.

C. Extend insulation to envelop entire area to be insulated. Cut and fit tightly around obstructions and fill voids with insulation. Remove projections that interfere with placement.

D. Provide sizes to fit applications indicated and selected from manufacturer's standard thicknesses, widths, and lengths. Apply single layer of insulation units to produce thickness indicated unless multiple layers are otherwise shown or required to make up total thickness.

3.2 INSTALLATION OF BELOW-GRADE INSULATION

A. On vertical surfaces, set insulation units using manufacturer's recommended adhesive according to manufacturer's written instructions.

1. If not otherwise indicated, extend insulation a minimum of 36 inches (915 mm**)** below exterior grade line.

B. On horizontal surfaces, loosely lay insulation units according to manufacturer's written instructions. Stagger end joints and tightly abut insulation units.

1. If not otherwise indicated, extend insulation a minimum of 36 inches (915 mm**)** in from exterior walls.

C. Cut insulation to fit snugly around pilasters, projections, curves and irregularities on the wall surface. Fill voids with insulation.

3.3 INSTALLATION OF CAVITY-WALL INSULATION

A. Foam-Plastic Board Insulation: Install 2” diameter daubs of adhesive spaced approximately 12 inches (610 mm) o.c. both ways on inside face, and as recommended by manufacturer. Fit courses of insulation between wall ties and other obstructions, with edges butted tightly in both directions. Press units firmly against inside substrates.

1. Supplement adhesive attachment of insulation by securing boards with two-piece wall ties designed for this purpose and specified in Section 042000 "Unit Masonry."

2. Wedge insulation from outside wythe of construction with small fragments of masonry materials spaced 24" o.c. both ways.

3. Make insulation continuous. Fill all voids

3.4 INSTALLATION OF INSULATION FOR FRAMED CONSTRUCTION

A. Apply insulation units to substrates by method indicated, complying with manufacturer's written instructions. If no specific method is indicated, bond units to substrate with adhesive or use mechanical anchorage to provide permanent placement and support of units.

B. Foam-Plastic Board Insulation: Seal joints between units by applying adhesive, mastic, or sealant to edges of each unit to form a tight seal as units are shoved into place. Fill voids in completed installation with adhesive, mastic, or sealant as recommended by insulation manufacturer.

C. Glass-Fiber or Mineral-Wool Blanket Insulation: Install in cavities formed by framing members according to the following requirements:

1. Use insulation widths and lengths that fill the cavities formed by framing members. If more than one length is required to fill the cavities, provide lengths that will produce a snug fit between ends.
2. Place insulation in cavities formed by framing members to produce a friction fit between edges of insulation and adjoining framing members.
3. Maintain 3-inch (76-mm) clearance of insulation around recessed lighting fixtures not rated for or protected from contact with insulation.
4. For metal-framed wall cavities where cavity heights exceed 96 inches (2438 mm), support unfaced blankets mechanically and support faced blankets by taping flanges of insulation to flanges of metal studs.
5. Vapor-Retarder-Faced Blankets: Tape joints and ruptures in vapor-retarder facings, and seal each continuous area of insulation to ensure airtight installation.

    a. Exterior Walls: Set units with facing placed toward as indicated on Drawings.
    b. Interior Walls: Set units with facing placed as indicated on Drawings.

D. Miscellaneous Voids: Install insulation in miscellaneous voids and cavity spaces where required to prevent gaps in insulation using the following materials:

1. Loose-Fill Insulation: Compact to approximately 40 percent of normal maximum volume equaling a density of approximately 2.5 lb/cu. ft. (40 kg/cu. m).
2. Spray Polyurethane Insulation: Apply according to manufacturer's written instructions.

3.5 INSTALLATION OF INSULATION FOR CONCRETE SUBSTRATES

A. Install board insulation on concrete substrates by adhesively attached, spindle-type insulation anchors as follows:

1. Fasten insulation anchors to concrete substrates with insulation anchor adhesive according to anchor manufacturer's written instructions. Space anchors according to insulation manufacturer's written instructions for insulation type, thickness, and application indicated.
2. Apply insulation standoffs to each spindle to create cavity width indicated between concrete substrate and insulation.
3. After adhesive has dried, install board insulation by pressing insulation into position over spindles and securing it tightly in place with insulation-retaining washers, taking care not to compress insulation below indicated thickness.
4. Where insulation will not be covered by other building materials, apply capped washers to tips of spindles.

3.6 INSTALLATION OF STOREFRONT-WALL INSULATION

A. Install board insulation in storefront-wall construction where indicated on Drawings according to curtain-wall manufacturer's written instructions.

1. Hold insulation in place by securing metal clips and straps or integral pockets within window frames, spaced at intervals recommended in writing by insulation manufacturer to hold insulation securely in place without touching spandrel glass. Maintain cavity width of dimension indicated between insulation and glass.
2. Install insulation where it contacts perimeter fire-containment system to prevent insulation from bowing under pressure from perimeter fire-containment system.

3.7 INSTALLATION OF VAPOR RETARDERS

A. Place vapor retarders on side of construction indicated on Drawings. Extend vapor retarders to extremities of areas to protect from vapor transmission. Secure vapor retarders in place with adhesives or other anchorage system as indicated. Extend vapor retarders to cover miscellaneous voids in insulated substrates, including those filled with loose-fiber insulation.

B. Seal vertical joints in vapor retarders over framing by lapping no fewer than two studs.

1. Fasten vapor retarders to wood framing at top, end, and bottom edges; at perimeter of wall openings; and at lap joints. Space fasteners 16 inches (406 mm) o.c.
2. Before installing vapor retarders, apply urethane sealant to flanges of metal framing including runner tracks, metal studs, and framing around door and window openings. Seal overlapping joints in vapor retarders with vapor-retarder tape according to vapor-retarder manufacturer's written instructions. Seal butt joints with vapor-retarder tape. Locate all joints over framing members or other solid substrates.
3. Firmly attach vapor retarders to metal framing and solid substrates with vapor-retarder fasteners as recommended by vapor-retarder manufacturer.

C. Seal joints caused by pipes, conduits, electrical boxes, and similar items penetrating vapor retarders with vapor-retarder tape to create an airtight seal between penetrating objects and vapor retarders.

D. Repair tears or punctures in vapor retarders immediately before concealment by other work. Cover with vapor-retarder tape or another layer of vapor retarders.

3.8 INSTALLATION OF FOAM INSULATION

A. Verify existing conditions are ready to receive work.

B. Ensure surfaces are free of frost, oil, grease, oxidation, dirt, loose paint, loose scale, or other deleterious material that would impair bond.

C. Ensure that items required to penetrate sprayed insulation are installed prior to installation of sprayed insulation.

D. Clean area of work prior to application of sprayed insulation. Beginning of application implies acceptance of existing conditions.

E. Mask and cover adjacent areas to protect from overspray.

F. Apply any required primers for special conditions as recommended by manufacturer. Prepare surfaces within the exterior soffit at the pool to receive sprayed foam insulation where indicated.

G. Cover wide joints with transition sheet membrane as specified in Section 07 27 50.

H. Seal any voids between the existing precast concrete T’s and adjoining building components.

I. Must be installed by manufacturer’s Approved Applicator at time of bidding.

J. Apply SPF in accordance with ASTM C1029 and manufacturer's installation guidelines: complying with preparation methods.

K. Apply sprayed foam insulation in consecutive layers of not less than ½ inch and not more than 2 inch thick each to achieve total thickness required (total thickness as indicated per application) for a minimum R value of 25. For light gage steel and extruded polystyrene board first layer should be a skim coat of (12 mm) (½ inch) before adding extra layers. Ensure the substrate is well supported.

L. Avoid formation of sub-layer air pockets.

M. Apply product in overlapping layers, so as to obtain a smooth, uniform surface.

N. Maintain 3 inch clearance around chimneys, heating vents, steam pipes, recessed lighting fixtures and other heat sources.

O. Do not apply Product to inside of exit openings or electrical junction boxes.

P. Conduct field inspection and testing in accordance with manufacturers and general contractors instructions.

Q. Test completed application daily for core density and cohesion/adhesion to substrate. Record results daily in daily work records.

R. Site Tolerances: Maximum Variation in Applied Thickness: minus 1/4 inch, plus 5/8 inch.

S. Remove overspray from non-prescribed surfaces without causing damage to surfaces.

T. Remove protective covers from adjacent surfaces.

U. Protect completed installation from damage Repair as required.

V. Any open flame or welding shall not be in contact with the Spray Polyurethane Foam.

W. All plastic insulation must be protected from interior occupancy space by an approved thermal barrier to meet the requirements of local Building Codes.

3.9 WASTE MANAGEMENT

A. Coordinate with Section 01 74 19.
   1. Separate and recycle cut-offs and waste materials and material packaging in accordance with Waste Management Plan and to the maximum extent economically feasible and place in designated areas for recycling.
   2. Set aside and protect materials suitable for reuse and/or remanufacturing.
   3. Separate and fold up metal banding; flatten and place along with other metal scrap for recycling in designated area.

END OF SECTION 07 21 00

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SECTION 07 27 13 – FIRE RESISTANT, SELF-ADHERING MEMBRANE AIR & VAPOR BARRIERS

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 SECTION INCLUDES

A. A self-adhered membrane and accessory products of fire-resistant composition for use as an air and vapor barrier in exterior walls.

B. Materials and installation 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 frames, door frames, store front, curtain wall
5. Barrier pre-cast concrete and other envelope systems
6. Door frames Piping, conduit, duct and similar penetrations
7. Masonry ties, screws, bolts and similar penetrations
8. All other air leakage pathways through the walls

1.3 RELATED SECTIONS

A. Section 03 30 00 Cast-in-place Concrete

B. Section 04 20 00 Unit Masonry

C. Section 07 21 00 Thermal Insulation

D. Section 07 53 23 EPDM Roofing

E. Section 07 921 00 Joint Sealants

F. Section 08 12 55 Fiberglass Reinforced Polyester Doors

G. Section 08 41 13 Aluminum Framed entrances and storefronts

H. Section 09 29 00 Gypsum Board

1.4 REFERENCES

A. American Association of Textile Chemists and Colorists (AATCC) Test Method 127. “Water Resistance – Hydrostatic Pressure Test”

B. American Society of Heating, Refrigerating and Air-Conditioning Engineers (ASHRAE) Standard 90.1-2010 “Energy Standard for Buildings Except Low-Rise Residential Buildings”

C. ASTM C 920 Standard Specification for Elastomeric Joint Sealants

D. ASTM C 1305 Standard Test Method for Crack Bridging Ability of Liquid-Applied Waterproofing Membrane

E. ASTM D 882 Standard Test Methods for Vulcanized Rubber and Thermoplastic Elastomers – Tension

F. ASTM D 1876 Standard Test Method for Peel Resistance of Adhesive

G. ASTM D 1970 Standard Specification for Self-Adhering Polymer Modified Bituminous Sheet Materials Used as Steep slope roofing Underlayment for Ice Dam Protection

H. ASTM D 4073 Standard Test Method for Tensile-Tear Strength of Bituminous Roofing Membranes

I. ASTM D 4541 Standard Test Method for Pull-Off Strength of Coatings Using Portable Adhesion Testers

J. ASTM E 84 Standard Test Method for Surface Burning Characteristics of Building Materials

K. ASTM E 96 Standard Test Methods for Water Vapor Transmission of Materials.

L. ASTM E 154 Standard Test Methods for Water Vapor Retarders used in Contact with Earth under Concrete Slabs, on Walls or as Ground Cover

M. ASTM E 783 Standard Test Method for Field Measurement of Air Leakage Through Installed Exterior Windows and Doors

N. ASTM E 1105 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.

O. ASTM E 1354 Standard Test Method for Heat and Visible Smoke Release Rates for Materials and Products Using an Oxygen Consumption Calorimeter

P. ASTM E 2178 Standard Test Method for Air Permeance of Building Materials

Q. ASTM E 2357 Standard Test Method for Determining Air Leakage of Air Barrier Assemblies

R. National Fire Protection Association (NFPA) 285 Standard Fire Test Method for Evaluation of Fire Propagation Characteristics of Exterior Non-Load-Bearing Wall Assemblies Containing Combustible Components

1.5 MEETINGS

A. Preinstallation Conference: Conduct conference at Project site.

1. Review air-barrier requirements and installation, special details, mockups, air-leakage and bond testing, air-barrier protection, and work scheduling that covers air barriers.

1.6 SUBMITTALS

A. Product Data: For each type of product.

1. Include manufacturer's written instructions for evaluating, preparing, and treating substrate; technical data; and tested physical and performance properties of products.

B. At bid submission, provide evidence to the Architect of installer qualification by the air & vapor barrier manufacturer.

C. Shop drawings showing locations and extent of air & vapor barrier and details of all typical conditions.

D. Manufacturer’s list and description of wall assemblies, incorporating product, tested per NFPA 285

E. Manufacturer's technical data sheets and material safety data sheets for product and accessories.

F. Manufacturer's installation instructions.

G. Certification of compatibility by manufacturer, listing all materials on the project with which the product and accessories may come into contact.

H. Sample of product and transition membrane, minimum 2 inch by 3 inch size.

1.7 PERFORMANCE REQUIREMENTS

A. Installed product and accessories constitute a continuous air barrier, as described in ASHRAE Standard 90.1-2010 Section 5.4.3.1

B. Installed product and accessories shall perform as a liquid water drainage plane flashed to discharge to the exterior any incidental condensation or water penetration.

C. Installed product and accessories shall exhibit an air leakage rate, infiltration and exfiltration modes, measured after pressure cycling, not to exceed 0.2 $L/s*m^2$ at 75 Pa (0.040 CFM/ft^2 at 1.57 PSF) according to ASTM E 2357.

D. Installed product and accessories shall perform as a vapor barrier, installed on the predominantly warm side of the insulation.

E. For Type I, II, III and IV construction: Installed product and accessories shall be evaluated to NFPA 285 in wall assemblies of Project.

F. Product shall consist of nominal 0.040 inch (40 mils) thickness composite membrane consisting of an aluminum-faced cross-laminated high density polyethylene sheet laminated with a styrene-butadiene-styrene modified asphalt adhesive.

G. Product shall meet the following requirements:

REQUIREMENT	RESULT	TEST METHOD
Air Permeance	Not more than 0.02 L/s*m^2 at 75 Pa (0.004 CFM/ft^2 at 1.57 PSF)	ASTM E-2178
Tensile Strength	Not less than 40 lb_f per inch	ASTM D-882
Puncture Resistance	Not less than 50 lb_f	ASTM E 154
Tear Initiation and Propagation	Not less than 30 lb_f, machine direction and cross direction	ASTM D 4073
Low Temperature Flexibility	No cracking at minus 20 degrees F, 1 inch mandrel	ASTM D 1970
Fastener Sealability	No water leaking through fastener penetration after 24 h.	ASTM D 1970
Water Resistance	Membrane specimen including a lap shall resist a 55 cm (22 inch) column of water for 5 hours, no leaking or wet through.	AATCC-127, modified static head generated with 5”diameter PVC pipe sealed to specimen
Pull Adhesion	Not less than 16 lb_f per square inch (or report value at substrate failure) on glass-faced gypsum sheathing and concrete masonry unit, substrate prepared with contact adhesive	ASTM D 4541, modified 4 inch puck
Lap Adhesion	Not less than 5 lb_f per inch of width	ASTM D 1876
Water Vapor Permeance	Not more than 0.1 Perm	ASTM E-96, Method B
Surface Burning Characteristics.	Flame Spread Index: Not more than 25 Smoke Generation Index: Not more than 450	ASTM E 84, sample tested at full coverage, cement board substrate, including surface preparation
Measurement of Heat Release Rate by Cone Calorimeter	Effective Heat of Combustion of 0 MJ/kg or less Peak heat release rate of 6.67 kW/m^2 or less Total heat release rate of 1.1 MJ/m^2 or less	ASTM E 1354, membrane applied to glass-faced gypsum sheathing, including surface preparation. 50 kW/m^2 heat flux.

1.8 QUALITY ASSURANCE

A. Installer Qualifications: Shall be experienced in applying the same or similar materials and shall be specifically approved in writing by Manufacturer.

B. Single-Source Responsibility: Obtain product and accessories from single manufacturer.

C. Product and Accessories shall comply with all state and local regulations controlling use of volatile organic compounds (VOCs).

D. Pre-Installation Meeting: Convene one week prior to commencing Work of this Section.

E. Field-Constructed Mock-Ups: Prior to installation on Project, apply Product and Accessories on mock-up to verify details under shop drawing submittals, to demonstrate tie-ins with adjoining construction and other termination conditions and to become familiar with properties of materials in application:

F. Construct typical exterior wall panel, 8 feet long by 8 feet wide, incorporating back-up wall, cladding, window and doorframe and sill, insulation, flashing; illustrating interface of materials and seals

G. Test mock-up in accordance with ASTM E 783 and ASTM E1105 for air and water infiltration

H. Cooperate and coordinate with the Owner's inspection and testing agency. Do not cover any installed Product unless it has been inspected, tested and approved.

1.9 DELIVERY, STORAGE, AND HANDLING

A. Remove and replace liquid materials that cannot be applied within their stated shelf life.

B. Refer to current Product MSDS for proper storage and handling.

C. Deliver materials to the job site in undamaged and original packaging indicating the name of the manufacturer and product.

D. Store roll materials on end in original packaging. Protect rolls from direct sunlight until ready for use.

E. Store air barrier membranes, adhesives and primers at temperatures of 40 degrees

F. Protect stored materials from direct sunlight.

G. Keep solvent away from flame or excessive heat.

1.10 FIELD CONDITIONS

A. Do not apply product or accessories during rain or accumulating snowfall.

B. Apply product and accessories within approved ambient and substrate temperature range stated in manufacturer’s literature.

C. Do not apply product or accessories over incompatible materials.

D. Observe safety and environmental measures indicated in manufacturer’s MSDS, and mandated by federal, state and local regulations.

1.11 WARRANTY

A. System Warranty: Provide the manufacturer's five (5) year system warranty, including the primary air/vapor barrier and installed accessory sealant and membrane materials which fail to achieve air tight and watertight seal, exhibit loss of adhesion or cohesion, or do not cure.

PART 2 - PRODUCTS

2.1 FIRE-RESISTANT, SELF-ADHERING MEMBRANE AIR & VAPOR BARRIERS

A. **TO BE INSTALLED FOR ALL ABOVE-GRADE WALLS OVER TOP OF THE DENSGLASS GOLD SHEATHING**

B. Basis of Design: Fire Resist™ 705 FR-A by Carlisle Coatings & Waterproofing, Incorporated (CCW). 900 Hensley Lane, Wylie, TX 75098. Phone 1-800-527-7092. Website http://www.carlisleccw.com

C. Other comparable manufacturers and products, as approved by Architect.

2.2 ACCESSORIES

A. Provide from same manufacturer as air barrier membrane

B. Detail Flashing: Similar composition to air barrier membrane. Factory slit to convenient sizes.
1. CCW: Fire Resist 705 FR-A
2. Others: As specified by air barrier membrane manufacturer

C. Contact Adhesive: Liquid or spray-applied for preparing surfaces accepting air barrier membrane
1. CCW: CCW-702 Solvent-Based , CCW-702 LV VOC Compliant, Solvent-Based, CCW-702 WB Water-Based or CAV-GRIP™ Aerosol Spray
2. Others: As specified by air barrier membrane manufacturer

D. Detail Mastic: 1-part material for sealing details. Installation over air barrier membrane.
1. CCW: Universal Single Ply Sealant
2. Others: As specified by air barrier membrane manufacturer

E. Transition Membrane: Tough, elastomeric sheet capable of bridging a 1" gap. Minimum 60 mils thickness
1. CCW: SURE-SEAL Pressure-Sensitive Elastoform.
2. Others: As specified by air barrier membrane manufacturer

F. Fill Compound: 2-part chemical cure sealant, compatible with adhesive side of air barrier membrane.
1. CCW: CCW-703 V Modified polyurethane, 2-part or CCW-201 Polyurethane, 2-part
2. Others: As specified by air barrier membrane manufacturer

2.3 RELATED MATERIALS

A. Polyurethane Sealant: used for sealing membrane surface defects, penetrations and terminations :
1. Approved by CCW: Sonneborn NP-1, Dymonic FC, S-M 7100 Permathane Pro-Installer by Schnee-Morehead Div, ITW or Xtra-Bond 7500 TX by Premiere Industrial Supply
2. Others: As specified by air barrier membrane manufacturer

B. Silicone Sealant: used for sealing fenestration to air barrier membrane, surface defects and penetrations
1. Approved by CCW: Dow-Corning 758, 790, 791 or 795 or Pecora AVB Silicone, 890, 891 or 895 or GE Silpruf or Silpruf LM
2. Others: As specified by air barrier membrane manufacturer

C. Polyurethane Foam Sealant: used for sealing gaps around fenestration and other penetrations
1. Approved by CCW: Great Stuff by Dow Chemical Company, FireBlock Gun Foam by TVM Building Products or Fireblock Foam Sealant by FOMO
2. Others: As specified by air barrier membrane manufacturer

D. Insulation Adhesive: used for bonding foam board insulation to air barrier membrane
1. Approved by CCW for polyisocyanurate insulation: LM 800 XL or CAV-GRIP Spray Contact Adhesive by Carlisle Coatings & Waterproofing Incorporated
2. Approved by CCW for extruded polystyrene insulation: CAV-GRIP Spray Contact Adhesive by CCW, QB-300 Multi-Pupose Construction Adhesive by OSI or PL-300 VOC Foamboard Adhesive by Loctite
3. Others: As specified by air barrier membrane manufacturer

PART 3 - EXECUTION

3.1 EXAMINATION

A. Examine substrates, areas, and conditions affecting installation of the air & vapor barrier and accessory products for compliance with requirements. Verify that surfaces and conditions are suitable prior to commencing Work of this section. Do not proceed with installation until unsatisfactory conditions have been corrected.

B. Verify that wall assemblies are dried in, such that water intrusion will not occur from above, behind or around the air barrier installation.

C. Concrete shall be cured for a minimum of seven days. It shall be smooth, with sharp protrusions such as form joints ground flush. Honeycomb and holes/cracks exceeding ¼ inch across shall be filled with grout or mortar.

D. Surfaces shall be sound, dry and free of oil, grease, dirt, excess mortar or other contaminants.

E. Surfaces shall be supported and flush at joints without large voids or sharp protrusions.

F. Mortar joints shall be struck flush and shall be free of voids exceeding ¼ inch across. Mortar droppings shall be removed from brick ties and all other surfaces accepting air barrier.

G. Sheathing boards shall be flush at joints, with gaps between boards according to building code and sheathing manufacturer's requirements. Sheathing boards shall also be securely fastened to the structure with proper fastener type, technique and spacing according to building code and sheathing manufacturer's requirements. Sheathing boards shall be repaired or replaced if inspection reveals moisture damage, mechanical damage or if sheathing boards have exceeded the exposure duration or exposure conditions as required by the sheathing manufacturer.

H. Plywood, OSB, lumber or pressure-treated wood moisture content, measured with a wood moisture meter in the core of the substrate, shall be below 20%.

I. Inform Architect [Consultant] [Owner] in writing of
1. Cracks in concrete and masonry.
2. Gaps or obstructions such as steel beams, angles, plates and projections which cannot be spanned or covered by Product or Accessories.
3. Anticipated problems applying Product and Accessories over substrate.

3.2 SURFACE PREPARATION

A. Concrete masonry unit (CMU) wall shall be prepared as follows to accept the air & vapor barrier:
1. Surfaces shall be free of contaminants such as grease, oil and wax on surfaces to receive membrane
2. The CMU surfaces shall be free from projections.
3. Strike all mortar joints flush to the face of the concrete block.
4. Fill all voids and holes greater than ¼ inch across at any point with mortar, sealant or other approved fill material.
5. Surface irregularities exceeding ¼ inch in height or sharp to touch shall be ground flush or made smooth.
6. Fill around all penetrations with mortar, sealant or other approved fill material and strike flush.
7. If the surfaces cannot be made smooth to the satisfaction of the Architect, it will be the responsibility of the trade to alternatively apply a parge coat (typically one part cement to three parts sand) over the entire surface to receive Air & Vapor Barrier Membrane
8. Remove mortar droppings on brick ties, shelf angles, brick shelves or other horizontal obstructions.

B. Fill cracks, gaps and joints exceeding ¼ inch width with fill compound or paintable sealant.

C. Fill rough gaps around pipe, conduit and similar penetrations with mortar, non-shrink grout, fill compound or polyurethane foam sealant shaved flush.

D. Apply a ¾ inch cant of fill compound at the intersection of the base of the wall and the footing.

3.3 INSTALLATION

A. Apply product over opaque wall surfaces as indicated in Project.

B. Allow sealants used during surface preparation to cure fully before applying product.

C. Apply contact adhesive to all surfaces accepting product, according to manufacturer's instructions.

D. Apply product to prepared surfaces according to manufacturer's instructions and drawings.

E. Sequence installation to provide shingled laps. Lap neighboring sheets 2 inches minimum.

F. Install detail flashing or transition membrane according to manufacturer's drawings and instructions at expansion joints, seismic joints, mechanical/electrical penetrations and similar conditions.

G. Install detail mastic, polyurethane sealant or silicone sealant covering non-water shedding laps, penetrations and similar surface defects.

3.4 SCHEDULE

A. Wall substrates and roof or temporary roof shall be in place, effectively enclosing interior space, before proceeding with air barrier installation.

B. Seal penetrations made through installed product according to manufacturer's instructions and drawings.

C. Seal fenestration to product with detail membrane, transition membrane, polyurethane sealant, silicone sealant or polyurethane foam sealant according to Project drawings

D. Through-wall flashing may be installed before or after product. Seal termination of metal through-wall flashing to product with 6 inch wide detail flashing.

E. Cladding shall be installed after product.

F. Rigid or semi-rigid insulation installed over product shall be attached with insulation adhesive and mechanical fastening according to insulation manufacturer and air barrier manufacturer's instructions.

G. Sequence Work to enable air barrier continuity at wall-to-foundation, shelf angle, wall-to-roof, fenestration, different wall assemblies and other conditions providing challenges to air barrier continuity.

3.5 REPAIR AND PROTECTION

A. Protect from damage during application and remainder of construction period.

B. Inspect before covering. Repair or replace damaged material according to manufacturer's literature.

C. Product and accessories are not designed for permanent exposure. Cover with insulation or exterior cladding as soon as schedule allows.

D. Outdoor exposure of installed product and accessories shall not exceed 180 days.

3.6 WASTE MANAGEMENT

A. Coordinate with Section 01 74 19.

1. Separate and recycle cut-offs and waste materials and material packaging in accordance with Waste Management Plan and to the maximum extent economically feasible and place in designated areas for recycling.
2. Set aside and protect materials suitable for reuse and/or remanufacturing.
3. Separate and fold up metal banding; flatten and place along with other metal scrap for recycling in designated area.

END OF SECTION 07 27 13

SECTION 073113 – ASPHALT SHINGLES

PART 1 - GENERAL

1.1 SUMMARY

A. Section Includes:

1. Glass-fiber-reinforced asphalt shingles.
2. Underlayment materials.
3. Ridge Vents.
4. Metal flashing and trim.

1.2 ACTION SUBMITTALS

A. Product Data: For the following:

1. Asphalt shingles.
2. Underlayment materials.
3. Ridge vents.
4. Asphalt roofing cement.
5. Elastomeric flashing sealant.

B. Shop Drawings: For metal flashing and trim.

C. Samples: For each exposed product and for each color and blend specified

1.3 INFORMATIONAL SUBMITTALS

A. Product test reports.

B. Research reports for synthetic underlayment.

1.4 CLOSEOUT SUBMITTALS

A. Maintenance data.

1.5 QUALITY ASSURANCE

A. Installer Qualifications: An authorized installer who is trained and approved by manufacturer.

1.6 WARRANTY

A. Material Warranty: Manufacturer agrees to repair or replace asphalt shingles that fail within specified warranty period.

1. Materials Warranty Period: 35 years from the date of Substantial Completion, prorated, with first five years nonprorated.
2. Wind-Speed Warranty Period: Asphalt shingles will resist blow-off or damage caused by wind speeds of up to 110 mph (49 m/s) for 15 years from the date of Substantial Completion.
3. Algae-Resistance Warranty Period: Asphalt shingles will not discolor for five years from date of Substantial Completion.
4. Workmanship Warranty Period: 20 years from date of Substantial Completion.

PART 2 - PRODUCTS

2.1 PERFORMANCE REQUIREMENTS

A. Exterior Fire-Test Exposure: Provide asphalt shingles and related roofing materials identical to those of assemblies tested for Class A fire resistance in accordance with ASTM E108 or UL 790 by Underwriters Laboratories or another testing and inspecting agency acceptable to authorities having jurisdiction. Identify products with appropriate markings of applicable testing agency.

B. Wind Resistance: Provide asphalt shingles that comply with requirements of ASTM D3161/D3161M, Class F, and with ASTM D7158/D7158M, Class H.

C. Energy Performance, ENERGY STAR: Provide asphalt shingles that are listed on the DOE's "ENERGY STAR Roof Product List" for steep-slope roof products.

2.2 GLASS-FIBER-REINFORCED ASPHALT SHINGLES

A. Impact-Resistant, Three-Tab-Strip Asphalt Shingles: ASTM D3462/D3462M; glass-fiber reinforced, mineral-granule surfaced, and self-sealing; with tabs regularly spaced and with impact resistance complying with UL 2218, Class 4.

1. Manufacturers: Subject to compliance with requirements, provide products by one of the following:

    a. GAF.
    b. Owens Corning.
    c. Certain Teed Saint-Gobain.

2. Strip Size: Manufacturer's standard.
3. Algae Resistance: Granules resist algae discoloration.
4. Color and Blends: Match Architect's sample.

B. Hip and Ridge Shingles: Manufacturer's standard units to match asphalt shingles.

2.3 UNDERLAYMENT MATERIALS

A. Glass-Reinforced Felt: ASTM D6757/D6757M, asphalt-saturated, glass-reinforced organic felt or inorganic fiber-based felt.
   1. Manufacturers: Subject to compliance with requirements, provide products by one of the following:

      a. GAF.
      b. Owens Corning.
      c. Atlas EPS; a Division of Atlas Roofing Corporation.
      d. Certain Teed Coorporation.

2.4 RIDGE VENTS

A. Rigid Ridge Vent: Manufacturer's standard, rigid-section, high-density, UV-stabilized plastic ridge vent for use under ridge shingles.
   1. Manufacturers: Subject to compliance with requirements, provide products by one of the following:

      a. GAF.
      b. Owens Corning.
      c. Certain Teed Saint-Gobain.
      d. Cor-A-Vent, Inc.
      e. Tamko Building Products, Inc.

   2. Features:

      a. Nonwoven geotextile filter strips.

2.5 ACCESSORIES

A. Asphalt Roofing Cement: ASTM D4586/D4586M Type II, asbestos free.

B. Elastomeric Flashing Sealant: ASTM C920, Type S, Grade NS, one-part, non-sag, elastomeric polymer sealant; of class and use classifications required to seal joints and remain watertight; recommended in writing by manufacturer for installation of flashing systems.

C. Roofing Nails: ASTM F1667, aluminum, stainless-steel, copper, or hot-dip galvanized-steel wire shingle nails, minimum 0.120-inch- (3-mm-) diameter, sharp-pointed, with a 3/8- to 7/16- inch- (10- to 11-mm-) diameter flat head and of sufficient length to penetrate 3/4 inch (19 mm) into solid wood decking or extend at least 1/8 inch (3 mm) through sheathing less than 3/4 inch (19 mm) thick.

1. Where nails are in contact with metal flashing, use nails made from same metal as flashing.

D. Underlayment Nails: Aluminum, stainless-steel, or hot-dip galvanized-steel wire nails with low- profile metal or plastic caps, 1-inch- (25-mm-) minimum diameter.

1. Provide with minimum 0.0134-inch- (0.34-mm-) thick metal cap, 0.010-inch- (0.25-mm-) thick power-driven metal cap, or 0.035-inch- (0.89-mm-) thick plastic cap; and with minimum 0.083-inch- (2.11-mm-) thick ring shank or 0.091-inch- (2.31-mm-) thick smooth shank of length to penetrate at least 3/4 inch (19 mm) into roof sheathing or to penetrate through roof sheathing less than 3/4 inch (19 mm) thick.

2.6 METAL FLASHING AND TRIM

A. Comply with requirements in Section 076200 "Sheet Metal Flashing and Specialties."

1. Sheet Metal: Stainless-steel.

B. Fabricate sheet metal flashing and trim to comply with recommendations in SMACNA's "Architectural Sheet Metal Manual" that apply to design, dimensions, metal, and other characteristics of the item unless otherwise indicated on Drawings.

1. Vent-Pipe Flashings: ASTM B749, Type L51121, at least 1/16 inch (1.6 mm) thick. Provide lead sleeve sized to slip over and turn down into pipe, soldered to skirt at slope of roof, and extending at least 4 inches (102 mm) from pipe onto roof.

PART 3 - EXECUTION

3.1 INSTALLATION OF UNDERLAYMENT MATERIALS

A. Comply with asphalt shingle and underlayment manufacturers' written installation instructions and with recommendations in NRCA's "The NRCA Roofing Manual: Steep-Slope Roof Systems" applicable to products and applications indicated unless more stringent requirements are specified in this Section or indicated on Drawings.

B. Metal-Flashed, Open-Valley Underlayment: Install two layers of minimum 36-inch- (914-mm-) wide underlayment centered in valley.

1. Use same underlayment as installed on field of roof.
2. Stagger end laps between layers at least 72 inches (1829 mm).
3. Lap ends of each layer at least 12 inches (305 mm) in direction that sheds water, and seal with asphalt roofing cement.

4. Fasten each layer to roof deck with underlayment nails located as far from valley center as possible and only to extend necessary to hold underlayment in place until installation of valley flashing.
5. Lap roof-deck underlayment over first layer of valley underlayment at least 6 inches (152 mm).

3.2 INSTALLATION OF METAL FLASHING AND TRIM

A. Install metal flashings and trim to comply with requirements in Section 076200 "Sheet Metal Flashing and Specialties."

1. Install metal flashings in accordance with recommendations in NRCA's "NRCA Guidelines for Asphalt Shingle Roof Systems."
2. Bed flanges of metal flashings using asphalt roofing cement or elastomeric flashing sealant.

B. Pipe Flashings: Form flashing around pipe penetrations and asphalt shingles. Fasten and seal to asphalt shingles as recommended by manufacturer.

3.3 INSTALLATION OF ASPHALT SHINGLES

A. Install asphalt shingles in accordance with manufacturer's written instructions and recommendations in NRCA's "NRCA Guidelines for Asphalt Shingle Roof Systems."

B. Install starter strip along lowest roof edge, consisting of an asphalt shingle strip with tabs removed at least 7 inches (178 mm) wide with self-sealing strip face up at roof edge.

1. Extend asphalt shingles 3/4 inch (19 mm) over fasciae at eaves and rakes.
2. Install starter strip along raked edge.

C. Install first and remaining courses of laminated asphalt shingles stair-stepping diagonally across roof deck with manufacturer's recommended offset pattern at succeeding courses, maintaining uniform exposure.

D. Install first and remaining courses of three-tab-strip asphalt shingles stair-stepping diagonally across roof deck with 5-inch (127-mm) offset pattern at succeeding courses, maintaining uniform exposure.

E. Fasten asphalt shingle strips with a minimum of four roofing nails, but not less than the number indicated in manufacturer's written instructions for roof slope and design wind speed indicated on Drawings and for warranty requirements specified in this Section.

1. Locate fasteners in accordance with manufacturer's written instructions.
2. Where roof slope exceeds 18:12, hand seal self-sealing asphalt shingles to improve the shingles' positive bond by applying asphalt roofing cement spots between course overlaps after nailing the upper course.

3. Where roof slope is less than 4:12, hand seal self-sealing asphalt shingles to improve the shingles' positive bond by applying asphalt roofing cement spots between course overlaps after nailing the upper course.
4. When ambient temperature during installation is below 50 deg F (10 deg C), hand seal self-sealing asphalt shingles by applying asphalt roofing cement spots between course overlaps after nailing the upper course.

F. Woven Valleys: Extend succeeding asphalt shingle courses from both sides of valley 12 inches (305 mm) beyond center of valley, weaving intersecting shingle-strip courses over each other. Use one-piece shingle strips without joints in valley.
1. Do not asphalt shingles within 6 inches (152 mm) of valley center.

G. Closed-Cut Valleys: Extend asphalt shingle strips from one side of valley 12 inches (305 mm) beyond center of valley.

1. Use one-piece shingle strips without joints in valley.
2. Fasten with extra nail in upper end of shingle. Install asphalt shingle courses from other side of valley and cut back to a straight line 2 inches (51 mm) short of valley centerline.
3. Trim upper concealed corners of cut-back shingle strips.
4. Do not nail asphalt shingles within 6 inches (152 mm) of valley center.
5. Set trimmed, concealed-corner asphalt shingles in a 3-inch- (76-mm-) wide bed of asphalt roofing cement.

H. Open Valleys: Cut and fit asphalt shingles at open valleys, trimming upper concealed corners of shingle strips.

1. Maintain uniform width of exposed open valley from highest to lowest point.
2. Extend shingle a minimum of 4 inches (102 mm) over valley metal.
3. Set valley edge of asphalt shingles in a 3-inch- (76-mm-) wide bed of asphalt roofing cement.
4. Do not nail asphalt shingles to metal open-valley flashings.

I. Ridge Vents: Install continuous ridge vents over asphalt shingles in accordance with manufacturer's written instructions. Fasten with roofing nails of sufficient length to penetrate sheathing.

J. Hip and Ridge Shingles: Maintain same exposure of cap shingles as roofing-shingle exposure. Lap cap shingles at ridges to shed water away from direction of prevailing winds.

1. Fasten with roofing nails of sufficient length to penetrate sheathing.
2. Fasten ridge cap asphalt shingles to cover ridge vent without obstructing airflow.

END OF SECTION 073113

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SECTION 07 42 13 - COMPOSITE METAL PANELS

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 performance criteria, materials, production, and erection of metal composite material wall panel systems for the project. The work performed under this Section consists of the provision of all plant, materials, labor and equipment and the like necessary and/or required for the complete execution of all metal composite material wall panel systems as required by the this section, schedules, keynotes and drawings including, but not limited to the following.

1. Aluminum faced composite panels with mounting system. Panel mounting system including anchorages, shims, furring, fasteners, gaskets and sealants, related flashing adapters, and masking (as required) for a complete watertight installation.
2. Parapet coping, column covers, soffits, sills, border, and filler items indicated as integral components of the panel system or as designed.
3. Interior panel ceiling system work that matches exterior panel system work.
4. Provide for two colors of metal panels. See drawings for color locations.

B. Related Requirements:

1. Division 5: Structural steel and Cold-formed metal framing
2. Division 6: Back up walls.
3. Division 7: Insulation, Metal flashing and counter flashing, Caulking and sealants.
4. Division 9: Interior finishes.

C. This work includes all composite metal panels, with the exception that at the East and West Additions, the exterior metal panels are installed under separate envelope project.

1.3 PREINSTALLATION MEETINGS

A. Preinstallation Conference: Conduct conference at Project site.

1. Meet with Owner, Architect, Owner's insurer if applicable, metal composite material panel Installer, metal composite material panel manufacturer's representative, structural-support Installer, and installers whose work interfaces with or affects metal composite material panels, including installers of doors, windows, and louvers.
2. Review and finalize construction schedule and verify availability of materials, Installer's personnel, equipment, and facilities needed to make progress and avoid delays.

3. Review methods and procedures related to metal composite material panel installation, including manufacturer's written instructions.
4. Examine support conditions for compliance with requirements, including alignment between and attachment to structural members.
5. Review flashings, special siding details, wall penetrations, openings, and condition of other construction that affect metal composite material panels.
6. Review governing regulations and requirements for insurance, certificates, and tests and inspections if applicable.
7. Review temporary protection requirements for metal composite material panel assembly during and after installation.
8. Review procedures for repair of panels damaged after installation.
9. Document proceedings, including corrective measures and actions required, and furnish copy of record to each participant.

1.4 ACTION SUBMITTALS

A. Product Data: For each type of product.

1. Include construction details, material descriptions, and tested physical and performance properties of panels and accessories.
2. Include manufacturer's written instructions for evaluating, preparing, and treating substrate.

B. Shop Drawings:

1. Show locations and extent of waterproofing and details of substrate joints and cracks, sheet flashings, penetrations, inside and outside corners, tie-ins with adjoining waterproofing, and other termination conditions.
2. Include fabrication and installation layouts of metal composite material panels; details of edge conditions, joints, panel profiles, corners, anchorages, attachment assembly, trim, flashings, closures, and accessories; and special details.
3. Accessories: Include details of the flashing, trim and anchorage, at a scale of not less than 1-1/2 inches per 12 inches (1:10).

C. Samples for Initial Selection: For each type of metal composite material panel indicated with factory-applied color finishes.

1. Include similar Samples of trim and accessories involving color selection.

D. Samples for Verification: For each type of exposed finish required, prepared on Samples of size indicated below.

1. Mockup for each type of panel system assembly (12” x 12”).
2. Two samples of each color or finish selected minimum 3” x 4”.
3. Metal Composite Material Panels: 12 inches (305 mm) long by actual panel width. Include fasteners, closures, and other metal composite material panel accessories.

E. Code Compliance

1. Documents showing product compliance with the national and local building code shall be submitted prior to the bid. These documents shall include, but not be limited to, appropriate Evaluation Reports and/or test reports supporting the use of the product.

1.5 INFORMATIONAL SUBMITTALS

A. Qualification Data: For Installer.

B. Product Test Reports: For each product, tests performed by a qualified testing agency.

C. Field quality-control reports.

D. Sample Warranties: For special warranties.

1.6 CLOSEOUT SUBMITTALS

A. Maintenance Data: For metal composite material panels to include in maintenance manuals.

1.7 QUALITY ASSURANCE

A. Manufacturer/Installer Qualifications:

1. Products shall be produced by a single manufacturer unless otherwise specified.
2. Composite Panel Manufacturer shall have a minimum of 5 years experience in the manufacturing of this product.
3. Composite Panel Manufacturer shall be solely responsible for panel manufacture and application of the finish.
4. Fabricator/installer shall be acceptable to the composite panel manufacturer.
5. Fabricator/Installer shall have a minimum 5 years experience of metal panel work similar in scope and size to this project.

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 mockup of typical metal composite material panel assembly as shown on Drawings including corner, soffits, supports, attachments, and accessories.
2. Water-Spray Test: Conduct water-spray test of mockup of metal composite material panel assembly, testing for water penetration according to AAMA 501.2.
3. Approval of mockups does not constitute approval of deviations from the Contract Documents contained in mockups unless Architect specifically approves such deviations in writing.
4. Subject to compliance with requirements, approved mockups may become part of the completed Work if undisturbed at time of Substantial Completion.

C. Field Measurements should be taken prior to the completion of shop fabrication whenever possible. Coordinate fabrication schedule with constriction progress as directed by the Contractor to avoid delay of work. Field fabrication is required to ensure proper fit.

1.8 DELIVERY, STORAGE, AND HANDLING

A. Deliver components, metal composite material panels, and other manufactured items so as not to be damaged or deformed. Package metal composite material panels for protection during transportation and handling.

B. Unload, store, and erect metal composite material panels in a manner to prevent bending, warping, twisting, and surface damage.

C. Stack metal composite material panels horizontally on platforms or pallets, covered with suitable weathertight and ventilated covering. Store metal composite material panels to ensure dryness, with positive slope for drainage of water. Do not store metal composite material panels in contact with other materials that might cause staining, denting, or other surface damage.

D. Retain strippable protective covering on metal composite material panels during installation.

1.9 FIELD CONDITIONS

A. Weather Limitations: Proceed with installation only when existing and forecasted weather conditions permit assembly of metal composite material panels to be performed according to manufacturers' written instructions and warranty requirements.

1.10 COORDINATION

A. Coordinate metal composite material panel installation with rain drainage work, flashing, trim, construction of soffits, and other adjoining work to provide a leakproof, secure, and noncorrosive installation.

1.11 WARRANTY

A. Special Warranty: Manufacturer's standard form in which manufacturer agrees to repair or replace components of metal composite material panel systems that fail in materials or workmanship within specified warranty period.

1. Failures include, but are not limited to, the following:

    a. Structural failures including rupturing, cracking, or puncturing.
    b. Deterioration of metals and other materials beyond normal weathering.

2. Warranty Period: Five years from date of Substantial Completion.

B. Special Warranty on Panel Finishes: Manufacturer's standard form in which manufacturer agrees to repair finish or replace metal composite material panels that show evidence of deterioration of factory-applied finishes within specified warranty period.

1. Exposed Panel 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 MATERIALS, GENERAL

A. Source Limitations for Wall Panel System: Obtain system materials from single source from single manufacturer.

2.2 PERFORMANCE REQUIREMENTS

A. Structural Performance: Provide metal composite material panel systems capable of withstanding the effects of the following loads, based on testing according to ASTM E 330:

1. Wind Loads: As indicated on Drawings.
2. Other Design Loads: As indicated on Drawings.
3. Deflection Limits: For wind loads, no greater than 1/240 of the span.

B. Air Infiltration: Air leakage of not more than 0.06 cfm/sq. ft. (0.3 L/s per sq. m) when tested according to ASTM E 283 at the following test-pressure difference:

1. Test-Pressure Difference: 6.24 lbf/sq. ft. (300 Pa).

C. Water Penetration under Static Pressure: No water penetration when tested according to ASTM E 331 at the following test-pressure difference:

1. Test-Pressure Difference: 6.24 lbf/sq. ft. (300 Pa).
2. Design to drain any water leakage occurring at the joints.

D. Thermal Movements: Allow for thermal movements from ambient and surface temperature changes by preventing buckling, opening of joints, overstressing of components, failure of joint sealants, failure of connections, and other detrimental effects. 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 (67 deg C), ambient; 180 deg F (100 deg C), material surfaces.

E. Fire-Resistance Ratings: Comply with ASTM E 119; testing by a qualified testing agency. Identify products with appropriate markings of applicable testing agency.

1. Indicate design designations from UL's "Fire Resistance Directory" or from the listings of another qualified testing agency.

2.3 EXTERIOR METAL COMPOSITE MATERIAL WALL PANELS

A. Metal Composite Material Wall Panel Systems: Provide factory-formed and -assembled, metal composite material wall panels fabricated from two metal facings that are bonded to a solid, extruded thermoplastic core; formed into profile for installation method indicated, with no glues or adhesives between dissimilar materials. The core material shall be free of voids and / or air spaces and not contain foamed insulation material. Include attachment assembly components, panel stiffeners, and accessories required for weathertight system.

1. Basis-of-Design Product: Subject to compliance with requirements, provide CF Architectural Vertical, Insulated Metal Wall Panel by Metal Span, a Nucor Company or approved equal product by one of the following:

    a. Kingspan, Optima Insulated Wall Panel System
    b. Or equal

B. Aluminum-Faced Composite Wall Panels: Formed with 22GA thick, zinc-coated aluminum sheet facings.

1. Panel Thickness: 2”
2. Exterior & Interior Finish: Three-coat fluoropolymer.
3. Color: To be selected by Architects from Manufacturers range of colors.

C. Attachment Assembly Components: Formed from extruded aluminum.

D. Attachment Assembly: Manufacturer’s standard.

E. R-Value: 17.5

F. U-Value U-0.059

G. System Type: Lock and Groove

H. Fasteners: As per Manufacturer’s recommendation.

2.4 INTERIOR METAL COMPOSITE MATERIAL WALL PANELS

A. Metal Composite Material Wall Panel Systems: Provide factory-formed and -assembled, metal composite material wall panels fabricated from two metal facings that are bonded to a solid, extruded thermoplastic core; formed into profile for installation method indicated, with no glues or adhesives between dissimilar materials. The core material shall be free of voids and / or air spaces and not contain foamed insulation material. Include attachment assembly components, panel stiffeners, and accessories required for weathertight system.

1. Basis-of-Design Product: Subject to compliance with requirements, provide Interiors Alucobond Plus by 3A Composites USA, Inc., or approved equal product by one of the following:

    a. Alcoa Inc.
    b. Gordon, Inc.
    c. Omega Panel Products.
    d. Petersen Aluminum Corporation.

B. Aluminum-Faced Composite Wall Panels: Formed with 0.020-inch- (0.50-mm-) thick, coil-coated aluminum sheet facings.

1. Panel Thickness: 0.157 inch (4 mm).
2. Panel Weight: 1.12 lbs./sq.ft.
3. Exterior Finish: Three-coat fluoropolymer.

C. Attachment Assembly Components: Formed from extruded aluminum.

D. Attachment Assembly: Manufacturer's standard.

E. System Type:

1. Rout and Return Dry:

a. System must provide a perimeter aluminum extrusion with integral weather stripping. No field sealant required in joints unless specifically noted on drawings, Provide a means of concealed drainage with baffles and weeps for water which may accumulate in members of the system.

F. Fasteners: As per Manufacturer's recommendation.

2.5 MISCELLANEOUS MATERIALS

A. Miscellaneous Metal Subframing and Furring: ASTM C 645, cold-formed, metallic-coated steel sheet ASTM A 653/A 653M, G90 (Z275 hot-dip galvanized) coating designation or ASTM A 792/A 792M, Class AZ50 (Class AZM150) aluminum-zinc-alloy coating designation unless otherwise indicated. Provide manufacturer's standard sections as required for support and alignment of metal composite material panel system.

B. Panel Accessories: Provide components required for a complete, weathertight panel system including trim, copings, fasciae, mullions, sills, corner units, clips, flashings, sealants, gaskets, fillers, closure strips, and similar items. Match material and finish of metal composite material panels unless otherwise indicated.

C. Flashing and Trim: Provide flashing and trim formed from same material as metal composite material panels as required to seal against weather and to provide finished appearance. Locations include, but are not limited to, bases, drips, sills, jambs, corners, endwalls, framed openings, rakes, fasciae, parapet caps, soffits, reveals, and fillers. Finish flashing and trim with same finish system as adjacent metal composite material panels.

D. Panel Fasteners: Self-tapping screws designed to withstand design loads. Provide exposed fasteners with heads matching color of metal composite material panels by means of plastic caps or factory-applied coating. Provide EPDM or PVC sealing washers for exposed fasteners.

2.6 FABRICATION

A. General: Fabricate and finish metal composite material panels and accessories at the factory, by manufacturer's standard procedures and processes, as necessary to fulfill indicated performance requirements demonstrated by laboratory testing. Comply with indicated profiles and with dimensional and structural requirements.

B. Fabricate metal composite material panel joints with factory-installed captive gaskets or separator strips that provide a weathertight seal and prevent metal-to-metal contact, and that minimize noise from movements.

C. Sheet Metal Flashing and Trim: Fabricate flashing and trim to comply with manufacturer's recommendations and recommendations in SMACNA's "Architectural Sheet Metal Manual" that apply to design, dimensions, metal, and other characteristics of item indicated.

1. Form exposed sheet metal accessories that are without excessive oil canning, buckling, and tool marks and that are true to line and levels indicated, with exposed edges folded back to form hems.
2. Seams for Aluminum: Fabricate nonmoving seams with flat-lock seams. Form seams and seal with epoxy seam sealer. Rivet joints for additional strength.
3. Seams for Other Than Aluminum: Fabricate nonmoving seams in accessories with flat-lock seams. Tin edges to be seamed, form seams, and solder.
4. Sealed Joints: Form non-expansion, but movable, joints in metal to accommodate sealant and to comply with SMACNA standards.
5. Conceal fasteners and expansion provisions where possible. Exposed fasteners are not allowed on faces of accessories exposed to view.
6. Fabricate cleats and attachment devices from same material as accessory being anchored or from compatible, noncorrosive metal recommended in writing by metal panel manufacturer.

    a. Size: As recommended by SMACNA's "Architectural Sheet Metal Manual" or metal wall panel manufacturer for application but not less than thickness of metal being secured.

2.7 FINISHES

A. Protect mechanical and painted finishes on exposed surfaces from damage by applying a strippable, temporary protective covering before shipping.

B. 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 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.

C. Aluminum Panels and Accessories:

1. Coil coated KYNAR 500 or HYLAR 5000 based PolyvInylidene Fluoride (PVDF) or Fluoro Ethylene Alkyl Vinyl Ether (FEVE) resin in conformance with the general requirements of AAMA 2605.

D. Colors:

1. Field Color: Basis of Design- Dark Bronze, PVDF-2/Gloss level-30

2. As selected by Architect, from full range of manufacturer’s standard colors.

PART 3 - EXECUTION

3.1 EXAMINATION

A. Examine substrates, areas, and conditions, with Installer present, for compliance with requirements for installation tolerances, metal composite material panel supports, and other conditions affecting performance of the Work.

1. Examine wall framing to verify that girts, angles, channels, studs, and other structural panel support members and anchorage have been installed within alignment tolerances required by metal composite material wall panel manufacturer.
2. Examine wall sheathing to verify that sheathing joints are supported by framing or blocking and that installation is within flatness tolerances required by metal composite material wall panel manufacturer.

    a. Verify that air- or water-resistive barriers have been installed over sheathing or backing substrate to prevent air infiltration or water penetration.

B. Examine roughing-in for components and assemblies penetrating metal composite material panels to verify actual locations of penetrations relative to seam locations of metal composite material panels before installation.

C. Proceed with installation only after unsatisfactory conditions have been corrected.

3.2 PREPARATION

A. Miscellaneous Supports: Install subframing, furring, and other miscellaneous panel support members and anchorages according to ASTM C 754 and metal composite material panel manufacturer's written recommendations.

3.3 METAL COMPOSITE MATERIAL PANEL INSTALLATION

A. General: Install metal composite material panels according to manufacturer's written instructions in orientation, sizes, and locations indicated on Drawings. Install panels perpendicular to supports unless otherwise indicated. Anchor metal composite material panels and other components of the Work securely in place, with provisions for thermal and structural movement.

1. Shim or otherwise plumb substrates receiving metal composite material panels.
2. Flash and seal metal composite material panels at perimeter of all openings. Fasten with self-tapping screws. Do not begin installation until air- or water-resistive barriers and flashings that will be concealed by metal composite material panels are installed.
3. Install screw fasteners in predrilled holes.
4. Locate and space fastenings in uniform vertical and horizontal alignment.
5. Install flashing and trim as metal composite material panel work proceeds.
6. Locate panel splices over, but not attached to, structural supports. Stagger panel splices and end laps to avoid a four-panel lap splice condition.
7. Align bottoms of metal composite material panels and fasten with blind rivets, bolts, or self-tapping screws. Fasten flashings and trim around openings and similar elements with self-tapping screws.

8. Provide weathertight escutcheons for pipe- and conduit-penetrating panels.

B. Fasteners:

1. Aluminum Panels: Use aluminum or stainless-steel fasteners for surfaces exposed to the exterior; use aluminum or galvanized-steel fasteners for surfaces exposed to the interior.

C. Metal Protection: Where dissimilar metals contact each other or corrosive substrates, protect against galvanic action as recommended in writing by metal composite material panel manufacturer.

D. Attachment Assembly, General: Install attachment assembly required to support metal composite material wall panels and to provide a complete weathertight wall system, including subgirts, perimeter extrusions, tracks, drainage channels, panel clips, and anchor channels.

1. Include attachment to supports, panel-to-panel joinery, panel-to-dissimilar-material joinery, and panel-system joint seals.

E. Installation: Attach metal composite material wall panels to supports at locations, spacings, and with fasteners recommended by manufacturer to achieve performance requirements specified.

1. Seal horizontal and vertical joints between adjacent metal composite material wall panels with manufacturer's standard gaskets.
2. Install furring channels (7/8-inch) outboard of rigid insulation, secured to CMU backup; metal composite panels are installed with system clips and fastened thru the furring channel.

F. Clip Installation: Attach panel clips to supports at locations, spacings, and with fasteners recommended by manufacturer. Attach routed-and-returned flanges of wall panels to panel clips with manufacturer's standard fasteners.

1. Seal horizontal and vertical joints between adjacent metal composite material wall panels with manufacturer's standard gaskets.
2. Install furring channels (7/8-inch) outboard of rigid insulation, secured to CMU backup; metal composite panels are installed with system clips and fastened thru the furring channel.

G. Accessory Installation: Install accessories with positive anchorage to building and weathertight mounting, and provide for thermal expansion. Coordinate installation with flashings and other components.

1. Install components required for a complete metal composite material panel assembly including trim, copings, corners, seam covers, flashings, sealants, gaskets, fillers, closure strips, and similar items. Provide types indicated by metal composite material panel manufacturer; or, if not indicated, provide types recommended in writing by metal composite material panel manufacturer.

H. Flashing and Trim: Comply with performance requirements, manufacturer's written installation instructions, and SMACNA's "Architectural Sheet Metal Manual." Provide concealed fasteners where possible, and set units true to line and level as indicated. Install work with laps, joints, and seams that are permanently watertight.

1. Install exposed flashing and trim that is without buckling and tool marks and that is true to line and levels indicated, with exposed edges folded back to form hems. Install sheet metal flashing and trim to fit substrates and to result in waterproof performance.
2. Expansion Provisions: Provide for thermal expansion of exposed flashing and trim. Space movement joints at a maximum of 10 feet (3 m) with no joints allowed within 24 inches (605 mm) of corner or intersection. Where lapped expansion provisions cannot be used or would not be sufficiently waterproof, form expansion joints of intermeshing hooked flanges, not less than 1 inch (25 mm) deep, filled with mastic sealant (concealed within joints).

3.4 ERECTION TOLERANCES

A. Installation Tolerances: Shim and align metal composite material wall panel units within installed tolerance of 1/4 inch in 20 feet (6 mm in 6 m), non-accumulative, on level, plumb, and location lines as indicated, and within 1/8-inch (3-mm) offset of adjoining faces and of alignment of matching profiles.

3.5 FIELD QUALITY CONTROL

A. Testing Agency: Owner will engage a qualified independent testing agency to perform field tests and inspections.

B. Water-Spray Test: After installation, test area of assembly as directed by Architect for water penetration according to AAMA 501.2.

C. Manufacturer's Field Service: Engage a factory-authorized service representative to test and inspect completed metal composite material wall panel installation, including accessories.

D. Metal composite material wall panels will be considered defective if they do not pass test and inspections.

E. Additional tests and inspections, at Contractor's expense, are performed to determine compliance of replaced or additional work with specified requirements.

F. Prepare test and inspection reports.

3.6 CLEANING AND PROTECTION

A. Remove temporary protective coverings and strippable films, if any, as metal composite material panels are installed, unless otherwise indicated in manufacturer's written installation instructions. On completion of metal composite material panel installation, clean finished surfaces as recommended by metal composite material panel manufacturer. Maintain in a clean condition during construction.

B. After metal composite material panel installation, clear weep holes and drainage channels of obstructions, dirt, and sealant.

C. Replace metal composite material panels that have been damaged or have deteriorated beyond successful repair by finish touchup or similar minor repair procedures.

3.7 WASTE MANAGEMENT

A. Coordinate with Section 01 74 19.

1. Separate and recycle cut-offs and waste materials and material packaging in accordance with Waste Management Plan and to the maximum extent economically feasible and place in designated areas for recycling.
2. Set aside and protect materials suitable for reuse and/or remanufacturing.
3. Separate and fold up metal banding; flatten and place along with other metal scrap for recycling in designated area.

END OF SECTION 07 42 13

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SECTION 075600.13 - FLUID-APPLIED MEMBRANE ROOFING, INSULATED FOR NEW ROOFS

PART 1 - GENERAL

1.1 SUMMARY

A. This Section includes fluid-applied roof membrane system on insulated wood deck, consisting of the following:

1. Substrate board.
2. Vapor retarder.
3. Roof insulation and cover board.
4. Base-ply sheet.
5. Application of reinforced fluid-applied polyurethane roof membrane and membrane flashings.

B. Related Information:

1. Division 06 Section "Miscellaneous Rough Carpentry" for wood blocking and nailers.
2. Division 07 Section "Preparation for Re-Roofing" for existing roofing tear-off and substrate preparation for installation of new roofing membrane.
3. Division 07 Section "Sheet Metal Flashing and Trim" for manufactured reglets, formed metal roof flashings, expansion joints, copings, and roof edge metal.

1.2 ROOFING CONFERENCES

A. Roofing Preinstallation Conference: Conduct conference at Project site. Review methods and procedures related to roofing system.

1. Meet with Owner, Architect, Owner's insurer if applicable, testing and inspecting agency representative if applicable, roofing materials manufacturer's representative, roofing Installer including project manager and foreman, and installers whose work interfaces with or affects roofing including installers of roof accessories and roof-mounted equipment requiring removal and replacement as part of the Work.
2. Review methods and procedures related to preparation, including membrane roofing system manufacturer's written instructions.
3. Review drawings and specifications.

4. Review temporary protection requirements for existing roofing system that is to remain, during and after installation.

5. Review roof drainage during each stage of roofing and review roof drain plugging and plug removal procedures.

6. Review and finalize construction schedule, and verify availability of materials, Installer's personnel, equipment, and facilities needed to make progress and avoid delays.

7. Review base flashings, special roofing details, drainage, penetrations, equipment curbs, and condition of other construction that will affect re-coating.

8. Review HVAC shutdown and sealing of air intakes.

9. Review shutdown of fire-suppression, -protection, and -alarm and -detection systems.

10. Review procedures for asbestos removal or unexpected discovery of asbestos-containing materials.

11. Review governing regulations and requirements for insurance and certificates if applicable.

12. Review existing conditions that may require notification of Owner before proceeding.

1.3 DEFINITIONS

A. Roofing Terminology: Refer to ASTM D1079 "Standard Terminology Relating to Roofing and Waterproofing" and glossary in applicable edition of NRCA's "The NRCA Roofing Manual: Membrane Roof Systems" for definition of terms related to roofing work in this Section.

1.4 ACTION SUBMITTALS

A. Product Data: For each type of product specified.

B. Shop Drawings: Include plans, elevations, sections, details, and attachments to other work. Provide roof plan showing orientation and types of roof deck and orientation of membrane roofing and fastening spacings and patterns for mechanically fastened components.

1. Base flashings and terminations.

2. Tapered insulation, including slopes.

3. Crickets, saddles, and tapered edge strips, including slopes.

1.5 INFORMATIONAL SUBMITTALS

A. Contractor's Product Certificate: Submit certificate, indicating products intended for Work of this Section, including product names and numbers and manufacturers' names, with statement indicating that products to be provided meet the requirements of the Contract Documents.

B. Qualification Data: For Installer, Manufacturer, and Roofing Inspector.

1. Letter written for this Project indicating manufacturer approval of Installer to apply specified products and provide specified warranty.

C. Warranties: Unexecuted sample copies of special warranties.

D. Photographs or Videotape: Show existing conditions of adjoining construction and site improvements, including exterior and interior finish surfaces, which might be misconstrued as having been damaged by re-coating operations. Submit before Work begins.

E. Inspection Reports: Reports of Roofing Inspector. Include description of work performed, tests performed, defective work observed, and corrective actions required and carried out.

1.6 CLOSEOUT SUBMITTALS

A. Maintenance Data: To include in maintenance manuals.

B. Warranties: Executed copies of approved warranty forms.

1.7 QUALITY ASSURANCE

A. Installer Qualifications: An employer of workers trained and certified by manufacturer, including a full-time on-site supervisor with a minimum of five years' experience installing products comparable to those specified, able to communicate verbally with Contractor, Architect, and employees, and the following:

1. Qualified by the manufacturer to install manufacturer's product and furnish warranty of type specified.

B. Manufacturer Qualifications: Approved manufacturer listed in this Section, with minimum five years' experience in manufacture of specified products in successful use in similar applications.

1. Approval of Other Manufacturers and Comparable Products: Submit the following in accordance with project substitution requirements, within time allowed for substitution review:

a. Product data, including certified independent test data indicating compliance with requirements.

b. Samples of each component.

c. Sample submittal from similar project.

d. Project references: Minimum of five installations of specified products not less than five years old, with Owner and Architect contact information.

e. Sample warranty.

C. Roofing Inspector Qualifications: A technical representative of manufacturer not engaged in the sale of products and experienced in the installation and maintenance of the specified roofing system, qualified to perform roofing observation and inspection specified in Field Quality Control Article, to determine Installer's compliance with the requirements of this Project, and approved by the manufacturer to issue warranty certification. The Roofing Inspector shall be one of the following:

1. An authorized full-time technical employee of the manufacturer.

2. An independent party certified as a Registered Roof Observer by the International Institute of Building Enclosure Consultants (formerly the Roof Consultants Institute) retained by the Contractor or the Manufacturer and approved by the Manufacturer.

1.8 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. Handle and store roofing materials, and place equipment in a manner to avoid significant or permanent damage to deck or structural supporting members.

C. Protect materials from physical damage and from deterioration by sunlight, moisture, soiling, and other sources. Store in a dry location. Comply with manufacturer's written instructions for handling, storing, and protecting.

1.9 PROJECT / FIELD CONDITIONS

A. Protect building, adjacent buildings, walkways, site improvements, exterior plantings, and landscaping from damage or soiling from roofing operations.

B. Maintain access to existing walkways, corridors, and other adjacent occupied or used facilities.

C. Weather Limitations: Proceed with roofing work only when existing and forecasted weather conditions permit Work to proceed without water entering into existing roofing system or building.

1. Store all materials prior to application at temperatures between 60 and 90 deg. F (16 and 32 deg C).

2. Apply coatings within range of ambient and substrate temperatures recommended by manufacturer. Do not apply materials when air temperature is below 50 or above 110 deg. F (10 or above 43 deg C).

3. Do not apply roofing in snow, rain, fog, or mist.

D. Daily Protection: Coordinate installation of roofing so insulation and other components of roofing system not permanently exposed are not subjected to precipitation or left uncovered at the end of the workday or when rain is forecast.

E. Owner will occupy portions of building immediately below roofing area. Conduct roofing so Owner's operations will not be disrupted. Provide Owner with not less than 72 hours' notice of activities that may affect Owner's operations.

1.10 WARRANTY

A. Manufacturer's Warranty: Roof System Manufacturer's standard form in which Manufacturer agrees to repair or replace components of roofing system that fail in materials or workmanship within warranty period, as follows.

1. Form of Warranty: Manufacturer's standard warranty form.

2. Scope of Warranty: Work of this Section and including sheet metal details and termination details installed by the roof system Installer and approved by the Roof System Manufacturer.

3. Warranty Period: 20 years from date of completion.

B. Manufacturer Inspection Services: By manufacturer's technical representative, to report maintenance responsibilities to Owner necessary for preservation of Owner's warranty rights. The cost of manufacturer's inspections is included in the Contract Sum.

1. Inspections to occur in following years: 2, 5, 10 and 15 following completion.

C. Installer Warranty: Installer's warranty signed by Installer, as follows.

1. Form of Warranty: Form acceptable to Roofing Manufacturer and Owner.

2. Scope of Warranty: Work of this Section.

3. Warranty Period: 2 years from date of completion.

PART 2 - PRODUCTS

2.1 MANUFACTURERS

A. Basis of Design: The roof system specified in this Section is based upon products of Tremco CPG Inc, Beachwood, OH, (800) 562-2728, www.tremcoroofing.com that are named in other Part 2 articles. Provide specified products or comparable products of one of the following.

1. Kemper.

2. Pacific Polymers.

B. Source Limitations: Obtain components for roofing system from same manufacturer as membrane roofing or manufacturer approved by membrane roofing manufacturer.

2.2 PERFORMANCE REQUIREMENTS

A. General: Provide roofing membrane and base flashings that remain watertight; do not permit the passage of water; and resist specified uplift pressures, thermally induced movement, and exposure to weather without failure.

1. Accelerated Weathering: Roofing system shall withstand 2000 hours of exposure when tested according to ASTM G152, ASTM G154, or ASTM G155.

2. Impact Resistance: Roof membrane shall resist impact damage when tested according to ASTM D3746/D3746M, ASTM D4272/D4272M, or the "Resistance to Foot Traffic Test" in FM Approvals 4470.

B. Material Compatibility: Provide roofing materials that are compatible with one another under conditions of service and application required, as demonstrated by roofing manufacturer based on testing and field experience.

C. Roofing System Design: Provide roofing system that is identical to systems that have been successfully tested by a qualified testing and inspecting agency in accordance with ANSI/FM 4474, UL 580, or UL 1897, and to resist uplift pressures.

1. Zone 1 (Field-of-Roof) Uplift Pressure: 63.3 psf.

2. Zone 2 (Perimeter) Uplift Pressure: 83.6 psf, located within 24 ft. of roof perimeter.

3. Zone 3 (Corner) Uplift Pressure: 113.9 psf, located within 24 ft. of outside corners.

D. SPRI Wind Design Standard: Manufacture and install copings and roof edge flashings tested according to ANSI/SPRI ES-1.

1. Design Pressure: 113.9 psf.

E. Flashings: Comply with requirements of Division 07 Sections "Sheet Metal Flashing and Trim" and "Manufactured Roof Specialties." Provide base flashings, perimeter flashings, detail flashings and component materials that comply with requirements and recommendations of the following:

1. FMG 1-49 Loss Prevention Data Sheet for Perimeter Flashings.

2. FMG 1-29 Loss Prevention Data Sheet for Above Deck Roof Components.

3. NRCA Roofing Manual (Sixth Edition) for construction details and recommendations.

4. SMACNA Architectural Sheet Metal Manual (Seventh Edition) for construction details.

F. Solar Reflectance Index: Not less than 78 when calculated according to ASTM E1980, based on testing identical products by a qualified testing agency.

G. Exterior Fire-Test Exposure: ASTM E108, 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.

2.3 MATERIALS

A. General: Roofing materials recommended by roofing system manufacturer for intended use and compatible with components of existing membrane roofing system.

B. General: Provide adhesive and sealant materials recommended by roofing manufacturer for intended use and compatible with built-up roofing.

1. Liquid-type auxiliary materials shall comply with VOC limits of authorities having jurisdiction.

2.4 SHEET MATERIALS

A. Base-Ply Sheet:

1. SBS-modified asphalt coated composite polyester / fiberglass/fiberglass mat reinforced high tensile strength base sheet, ASTM D4601 Type II.

a. Basis of design product: Tremco, BURmastic Composite Ply HT.

b. Tensile Strength at 77 deg. F (25 deg. C), minimum, ASTM D5147: Machine direction, 165 lbf/in (725 N); Cross machine direction, 150 lbf/in (660 N).

c. Tear Strength at 77 deg. F (25 deg. C), minimum, ASTM D5147: Machine direction, 260 lbf (1150 N); Cross machine direction, 230 lbf (1120 N).

d. Thickness, minimum, ASTM D5147: 0.060 inch (1.5 mm).

B. Flashing Base-Ply Sheet: Same product as base-ply sheet.

2.5 FLUID-APPLIED ROOFING MEMBRANE

A. Polyurethane Elastomeric Fluid-Applied System: Two-coat reinforced fluid-applied roofing membrane formulated for application over prepared existing roofing substrate.

1. Base Coat:

a. Polyurethane Roof Coating System Base Coat: Bio-based, low-odor low-VOC two-part, for use with a compatible top coat.

1) Basis of design product: Tremco, AlphaGuard BIO Base Coat.

2) Combustion Characteristics, UL 790: Maintains combustion characteristics of existing roof system.

3) Volatile Organic Compounds (VOC), maximum, ASTM D3960: 1 g/L.

4) Accelerated Weathering, 5000 hours, ASTM G154: Pass.

5) Hardness, Shore A, minimum, ASTM D2240: 80.

6) Solids, by volume, ASTM D2697: 100 percent.

7) Bio-Based Content, Minimum: 70 percent.

8) Minimum Thickness, Base Coat reinforced over Smooth BUR, MB, Concrete, Single-Ply: 48 mils (1.22 mm) wet.

2. Top Coat:

a. Polyurethane roof coating system top coat, bio-based low-odor low-VOC two-part, for application over compatible base coat.

1) Basis of design product: Tremco, AlphaGuard BIO Top Coat.

2) Combustion Characteristics, UL790: Maintains combustion characteristics of existing roof system.

3) Volatile Organic Compounds (VOC), maximum, ASTM D3960: 6 g/L.

4) Solar Reflectance Index (SRI), ASTM E1980: For white, not less than 103.

5) Accelerated Weathering, 5000 hours, ASTM G 154: Pass.

6) Hardness, Shore A, minimum, ASTM D2240: 81.

7) Solids, by volume, ASTM D2697: 100 percent.

8) Bio-Based Content, Minimum: 60 percent.

9) Minimum Thickness, reinforced system: 32 mils (0.81 mm) wet.

10) Minimum Thickness, Slip-Resistant Coat: 24 mils (0.60 mm) wet.

11) Color: White.

3. Reinforcing Fabric:

a. Polyester Reinforcing Fabric: 100 percent stitch-bonded mildew-resistant polyester fabric intended for reinforcement of compatible fluid-applied membranes and flashings.

1) Basis of design product: Tremco, Permafab.

2) Tensile Strength, Minimum, ASTM D5034 (2-inch): MD - 110 lbs (49.8 kg); XMD - 60 lbs (27.2 kg) avg.

3) Elongation, Minimum, ASTM D5034 (1-inch): MD - 25 percent; XMD - 100 percent.

4) Tear Strength, Minimum, ASTM D5587: MD - 20 lbs (9.0 kg) avg; XMD - 20 lbs (9.0 kg) avg.

5) Weight: 3 oz./sq. yd (102 g/sq. m).

4. Primers:

a. Primer for Asphaltic and Single-Ply Membranes: Water-based, polymer-modified quick-dry low odor primer.

1) Basis of design product: Tremco, AlphaGuard WB Primer.

2) Volatile Organic Compounds (VOC), maximum, ASTM D3960: 1 g/L.

3) Solids, by weight: 70 percent.

b. Primer for Masonry Surfaces: Two-part high-solids epoxy-penetrating low-odor primer for masonry and concrete surfaces.

1) Basis of design product: Tremco, AlphaGuard C-Prime.

2) Volatile Organic Compounds (VOC), maximum, ASTM D3960: 0 g/L.

3) Solids, by weight: 100 percent.

c. Primer for Non-Porous Surfaces: Single-part, water based primer to promote adhesion of urethanes to metals, PVC and other non-porous surfaces.

1) Basis of design product: Tremco, AlphaGuard M-Prime.

2) Volatile Organic Compounds (VOC), maximum, ASTM D3960: 22 g/L.

3) Nonvolatile Content, minimum, ASTM D2369: 5 percent.

4) Density at 77 deg F (25 deg C): 8.3 lb./gal (1kg/L).

d. Single-component reactivating primer used to prepare aged bio-based urethane products.

1) Basis of design product: Tremco, BIO Prime.

2) Coverage Rate: 1/4 gal / 100 sq. ft. (0.1 L/m2) (4 wet mils) minimum.

2.6 ADHESIVE MATERIALS

A. Base-Ply Sheet Adhesive:

1. Cold-applied bio-based low odor urethane roofing adhesive, two-part, USDA BioPreferred, formulated for compatibility and use with specified roofing membranes and flashings.

a. Basis of design product: Tremco, POWERply Endure BIO Adhesive TF.

b. Volatile Organic Compounds (VOC), maximum, ASTM D3690: 0 g/L.

c. Low Temperature Flexibility, ASTM D2240: Pass at -30 deg F (-34 deg C).

d. Solids, by Volume, ASTM D2697: 100 percent.

e. Biobase Content, Minimum, ASTM D6866: 70 percent.

B. Flashing Base-Ply Sheet Adhesive: Same product as base-ply sheet adhesive.

2.7 AUXILIARY ROOFING MEMBRANE MATERIALS

A. General: Auxiliary materials recommended by roofing system manufacturer for intended use and compatible with existing roofing system and fluid-applied roofing system.

B. Joint Sealant: Elastomeric joint sealant compatible with applied coating, with movement capability appropriate for application.

1. Joint Sealant, Polyurethane: ASTM C920, Type S, Grade NS, Class 50 single-component moisture curing sealant, formulated for compatibility and use in dynamic and static joints; paintable.

a. Basis of design product: Tremco, TremSEAL Pro.

b. Volatile Organic Compounds (VOC), maximum, ASTM D3960: 40 g/L.

c. Hardness, Shore A, ASTM C661: 40.

d. Adhesion to Concrete, ASTM C794: 35 pli.

e. Tensile Strength, ASTM D412: 350 psi (2410 kPa).

f. Color: White.

C. Stripping Adhesive / Sealer:

1. Seam Sealer: Aromatic polyurethane sealer, single-component, high solids, moisture curing, formulated for compatibility and use with a variety of roofing and flashing substrates.

a. Basis of design product: Tremco, GEOGARD Seam Sealer.

b. Volatile Organic Compounds (VOC), maximum, ASTM D3960: 189 g/L.

c. Tensile Strength, ASTM D412: 270 psi (1860 kPa).

d. Tear Strength, ASTM D412: 35 pli (6.13 kNm).

e. Elongation, ASTM D412: 220 percent.

f. Color: Gray.

D. Miscellaneous Accessories: Provide miscellaneous accessories recommended by roofing system manufacturer.

2.8 SUBSTRATE BOARDS

A. Substrate Boards:

1. Gypsum panel, glass-mat-faced, primed, ASTM C1177/C1177M.

a. Basis of design product: GP Gypsum DensDeck Prime.

b. Thickness: 1/2 inch (12 mm).

B. Fasteners: Factory-coated steel fasteners and metal plates complying with corrosion-resistance provisions in FM Approvals 4470, designed for fastening substrate board to roof deck.

2.9 VAPOR RETARDER/AIR BARRIER

A. Vapor Retarder Sheet:

1. SBS-modified asphalt coated composite polyester / fiberglass/fiberglass mat reinforced high tensile strength base sheet, ASTM D4601 Type II.

a. Basis of design product: Tremco, BURmastic Composite Ply HT.

b. Tensile Strength at 77 deg. F (25 deg. C), minimum, ASTM D5147: Machine direction, 165 lbf/in (725 N); Cross machine direction, 150 lbf/in (660 N).

c. Tear Strength at 77 deg. F (25 deg. C), minimum, ASTM D5147: Machine direction, 260 lbf (1150 N); Cross machine direction, 230 lbf (1120 N).

d. Thickness, minimum, ASTM D5147: 0.060 inch (1.5 mm).

B. Vapor Retarder Adhesive:

1. Cold-applied bio-based low odor urethane roofing adhesive, two-part, USDA BioPreferred, formulated for compatibility and use with specified roofing membranes and flashings.

a. Basis of design product: Tremco, POWERply Endure BIO Adhesive TF.

b. Volatile Organic Compounds (VOC), maximum, ASTM D3690: 0 g/L.

c. Low Temperature Flexibility, ASTM D2240: Pass at -30 deg F (-34 deg C).

d. Solids, by Volume, ASTM D2697: 100 percent.

e. Biobase Content, Minimum, ASTM D6866: 70 percent.

2.10 ROOF INSULATION

A. General: Preformed roof insulation boards manufactured or approved by roofing manufacturer, selected from manufacturer's standard sizes suitable for application, of thicknesses indicated.

1. Tapered Insulation: Provide factory-tapered insulation boards fabricated to slope of 1/8 inch per 12 inches (1:96) unless otherwise indicated.

2. Provide preformed saddles, crickets, tapered edge strips, and other insulation shapes where indicated for sloping to drain. Fabricate to slopes indicated, not less than two times the roof slope.

B. Roof Insulation:

1. Board Insulation, Polyisocyanurate: CFC- and HCFC- free, with recycled content glass-fiber mat facer on both major surfaces, ASTM C1289 Type II Class 1.

a. Compressive Strength, ASTM D1621: Grade 2: 20 psi (138 kPa).

2.11 INSULATION ACCESSORIES

A. General: Roof insulation accessories recommended by insulation manufacturer for intended use and compatible with built-up roofing.

B. Fasteners: Factory-coated steel fasteners and metal or plastic plates meeting corrosion-resistance provisions in FM Global 4470, designed for fastening roof insulation to substrate and acceptable to roofing manufacturer.

C. Roof Insulation Adhesive:

1. Urethane adhesive, bead-applied, low-rise two-component solvent-free low odor, formulated to adhere roof insulation to substrate.

a. Basis of design product: Tremco, Low Rise Foam Insulation Adhesive.

b. Flame Spread Index, ASTM E84: 10.

c. Smoke Developed Index, ASTM E84: 30.

d. Volatile Organic Compounds (VOC), maximum, ASTM D3960: 0 g/L.

e. Tensile Strength, minimum, ASTM D412: 250 psi (1720 kPa).

f. Peel Adhesion, minimum, ASTM D903: 17 lbf/in (2.50 kN/m).

g. Flexibility, 70 deg. F (39 deg. C), ASTM D816: Pass.

D. Insulation Cant Strips: ASTM C208, Type II, Grade 1, cellulosic-fiber insulation board.

E. Tapered Edge Strips: ASTM C208, Type II, Grade 1, cellulosic-fiber insulation board.

F. Cover Board:

1. Gypsum panel, glass-mat-faced, primed, ASTM C1177/C1177M.

a. Basis of design product: GP Gypsum DensDeck Prime.

b. Thickness: 1/2 inch (12 mm).

2.12 WALKWAYS

A. Walkway Materials:

1. Polyurethane Top Coat, Slip-Resistant: Second top coat with broadcast slip-resistant aggregate.

a. Basis of design product: Tremco, AlphaGuard BIO Top Coat Slip-Resistant.

b. Minimum Thickness: As indicated in Part 2 product listing; over cured top coat.

c. Ceramic granules: 10 to 15 lb./100 sq. ft.

d. Color: As selected from manufacturer's standard colors.

PART 3 - EXECUTION

3.1 EXAMINATION

A. Examine substrates, areas, and conditions, with Installer present, for compliance with the following requirements and other conditions affecting performance of roofing system:

1. Verify that roof openings and penetrations are in place and curbs are set and braced and that roof drain bodies are securely clamped in place.

2. Verify that existing substrate is sound and dry.

B. Proceed with installation once unsatisfactory conditions have been corrected.

3.2 PREPARATION

A. Remove existing roofing and protect existing building in accordance with requirements of Division 07 Section "Preparation for Re-Roofing."

B. Clean substrate of dust, debris, moisture, and other substances detrimental to roofing installation according to roofing manufacturer's written instructions. Remove sharp projections.

C. Protect existing roofing system that is indicated to remain, and adjacent portions of building and building equipment.

1. Mask surfaces to be protected. Seal joints subject to infiltration by coating materials.

2. Limit traffic and material storage to areas of existing roofing membrane that have been protected.

3. Maintain temporary protection and leave in place until replacement roofing has been completed.

D. Shut down air intake equipment in the vicinity of the Work in coordination with the Owner. Cover air intake louvers before proceeding with re-coating work that could affect indoor air quality or activate smoke detectors in the ductwork.

1. Verify that rooftop utilities and service piping affected by the Work have been shut off before commencing Work.

E. Maintain roof drains in functioning condition to ensure roof drainage at end of each workday. Prevent debris from entering or blocking roof drains and conductors. Use roof-drain plugs specifically designed for this purpose. Remove roof-drain plugs at end of each workday, when no work is taking place, or when rain is forecast.

1. Do not permit water to enter into or under existing membrane roofing system components that are to remain.

3.3 MEMBRANE ROOFING INSTALLATION, GENERAL

A. Install roofing membrane according to roofing manufacturer's written instructions.

1. Commence installation of roofing in presence of manufacturer's technical personnel.

B. Coordinate installation of roofing so insulation and other components of roofing not permanently exposed are not subjected to precipitation or left uncovered at the end of the workday or when rain is forecast.

1. Provide tie-offs at end of each day's work to cover exposed roofing sheets and insulation with a course of coated felt set in roofing cement with joints and edges sealed.

2. Complete terminations and base flashings and provide temporary seals to prevent water from entering completed sections of roofing.

3. Remove and discard temporary seals before beginning work on adjoining roofing.

C. Substrate-Joint Penetrations: Prevent fluid-applied materials and adhesives from penetrating substrate joints, entering building, or damaging built-up roofing components or adjacent building construction.

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 top flanges of steel deck to resist uplift pressure at corners, perimeter, and field of roof according to membrane roofing system manufacturers' written instructions. Spacing every 1.30 feet on center.

3.5 VAPOR-RETARDER INSTALLATION

A. Vapor Retarder Sheet, General: Completely seal vapor retarder/air barrier at terminations, obstructions, and penetrations to prevent air movement into roofing system. Seal vapor retarder/air barrier to air barrier in adjacent construction at perimeter of roofing system.

B. SBS Modified Bituminous Membrane Sheet Vapor Retarder: Install one lapped vapor retarder course and adhere in a uniform coating of cold-applied adhesive, according to roofing system manufacturer’s written instructions.

3.6 INSULATION INSTALLATION

A. Comply with roofing manufacturer's written instructions for installing roof insulation.

B. Coordinate installing membrane roofing system components, so insulation is not exposed to precipitation or left exposed at the end of the workday.

C. Tapered Insulation and Crickets: Install tapered insulation under area of roofing to conform to slopes indicated.

1. Where saddles or crickets are indicated or required to provide positive slope to drain, make slope of crickets minimum of two times the roof slope.

D. 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 (6 mm) with insulation.

1. Cut and fit insulation within 1/4 inch (6 mm) of nailers, projections, and penetrations.

E. Install insulation under area of roofing to achieve required thickness. Where overall insulation thickness is 2.7 inches (70 mm) or greater, install two or more layers with joints of each succeeding layer staggered from joints of previous layer a minimum of 6 inches (150 mm) in each direction.

1. Tapered Insulation System for Flat Roof Deck: Install insulation as follows:

a. Minimum Continuous Insulation R-value: Not less than R-30.

2. Insulation Drain Sumps: Tapered insulation sumps, not less than 2 by 2 ft (600 by 600 mm), sloped to roof drain; sump to maximum depth of not more than 1 inch (25 mm) less than the Project-stipulated continuous insulation thickness based upon code requirements.

F. Trim surface of insulation where necessary at roof drains so completed surface is flush and does not restrict flow of water.

G. Install tapered edge strips at perimeter edges of roof that do not terminate at vertical surfaces.

H. Adhered Insulation: Install each layer of insulation and adhere to substrate as follows:

1. Set each layer of insulation in ribbons of bead-applied insulation adhesive, firmly pressing and maintaining insulation in place.

2. Adhesive bead spacing 6 inches on center each layer.

I. 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 (150 mm) in each direction. Loosely butt cover boards together.

1. Set cover board in ribbons of bead-applied insulation adhesive, firmly pressing and maintaining cover in place.

2. Adhesive bead spacing 6 inches on center.

3.7 BASE-PLY SHEET INSTALLATION

A. Install base sheet starting at low point of roofing. Align base sheet without stretching. Shingle side laps of base a minimum of 4 inches (100 mm). Shingle in direction to shed water. Extend base sheets over edges and terminate above cants.

1. Embed base sheet in cold-applied membrane adhesive applied at rate required by roofing manufacturer.

B. Extend base flashing up walls or parapets a minimum of 8 inches (200 mm) above roofing and 6 inches (150 mm) onto field of roofing.

C. Mechanically fasten top of base flashing securely at terminations and perimeter of roofing.

1. Seal top termination of base flashing with a metal termination bar.

D. Install stripping according to roofing manufacturer's written instructions where metal flanges and edgings are set on roofing.

1. Flashing Sheet Stripping: Install flashing sheet stripping in specified cold adhesive and extend onto roofing membrane.

E. Roof Drains: Install base-ply sheet in cold adhesive around drain bowl. Base sheet must be installed so that it will be under compression from the clamping ring. Install base coat, fabric reinforcement, and top coat over base sheet. Install drain clamping ring and strainer.

3.8 FLUID-APPLIED FLASHING APPLICATION

A. Fluid-Applied Flashing and Detail Base Coat Application: Complete base coat and fabric reinforcement at parapets, curbs, penetrations, and drains prior to application of field of fluid-applied membrane. Apply base coat in accordance with manufacturer's written instructions.

1. Extend coating minimum of 8 inches (200 mm) up vertical surfaces and 4 inches onto horizontal surfaces.

2. Back roll to achieve minimum coating thickness indicated on Part 2 product listing unless greater thickness is recommended by manufacturer; verify thickness of base coat as work progresses.

3. Reinforcing Fabric: Embed fabric reinforcement into wet base coat. Lap adjacent flashing pieces of fabric minimum 3 inches (75 mm) along edges and 6 inches (150 mm) at end laps.

a. Roll surface of fabric reinforcing to completely embed and saturate fabric. Leave finished base coat with fabric free of pin holes, voids, or openings.

4. Roll surface of fabric reinforcing to completely embed and saturate fabric. Leave finished base coat with fabric free of pin holes, voids, or openings.

5. Roof Drains: Set 30 by 30 inch (760 by 760 mm) square metal flashing in bed of compatible mastic/adhesive sealer on roofing base-ply sheet. Cover metal flashing with stripping ply and extend a minimum of 6 inches (150 mm) beyond edge of metal flashing. Allow to cure.

a. Apply base coat and immediately install target piece of fabric reinforcement into wet base coat, extend into drain bowl and roll to fully embed and saturate fabric. Apply top coat after base coat has cured.

b. Following application and curing of fluid-applied roofing membrane, install clamping ring and strainer. Replace broken drain ring clamping bolts.

6. Allow base coat to cure prior to application of top coat.

3.9 FLUID-APPLIED MEMBRANE APPLICATION

A. Base Coat: Apply base coat to field of membrane in accordance with manufacturer's written instructions.

1. Apply base coat on prepared and primed surfaces and spread coating evenly.

2. Back roll to achieve minimum coating thickness indicated on Part 2 product listing unless greater thickness is recommended by manufacturer; verify thickness of base coat as work progresses.

3. Reinforcing Fabric: Embed fabric reinforcement into wet base coat. Lap adjacent flashing pieces of fabric minimum 3 inches (75 mm) along edges and 6 inches (150 mm) at end laps.

a. Roll surface of fabric reinforcing to completely embed and saturate fabric. Leave finished base coat with fabric free of pin holes, voids, or openings.

4. Roll surface of fabric reinforcing to completely embed and saturate fabric. Leave finished base coat with fabric free of pin holes, voids, or openings.

5. Allow base coat to cure prior to application of top coat.

B. Top Coat: Apply top coat to field of membrane and flashings uniformly in a complete, continuous installation.

1. Prime base coat prior to application of top coat if top coat is not applied within 72 hours of the base coat application, using manufacturer's recommended primer.

2. Apply top coat extending coating up vertical surfaces and out onto horizontal surfaces. Install top coat over field base coat and spread coating evenly.

3. Back roll to achieve minimum coating thickness indicated on Part 2 product listing unless greater thickness is recommended by manufacturer; verify thickness of base coat as work progresses.

4. Avoid foot traffic on new fluid-applied membrane for a minimum of 24 hours.

3.10 WALKWAY INSTALLATION

A. Walkways, General: Install walkways according to roofing manufacturer's written instructions.

B. Slip-Resistant Walkway Topcoat: Apply walkway second topcoat following application and curing of top coat. Locate as indicated on Drawings.

1. Mask walkway location with tape.

2. Prime first top coat prior to application of walkway top coat if walkway top coat is not applied within 72 hours of the first top coat application, using manufacturer's recommended primer.

3. Apply walkway topcoat and back roll to achieve minimum coating thickness indicated on Part 2 product listing unless greater thickness is recommended by manufacturer; verify thickness of base coat as work progresses.

4. Broadcast Slip-Resistant Top Coat Aggregate in wet top coat at rate indicated in Part 2 product listing or as otherwise recommended by coating manufacturer.

   a. Back roll aggregate and top coat creating even dispersal of aggregate.

5. Remove masking immediately.

3.11 FIELD QUALITY CONTROL

A. Roofing Inspector: Contractor shall engage a qualified roofing inspector for a minimum of twice per week on site to perform roof tests and inspections and to prepare start up, interim, and final reports. Roofing Inspector's quality assurance inspections shall comply with criteria established in Quality Control and Quality-assurance Guidelines for the Application of Membrane Roof Systems."

B. Roof Inspection: Contractor shall engage roofing system manufacturer's technical personnel to inspect roofing installation and submit report to the Architect. Notify Architect 48 hours in advance of dates and times of inspections. Inspect work as follows:

   1. Upon completion of preparation of first component of work, prior to application of re-coating materials.

   2. Following application of re-coating to flashings and application of base coat to field of roof.

   3. Upon completion of re-coating but prior to re-installation of other roofing components.

C. Repair fluid-applied membrane where test inspections indicate that they do not comply with specified requirements.

D. Arrange for additional inspections, at Contractor's expense, to verify compliance of replaced or additional work with specified requirements.

3.12 PROTECTING AND CLEANING

A. Protect roofing system from damage and wear during remainder of construction period.

B. Correct deficiencies in or remove coating that does not comply with requirements, repair substrates, and reapply coating.

C. Clean overspray and spillage from adjacent construction using cleaning agents and procedures recommended by manufacturer of affected construction.

END OF SECTION 075600.13

SECTION 07 62 00 - SHEET METAL FLASHINGS & SPECIALTIES

PART 1 - GENERAL

1.1 SUMMARY

A. The Work of this Section consists of the provision of all plant, labor, materials, equipment, testing and services necessary to complete the work of Sheet Metal Flashings & Specialties, shown on the schedules, keynotes, drawings, as specified herein, and as may be required by conditions and authorities having jurisdiction, including, but not limited to, the following:

1. Sheet metal work that is compatible with the roofing systems specified, including cap and through wall flashings, hook strips, fascia, gravel stops, copings, gutters, leaders, valleys, flat and standing seam panels, ridges and miscellaneous flashings.

B. Related Requirements

1. Rough Carpentry - Section 06 10 00
2. EPDM Roofing - Section 07 53 23
3. Roof Accessories - Section 07 20 00

1.2 CODE APPROVAL REQUIREMENTS

A. Fabricate and install roof perimeter flashings that comply with the NY State Uniform Fire Prevention and Building Code and ANSI/SPRI ES-1 requirements.

1.3 QUALITY ASSURANCE

A. Installer Qualifications:

1. A firm (Installer) with not less than 5 continuous years experience performing Sheet Metal work similar to that required for this project, employing personnel skilled in the specified work.
    a. The Installer shall directly employ the personnel performing the work of this section.
    b. The Installer shall have a full time supervisor/foreman on the roof when work is in progress. The Supervisor shall have a minimum of 5 years experience in work similar in nature and scope to this project, and speak fluent English.
2. The Installer shall provide a reference list of at least three projects of comparable size and similar design, within a fifty mile radius of this project, which may be observed by representatives of the Owner:
    a. The reference list shall include at a minimum, the completion date, a description of the work performed, the Owner’s name - contact person - phone number and address and the Architect’s name - contact person and phone number.
    b. The Installer shall provide the reference list prior to contract award if requested.

B. Material Quality:

1. Obtain each product from a single Manufacturer which has manufactured the same product in the United States of America for not less than 5 continuous years.
2. Obtain copper and pre-finished sheet metal items from the same mill run to maintain consistent color hue and surface finish.

C. Pre-Work Conference: Meet at the project site approximately one week prior to starting work, with the Architect, Owner and other representatives concerned about the work, to discuss the following:

1. How the existing building will be kept watertight as work progresses.
2. How sheet metal work will be coordinated with the installation of the vapor barrier, thermal barrier, insulation, cover board, roofing, flashings, roof accessories and other items to provide a watertight installation.
3. Generally accepted industry practice, the Manufacturer's instructions for handling and installing his products, and specified work requirements.
4. The condition of the substrate (deck), curbs, penetrations and other preparatory work needed.
5. Submittals, both completed and yet to be completed.
6. The construction schedule, forecast weather, availability of materials, personnel, equipment and facilities needed to proceed and complete the work on schedule.
7. A schedule for Manufacturer and Architect inspections.

1.4 SUBMITTALS

A. Submit the following items far enough in advance to obtain approval prior to performing any work:

1. Pre-work site and existing building inspection report with photos to document conditions before work starts.
2. Shop drawings, or 2 foot long samples, for each sheet metal item, to show how it relates and fits on adjoining masonry and wood blocking assemblies, and with the roof, stripping, and flashings.
3. A 6 inch square piece of each type of sheet metal to show surface finish, texture and color.
4. Literature for each type of sheet metal, sealant and fastener, including the Manufacturer's instructions which show how to install the items, and form and seal joints.
5. A sample of the Contractor’s guarantee form.

B. Technical submittals shall be prepared and made by the firm that will perform the actual work.

C. Payment requisitions will not be processed until all submittals are received and approved.

1.5 JOB MOCK-UPS

A. After the submittals are approved, prepare in actual job locations, mock-ups of cap and through wall flashings, hook strips, drip edges, fascia, gravel stops, and all other items of sheet metal and related work, for inspection and approval by the Architect.

B. Construct each mock-up of two full lengths of metal, fastened, connected and stripped-in to the related roofing system, to show the following:

1. Type, gauge, color, cross-sectional dimensions and shape, and joint and mitering techniques.
2. Related masonry work, wood blocking, and the attachment techniques and fasteners for all wood and metal components.
3. Other sheet metal related materials and their installation techniques to fully define the detailing of each mock-up.

C. The purpose of each mock-up is to establish the minimum standard of materials and workmanship, and to assure that completed work which matches the mock-ups will be fully functional and serve the purpose for it has been designed.

D. Approved mock-ups may be left in place and incorporated into the permanent installation. Rejected mock-ups shall be removed and replaced until approved.
E. Do not purchase or fabricate sheet metal items until mock-up installation, inspection and approval are completed and approval is documented in writing.

1.6 GUARANTEE

A. Provide a Contractor's written Guarantee which warrants that all work will remain free of material and workmanship defects and in a watertight condition for a five year period beginning upon Final Completion:

1. Defective work includes but is not limited to the following types of failure: leakage, adhesive separation, delamination, lifting, loosening, splitting, cracking, and undue expansion.
2. The Contractor's Guarantee shall provide that the Contractor will make the repairs and modifications necessary to enable the work to perform as warranted at his own expense.
3. The Guarantee shall include the removal and replacement of items or materials installed as part of the original work, if removal is needed to affect guaranteed repairs.

B. The Guarantee shall be issued no more than 30 days before the satisfactory completion of punch list work.

C. The Contractor’s Surety Company may add a rider to the Performance Bond which clarifies that Bond Coverage expires two years after Final Completion; i.e., Performance Bond Coverage does not run for the entire five year term of the Contractor’s Guarantee.

PART 2 - PRODUCTS

2.1 MATERIALS

A. Copper sheet: ASTM B370, 99.0 % pure copper, thickness 16 ounces per square foot. Use copper for all metal items not otherwise indicated

B. Zinc-Tin coated copper: copper sheet, coated on both sides, with a smooth uniform coating of zinc and tin, base metal weight 16 ounces per square foot, cold rolled temper, available as FreedomGray Copper by Revere.

C. Solder:

1. 50-50 tin and lead for plain copper, supplied in one pound bars with the alloy mixture stamped into the bar by the Manufacturer.
2. Lead free / or pure tin solder for zinc-tin coated copper, Number 497 by Johnson Manufacturing.

D. Flux:

1. Water-Soluble Liquid Flux, Kester #3345 for iron soldering of brass and copper.
2. Tin-bearing flux such as “Flux-N-Solder E127 with pure tin” by Johnson Manufacturing.

E. Factory Fabricated Roof Edge System: Extruded aluminum anchor bars secured with #9 stainless steel screws spaced 12 inches on center and .050 inch thick Kynar 500 prefinished aluminum trim covers, independently tested to comply with the ANSI / SPRI ES-1 Wind Design Guide.

F. Fasteners: stainless steel, or to match the sheet metal being fastened.

G. Glass Cloth: open mesh glass fabric coated on each side with plasticized asphalt as manufactured by Karnak Corporation or equal.

H. Asphalt cement: Federal Specification SS-C-153B, Type 1, asbestos free grade.

I. Exterior mounted leaders and straps: .027 inch thick rectangular corrugated aluminum leaders factory finished with baked acrylic enamel. Fasten each leader with 1/16 inch thick by 1 inch wide straps spaced 7 feet on center.

J. Sealant: High performance, solvent free, formulated and moisture curing silyl-terminated polyether sealant, ASTM C-920, Type S, Grade NS, Class 25, NovaLink construction sealant by ChemLink, color as selected.

PART 3 - EXECUTION

3.1 GENERAL

A. Accurately reproduce the details and design shown, and form profiles, bends and intersections, sharp, true and even. Fabricate sheet metal in the shop whenever possible, and form joints, laps, splices and connections to shed water and condensation in the direction of flow.

B. Provide any miscellaneous flashing and sheet metal work not shown on the drawings but otherwise needed to leave the project complete and entirely watertight, neatly and carefully executed in a thorough and workmanlike manner.

3.2 INSPECTION

A. Examine surfaces to receive work of this section and report any defects to the Owner and Architect.

3.3 INSTALLATION

A. Fabricate and install copper work in accordance with the current edition of "Copper and Common Sense" as published by the Revere Copper and Brass Company, unless otherwise indicated.

1. Form all joints, except loose locked sealant filled expansion joints, to overlap 2 inches.
2. Secure the joints with rivets spaced 1 inch on center positioned about 1/2 inch from the top edge of the joint, then sweat solder the joint.
3. Use solder only to fill and seal the joint, not for mechanical strength. Form soldered joints continuous, strong and free from defects, with well heated soldering irons. Do not use open flame torches for soldering.
4. Clean soldered joints daily, immediately after soldering, by washing them with soap and water applied with a soft bristle brush, then rinsing with clear water.

B. Securely fasten and anchor all work, and make provisions for thermal expansion. Submit details of expansion joints for approval. Install fasteners through one edge of metal only, use a hook strip on the other edge.

C. Use stainless steel pin Zamac type nail-in fasteners, or stainless steel screws and washers with neoprene inserts where fasteners will be exposed.

3.4 CAP FLASHINGS

A. Install new copper cap flashings built into masonry walls properly joined to all related materials in a watertight manner.

1. Solder all joints in the new cap flashing, except form 2 inch wide flat locked sealant filled expansion joints a maximum of 32 feet on center.
2. Form the flashing to turn up 2 inches inside the wall and finish with a hem on the bottom exposed edge.
3. Fasten the top edge of the cap flashing to the back up masonry 12 inches on center.
4. Install the new cap flashing under flexible type wall flashings where possible. Where it is not possible to lap the new cap flashing under an existing wall flashing, install a ply of glass cloth set in and coated with asphalt cement to connect the new cap flashing to the existing wall flashing.
5. In the absence of an existing wall flashing, or at a solid masonry wall, turn up the new cap flashing 2 inches behind the first wythe of masonry.
6. Install new cap flashings where shown on the drawings, and at a height of 10 to 12 inches above the roof surface.

B. Install new aluminum cap flashings on existing and new skylight and equipment curbs.

1. Form the cap flashing to extend 2 inches under the equipment or skylight, 4 inches over the base flashing, and finish with a 1/2 inch hem on the bottom edge.
2. Install a 1/2 inch thick by 2 inch wide continuous foam gasket between the cap flashing and mechanical equipment or skylight. Do not set the equipment or skylight in sealant.
3. Secure the equipment or skylight to the curb with stainless steel screws spaced 12 inches on center.

3.5 DRIP EDGES

A. Fabricate drip edges to extend 1-1/2 inches past the roof edge, and turn down to ensure water cannot track back and run down the fascia. Secure the drip edge with roofing nails along the top edge, spaced 4 inches apart along the raw metal edge. Form joints in the drip edge with 6 inch wide concealed under plates which duplicate the profile of the drip edge. Set the underplates in a full bed of sealant.

3.6 HOOK STRIPS

A. Form continuous hook strips with locks that engage the superimposed trim piece a minimum of 3/4 inch, and to cover the entire underside edge of the wood blocking and neatly extend to the building wall.

B. Fasten hook strips along their bottom edge, just above the 45 degree bend, with nails spaced 4 inches on center into underlying wood blocking; Zamac type nail-in type fasteners spaced 8 inches on center into masonry surfaces, or screws spaced 8 inches on-center into sheet metal surfaces.

3.7 ROOF EDGE SYSTEM

A. Install a factory fabricated roof edge system on all roof eaves.

1. Extend the EPDM roof down the face of the fascia trim, so it stops just short of the bottom edge of the anchor bar.
2. Install the anchor bar straight, level and true, set in a full bed of sealant, and secure the bar with #9 by 2 inch long stainless steel screws spaced no more than 12 inches apart.
3. Pre-drill screw holes in the underlying metal fascia trim, and where extra fasteners are needed at corners and special conditions.

4. Install color matching under plates at each joint in the roof edge trim; set the under plates in a full bed of sealant.

3.8 CLEANING, PROTECTION AND WATERTIGHTNESS

A. Conduct an inspection of the interior and exterior of the building and grounds, and submit a written report with photos to document any pre-existing leakage or damage, prior to performing any work.

B. The Owner will conduct a similar inspection at the completion of the work, and the Contractor will be charged for all leakage or damage which was not documented in the Contractor's report, or repaired to the Owners satisfaction at the Contractor's expense.

C. Provide any equipment, material and labor necessary to protect the site, the building, its contents and occupants, pedestrians, and surrounding landscaped and paved areas from damage due to the construction work or from inclement weather during construction.

D. Do not perform work during inclement weather. Protect incomplete work and the building from damage by inclement weather which may occur unexpectedly. Make all work areas watertight at the end of each day's work.

E. Frequently clean up all refuse, rubbish, scrap materials and debris so the work site presents a neat, orderly and workmanlike appearance.

F. Carefully clean the roof to remove all residual debris when work is complete. After cleaning the roof, thoroughly clean all drain sumps, drain lines, leader heads and leaders. Do not allow debris to enter the drainage system.

3.9 WASTE MANAGEMENT

A. Coordinate with Section 01 74 19

1. Separate and recycle cut-offs and waste materials and material packaging in accordance with the Waste Management Plan and to the maximum extent economically feasible and place in designated areas for recycling.
2. Set aside and protect materials suitable for reuse and/or remanufacturing until removed from the site.
3. Separate and fold up metal banding; flatten and place along with other metal scrap for recycling in designated area.

END OF SECTION 07 62 00

SECTION 07 84 13 - PENETRATION FIRESTOPPING

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 performance criteria, materials, production, and erection of penetration firestopping for the project. The work performed under this Section consists of the provision of all plant, materials, labor and equipment and the like necessary and/or required for the complete execution of all penetration firestopping as required by the this section, schedules.

1. Penetrations in fire-resistance-rated walls.
2. Penetrations in horizontal assemblies.
3. Penetrations in smoke barriers.

1.3 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.

1.4 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.

1.5 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."

B. Installer Qualifications: A firm experienced in installing penetration firestopping similar in material, design, and extent to that indicated for this Project, whose work has resulted in construction with a record of successful performance. Qualifications include having the necessary experience, staff, and training to install manufacturer's products per specified requirements. Manufacturer's willingness to sell its penetration firestopping products to Contractor or to Installer engaged by Contractor does not in itself confer qualification on buyer.

C. 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."

D. Preinstallation Conference: Conduct conference at Project site.

1.6 REFERENCED STANDARDS

A. American Society for Testing and Materials (ASTM).

1. E 814 – Standard Method of fire Tests of Through Penetration Fire Stops.
2. E 119 – Methods of Fire Tests of Building Construction and Materials.
3. E 84 – Standard Test Method for Surface Burning Characteristics of Building Materials.
4. E 136 – Test Method for Behavior of Materials in a Vertical Tube Furnace at 750F.
5. E 1399 – Cyclic Movement and Measuring Minimum and Maximum Joint Widths.
6. E 1966 – Test method for Resistance of Building Joint.
7. E 2174 – Standard practice for On-Site Inspection of Installed Firestops.
8. E 05.11.14 – Standard Test method for Determining the fire endurance of Perimeter Fire Barrier Systems Using the Intermediate-Scale, Multi Story Test Apparatus (ISMA): ASTM number pending draft approval.

B. Underwriters Laboratories, Inc. (UL).

1. UL 1479 – Fire Tests of Through Penetration fire Stops.
2. UL 263 – Fire Test of Building Construction and Materials.
3. UL 723 – Surface Burning Characteristics of Building Materials.
4. UL 2079 – Tests for Fire Resistance of Building Joint Systems.

5. UL “Fire Resistance Directory”, current year, including but not limited to the following:

   a. For penetrations by uninsulated, non-combustible items including steel pipe, copper pipe, rigid steel conduit and electrical metallic tubing (EMT):
      1) UL System: CAJ-1235, CAJ-1404, WL-1152.
   b. For penetrations by insulated, non-combustible items including steel pipe, cooper pipe, rigid steel conduit and electrical metallic tubing (EMT):
      1) UL Systems: CAJ-5222, CAJ-5250, CAJ-5251, WL-5171.
   c. For penetrations of PVC jacketed, flexible cable or cable bundles and plastic pipe (closed piping systems):
      1) UL Systems: CAJ-2401, CAJ-3185, CAJ-3199, CAJ-3234, WL-3118, WL-3179, WL-3199.
   d. For penetrations of combustible plastic pipe (open piping system):
      1) UL Systems: CAJ-2174, CAJ-2330, CAJ-2351, CAJ-2432, WL-2168, WL-2170, WL-2185, WL-2259.
   e. For penetrations by multiple combustible and/or non-combustible items:
      1) UL Systems: CAJ-8101, CAJ-8133, WL-8007.
   f. For large size / complex penetrations made to accommodate cable trays, multiple steel and cooper pipes, electrical busways in raceways:
      1) UL Systems: CAJ-1406, CAJ-1502, CAJ-4053, CAJ-6027, WJ6004, WL-1207, WL-2343, WL-4030, WL-6018.
   g. For penetrations by steel ducts:
      1) UL Systems: CAJ-7075, CAJ-7082, WJ-7045, WJ-7046, WL-7006, WL-7046, WL-7081, WL-7082.
   h. For fire-rated construction joints and other gaps:
      1) UL Systems: CEJ-296P, CEJ-302P.
   i. For openings between structurally separate sections of wall and floors:
      1) At the top of walls: UL systems: HWD-0107, HWD-0110, HWD-0257, HWD-0267, HWD-0299, HWD-0327, HWD-0266, HWD-0333, HWD-0334.

C. Factory Mutual (FM) Approval guide, current year.

D. National Fire Protection Association.

E. FICA “Manual of Practice”.

F. International Firestop Council (IFC).

1.7 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.

1.8 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. Manufacturers: Subject to compliance with requirements, provide products by one of the following, or approved equal:

1. Grace Construction Products.
2. Hilti, Inc.
3. Johns Manville.
4. NUCO Inc.
5. Passive Fire Protection Partners.
6. Specified Technologies Inc.
7. 3M Fire Protection Products.
8. Tremco, Inc.; Tremco Fire Protection Systems Group.
9. USG Corporation.

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 (2.49 Pa).

1. Fire-resistance-rated walls include fire walls, fire-barrier walls, smoke-barrier walls and fire partitions.
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 (2.49 Pa).

1. Horizontal assemblies include floors, floor/ceiling assemblies and ceiling membranes of roof/ceiling assemblies.
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. (0.025 cu. m/s per sq. m) of penetration opening at 0.30-inch wg (74.7 Pa) 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. 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. Flexible Firestop Sealant (For use where roof joists penetrate fire-rated walls): Acrylic based firestop sealant that provides movement capability in fire rated joint applications. Basis of Design: Hilti CP 606.

C. Latex Sealants: Single-component latex formulations that do not re-emulsify after cure during exposure to moisture.

D. Firestop Devices: Factory-assembled collars formed from galvanized steel and lined with intumescent material sized to fit specific diameter of penetrant.

E. Intumescent Composite Sheets: Rigid panels consisting of aluminum-foil-faced elastomeric sheet bonded to galvanized-steel sheet.

F. Intumescent Putties: Nonhardening dielectric, water-resistant putties containing no solvents, inorganic fibers, or silicone compounds.

G. Intumescent Wrap Strips: Single-component intumescent elastomeric sheets with aluminum foil on one side.

H. 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.

I. Pillows/Bags: Reusable heat-expanding pillows/bags consisting of glass-fiber cloth cases filled with a combination of mineral-fiber, water-insoluble expansion agents, and fire-retardant additives. Where exposed, cover openings with steel-reinforcing wire mesh to protect pillows/bags from being easily removed.

J. Silicone Foams: Multicomponent, silicone-based liquid elastomers that, when mixed, expand and cure in place to produce a flexible, nonshrinking foam.

K. 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 (150 mm) 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.

3.7 PENETRATION FIRESTOPPING SCHEDULE

A. The following schedules shall be completed by the Contractor and reviewed prior to submission to the Architect. The Table included shall be completed with each of the following categories of penetrating items:

1. Single uninsulated metallic piping and conduit.

2. Multiple uninsulated metallic piping and conduit.
3. Uninsulatted plastic piping and conduit.
4. Insulated metallic piping.
5. Insulated high temperature flues and exhaust pipes (boiler flues, generator exhausts insulated with calcium silicate or on the non-combustible insulation, etc.)
6. Cable tray.
7. Electric / telephone cable.
8. Bus duct.
9. Miscellaneous penetrations.

B. Complete the additional Tables for the following, using the format provided.

1. Blanks, voids, holes (including edge of slab).
2. Engineering judgments.
3. Ductwork engineering judgments.

3.3 WASTE MANAGEMENT

A. Coordinate with Section 01 74 19.

1. Separate and recycle cut-offs and waste materials and material packaging in accordance with Waste Management Plan and to the maximum extent economically feasible and place in designated areas for recycling.
2. Set aside and protect materials suitable for reuse and/or remanufacturing.
3. Separate and fold up metal banding; flatten and place along with other metal scrap for recycling in designated area.

END OF SECTION 07 84 13

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SECTION 07 84 46 - FIRE-RESISTIVE JOINT 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. The Work of this Section consists of the provision of all plant, labor, materials, equipment, testing and services necessary to complete the work for fire resistive joint systems as shown on the schedules, keynotes, drawings, as specified herein, and as may be required by conditions and authorities having jurisdiction, including, but not limited to, the following:

1. Joints in or between fire-resistance-rated constructions.
2. Joints at exterior storefront-wall/floor intersections.
3. Joints in smoke barriers.

1.3 ACTION SUBMITTALS

A. Product Data: For each type of product indicated.

B. Product Schedule: For each fire-resistive joint system. Include location and design designation of qualified testing agency. Retain subparagraph below only after verifying that authorities having jurisdiction will accept modifications handled by method in subparagraph.

1. Where Project conditions require modification to a qualified testing agency's illustration for a particular fire-resistive joint system condition, submit illustration, with modifications marked, approved by fire-resistive joint system manufacturer's fire-protection engineer as an engineering judgment or equivalent fire-resistance-rated assembly.

1.4 INFORMATIONAL SUBMITTALS

A. Installer Certificates: From Installer indicating fire-resistive joint systems have been installed in compliance with requirements and manufacturer's written recommendations.

B. Product test reports.

1.5 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 UL's "Qualified Firestop Contractor Program Requirements."

B. Fire-Test-Response Characteristics: Fire-resistive joint systems shall comply with the following requirements:

1. Fire-resistive joint system tests are performed by a qualified testing agency acceptable to authorities having jurisdiction.

C. Pre-installation Conference: Conduct conference at Project site.

PART 2 - PRODUCTS

2.1 FIRE-RESISTIVE JOINT SYSTEMS

A. Where required, provide fire-resistive joint systems that are 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 assemblies in or between which fire-resistive joint systems are installed. Fire-resistive joint systems shall accommodate building movements without impairing their ability to resist the passage of fire and hot gases.

B. Joints in or between Fire-Resistance-Rated Construction: Ratings determined per ASTM E 1966 or UL 2079:

1. Fire-Resistance Rating: Equal to or exceeding the fire-resistance rating of construction they will join.

2. Manufacturers: Subject to compliance with requirements, provide products by one of the following available manufacturers offering products that may be incorporated into the Work include, but are not limited to, the following:

a. Grace Construction Products.
b. Hilti, Inc.
c. 3M Fire Protection Products.
d. Tremco, Inc.; Tremco Fire Protection Systems Group.
e. USG Corporation.

C. Joints at Exterior Storefront-Wall/Floor Intersections: Rating determined by ASTM E 119 based on testing at a positive pressure differential of 0.01-inch wg or ASTM E 2307.

1. Fire-Resistance Rating: Equal to or exceeding the fire-resistance rating of the floor assembly.

2. Basis of Design: Perimeter Fire Barrier System CEJ 127P (HI/JS 120-05) by Hilti, Inc.

3. Manufacturers: Subject to compliance with requirements, provide products by one of the following available manufacturers offering products that may be incorporated into the Work include, but are not limited to, the following:

a. Grace Construction Products.
b. Hilti, Inc.
c. 3M Fire Protection Products.
d. Thermafiber, Inc.
e. Tremco, Inc.; Tremco Fire Protection Systems Group.
f. USG Corporation.

D. Joints in Smoke Barriers: Ratings determined per UL 2079.

1. L-Rating: Not exceeding 5.0 cfm/ft of joint at 0.30 inch wg at both ambient and elevated temperatures.
2. Manufacturers: Subject to compliance with requirements, provide products by one of the following available manufacturers offering products that may be incorporated into the Work include, but are not limited to, the following:

    a. Grace Construction Products.
    b. Hilti, Inc.
    c. 3M Fire Protection Products.
    d. Tremco, Inc.; Tremco Fire Protection Systems Group.
    e. USG Corporation.

E. Exposed Fire-Resistive Joint Systems: Provide products with flame-spread and smoke-developed indexes of less than 25 and 450, respectively, as determined per ASTM E 84.

F. VOC Content: Fire-resistive joint system sealants shall comply with the following limits for VOC content when calculated according to 40 CFR 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.

G. Accessories: Provide components of fire-resistive joint systems, including primers and forming materials that are needed to install fill materials and to maintain ratings required. Use only components specified by fire-resistive joint system manufacturer and approved by the qualified testing agency for systems indicated.

PART 3 - EXECUTION

3.1 INSTALLATION

A. Examine substrates and conditions, with Installer present, for compliance with requirements for joint configurations, substrates, and other conditions affecting performance of the Work.

B. Install fire-resistive joint systems to comply with manufacturer's written installation instructions and published drawings for products and applications indicated.

C. Install forming materials and other accessories of types required to support fill materials during their application and in 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 fire-resistive joint system.

D. Install fill materials for fire-resistive joint systems by proven techniques to produce the following results:

1. Fill voids and cavities formed by joints and forming materials as required to achieve fire-resistance ratings indicated.

2. Apply fill materials so they contact and adhere to substrates formed by joints.
3. For fill materials that will remain exposed after completing the Work, finish to produce smooth, uniform surfaces that are flush with adjoining finishes.

3.2 IDENTIFICATION

A. Identify fire-resistive joint systems with preprinted metal or plastic labels. Attach labels permanently to surfaces adjacent to and within 6 inches of joint edge so labels will be visible to anyone seeking to remove or penetrate joint system. 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 - Fire-Resistive Joint System - Do Not Disturb. Notify Building Management of Any Damage."
2. Contractor's name, address, and phone number.
3. Designation of applicable testing agency.
4. Date of installation.
5. Manufacturer's name.
6. Installer's name.

3.3 FIELD QUALITY CONTROL

A. Inspecting Agency: Owner will engage a qualified testing agency to perform tests and inspections.

B. Where deficiencies are found or fire-resistive joint systems are damaged or removed due to testing, repair or replace fire-resistive joint systems so they comply with requirements.

C. Proceed with enclosing fire-resistive joint systems with other construction only after inspection reports are issued and installations comply with requirements

3.4 FIRE-RESISTIVE JOINT SYSTEM SCHEDULE

A. Where UL-classified systems are indicated, they refer to system numbers in UL's "Fire Resistance Directory" under product Category XHBN or Category XHDG.

B. Where Intertek ETL SEMKO-listed systems are indicated, they refer to design numbers in Intertek ETL SEMKO's "Directory of Listed Building Products" under product category Expansion/Seismic Joints or Firestop Systems.

C. Floor-to-Floor, Fire-Resistive Joint Systems FRJS-1:

1. UL-Classified Systems: FF-D S-Insert four-digit number 0000-0999 1000-1999 2000-2999 3000-3999 4000-4999.

D. Wall-to-Wall, Fire-Resistive Joint Systems FRJS-2:

1. UL-Classified Systems: WW-D S-Insert four-digit number 0000-0999 1000-1999 2000-2999 3000-3999 4000-4999.

E. Floor-to-Wall, Fire-Resistive Joint Systems FRJS-3:

1. UL-Classified Systems: FW-D or S-Insert four-digit number 0000-0999 1000-1999 2000-2999 3000-3999 4000-4999.

F. Head-of-Wall, Fire-Resistive Joint Systems FRJS-4:

1. UL-Classified Systems: HW-D S-Insert four-digit number 0000-0999 1000-1999 2000-2999 3000-3999 4000-4999.
2. Intertek ETL SEMKO-Listed Systems:

G. Bottom-of-Wall, Fire-Resistive Joint Systems FRJS-5:

1. UL-Classified Systems: BW-D S-Insert four-digit number 0000-0999 1000-1999 2000-2999 3000-3999 4000-4999.

H. Wall-to-Wall, Fire-Resistive Joint Systems Intended for Use as Corner Guards FRJS-6:

1. UL-Classified Systems: CG-D S-Insert four-digit number 0000-0999 1000-1999 2000-2999 3000-3999 4000-4999.

I. Perimeter Fire-Resistive Joint Systems PFRJS-1:

1. UL-Classified Perimeter Fire-Containment Systems: CW-D S-Insert four-digit number 0000-0999 1000-1999 2000-2999.
2. Intertek ETL SEMKO-Listed, Perimeter Fire-Barrier Systems.

3.5 WASTE MANAGEMENT

A. Coordinate with Section 01 74 19.

1. Separate and recycle cut-offs and waste materials and material packaging in accordance with Waste Management Plan and to the maximum extent economically feasible and place in designated areas for recycling.
2. Set aside and protect materials suitable for reuse and/or remanufacturing.
3. Separate and fold up metal banding; flatten and place along with other scrap for recycling.

END OF SECTION 07 84 46

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SECTION 07 92 00 - JOINT SEALANTS

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. The Work of this Section consists of the provision of all plant, labor, materials, equipment, testing and services necessary to complete the work for joint sealants as shown on the schedules, keynotes, drawings, as specified herein, and as may be required by conditions and authorities having jurisdiction, including, but not limited to, the following:

1. Architectural Sealants.
2. Sealant Primers for Nonporous Substrates.
3. Sealant Primers for Porous Substrates.

B. Related Sections:

1. Division 04 "Unit Masonry" for masonry control and expansion joint fillers and gaskets.
2. Division 07 "Expansion Control" for building expansion joints, "Fire-Resistive Joint Systems" for sealing joints in fire-resistance-rated construction.
3. Division 08 "Glazing" for glazing sealants.
4. Division 09 "Gypsum Board" for sealing perimeter joints, "Tiling" for sealing tile joints,
5. "Acoustical Tile Ceilings**"** for sealing edge moldings at perimeters with acoustical sealant.

1.3 PRECONSTRUCTION TESTING

A. Preconstruction Compatibility and Adhesion Testing: Submit to joint-sealant manufacturers, for testing indicated below, samples of materials that will contact or affect joint sealants.

1. Use ASTM C 1087 to determine whether priming and other specific joint preparation techniques are required to obtain rapid, optimum adhesion of joint sealants to joint substrates.
2. Submit not fewer than eight pieces of each kind of material, including joint substrates, shims, joint-sealant backings, secondary seals, and miscellaneous materials.
3. Schedule sufficient time for testing and analyzing results to prevent delaying the Work.
4. For materials failing tests, obtain joint-sealant manufacturer's written instructions for corrective measures including use of specially formulated primers.
5. Testing will not be required if joint-sealant manufacturers submit joint preparation data that are based on previous testing, not older than 24 months, of sealant products for adhesion to, and compatibility with, joint substrates and other materials matching those submitted.

B. Preconstruction Field-Adhesion Testing: Before installing sealants, field test their adhesion to Project joint substrates as follows:

1. Locate test joints where indicated on Project or, if not indicated, as directed by Architect.
2. Conduct field tests for each application indicated below:

    a. Each kind of sealant and joint substrate indicated.

3. Notify Architect seven days in advance of dates and times when test joints will be erected.
4. Arrange for tests to take place with joint-sealant manufacturer's technical representative present.

    a. Test Method: Test joint sealants according to Method A, Field-Applied Sealant Joint Hand Pull Tab, in Appendix X1 in ASTM C 1193 or Method A, Tail Procedure, in ASTM C 1521.

        1) For joints with dissimilar substrates, verify adhesion to each substrate separately; extend cut along one side, verifying adhesion to opposite side. Repeat procedure for opposite side.

5. Report whether sealant failed to adhere to joint substrates or tore cohesively. Include data on pull distance used to test each kind of product and joint substrate. For sealants that fail adhesively, retest until satisfactory adhesion is obtained.
6. Evaluation of Preconstruction Field-Adhesion-Test Results: Sealants not evidencing adhesive failure from testing, in absence of other indications of noncompliance with requirements, will be considered satisfactory. Do not use sealants that fail to adhere to joint substrates during testing.

1.4 ACTION 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. Samples for Verification: For each kind and color of joint sealant required, provide Samples with joint sealants in 1/2-inch- (13-mm-) wide joints formed between two 6-inch- (150-mm-) long strips of material matching the appearance of exposed surfaces adjacent to joint sealants.

D. 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.

1.5 INFORMATIONAL SUBMITTALS

A. Qualification Data: For qualified Installer and testing agency.

B. Product Certificates: For each kind of joint sealant and accessory, from manufacturer.

C. Sealant, Waterproofing, and Restoration Institute (SWRI) Validation Certificate: For each sealant specified to be validated by SWRI's Sealant Validation Program.

D. Product Test Reports: Based on evaluation of comprehensive tests performed by a qualified testing agency, indicating that sealants comply with requirements.

E. Preconstruction Compatibility and Adhesion Test Reports: From sealant manufacturer, indicating the following:

1. Materials forming joint substrates and joint-sealant backings have been tested for compatibility and adhesion with joint sealants.
2. Interpretation of test results and written recommendations for primers and substrate preparation needed for adhesion.

F. Preconstruction Field-Adhesion Test Reports: Indicate which sealants and joint preparation methods resulted in optimum adhesion to joint substrates based on testing specified in "Preconstruction Testing" Article.

G. Field-Adhesion Test Reports: For each sealant application tested.

H. Warranties: Sample of special warranties.

1.6 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.

C. Product Testing: Test joint sealants using a qualified testing agency.

1. Testing Agency Qualifications: An independent testing agency qualified according to ASTM C 1021 to conduct the testing indicated.
2. Test according to SWRI's Sealant Validation Program for compliance with requirements specified by reference to ASTM C 920 for adhesion and cohesion under cyclic movement, adhesion-in-peel, and indentation hardness.

D. Mockups: Install sealant in mockups of assemblies specified in other Sections that are indicated to receive joint sealants specified in this Section. Use materials and installation methods specified in this Section.

E. Preinstallation Conference: Conduct conference at Project site.

1.7 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 (5 deg C).
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.

1.8 WARRANTY

A. Special Installer's Warranty: Manufacturer's standard form in which Installer agrees to repair or replace joint sealants that do not comply with performance and other requirements specified in this Section within specified warranty period.

1. Warranty Period: Five years from date of Substantial Completion.

B. Special Manufacturer's Warranty: Manufacturer's standard form in which joint-sealant manufacturer agrees to furnish joint sealants to repair or replace those that do not comply with performance and other requirements specified in this Section within specified warranty period.

1. Warranty Period: Five years from date of Substantial Completion.

C. Special warranties specified in this article exclude deterioration or failure of joint sealants from the following:

1. Movement of the structure caused by structural settlement or errors attributable to design or construction resulting in stresses on the sealant exceeding sealant manufacturer's written specifications for sealant elongation and compression.
2. Disintegration of joint substrates from natural causes exceeding design specifications.
3. Mechanical damage caused by individuals, tools, or other outside agents.
4. Changes in sealant appearance caused by accumulation of dirt or other atmospheric contaminants.

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: Sealants and sealant primers used inside the weatherproofing system shall comply with the following limits for VOC content when calculated according to 40 CFR 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.

1. Suitability for Immersion in Liquids. Where sealants are indicated for Use I for joints that will be continuously immersed in liquids, provide products that have undergone testing according to ASTM C 1247. Liquid used for testing sealants is deionized water, unless otherwise indicated.

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.

G. Suitability for Contact with Food: Comply with 21 CFR 177.2600, where applicable.

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, available products that may be incorporated into the Work include, but are not limited to, the following:

a. Dow Corning Corporation; 790
b. GE Advanced Materials - Silicones; SilPruf LM SCS2700.
c. May National Associates, Inc.; [Bondaflex Sil 290] [Bondaflex Sil 728 NS].
d. Pecora Corporation; [301 NS] [311 NS] [890] [890FTS].
e. Sika Corporation, Construction Products Division; SikaSil-C990.
f. Tremco Incorporated; [Spectrem 1] [Spectrem 800].

B. Single-Component, Nonsag, Urethane Joint Sealant: ASTM C 920, Type S, Grade NS, Class 100/50, for Use NT.

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. Sika Corporation, Construction Products Division; Sikaflex - 15LM.
b. Tremco Incorporated; [Vulkem 921] [Dymonic FC].

2.3 ACOUSTICAL JOINT SEALANTS

A. 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 the following] [provide one of the following] [available products that may be incorporated into the Work include, but are not limited to, the following]:

    a. Pecora Corporation; [AC-20 FTR] [AIS-919].
    b. USG Corporation; SHEETROCK Acoustical Sealant.

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 C (closed-cell material with a surface skin), Type O (open-cell material), Type B (bicellular material with a surface skin), or any of the preceding types, as approved in writing by joint-sealant manufacturer for joint application indicated, 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 substrates, areas, and conditions, with Installer present, to verify actual locations, dimensions, and other conditions affecting performance of the Work.

B. Examine joints for suitable conditions.

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 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. Porcelain enamel.
    d. 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.
4. Provide flush joint profile where indicated per Figure 8B in ASTM C 1193.
5. Provide recessed joint configuration of recess depth and at locations indicated per Figure 8C in ASTM C 1193.

    a. Use masking tape to protect surfaces adjacent to recessed tooled joints.

G. Installation of Preformed Silicone-Sealant System: Comply with the following requirements:

1. Apply masking tape to each side of joint, outside of area to be covered by sealant system.
2. Apply silicone sealant to each side of joint to produce a bead of size complying with preformed silicone-sealant system manufacturer's written instructions and covering a bonding area of not less than 3/8 inch (10 mm). Hold edge of sealant bead 1/4 inch inside masking tape.
3. Within 10 minutes of sealant application, press silicone extrusion into sealant to wet extrusion and substrate. Use a roller to apply consistent pressure and ensure uniform contact between sealant and both extrusion and substrate.
4. Complete installation of sealant system in horizontal joints before installing in vertical joints. Lap vertical joints over horizontal joints. At ends of joints, cut silicone extrusion with a razor knife.

H. Acoustical Sealant Installation: At sound-rated assemblies and elsewhere as indicated, 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.

3.4 FIELD QUALITY CONTROL

A. Field-Adhesion Testing: Field test joint-sealant adhesion to joint substrates as follows:

1. Extent of Testing: Test completed and cured sealant joints as follows:

    a. Perform 10 tests for the first 1000 feet (300 m) of joint length for each kind of sealant and joint substrate.
    b. Perform 1 test for each 1000 feet (300 m) of joint length thereafter or 1 test per each floor per elevation.

2. Test Method: Test joint sealants according to Method A, Field-Applied Sealant Joint Hand Pull Tab, in Appendix X1 in ASTM C 1193 or Method A, Tail Procedure, in ASTM C 1521.

    a. For joints with dissimilar substrates, verify adhesion to each substrate separately; extend cut along one side, verifying adhesion to opposite side. Repeat procedure for opposite side.

3. Inspect tested joints and report on the following:

    a. Whether sealants filled joint cavities and are free of voids.
    b. Whether sealant dimensions and configurations comply with specified requirements.
    c. Whether sealants in joints connected to pulled-out portion failed to adhere to joint substrates or tore cohesively. Include data on pull distance used to test each kind of product and joint substrate. Compare these results to determine if adhesion passes sealant manufacturer's field-adhesion hand-pull test criteria.

4. Record test results in a field-adhesion-test log. Include dates when sealants were installed, names of persons who installed sealants, test dates, test locations, whether joints were primed, adhesion results and percent elongations, sealant fill, sealant configuration, and sealant dimensions.
5. Repair sealants pulled from test area by applying new sealants following same procedures used originally to seal joints. Ensure that original sealant surfaces are clean and that new sealant contacts original sealant.

B. Evaluation of Field-Adhesion Test Results: Sealants not evidencing adhesive failure from testing or noncompliance with other indicated requirements will be considered satisfactory. Remove sealants that fail to adhere to joint substrates during testing or to comply with other requirements. Retest failed applications until test results prove sealants comply with indicated requirements.

3.5 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.

3.6 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.

3.7 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. Joints between plant-precast architectural concrete units.
    c. Control and expansion joints in unit masonry.
    d. Joints in dimension cast stone cladding.
    e. Joints in glass unit masonry assemblies.
    f. Joints between metal panels.
    g. Joints between different materials listed above.
    h. Perimeter joints between materials listed above and frames of doors, windows and louvers.
    i. Control and expansion joints in ceilings and other overhead surfaces.

2. Silicone Joint Sealant: Single component, nonsag, neutral curing, Class 100/50.
3. Urethane Joint Sealant: Single component, nonsag, Class 100/50.
4. 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 of exterior openings where indicated.
    c. Tile control and expansion joints.
    d. Vertical joints on exposed surfaces of interior unit masonry, concrete walls and] partitions.
    e. Joints on underside of plant-precast structural concrete planks.
    f. Perimeter joints between interior wall surfaces and frames of interior doors, windows and elevator entrances.
    g. Other joints as indicated.
2. Joint-Sealant Color: As selected by Architect from manufacturer's full range of colors.

C. Joint-Sealant Application: Interior acoustical joints in vertical surfaces and horizontal nontraffic surfaces.

1. Joint Location:

    a. Acoustical joints where indicated.
    b. Other joints as indicated.

2. Joint Sealant: Acoustical.
3. Joint-Sealant Color: As selected by Architect from manufacturer's full range.

3.8 WASTE MANAGEMENT

A. Coordinate with Section 01 74 19.

1. Separate and recycle cut-offs and waste materials and material packaging in accordance with Waste Management Plan and to the maximum extent economically feasible and place in designated areas for recycling.
2. Set aside and protect materials suitable for reuse and/or remanufacturing.
3. Separate and fold up metal banding; flatten and place along with other scrap for recycling.

END OF SECTION 07 92 00

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SECTION 07 95 00 - 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. The Work of this Section consists of the provision of all plant, labor, materials, equipment, testing and services necessary to complete the work for expansion control as shown on the schedules, keynotes, drawings, as specified herein, and as may be required by conditions and authorities having jurisdiction, including, but not limited to, the following:

1. Interior floor wall ceiling expansion control systems.
2. Exterior wall expansion control systems.

B. Related Requirements:
1. Division 3 for concrete work
2. Division 5 for structural and non-structural metal work
3. Section 07 92 00 Joint Sealants
4. Section 07 53 23 EPDM Roofing
5. Section 07 62 00 SM Flashing and Specialties
6. Section 07 72 00 Roof Accessories
7. Division 9 for interior wall and floor work

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. Samples for Initial Selection: For each type of expansion control system indicated.

1. Include manufacturer's color charts showing the full range of colors and finishes available for each exposed metal and elastomeric seal material.

D. Samples for Verification: For each type of expansion control system indicated, full width by 6 inches (150 mm) long in size.

E. 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 and soffit expansion control systems with roof expansion control systems to ensure that wall transitions are watertight. Roof expansion joint assemblies are specified elsewhere.

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.

B. Seismic Performance: Expansion control systems shall withstand the effects of earthquake motions determined according to ASCE/SEI 7.

1. The term "withstand" means "the system will remain in place without separation of any parts when subjected to the seismic forces specified and the system will be fully operational after the seismic event."
2. Component Importance Factor is 1.5.

2.3 INTERIOR EXPANSION CONTROL SYSTEMS

A. Locations: Between existing Salzmann Building and new East and West Wing Additions and between existing Salzmann Building and new Entry Addition.

B. Basis-of-Design Product: Subject to compliance with requirements, provide products by MM Systems Corporation, as indicated on the drawings or a comparable product by one of the following:

1. Architectural Art Mfg., Inc.; Division of Pittcon Industries.
2. Balco, Inc.
3. JointMaster/InPro Corporation.
4. Michael Rizza Company, LLC.
5. Construction Specialties, Inc.
6. Nystrom, Inc.

C. Source Limitations: Obtain expansion control systems from single source from single manufacturer.

D. Interior Expansion Control System Requirement:

1. Floor to Floor - LASD
2. Floor to Wall – FSSTE
3. Wall to Wall – VSW
4. Wall to Corner – VSWL
5. Wall to Ceiling – VSWL
6. Ceiling to Ceiling – VSG
7. Wall to Soffit – VSWL

E. Finishes shall be compatible with adjacent materials or as designated in the drawings.

2.4 EXTERIOR WALL EXPANSION CONTROL SYSTEMS

A. Basis-of-Design Product: Subject to compliance with requirements, provide products by MM Systems Corporation, as indicated on the drawings or a comparable product by one of the following:

1. Architectural Art Mfg., Inc.; Division of Pittcon Industries.
2. Balco, Inc.
3. JointMaster/InPro Corporation.
4. Michael Rizza Company, LLC.
5. Construction Specialties, Inc.
6. Nystrom, Inc.

B. Source Limitations: Obtain expansion control systems from single source from single manufacturer.

C. Fire Resistance Rating: same as adjacent construction.

D. Exterior Expansion Control System Requirement with cover plates:
1. Wall to Wall – ESS
2. Wall to Corner – ESS

E. Exposed gasket: Extruded flexible gasket. Color as selected by Architect from manufacture'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. Elastomeric Concrete: Modified epoxy or polyurethane extended into a prepackaged aggregate blend, specifically designed for bonding to concrete substrates.

F. 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.

G. 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.

H. 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.

B. Clear Anodic Finish: AAMA 611, AA-M12C22A41, Class I, 0.018 mm or thicker.

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. Epoxy-Bonded Seals: Pressurize seal for time period and to pressure recommended by manufacturer. Do not overpressurize.

G. Terminate exposed ends of expansion control systems with field- or factory-fabricated termination devices.

H. 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.

I. Moisture Barrier: Provide at all exterior joints and where indicated on Drawings. Provide drainage fittings at a maximum of 50 feet (15.2 m) or where indicated on Drawings.

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.

3.5 WASTE MANAGEMENT

A. Coordinate with Section 01 74 19.

1. Separate and recycle cut-offs and waste materials and material packaging in accordance with Waste Management Plan and to the maximum extent economically feasible and place in designated areas for recycling.
2. Set aside and protect materials suitable for reuse and/or remanufacturing.
3. Separate and fold up metal banding; flatten and place along with other metal scrap for recycling in designated area.

END OF SECTION 07 95 00

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SECTION 08 11 13 - HOLLOW METAL DOORS AND 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. The work performed under this Section includes the performance criteria, materials, production, and erection of hollow-metal work for the project and consists of the provision of all plant, materials, labor and equipment and the like necessary and/or required for the complete execution of all hollow-metal work as required by schedules, keynotes and drawings, as specified herein, and as may be required by conditions and authorities.

B. Related Requirements:

1. Division 08 **"**Door Hardware" for door hardware for hollow-metal doors.

1.3 DEFINITIONS

A. Minimum Thickness: Minimum thickness of base metal without coatings according to NAAMM-HMMA 803 or SDI A250.8.

1.4 COORDINATION

A. Coordinate anchorage installation for hollow-metal frames with wall types in which they are installed. 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.

B. Coordinate installation of hollow-metal doors with existing hollow-metal door frames or existing wood frames. Contractor to verify existing frames are UL approved for fire-rated openings. Provide survey of existing hollow-metal frame showing existing conditions including squareness and plumbness. All fire-rated doors to fit with maximum of 1/8” gap. Fabricate doors to fit existing opening. Door openings not meeting these requirements may require and engineering judgement for each varying condition. Furnish setting drawings, templates, and directions for installing hinges, locksets, panic hardware, closers, etc. Deliver such items to Project site in time for installation.

1.5 PREINSTALLATION MEETINGS

A. Preinstallation Conference: Conduct conference at Project site.

1.6 ACTION SUBMITTALS

A. Product Data: For each type of product.

1. Include construction details, material descriptions, core descriptions, fire-resistance ratings, temperature-rise ratings**,** and finishes.

B. Shop Drawings: Include the following:

1. Elevations of each door type.
2. Details of doors, including vertical- and horizontal-edge details and metal thicknesses.
3. Frame details for each frame type, including dimensioned profiles and metal thicknesses.
4. Locations of reinforcement and preparations for hardware.
5. Details of each different wall opening condition.
6. Details of anchorages, joints, field splices, and connections.
7. Details of accessories.
8. Details of moldings, removable stops, and glazing.
9. Details of conduit and preparations for power, signal, and control systems.

C. Samples for Initial Selection: For units with factory-applied color finishes.

D. Samples for Verification:

1. For each type of exposed finish required, prepared on Samples of not less than 3 by 5 inches (75 by 127 mm).
2. For "Doors" and "Frames" subparagraphs below, prepare Samples approximately 8 by 10 inches (203 by 254 mm) to demonstrate compliance with requirements for quality of materials and construction:

a. Doors: Show vertical-edge, top, and bottom construction; core construction; and hinge and other applied hardware reinforcement. Include separate section showing glazing if applicable.
b. Frames: Show profile, corner joint, floor and wall anchors, and silencers. Include separate section showing fixed hollow-metal panels and glazing if applicable.

E. Schedule: Provide a schedule of hollow-metal work prepared by or under the supervision of supplier, using same reference numbers for details and openings as those on Drawings. Coordinate with final Door Hardware Schedule.

1.7 INFORMATIONAL SUBMITTALS

A. Product Test Reports: For each type of hollow-metal door and frame assembly, for tests performed by a qualified testing agency.

B. Oversize Construction Certification: For assemblies required to be fire rated and exceeding limitations of labeled assemblies.

1.8 DELIVERY, STORAGE, AND HANDLING

A. Deliver hollow-metal work palletized, packaged, or crated to provide protection during transit and Project-site storage. Do not use nonvented plastic.

1. Provide additional protection to prevent damage to factory-finished units.

B. Deliver welded frames with two removable spreader bars across bottom of frames, tack welded to jambs and mullions.

C. Store hollow-metal work vertically under cover at Project site with head up. Place on minimum 4-inch- (102-mm-) high wood blocking. Provide minimum 1/4-inch (6-mm) space between each stacked door to permit air circulation.

PART 2 - PRODUCTS

2.1 MANUFACTURERS

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. Ceco Door Products; an Assa Abloy Group company.
2. Curries Company; an Assa Abloy Group company.
3. Custom Metal Products.
4. Hollow Metal Inc.
5. National Custom Hollow Metal.
6. North American Door Corp.
7. Pioneer Industries, Inc.
8. Republic Doors and Frames.
9. Steelcraft; an Ingersoll-Rand company.

B. Source Limitations: Obtain hollow-metal work from single source from single manufacturer.

2.2 REGULATORY REQUIREMENTS

A. Fire-Rated Assemblies: Complying with NFPA 80 and listed and labeled by a qualified testing agency acceptable to authorities having jurisdiction for fire-protection ratings and temperature-rise limits indicated, based on testing at positive pressure according to NFPA 252 or UL 10C.

1. Smoke- and Draft-Control Assemblies: Provide an assembly with gaskets listed and labeled for smoke and draft control by a qualified testing agency acceptable to authorities having jurisdiction, based on testing according to UL 1784 and installed in compliance with NFPA 105.

B. Fire-Rated, Borrowed-Light Assemblies: Complying with NFPA 80 and listed and labeled by a testing and inspecting agency acceptable to authorities having jurisdiction for fire-protection ratings indicated, based on testing according to NFPA 257 or UL 9.

2.3 INTERIOR DOORS AND FRAMES

A. Construct interior doors and frames to comply with the standards indicated for materials, fabrication, hardware locations, hardware reinforcement, tolerances, and clearances, and as specified.

B. Commercial Doors and Frames: NAAMM-HMMA 861. Provide 18 gauge doors, 16 gauge frames at openings 4'-0" or less in width; 14 gauge doors at openings larger than 4'-0" in width; 14 gauge frames at openings larger than 4'-0" in width. **No knock-down type frames are allowed** except where explicitly indicated as acceptable.

1. Physical Performance: Level A according to SDI A250.4.
2. Doors:

    a. Type: As indicated in the Door and Frame Schedule.
    b. Thickness: 1-3/4 inches (44.5 mm.)
    c. Face: Uncoated, cold-rolled steel sheet, minimum thickness of 0.042 inch (1.0 mm).
    d. Edge Construction: Continuously welded with no visible seam.
    e. Core: Steel stiffened.

3. Frames:

    a. Materials: Uncoated steel sheet, minimum thickness of 0.053 inch (1.3 mm) for door openings 48 inches (1219 mm) or less, or window frames; minimum thickness of 0.067 inch (1.7 mm)for door openings greater than 48 inches (1219 mm).
    b. Construction: Full profile welded.
    c. KD frames are not acceptable.

4. Exposed Finish: Prime.

2.4 EXTERIOR HOLLOW-METAL DOORS AND FRAMES

A. Construct exterior doors and frames to comply with the standards indicated for materials, fabrication, hardware locations, hardware reinforcement, tolerances, and clearances, and as specified.

B. Commercial Doors and Frames: NAAMM-HMMA 861. Provide 16 gauge doors, 14 gauge frames. **No knock-down type frames are allowed** except where explicitly indicated as acceptable.

1. Physical Performance: Level A according to SDI A250.4.
2. Doors:

    a. Type: As indicated in the Door and Frame Schedule.
    b. Thickness: 1-3/4 inches (44.5 mm.)
    c. Face: Metallic-coated steel sheet, minimum thickness of 0.053 inch (1.30 mm), with minimum G60 (Z180 or)A60 (ZF180) coating.
    d. Edge Construction: Continuously welded with no visible seam.
    e. Core: Steel stiffened.

1) Thermal-Rated Doors: Provide doors fabricated with thermal-resistance value (R-value) of not less than 2.1 deg F x h x sq. ft./Btu (0.370 K x sq. m/W) when tested according to ASTM C 1363.

3. Frames:

a. Materials: Metallic-coated steel sheet, minimum thickness of 0.067 inch (1.7 mm), with minimum G60 (Z180 or)A60 (ZF180) coating.
b. Construction: Full profile welded.
c. KD frames are not acceptable.

4. Exposed Finish: Prime (Galvanized – zinc coating applied by hot dip process).

2.5 HOLLOW-METAL PANELS

A. Provide hollow-metal panels of same materials, construction, and finish as adjacent door assemblies.

2.6 FRAME ANCHORS

A. Jamb Anchors:

1. Masonry Type: Adjustable strap-and-stirrup or T-shaped anchors to suit frame size, not less than 0.042 inch (1.0 mm) thick, with corrugated or perforated straps not less than 2 inches (51 mm) wide by 10 inches (254 mm) long; or wire anchors not less than 0.177 inch (4.5 mm) thick.
2. Stud-Wall Type: Designed to engage stud, welded to back of frames; not less than 0.042 inch (1.0 mm) thick.
3. Postinstalled Expansion Type for In-Place Concrete or Masonry: Minimum 3/8-inch- (9.5-mm-) diameter bolts with expansion shields or inserts. Provide pipe spacer from frame to wall, with throat reinforcement plate, welded to frame at each anchor location.

B. Floor Anchors: Formed from same material as frames, minimum thickness of 0.042 inch (1.0 mm), and as follows:

1. Monolithic Concrete Slabs: Clip-type anchors, with two holes to receive fasteners.
2. Separate Topping Concrete Slabs: Adjustable-type anchors with extension clips, allowing not less than 2-inch (51-mm) height adjustment. Terminate bottom of frames at finish floor surface.

2.7 MATERIALS

A. Recycled Content of Steel Products: Postconsumer recycled content plus one-half of preconsumer recycled content not less than 25 percent.

B. Cold-Rolled Steel Sheet: ASTM A 1008/A 1008M, Commercial Steel (CS), Type B; suitable for exposed applications.

C. Hot-Rolled Steel Sheet: ASTM A 1011/A 1011M, Commercial Steel (CS), Type B; free of scale, pitting, or surface defects; pickled and oiled.

D. Metallic-Coated Steel Sheet: ASTM A 653/A 653M, Commercial Steel (CS), Type B.

E. Frame Anchors: ASTM A 879/A 879M, Commercial Steel (CS), 04Z (12G) coating designation; mill phosphatized.

1. For anchors built into exterior walls, steel sheet complying with ASTM A 1008/A 1008M or ASTM A 1011/A 1011M, hot-dip galvanized according to ASTM A 153/A 153M, Class B.

F. Inserts, Bolts, and Fasteners: Hot-dip galvanized according to ASTM A 153/A 153M.

G. Power-Actuated Fasteners in Concrete: Fastener system of type suitable for application indicated, fabricated from corrosion-resistant materials, with clips or other accessory devices for attaching hollow-metal frames of type indicated.

H. Grout: ASTM C 476, except with a maximum slump of 4 inches (102 mm), as measured according to ASTM C 143/C 143M.

I. Mineral-Fiber Insulation: ASTM C 665, Type I (blankets without membrane facing); consisting of fibers manufactured from slag or rock wool; with maximum flame-spread and smoke-developed indexes of 25 and 50, respectively; passing ASTM E 136 for combustion characteristics.

J. Glazing: Comply with requirements in Section 088000 "Glazing."

K. Bituminous Coating: Cold-applied asphalt mastic, compounded for 15-mil (0.4-mm) dry film thickness per coat. Provide inert-type noncorrosive compound free of asbestos fibers, sulfur components, and other deleterious impurities.

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 metal thickness. Where practical, fit and assemble units in manufacturer's plant. To ensure proper assembly at Project site, clearly identify work that cannot be permanently factory assembled before shipment.

B. Hollow-Metal Doors:

1. Steel-Stiffened Door Cores: Provide minimum thickness 0.026 inch (0.66 mm), steel vertical stiffeners of same material as face sheets extending full-door height, with vertical webs spaced not more than 6 inches (152 mm) apart. Spot weld to face sheets no more than 5 inches (127 mm) o.c. Fill spaces between stiffeners with glass- or mineral-fiber insulation.
2. Fire Door Cores: As required to provide fire-protection and temperature-rise ratings indicated.
3. Vertical Edges for Single-Acting Doors: Bevel edges 1/8 inch in 2 inches (3.2 mm in 51 mm).
4. Top Edge Closures: Close top edges of doors with inverted closures, except provide flush closures at exterior doors of same material as face sheets.

5. Bottom Edge Closures: Close bottom edges of doors where required for attachment of weather stripping with end closures or channels of same material as face sheets.
6. Exterior Doors: Provide weep-hole openings in bottoms of exterior doors to permit moisture to escape. Seal joints in top edges of doors against water penetration.
7. Astragals: Provide overlapping astragal on one leaf of pairs of doors where required by NFPA 80 for fire-performance rating or where indicated. Extend minimum 3/4 inch (19 mm) beyond edge of door on which astragal is mounted or as required to comply with published listing of qualified testing agency.

C. Hollow-Metal Frames: 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.

1. Sidelight 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.
2. Provide countersunk, flat- or oval-head exposed screws and bolts for exposed fasteners unless otherwise indicated.
3. Grout Guards: Weld guards to frame at back of hardware mortises in frames to be grouted.
4. Floor Anchors: Weld anchors to bottoms of jambs with at least four spot welds per anchor; however, for slip-on drywall frames, provide anchor clips or countersunk holes at bottoms of jambs.
5. Jamb Anchors: Provide number and spacing of anchors as follows:

    a. Masonry Type: Locate anchors not more than 16 inches (406 mm) from top and bottom of frame. Space anchors not more than 32 inches (813 mm) o.c., to match coursing, and as follows:

        1) Two anchors per jamb up to 60 inches (1524 mm) high.
        2) Three anchors per jamb from 60 to 90 inches (1524 to 2286 mm) high.
        3) Four anchors per jamb from 90 to 120 inches (2286 to 3048 mm) high.
        4) Four anchors per jamb plus one additional anchor per jamb for each 24 inches (610 mm) or fraction thereof above 120 inches (3048 mm) high.

    b. Stud-Wall Type: Locate anchors not more than 18 inches (457 mm) from top and bottom of frame. Space anchors not more than 32 inches (813 mm) o.c. and as follows:

        1) Three anchors per jamb up to 60 inches (1524 mm) high.
        2) Four anchors per jamb from 60 to 90 inches (1524 to 2286 mm) high.
        3) Five anchors per jamb from 90 to 96 inches (2286 to 2438 mm) high.
        4) Five anchors per jamb plus one additional anchor per jamb for each 24 inches (610 mm) or fraction thereof above 96 inches (2438 mm) high.
6. Door Silencers: Except on weather-stripped frames, drill stops to receive door silencers as follows. Keep holes clear during construction.

    a. Single-Door Frames: Drill stop in strike jamb to receive three door silencers.
    b. Double-Door Frames: Drill stop in head jamb to receive two door silencers.

7. Terminated Stops: Terminate stops 6 inches (152 mm) above finish floor with a 45 degree angle cut, and close open end of stop with steel sheet closure. Cover opening in

extension of frame with welded-steel filler plate, with welds ground smooth and flush with frame.

D. Fabricate concealed stiffeners and edge channels from either cold- or hot-rolled steel sheet.

E. Hardware Preparation: Factory prepare hollow-metal work to receive templated mortised hardware; include cutouts, reinforcement, mortising, drilling, and tapping according to SDI A250.6, the Door Hardware Schedule, and templates.

1. Reinforce doors and frames to receive nontemplated, mortised, and surface-mounted door hardware.
2. Comply with applicable requirements in SDI A250.6 and BHMA A156.115 for preparation of hollow-metal work for hardware.

F. Stops and Moldings: Provide stops and moldings around glazed lites and louvers where indicated. Form corners of stops and moldings with mitered hairline joints.

1. Single Glazed Lites: Provide fixed stops and moldings welded on secure side of hollow-metal work.
2. Multiple Glazed Lites: Provide fixed and removable stops and moldings so that each glazed lite is capable of being removed independently.
3. Provide fixed frame moldings on outside of exterior and on secure side of interior doors and frames.
4. Coordinate rabbet width between fixed and removable stops with glazing and installation types indicated.

2.9 STEEL FINISHES

A. Prime Finish: Clean, pretreat, and apply manufacturer's standard primer.

1. Shop Primer: Manufacturer's standard, fast-curing, lead- and chromate-free primer complying with SDI A250.10; recommended by primer manufacturer for substrate; compatible with substrate and field-applied coatings despite prolonged exposure.

B. Factory Finish: Clean, pretreat, and apply manufacturer's standard two-coat, baked-on finish consisting of prime coat and thermosetting topcoat, complying with SDI A250.3.

1. Color and Gloss: As selected by Architect from manufacturer's full range.

2.10 ACCESSORIES

A. Louvers: Provide louvers for interior doors, where indicated, which comply with SDI 111C, with blades or baffles formed of 0.020-inch- (0.5-mm-) thick, cold-rolled steel sheet set into 0.032-inch- (0.8-mm-) thick steel frame.

1. Sightproof Louver: Stationary louvers constructed with inverted-V or inverted-Y blades.
2. Lightproof Louver: Stationary louvers constructed with baffles to prevent light from passing from one side to the other.
3. Fire-Rated Automatic Louvers: Louvers constructed with movable blades closed by actuating fusible link, and listed and labeled for use in fire-rated door assemblies of type

and fire-resistance rating indicated by same qualified testing and inspecting agency that established fire-resistance rating of door assembly.

B. Mullions and Transom Bars: Join to adjacent members by welding or rigid mechanical anchors.

C. Grout Guards: Formed from same material as frames, not less than 0.016 inch (0.4 mm) thick.

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. Examine roughing-in for embedded and built-in anchors to verify actual locations before frame installation.

C. Prepare written report, endorsed by Installer, listing conditions detrimental to performance of the Work.

D. 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. Drill and tap doors and frames to receive nontemplated, 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 SDI A250.11 or NAAMM-HMMA 840 as required by standards specified.

1. Set frames accurately in position; plumbed, aligned, and braced securely until permanent anchors are set. After wall construction is complete, remove temporary braces, leaving surfaces smooth and undamaged.

    a. At fire-rated openings, install frames according to NFPA 80.
    b. Where frames are fabricated in sections because of shipping or handling limitations, field splice at approved locations by welding face joint continuously; grind, fill, dress, and make splice smooth, flush, and invisible on exposed faces.
    c. Install frames with removable stops located on secure side of opening.

d. Install door silencers in frames before grouting.
e. Remove temporary braces necessary for installation only after frames have been properly set and secured.
f. Check plumb, square, and twist of frames as walls are constructed. Shim as necessary to comply with installation tolerances.
g. Field apply bituminous coating to backs of frames that will be filled with grout containing antifreezing agents.

2. Floor Anchors: Provide floor anchors for each jamb and mullion that extends to floor, and secure with postinstalled expansion anchors.

   a. Floor anchors may be set with power-actuated fasteners instead of postinstalled expansion anchors if so indicated and approved on Shop Drawings.

3. Metal-Stud Partitions: Solidly pack mineral-fiber insulation inside frames.
4. Masonry Walls: Coordinate installation of frames to allow for solidly filling space between frames and masonry with grout.
5. Concrete Walls: Solidly fill space between frames and concrete with mineral-fiber insulation.
6. In-Place Concrete or Masonry Construction: Secure frames in place with postinstalled expansion anchors. Countersink anchors, and fill and make smooth, flush, and invisible on exposed faces.
7. In-Place Metal or Wood-Stud Partitions: Secure slip-on drywall frames in place according to manufacturer's written instructions.
8. Installation Tolerances: Adjust hollow-metal door frames for squareness, alignment, twist, and plumb to the following tolerances:

   a. Squareness: Plus or minus 1/16 inch (1.6 mm), measured at door rabbet on a line 90 degrees from jamb perpendicular to frame head.
   b. Alignment: Plus or minus 1/16 inch (1.6 mm), measured at jambs on a horizontal line parallel to plane of wall.
   c. Twist: Plus or minus 1/16 inch (1.6 mm), measured at opposite face corners of jambs on parallel lines, and perpendicular to plane of wall.
   d. Plumbness: Plus or minus 1/16 inch (1.6 mm), measured at jambs at floor.

C. Hollow-Metal Doors: Fit hollow-metal doors accurately in frames, within clearances specified below. Shim as necessary.

1. Non-Fire-Rated Steel Doors:

   a. Between Door and Frame Jambs and Head: 1/8 inch (3.2 mm) plus or minus 1/32 inch (0.8 mm).
   b. Between Edges of Pairs of Doors: 1/8 inch (3.2 mm) to 1/4 inch (6.3 mm) plus or minus 1/32 inch (0.8 mm).
   c. At Bottom of Door: 3/4 inch (19.1 mm) plus or minus 1/32 inch (0.8 mm).
   d. Between Door Face and Stop: 1/16 inch (1.6 mm) to 1/8 inch (3.2 mm) plus or minus 1/32 inch (0.8 mm).

2. Fire-Rated Doors: Install doors with clearances according to NFPA 80.
3. Smoke-Control Doors: Install doors and gaskets according to NFPA 105.

D. Glazing: Comply with installation requirements in Section 088000 "Glazing" and with hollow-metal manufacturer's written instructions.

1. Secure stops with countersunk flat- or oval-head machine screws spaced uniformly not more than 9 inches (230 mm) o.c. and not more than 2 inches (51 mm) o.c. from each corner.

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 Touchup: Immediately after erection, sand smooth rusted or damaged areas of prime coat and apply touchup of compatible air-drying, rust-inhibitive primer.

D. Metallic-Coated Surface Touchup: Clean abraded areas and repair with galvanizing repair paint according to manufacturer's written instructions.

E. Factory-Finish Touchup: Clean abraded areas and repair with same material used for factory finish according to manufacturer's written instructions.

F. Touchup Painting: Cleaning and touchup painting of abraded areas of paint are specified in painting Sections.

3.5 WASTE MANAGEMENT

A. Coordinate with Section 01 74 19.

1. Separate and recycle cut-offs and waste materials and material packaging in accordance with Waste Management Plan and to the maximum extent economically feasible and place in designated areas for recycling.
2. Set aside and protect materials suitable for reuse and/or remanufacturing.
3. Separate and fold up metal banding; flatten and place along with other metal scrap for recycling in designated area.

END OF SECTION 08 11 13

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SECTION 08 1416 - FLUSH WOOD DOORS

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

A. Drawings and general provisions of the Contract, including the General and Supplementary Conditions and Division 1 Specification Sections, apply to this Section.
   1. Division 6 Section "Finish Carpentry"
   2. Division 8 Section “Hollow Metal Doors and Frames”

1.2 SUMMARY

A. This Section includes the following:
   1. Solid core doors with wood veneer faces.
   2. Factory finishing of flush wood doors.
   3. Factory fitting flush wood doors to frames and factory machining for hardware.
   4. Louvers for flush wood doors.

1.3 SUBMITTALS

A. General: Submit each item in this Article according to the Conditions of the Contract and Division 1 Specification Sections.

B. Product data for each type of door, including details of core and edge construction, trim for openings, and factory-finishing specifications.

C. Shop drawings indicating location and size of each door, elevation of each kind of door, details of construction, location and extent of hardware blocking, fire ratings, requirements for veneer matching and factory finishing and other pertinent data.
   1. For factory-machined doors, indicate dimensions and locations of cutouts for locksets and other cutouts adjacent to light openings.

D. Samples for initial selection in the form of color charts consisting of actual materials in small sections for the following:
   1. Faces of factory-finished doors with transparent finish. Show the full range of colors available for stained finishes.

E. Samples for verification in the form and size indicated below:
   1. Corner sections of doors approximately 12 inches square with door faces and edgings representing the typical range of color and grain for each species of veneer and solid lumber required. Finish sample with same materials proposed for factory-finished doors.
   2. Frames for light openings, 6 inches long, for each material, type, and finish required.

1.4 QUALITY ASSURANCE

A. Quality Standard: Comply with the following standard:
   1. AWI Quality Standard: "Architectural Woodwork Quality Standards" of the Architectural Woodwork Institute for grade of door, core, construction, finish, and other requirements.

B. Fire-Rated Wood Doors: Provide wood doors that comply with NFPA 80; are identical in materials and construction to units tested in door and frame assemblies per ASTM E 152; and are labeled and listed by UL, Warnock Hersey, or another testing and inspection agency acceptable to authorities having jurisdiction.

C. Single-Source Responsibility: Obtain doors from one source and by a single manufacturer.

1.5 DELIVERY, STORAGE, AND HANDLING

A. Protect doors during transit, storage, and handling to prevent damage, soiling, and deterioration. Comply with requirements of referenced standard and manufacturer's instructions.

B. Identify each door with individual opening numbers as designated on shop drawings, using temporary, removable, or concealed markings.

1.6 PROJECT CONDITIONS

A. Conditioning: Do not deliver or install doors until conditions for temperature and relative humidity have been stabilized and will be maintained in storage and installation areas during the remainder of the construction period to comply with the following requirements applicable to Project's geographical location:
   1. AWI quality standard Section 100-S-11 "Relative Humidity and Moisture Content."

1.7 WARRANTY

A. General Warranty: Door manufacturer's warranty specified in this Article shall not deprive the Owner of other rights the Owner may have under other provisions of the Contract Documents and shall be in addition to, and run concurrent with, other warranties made by the Contractor under requirements of the Contract Documents.

B. Door Manufacturer's Warranty: Submit written agreement on door manufacturer's standard form signed by manufacturer, Installer, and Contractor, agreeing to repair or replace defective doors that have warped (bow, cup, or twist) more than 1/4 inch in a 42-by-84-inch section or that show telegraphing of core construction in face veneers exceeding 0.01 inch in a 3-inch span, or do not conform to tolerance limitations of referenced quality standards.

   1. Warranty shall be in effect during the following period of time after date of Substantial Completion.
      a. Solid Core Interior Doors: Life of installation.

PART 2 - PRODUCTS

2.1 MANUFACTURERS

A. Available Manufacturers: Subject to compliance with requirements, manufacturers offering doors that may be incorporated in the Work include, but are not limited to, the following:
   1. Solid Core Doors:
      a. Algoma Hardwoods Inc.
      b. Buell Door Co.
      c. Eggers Industries, Architectural Door Division.
      d. Graham Manufacturing Corp.
      e. Haley Brothers, Inc.
      f. Ideal Wood Products, Inc.
      g. IPIK Door Co., Inc.
      h. Mohawk Flush Doors, Inc.
      i. Ragland Manufacturing Co., Inc.
      j. V-T Industries Inc.
      k. Weyerhauser Co.

2.2 INTERIOR FLUSH WOOD DOORS

A. Solid Core Doors for transparent stained Finish: Comply with the following requirements:
   1. Faces: Rotary Natural Birch.
   2. Grade: Premium.
   3. Construction: 5 plies.
   4. Core: Particleboard ANSI A208.1, GRADE LD-2 – PC-5 ME. Provide wood blocking in particleboard core doors as needed to eliminate through-bolting hardware. 5” toprail on doors and closers..
   5. Bonding: Stiles and rails bonded to core, then entire unit abrasive planed before veneering.

2.3 VENEER MATCHING

A. Within Door Faces: Provide doors with the following veneer matching:
   1. Book matching.

B. Pairs and Sets: Provide pair matching and set matching for pairs of doors and for doors hung in adjacent sets.

C. Doors with Transoms (if any): Provide the following matching:
   1. Continuous matching.

2.4 FABRICATION

A. Fabricate flush wood doors to comply with following requirements:
   1. Factory fit doors to suit frame-opening sizes indicated, with the following uniform clearances and bevels:
      a. Comply with clearance requirements of referenced quality standard for fitting. Comply with requirements of NFPA 80 for fire-resistance-rated doors.

2. Factory machine doors for hardware that is not surface applied. Locate hardware to comply with DHI-WDHS-3. Comply with final hardware schedules, door frame shop drawings, DHI A115-W series standards, and hardware templates.
   a. Coordinate measurements of hardware mortises in metal frames to verify dimensions and alignment before proceeding with factory machining.
   b. Metal Astragals: Premachine astragals and formed-steel edges for hardware for pairs of fire-rated doors.

B. Transom and Side Panels (if any): Fabricate matching panels with same construction, exposed surfaces, and finish as specified for associated doors.
   1. Fixed Transom Panels (if any): Fabricate fixed panels with solid lumber transom bottom rail and door top rail, both rabbeted as indicated. Provide factory-installed spring bolts for concealed attachment into jambs of metal door frames.

C. Openings (if any): Cut and trim openings through doors to comply with applicable requirements of referenced standards for kind(s) of door(s) required.
   1. Light Openings: Trim openings with moldings of material and profile indicated.

2.5 FACTORY FINISHING

A. General: Comply with referenced quality standard's requirements for factory finishing.

B. Finish wood doors at factory.

C. Transparent Finish: Comply with requirements indicated for grade, finish system, staining effect, and sheen.
   1. Grade: Premium.
   2. Finish: Manufacturer's standard finish with performance requirements comparable to either AWI System TR-6 catalyzed polyurethane.
   3. Staining: As selected from manufacturer’s full line of standard stain colors.
   4. Effect: Filled finish.
   5. Sheen: Satin.

PART 3 - EXECUTION

3.1 EXAMINATION

A. Examine installed door frames prior to hanging door:
   1. Verify that frames comply with indicated requirements for type, size, location, and swing characteristics and have been installed with plumb jambs and level heads.
   2. Reject doors with defects.

B. Do not proceed with installation until unsatisfactory conditions have been corrected.

3.2 INSTALLATION

A. Hardware: For installation see Division 8 Section "Door Hardware."

B. Manufacturer's Instructions: Install wood doors to comply with manufacturer's instructions and referenced quality standard and as indicated.
   1. Install fire-rated doors in corresponding fire-rated frames according to requirements of NFPA 80.
   2. Fitting Clearances for Non-Fire-Rated Doors: Provide 1/8 inch at jambs and heads, 1/16 inch per leaf at meeting stiles for pairs of doors, and 1/8 inch from bottom of door to top of decorative floor finish or covering. Where threshold is shown or scheduled, provide 1/4-inch clearance from bottom of door to top of threshold.
   3. Fitting Clearances for Fire-Rated Doors: Comply with NFPA 80.
   4. Bevel non-fire-rated doors 1/8 inch in 2 inches at lock and hinge edges.
   5. Bevel fire-rated doors 1/8 inch in 2 inches on lock edge; trim stiles and rails only to extent permitted by labeling agency.

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 the job site.

3.3 ADJUSTING AND PROTECTION

A. Operation: Rehang or replace doors that do not swing or operate freely.

B. Finished Doors: Refinish or replace doors damaged during installation.

C. Protect doors as recommended by door manufacturer to ensure that wood doors will be without damage or deterioration at the time of Substantial Completion.

END OF SECTION 08 14 16

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SECTION 08 31 13 - ACCESS DOORS AND 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. The work performed under this Section includes the performance criteria, materials, production, and erection of access doors and frames for the project and consists of the provision of all plant, materials, labor and equipment and the like necessary and/or required for the complete execution of all access door work as required by schedules, keynotes and drawings, as specified herein, and as may be required by conditions and authorities having jurisdiction including, but not limited to the following:

1. Access doors and frames for walls and ceilings.
2. Floor access doors and frames.

B. Related Requirements:
1. Division 22 “Plumbing” for plumbing devices that require access.
2. Division 23 “Mechanical” for HVAC devices that require access.
3. Division 26 “Electrical” for Electrical devices that require access.
4. Division 28 “Electronic Safety and Security” for safety and security devices that require access.

1.3 ACTION SUBMITTALS

A. Product Data: For each type of product.

1. Include construction details, fire ratings, materials, individual components and profiles, and finishes.

B. Shop Drawings:

1. Include plans, elevations, sections, details, substrates and attachments to other work.
2. Detail fabrication and installation of access doors and frames for each type of substrate.

C. Samples: For each door face material, at least 3 by 5 inches (75 by 125 mm) in size, in specified finish.

D. Access Door and Frame Schedule: Provide complete access door and frame schedule, including types, locations, sizes, latching or locking provisions, and other data pertinent to installation.

E. Ceiling Coordination Drawings: Reflected ceiling plans, drawn to scale, on which ceiling mounted items including access doors and frames, lighting fixtures, diffusers, grilles, speakers, sprinklers, and special trim are shown and coordinated with each other.

PART 2 - PRODUCTS

2.1 PERFORMANCE REQUIREMENTS

A. Fire-Rated Access Doors and Frames: Units complying with NFPA 80 that are identical to access door and frame assemblies tested for fire-test-response characteristics according to the following test method and that are listed and labeled by UL or another testing and inspecting agency acceptable to authorities having jurisdiction:

1. NFPA 252 or UL 10B for fire-rated access door assemblies installed vertically.
2. NFPA 288 for fire-rated access door assemblies installed horizontally.

2.2 ACCESS DOORS AND FRAMES FOR WALLS AND CEILINGS

A. Basis-of-Design Product: Subject to compliance with requirements, provide access panels as fabricated by FF Systems Access Panels, Inc. or comparable product by one of the following:

1. Access Panel Solutions.
2. Acudor Products, Inc.
3. Babcock-Davis.
4. J. L. Industries, Elmdor/Stoneman Manufacturing Co.; Div. of Acorn Engineering Co.
5. Larsen's Manufacturing Company.
6. Metropolitan Door Industries Corp.
7. Milcor Inc.

B. Source Limitations: Obtain each type of access door and frame from single source from single manufacturer.

C. Aluminum Access Doors with Drywall Inserts **(at all public, occupied spaces)**

1. Basis-of-Design Product: FF Systems Access Panels, Inc., System F2AKL.
2. Assembly Description: Welded aluminum frame with both outer and inner frame of high grade aluminum, with drywall inlay.
3. Locations: Wall and ceiling.
4. Door Size: As indicated
5. Frame Material: Aluminum.
6. Hinges: Manufacturer's standard.
7. Seal: Air/dust seal.
8. Hardware: Cylinder-lock.

D. Hardware:

1. Lock: Cylinder.

2.3 FLOOR ACCESS DOORS AND FRAMES

A. Manufacturers: Subject to compliance with requirements, provide access panels as fabricated by Babcock Davis or comparable product by one of the following:

1. Acudor Products, Inc.
2. Metropolitan Door Industries Corp.
3. Milcor Inc.

B. Floor Doors, General: Equip each door with adjustable counterbalancing springs, heavy-duty hold-open arm that automatically locks door open at 90 degrees, release handle with red vinyl grip that allows for one-handed closure, and recessed lift handle.

C. Aluminum Floor Door: Coordinate with equipment. Extruded-aluminum angle frame with 1/4-inch- (6.4-mm-) thick, 1/8-inch pan recess for carpet or tile; nonwatertight; loading capacity to support 300-lbf/sq. ft. (14.4-kN/sq. m) pedestrian live load.

D. Hardware: Provide the following:

1. Hinges: Heavy-duty, stainless-steel butt hinges with stainless-steel pins.
2. Lock: Manufacturer’s standard.
3. Hardware Material: Manufacturer's standard.

E. Fire-Rating: Provide 2-hour fire rated doors in rated floors.

2.4 MATERIALS

A. Steel Plates, Shapes, and Bars: ASTM A 36/A 36M.

B. Rolled-Steel Floor Plate: ASTM A 786/A 786M, rolled from plate complying with ASTM A 36/A 36M or ASTM A 283/A 283M, Grade C or D.

C. Steel Sheet: Uncoated or electrolytic zinc coated, ASTM A 879/A 879M, with cold-rolled steel sheet substrate complying with ASTM A 1008/A 1008M, Commercial Steel (CS), exposed.

D. Metallic-Coated Steel Sheet: ASTM A 653/A 653M, Commercial Steel (CS), Type B; with minimum G60 (Z180) or A60 (ZF180) metallic coating.

E. Rolled-Stainless-Steel Floor Plate: ASTM A 793, manufacturer's standard finish.

F. Stainless-Steel Sheet, Strip, Plate, and Flat Bars: ASTM A 666, Type 316. Remove tool and die marks and stretch lines or blend into finish.

G. Aluminum Extrusions: ASTM B 221 (ASTM B 221M), Alloy 6063-T6.

H. Aluminum-Alloy Rolled Tread Plate: ASTM B 632/B 632M, Alloy 6061-T6.

I. Aluminum Sheet: ASTM B 209 (ASTM B 209M), 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-H15; with minimum sheet thickness according to ANSI H35.2 (ANSI H35.2M).

J. Frame Anchors: Same type as door face.

K. Inserts, Bolts, and Anchor Fasteners: Hot-dip galvanized steel according to ASTM A 153/A 153M or ASTM F 2329.

2.5 FABRICATION

A. General: Provide access door and frame assemblies manufactured as integral units ready for installation.

B. Metal Surfaces: For metal surfaces exposed to view in the completed Work, provide materials with smooth, flat surfaces without blemishes. Do not use materials with exposed pitting, seam marks, roller marks, rolled trade names, or roughness.

C. Doors and Frames: Grind exposed welds smooth and flush with adjacent surfaces. Furnish attachment devices and fasteners of type required to secure access doors to types of supports indicated.

1. For concealed flanges with drywall bead, provide edge trim for gypsum board securely attached to perimeter of frames.
2. For concealed flanges with plaster bead for full-bed plaster applications, provide zinc-coated expanded metal lath and exposed casing bead welded to perimeter of frames.
3. Provide mounting holes in frames for attachment of units to metal or wood framing.
4. Provide mounting holes in frame for attachment of masonry anchors.

D. Recessed Access Doors: Form face of panel to provide recess for application of applied finish. Reinforce panel as required to prevent buckling.

1. For recessed doors with plaster infill, provide self-furring expanded metal lath attached to door panel.

E. Latching Mechanisms: Furnish number required to hold doors in flush, smooth plane when closed.

1. For cylinder locks, furnish two keys per lock and key all locks alike.
2. For recessed panel doors, provide access sleeves for each locking device. Furnish plastic grommets and install in holes cut through finish.

F. Extruded Aluminum: After fabrication, apply manufacturer's standard protective coating on aluminum that will come in contact with concrete.

2.6 FINISHES

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.

D. Steel and Metallic-Coated-Steel Finishes:

1. Factory Prime: Apply manufacturer's standard, fast-curing, lead- and chromate-free, universal primer immediately after surface preparation and pretreatment.
2. Factory Finish: Immediately after cleaning and pretreating, apply manufacturer's standard two-coat, baked-on finish consisting of prime coat and thermosetting topcoat, with a minimum dry-film thickness of 1 mil (0.025 mm) for topcoat.

E. Stainless-Steel Finishes:

1. Surface Preparation: Remove tool and die marks and stretch lines, or blend into finish.
2. Polished Finishes: Grind and polish surfaces to produce uniform finish, free of cross scratches.

    a. Run grain of directional finishes with long dimension of each piece.
    b. When polishing is completed, passivate and rinse surfaces. Remove embedded foreign matter and leave surfaces chemically clean.
    c. Directional Satin Finish: No. 4.

3. Bright, Cold-Rolled, Unpolished Finish: No. 2B.

F. Aluminum Finishes:

1. Mill finish.

PART 3 - EXECUTION

3.1 EXAMINATION

A. Examine substrates 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 INSTALLATION

A. Comply with manufacturer's written instructions for installing access doors and frames.

B. Install doors flush with adjacent finish surfaces or recessed to receive finish material.

3.3 ADJUSTING

A. Adjust doors and hardware, after installation, for proper operation.

B. Remove and replace doors and frames that are warped, bowed, or otherwise damaged.

3.4 WASTE MANAGEMENT

A. Coordinate with Section 01 74 19.

1. Separate and recycle cut-offs and waste materials and material packaging in accordance with Waste Management Plan and to the maximum extent economically feasible and place in designated areas for recycling.
2. Set aside and protect materials suitable for reuse and/or remanufacturing.
3. Separate and fold up metal banding; flatten and place along with other metal scrap for recycling in designated area.

END OF SECTION 08 31 13

SECTION 08 41 13 - ALUMINUM-FRAMED ENTRANCES AND STOREFRONTS

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 performance criteria, materials, production, and erection of aluminum framed entrances and storefronts for the project. The work performed under this Section consists of the provision of all plant, materials, labor and equipment and the like necessary and/or required for the complete execution of all aluminum framed entrances and storefronts as required by the this section, schedules, keynotes and drawings, including, but not limited to the following:

1. Exterior storefront framing.
2. Storefront framing for window walls.
3. Storefront framing for punched openings.
4. Exterior and interior manual-swing entrance doors and door-frame units.

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 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.

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 Initial Selection: For units with factory-applied color finishes.

D. Samples for Verification: For each type of exposed finish required, in manufacturer's standard sizes.

E. Fabrication Sample: Of each vertical-to-horizontal intersection of assemblies, made from 12-inch (300-mm) 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.

F. Entrance Door Hardware Schedule: Prepared by or under supervision of supplier, detailing fabrication and assembly of entrance door hardware, as well as procedures and diagrams. Coordinate final entrance door hardware schedule with doors, frames, and related work to ensure proper size, thickness, hand, function, and finish of entrance door hardware.

G. 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.

1.5 INFORMATIONAL SUBMITTALS

A. Preconstruction Laboratory Mockup Testing Submittals:

1. Testing Program: Developed specifically for Project.
2. Test Reports: Prepared by a qualified preconstruction testing agency for each mockup test.
3. Record Drawings: As-built drawings of preconstruction laboratory mockups showing changes made during preconstruction laboratory mockup testing.

B. Qualification Data: For Installer and field testing agency.

C. 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.

D. Product Test Reports: For aluminum-framed entrances and storefronts, for tests performed by manufacturer and witnessed by a qualified testing agency.

E. Quality-Control Program: Developed specifically for Project, including fabrication and installation, according to recommendations in ASTM C 1401. Include periodic quality-control reports.

F. Source quality-control reports.

G. Field quality-control reports.

H. Sample Warranties: For special warranties.

1.6 CLOSEOUT SUBMITTALS

A. Maintenance Data: For aluminum-framed entrances and storefronts to include in maintenance manuals.

B. Maintenance Data for Structural Sealant: For structural-sealant-glazed storefront to include in maintenance manuals. Include ASTM C 1401 recommendations for post-installation-phase quality-control program.

1.7 QUALITY ASSURANCE

A. Installer Qualifications: An entity that employs installers and supervisors who are trained and approved by manufacturer.

B. Testing Agency Qualifications: Qualified according to ASTM E 699 for testing indicated.

C. 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.

D. Structural-Sealant Glazing: Comply with ASTM C 1401 for design and installation of storefront systems.

E. Quality-control program for structural-sealant-glazed system.

F. Preconstruction sealant testing.

1.8 MOCKUPS

A. 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. Mockups for each form of construction and finish.
3. Testing shall be performed on mockups according to requirements in "Field Quality Control" Article.
4. Approval of mockups does not constitute approval of deviations from the Contract Documents contained in mockups unless Architect specifically approves such deviations in writing.
5. Subject to compliance with requirements, approved mockups may become part of the completed Work if undisturbed at time of Substantial Completion.

1.9 WARRANTY

A. Special Warranty: Manufacturer and Installer 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. Structural Loads:

1. Wind Loads: 118 mph, and in compliance with NYS Building Code Section 2404 “Wind, Snow, Seismic, and Dead loads on Glass.”
2. Other Design Loads: As indicated on Drawings.

D. Deflection of Framing Members: At design wind pressure, as follows:

1. Deflection Normal to Wall Plane: Limited to 1/175 of clear span for spans up to 13 feet 6 inches (4.1 m) and to 1/240 of clear span plus 1/4 inch (6.35 mm) for spans greater than 13 feet 6 inches (4.1 m) or an amount that restricts edge deflection of individual glazing lites to 3/4 inch (19.1 mm), whichever is less.
2. Deflection Parallel to Glazing Plane: Limited to 1/360 of clear span or 1/8 inch (3.2 mm), whichever is smaller.

    a. Operable Units: Provide a minimum 1/16-inch (1.6-mm) clearance between framing members and operable units.

3. Cantilever Deflection: Where framing members overhang an anchor point, as follows:

    a. Perpendicular to Plane of Wall: No greater than 1/240 of clear span plus 1/4 inch (6.35 mm) for spans greater than 11 feet 8-1/4 inches (3.6 m) or 1/175 times span, for spans less than 11 feet 8-1/4 inches (3.6 m).

E. 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.

F. 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. (0.30 L/s per sq. m) at a static-air-pressure differential of 6.24 lbf/sq. ft. (300 Pa).

2. Entrance Doors:

a. Pair of Doors: Maximum air leakage of 1.0 cfm/sq. ft. (5.08 L/s per sq. m) at a static-air-pressure differential of 6.24 lbf/sq. ft. (300 Pa).
b. Single Doors: Maximum air leakage of 0.5 cfm/sq. ft. (2.54 L/s per sq. m) at a static-air-pressure differential of 6.24 lbf/sq. ft. (300 Pa).

G. Water Penetration under Static Pressure: Test according to ASTM E 331 as follows:

1. No evidence of water penetration through fixed glazing and framing areas when tested according to a minimum static-air-pressure differential of 20 percent of positive wind-load design pressure, but not less than 6.24 lbf/sq. ft. (300 Pa).

H. Water Penetration under Dynamic Pressure: Test according to AAMA 501.1 as follows:

1. No evidence of water penetration through fixed glazing and framing areas when tested at dynamic pressure equal to 20 percent of positive wind-load design pressure, but not less than 6.24 lbf/sq. ft. (300 Pa).
2. Maximum Water Leakage: According to AAMA 501.1. Water leakage does not include water controlled by flashing and gutters, or water that is drained to exterior.

I. Interstory Drift: Accommodate design displacement of adjacent stories indicated.

1. Design Displacement: As indicated on Drawings.
2. Test Performance: Complying with criteria for passing based on building occupancy type when tested according to AAMA 501.4 at design displacement and 1.5 times the design displacement.

J. Seismic Performance: Aluminum-framed entrances and storefronts shall withstand the effects of earthquake motions determined according to ASCE/SEI 7.

1. Seismic Drift Causing Glass Fallout: Complying with criteria for passing based on building occupancy type when tested according to AAMA 501.6 at design displacement and 1.5 times the design displacement.
2. Vertical Interstory Movement: Complying with criteria for passing based on building occupancy type when tested according to AAMA 501.7 at design displacement and 1.5 times the design displacement.

K. Energy Performance: Certify and label energy performance according to NFRC as follows:

1. Thermal Transmittance (U-factor): Fixed glazing and framing areas shall have U-factor of not more than 0.47 Btu/sq. ft. x h x deg F (2.55 W/sq. m x K) as determined according to NFRC 100.
2. Solar Heat Gain Coefficient: Fixed glazing and framing areas shall have a solar heat gain coefficient of no greater than 0.35 as determined according to NFRC 200.
3. Condensation Resistance: Fixed glazing and framing areas shall have an NFRC-certified condensation resistance rating of no less than 15 as determined according to NFRC 500.

L. Noise Reduction: Test according to ASTM E 90, with ratings determined by ASTM E 1332, as follows.

1. Outdoor-Indoor Transmission Class: Minimum 26.

M. Windborne-Debris Impact Resistance: Pass missile-impact and cyclic-pressure tests when tested according to ASTM E 1886 and testing information in ASTM E 1996 for Wind Zone 5.

1. Large-Missile Test: For glazed openings located within 30 feet (9.1 m) of grade.

N. Thermal Movements: Allow for thermal movements resulting from ambient and surface temperature changes:

1. Temperature Change: 120 deg F (67 deg C), ambient; 180 deg F (100 deg C), material surfaces.
2. Thermal Cycling: No buckling; stress on glass; sealant failure; excess stress on framing, anchors, and fasteners; or reduction of performance when tested according to AAMA 501.5.

a. High Exterior Ambient-Air Temperature: That which produces an exterior metal-surface temperature of 180 deg F (82 deg C).
b. Low Exterior Ambient-Air Temperature: 0 deg F (minus 18 deg C).
c. Interior Ambient-Air Temperature: 75 deg F (24 deg C).

O. Structural-Sealant Joints:

1. Designed to carry gravity loads of glazing.
2. Designed to produce tensile or shear stress of less than 20 psi (138 kPa).

P. Structural Sealant: Capable of withstanding tensile and shear stresses imposed by structural-sealant-glazed storefront system without failing adhesively or cohesively. When tested for preconstruction adhesion and compatibility, cohesive failure of sealant shall occur before adhesive failure.

1. Adhesive failure occurs when sealant pulls away from substrate cleanly, leaving no sealant material behind.
2. Cohesive failure occurs when sealant breaks or tears within itself but does not separate from each substrate because sealant-to-substrate bond strength exceeds sealant's internal strength.

2.2 MANUFACTURERS

A. Basis-of-Design: Subject to compliance with requirements, provide systems that match size and appearance of aluminum windows within the specifications of this section division, Trifab 451T (thermal) Storefront System, as manufactured by Kawneer Company, Inc., or comparable product by one of the following:

1. Architectural Windows.
2. Efco Corporation.
3. CRL – U.S. Aluminum

B. Source Limitations: Obtain all components of aluminum-framed entrance and storefront system, including framing spandrel panels and 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. System Dimensions: 2” x 4 ½” (50.8mm x 114.3 mm).
3. Glazing Plane: Front (exterior).
4. Finish: High-performance organic finish.
5. Color: Match Architect’s sample.

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 (ASTM B 209M).
b. Extruded Bars, Rods, Profiles, and Tubes: ASTM B 221 (ASTM B 221M).
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-inch overall thickness, 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.
2. Door Design: Medium or Wide stile. 10” high bottom rail for ADA compliance.
3. Glazing stops and gaskets.

4. Material: extra thick (3/16")

B. Entrance Door Hardware: Refer to Section 08 71 00 "Door Hardware."

1. Weather stripping: manufacturer's standard.
2. All hardware to be surface mounted to facilitate future maintenance.
3. Hardware finishes: As selected by Architect from Manufacture's full range.

C. Additional requirements:

1. Thresholds: Stainless steel, raised thresholds beveled with a slope of not more than 1:2, with maximum height of 1/2 inch (12.7 mm).
2. Opening-Force Requirements:
   a. Egress Doors: Not more than 15 lbf (67 N) to release the latch and not more than 30 lbf (133 N) to set the door in motion[and not more than 15 lbf (67 N) to open the door to its minimum required width].
   b. Accessible Interior Doors: Not more than 5 lbf (22.2 N) to fully open door.
3. Removable Mullions: BHMA A156.3, extruded aluminum.
   a. When used with panic exit devices, provide removable mullions listed and labeled by a testing and inspecting agency acceptable to authorities having jurisdiction, for panic protection, based on testing according to UL 305. Use only mullions that have been tested with exit devices to be used.

2.5 GLAZING

A. Glazing: Comply with Section 08 80 00 "Glazing."

B. Glazing Gaskets: Manufacturer's standard sealed-corner pressure-glazing system of black, resilient elastomeric glazing gaskets, setting blocks, and shims or spacers.

C. Glazing Sealants: As recommended by manufacturer.

D. Sealants used inside the weatherproofing system shall have a VOC content of 250 g/L.

E. Structural Glazing Sealants: ASTM C 1184, chemically curing silicone formulation that is compatible with system components with which it comes in contact, specifically formulated and tested for use as structural sealant and approved by structural-sealant manufacturer for use in storefront system indicated.

1. Color: As selected by Architect from manufacturer's full range of colors.

F. Weatherseal Sealants: ASTM C 920 for Type S; Grade NS; Class 25; Uses NT, G, A, and O; chemically curing silicone formulation that is compatible with structural sealant and other system components with which it comes in contact; recommended by structural-sealant, weatherseal-sealant, and structural-sealant-glazed storefront manufacturers for this use.

1. Color: Match structural sealant.

2.6 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 fabricated from 300 series stainless steel.

B. Anchors: Three-way adjustable anchors with minimum adjustment of 1 inch (25.4 mm) that accommodate fabrication and installation tolerances in material and finish compatible with adjoining materials and recommended by manufacturer.

1. Concrete and Masonry Inserts: Hot-dip galvanized cast-iron, malleable-iron, or steel inserts complying with ASTM A 123/A 123M or ASTM A 153/A 153M requirements.

C. Concealed Flashing: Manufacturer's standard corrosion-resistant, nonstaining, nonbleeding flashing compatible with adjacent materials.

D. Bituminous Paint: Cold-applied asphalt-mastic paint complying with SSPC-Paint 12 requirements except containing no asbestos, formulated for 30-mil (0.762-mm) thickness per coat.

E. Aluminum sunscreen extrusion profile – to be selected by Architect from Manufacturer’s standard profiles. Anchored directly to the vertical or horizontal mullions – refer to Drawings. Color to match storefront and windows.

2.7 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. 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.
2. At interior doors, provide silencers at stops to prevent metal-to-metal contact. Install three silencers on strike jamb of single-door frames and two silencers on head of frames for pairs of doors.

G. Entrance Doors: Reinforce doors as required for installing entrance door hardware.

1. At pairs of exterior doors, provide sliding-type weather stripping retained in adjustable strip and mortised into door edge.
2. At exterior doors, provide weather sweeps applied to door bottoms.

H. Entrance Door Hardware Installation: Factory install entrance door hardware to the greatest extent possible. Cut, drill, and tap for factory-installed entrance door hardware before applying finishes.

I. After fabrication, clearly mark components to identify their locations in Project according to Shop Drawings.

2.8 ALUMINUM FINISHES

A. High-Performance Organic Coating Finish: AA-C12C42R1x (Chemical Finish: cleaned with inhibited chemicals; Chemical Finish: acid chromate-fluoride-phosphate conversion coating; Organic Coating: as specified below). Prepare, pretreat, and apply coating to exposed metal surfaces to comply with coating and resin manufacturer's written instructions.

1. Fluoropolymer 3-Coat Coating System: Manufacturer's standard 3-coat, thermocured system composed of specially formulated inhibitive primer, fluoropolymer color coat, and clear fluorocarbon topcoat, with both color coat and clear topcoat containing not less than 70 percent polyvinylidene fluoride resin by weight; complying with AAMA 2605

a. Color and Gloss: Match Architect’s sample of Alucobond Anodic Clear Mica Cool PVDF-2/gloss level-30.
b. It is the intent that all aluminum framing members on the project shall match in color and gloss.

2.9 SOURCE QUALITY CONTROL

A. Structural Sealant: Perform quality-control procedures complying with ASTM C 1401 recommendations including, but not limited to, assembly material qualification procedures, sealant testing, and assembly fabrication reviews and checks.

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 07 92 00 "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 (3.2 mm in 3 m); 1/4 inch in 40 feet (6.35 mm in 12.2 m).
2. Level: 1/8 inch in 20 feet (3.2 mm in 6 m); 1/4 inch in 40 feet (6.35 mm in 12.2 m).
3. Alignment:

    a. Where surfaces abut in line or are separated by reveal or protruding element up to 1/2 inch (12.7 mm) wide, limit offset from true alignment to 1/16 inch (1.6 mm).
    b. Where surfaces are separated by reveal or protruding element from 1/2 to 1 inch (12.7 to 25.4 mm) wide, limit offset from true alignment to 1/8 inch (3.2 mm).
    c. Where surfaces are separated by reveal or protruding element of 1 inch (25.4 mm) wide or more, limit offset from true alignment to 1/4 inch (6 mm).

4. Location: Limit variation from plane to 1/8 inch in 12 feet (3.2 mm in 3.6 m); 1/2 inch (12.7 mm) over total length.

3.5 FIELD QUALITY CONTROL

A. Testing Agency: Owner will engage a qualified testing agency to perform tests and inspections.

B. Field Quality-Control Testing: Perform the following test on representative areas of aluminum-framed entrances and storefronts and mockups.

1. Water-Spray Test: Before installation of interior finishes has begun, areas designated by Architect shall be tested according to AAMA 501.2 and shall not evidence water penetration.

    a. Perform a minimum of two tests in areas as directed by Architect.
    b. Perform tests in each test area as directed by Architect. Perform at least three tests, prior to 10, 35, and 70 percent completion.

C. Structural-Sealant Adhesion: Test structural sealant according to recommendations in ASTM C 1401, Destructive Test Method A, "Hand Pull Tab (Destructive)," Appendix X2.

1. Test a minimum of three areas on each building facade.
2. Repair installation areas damaged by testing.

D. Aluminum-framed entrances and storefronts will be considered defective if they do not pass tests and inspections.

E. Prepare test and inspection reports.

3.6 MAINTENANCE SERVICE

A. Entrance Door Hardware:

1. Maintenance Tools and Instructions: Furnish a complete set of specialized tools and maintenance instructions as needed for Owner's continued adjustment, maintenance, and removal and replacement of entrance door hardware.
2. Initial Maintenance Service: Beginning at Substantial Completion, provide six months' full maintenance by skilled employees of entrance door hardware Installer. Include quarterly preventive maintenance, repair or replacement of worn or defective components, lubrication, cleaning, and adjusting as required for proper entrance door hardware operation at rated speed and capacity. Use parts and supplies that are the same as those used in the manufacture and installation of original equipment.

3.7 WASTE MANAGEMENT

A. Coordinate with Section 01 74 19.

1. Separate and recycle cut-offs and waste materials and material packaging in accordance with Waste Management Plan and to the maximum extent economically feasible and place in designated areas for recycling.
2. Set aside and protect materials suitable for reuse and/or remanufacturing.
3. Separate and fold up metal banding; flatten and place along with other metal scrap for recycling in designated area.

END OF SECTION

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SECTION 08 56 67 - BULLET-RESISTANT STEEL TRANSACTION WINDOWS

PART 1 GENERAL

1.1 SUMMARY

A. Section Includes:
   1. Bullet-resistant fixed steel transaction window assemblies.

B. Related Sections:
   1. Division 01: Administrative, procedural, and temporary work requirements.

1.2 REFERENCES

A. American Welding Society (AWS) D1.3/D1.3M - Structural Welding Code - Sheet Steel.

B. ASTM International (ASTM) A1008/A1008M - Standard Specification for Steel, Sheet, Cold-Rolled, Carbon, Structural, High-Strength Low-Alloy and High-Strength Low-Alloy with Improved Formability.

C. Underwriters Laboratories (UL) 752 - Bullet Resisting Equipment.

1.3 SYSTEM DESCRIPTION

A. Design Requirements:
   1. Provide window frames of “non-ricochet type" intended to permit capture and retention of attacking projectile, lessening potential of random injury or lateral penetration.

1.4 SUBMITTALS

A. Submittals for Review:
   1. Shop Drawings: Include window profiles and sizes, type and spacing of frame anchors, reinforcement size and locations, details of joints and connections, and welding details.
   2. Product Data: Include product description for window assemblies including bullet-resistant ratings.
   3. Samples: 2 x 2 inch coating samples showing available colors.

B. Closeout Submittals:
   1. Maintenance Data: Include instructions for cleaning of glazed panels.

1.5 QUALITY ASSURANCE

A. Transaction Window Assemblies: Ballistic Level 3, tested to UL 752.

1.6 DELIVERY, STORAGE AND HANDLING

A. Store window assemblies upright in protected, dry area, off ground or floor, with at least 1/4 inch space between individual units.

B. Do not cover with non-vented coverings that create excessive humidity.

C. Remove wet coverings immediately.

PART 2 PRODUCTS

2.1 MANUFACTURERS

A. Contract Documents are based on products by ARMORTEX, 5926 Corridor Parkway, Schertz, Texas, 800-880-8306, www.armortex.com.

Basis of Design: Transaction Window NV Split Frame, Model: W1-TW-NV-SA by ARMORTEX.

B. Substitutions: Under provisions of Division 01.

2.2 MATERIALS

A. Steel Sheet:
1. ASTM A1008/1008M, cold rolled, free from scale, pitting, coil breaks, and other surface defects.

B. Bullet-Resistant Composite: UL Listed Bullet Resistant Composite by ARMORTEX, of UL Ballistic Level equal to specified frame ballistic protection level.

C. Glazing:
1. UL Listed laminated glass or glass/polycarbonate composite.
2. Bottom edge of glazing panel provided with 18 gage stainless steel cap.

D. Track and Hangers:
1. Stainless steel 12 gage track guard and guide.

2.3 FABRICATION

A. Frames:
1. Fabricate from 16 gage steel lined with bullet-resistant composite.
2. Bullet-resistant rating equivalent to or greater than glazing.
3. Weld frame corners; knock-down and mechanical joints not acceptable.
4. Frame modules capable of being joined with other frame modules to form continuous line.
5. Replacement of glazing from secure side of window, not requiring removal of frame from opening.

B. Shelf: Minimum 2 inches thick with recessed dip tray, full width of window x minimum 12 inches deep, centered under glazing, covered with 18 gage stainless steel.

C. Dip Tray: Model RMDT1016, 16 gage stainless steel, 10 x 16 inches to outside edge of flanges, clear 1-5/8 inch open depth under glazing.

D. Welding: In accordance with AWS D1.3/D1.3M. Grind exposed welds flush and smooth.

E. Finish work neat and free from defects.

F. Allowable Tolerances: Plus or minus 1/16 inch for frame opening width, height, diagonal dimensions, and overall width and height (outside to outside).

2.4 FINISHES

A. Stainless Steel: No. 3 brushed finish.

PART 3 EXECUTION

3.1 INSTALLATION

A. Install window assemblies in accordance with manufacturer's instructions and approved Shop Drawings.

B. Set plumb and level.

C. Secure to adjacent construction using fastener type best suited to application.

D. Field alterations to window assemblies not permitted unless approved in advance by manufacturer and Architect.

3.2 ADJUSTING

A. Touch up minor scratches and abrasions to match factory finish.

END OF SECTION 08 56 67

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SECTION 087100 - DOOR HARDWARE

PART 1 - GENERAL

1.01 SUMMARY

A. Section includes:

1. Mechanical and electrified door hardware
2. Electronic access control system components
3. Field verification, preparation and modification of existing doors and frames to receive new door hardware.

B. Section excludes:

1. Windows
2. Cabinets (casework), including locks in cabinets
3. Signage
4. Toilet accessories
5. Overhead doors

C. Related Sections:

1. Division 01 Section "Alternates" for alternates affecting this section.
2. Division 06 Section "Rough Carpentry"
3. Division 06 Section "Finish Carpentry"
4. Division 07 Section "Joint Sealants" for sealant requirements applicable to threshold installation specified in this section.
5. Division 08 Sections:

    a. "Metal Doors and Frames"
    b. "Flush Wood Doors"
    c. "Stile and Rail Wood Doors"
    d. "Interior Aluminum Doors and Frames"
    e. "Aluminum-Framed Entrances and Storefronts"
    f. "Stainless Steel Doors and Frames"
    g. "Special Function Doors"
    h. "Entrances"

6. Division 09 sections for touchup, finishing or refinishing of existing openings modified by this section.
7. Division 26 "Electrical" sections for connections to electrical power system and for low-voltage wiring.
8. Division 28 "Electronic Safety and Security" sections for coordination with other components of electronic access control system and fire alarm system.

1.02 REFERENCES

A. UL LLC

1. UL 10B - Fire Test of Door Assemblies
2. UL 10C - Positive Pressure Test of Fire Door Assemblies
3. UL 1784 - Air Leakage Tests of Door Assemblies
4. UL 305 - Panic Hardware

B. DHI - Door and Hardware Institute

1. Sequence and Format for the Hardware Schedule
2. Recommended Locations for Builders Hardware
3. Keying Systems and Nomenclature
4. Installation Guide for Doors and Hardware

C. NFPA – National Fire Protection Association

1. NFPA 70 – National Electric Code
2. NFPA 80 – 2016 Edition – Standard for Fire Doors and Other Opening Protectives
3. NFPA 101 – Life Safety Code
4. NFPA 105 – Smoke and Draft Control Door Assemblies
5. NFPA 252 – Fire Tests of Door Assemblies

D. ANSI - American National Standards Institute

1. ANSI A117.1 – 2017 Edition – Accessible and Usable Buildings and Facilities
2. ANSI/BHMA A156.1 - A156.29, and ANSI/BHMA A156.31 - Standards for Hardware and Specialties
3. ANSI/BHMA A156.28 - Recommended Practices for Keying Systems
4. ANSI/WDMA I.S. 1A - Interior Architectural Wood Flush Doors
5. ANSI/SDI A250.8 - Standard Steel Doors and Frames

1.03 SUBMITTALS

A. General:

1. Submit in accordance with Conditions of Contract and Division 01 Submittal Procedures.
2. Prior to forwarding submittal:

    a. Comply with procedures for verifying existing door and frame compatibility for new hardware, as specified in PART 3, "EXAMINATION" article, herein.
    b. Review drawings and Sections from related trades to verify compatibility with specified hardware.
    c. Highlight, encircle, or otherwise specifically identify on submittals: deviations from Contract Documents, issues of incompatibility or other issues which may detrimentally affect the Work.

B. Action Submittals:

1. Product Data: Submit technical product data for each item of door hardware, installation instructions, maintenance of operating parts and finish, and other information necessary to show compliance with requirements.
2. Riser and Wiring Diagrams: After final approval of hardware schedule, submit details of electrified door hardware, indicating:

a. Wiring Diagrams: For power, signal, and control wiring and including:
   1) Details of interface of electrified door hardware and building safety and security systems.
   2) Schematic diagram of systems that interface with electrified door hardware.
   3) Point-to-point wiring.
   4) Risers.

3. Samples for Verification: If requested by Architect, submit production sample of requested door hardware unit in finish indicated and tagged with full description for coordination with schedule.

   a. Samples will be returned to supplier. Units that are acceptable to Architect may, after final check of operations, be incorporated into Work, within limitations of key coordination requirements.

4. Door Hardware Schedule:

   a. Submit concurrent with submissions of Product Data, Samples, and Shop Drawings. Coordinate submission of door hardware schedule with scheduling requirements of other work to facilitate fabrication of other work critical in Project construction schedule.
   b. Submit under direct supervision of a Door Hardware Institute (DHI) certified Architectural Hardware Consultant (AHC) or Door Hardware Consultant (DHC) with hardware sets in vertical format as illustrated by Sequence of Format for the Hardware Schedule published by DHI.
   c. Indicate complete designations of each item required for each opening, include:
      1) Door Index: door number, heading number, and Architect's hardware set number.
      2) Quantity, type, style, function, size, and finish of each hardware item.
      3) Name and manufacturer of each item.
      4) Fastenings and other pertinent information.
      5) Location of each hardware set cross-referenced to indications on Drawings.
      6) Explanation of all abbreviations, symbols, and codes contained in schedule.
      7) Mounting locations for hardware.
      8) Door and frame sizes and materials.
      9) Degree of door swing and handing.
      10) Operational Description of openings with electrified hardware covering egress, ingress (access), and fire/smoke alarm connections.

5. Key Schedule:

   a. After Keying Conference, provide keying schedule that includes levels of keying, explanations of key system's function, key symbols used, and door numbers controlled.
   b. Use ANSI/BHMA A156.28 "Recommended Practices for Keying Systems" as guideline for nomenclature, definitions, and approach for selecting optimal keying system.
   c. Provide 3 copies of keying schedule for review prepared and detailed in accordance with referenced DHI publication. Include schematic keying diagram and index each key to unique door designations.
   d. Index keying schedule by door number, keyset, hardware heading number, cross keying instructions, and special key stamping instructions.

e. Provide one complete bitting list of key cuts and one key system schematic illustrating system usage and expansion. Forward bitting list, key cuts and key system schematic directly to Owner, by means as directed by Owner.
f. Prepare key schedule by or under supervision of supplier, detailing Owner's final keying instructions for locks.

C. Informational Submittals:

1. Provide Qualification Data for Supplier, Installer and Architectural Hardware Consultant.
2. Provide Product Data:

a. Certify that door hardware approved for use on types and sizes of labeled fire-rated doors complies with listed fire-rated door assemblies.
b. Include warranties for specified door hardware.

D. Closeout Submittals:

1. Operations and Maintenance Data: Provide in accordance with Division 01 and include:

a. Complete information on care, maintenance, and adjustment; data on repair and replacement parts, and information on preservation of finishes.
b. Catalog pages for each product.
c. Final approved hardware schedule edited to reflect conditions as installed.
d. Final keying schedule
e. Copy of warranties including appropriate reference numbers for manufacturers to identify project.
f. As-installed wiring diagrams for each opening connected to power, both low voltage and 110 volts.

E. Inspection and Testing:

1. Submit written reports to the Owner and Authority Having Jurisdiction (AHJ) of the results of functional testing and inspection for:

a. fire door assemblies, in compliance with NFPA 80.
b. required egress door assemblies, in compliance with NFPA 101.

1.04 QUALITY ASSURANCE

A. Qualifications and Responsibilities:

1. Supplier: Recognized architectural hardware supplier with a minimum of 5 years documented experience supplying both mechanical and electromechanical door hardware similar in quantity, type, and quality to that indicated for this Project. Supplier to be recognized as a factory direct distributor by the manufacturer of the primary materials with a warehousing facility in the Project's vicinity. Supplier to have on staff, a certified Architectural Hardware Consultant (AHC) or Door Hardware Consultant (DHC) available to Owner, Architect, and Contractor, at reasonable times during the Work for consultation.
2. Installer: Qualified tradesperson skilled in the application of commercial grade hardware with experience installing door hardware similar in quantity, type, and quality as indicated for this Project.

3. Architectural Hardware Consultant: 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 and meets these requirements:

    a. For door hardware: DHI certified AHC or DHC.
    b. Can provide installation and technical data to Architect and other related subcontractors.
    c. Can inspect and verify components are in working order upon completion of installation.
    d. Capable of producing wiring diagram and coordinating installation of electrified hardware with Architect and electrical engineers.

4. Single Source Responsibility: Obtain each type of door hardware from single manufacturer.

B. Certifications:

1. Fire-Rated Door Openings:

    a. Provide door hardware for fire-rated openings that complies with NFPA 80 and requirements of authorities having jurisdiction.
    b. Provide only items of door hardware that are listed products tested by UL LLC, Intertek Testing Services, or other testing and inspecting organizations acceptable to authorities having jurisdiction for use on types and sizes of doors indicated, based on testing at positive pressure and according to NFPA 252 or UL 10C and in compliance with requirements of fire-rated door and door frame labels.

2. Smoke and Draft Control Door Assemblies:

    a. Provide door hardware that meets requirements of assemblies tested according to UL 1784 and installed in compliance with NFPA 105
    b. Comply with the maximum air leakage of 0.3 cfm/sq. ft. (3 cu. m per minute/sq. m) at tested pressure differential of 0.3-inch wg (75 Pa) of water.

3. Electrified Door Hardware

    a. Listed and labeled as defined in NFPA 70, Article 100, by testing agency acceptable to authorities having jurisdiction.

4. Accessibility Requirements:

    a. Comply with governing accessibility regulations cited in "REFERENCES" article 087100, 1.02.D3 herein for door hardware on doors in an accessible route. This project must comply with all Federal Americans with Disability Act regulations and all Local Accessibility Regulations.

C. Pre-Installation Meetings

1. Keying Conference

    a. Incorporate keying conference decisions into final keying schedule after reviewing door hardware keying system including:

1) Function of building, flow of traffic, purpose of each area, degree of security required, and 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.

2. Pre-installation Conference

a. Review and finalize construction schedule and verify availability of materials, Installer's personnel, equipment, and facilities needed to make progress and avoid delays.
b. Inspect and discuss preparatory work performed by other trades.
c. Inspect and discuss electrical roughing-in for electrified door hardware.
d. Review sequence of operation for each type of electrified door hardware.
e. Review required testing, inspecting, and certifying procedures.
f. Review questions or concerns related to proper installation and adjustment of door hardware.

3. Electrified Hardware Coordination Conference:

a. Prior to ordering electrified hardware, schedule and hold meeting to coordinate door hardware with security, electrical, doors and frames, and other related suppliers.

1.05 DELIVERY, STORAGE, AND HANDLING

A. Inventory door hardware on receipt and provide secure lock-up for hardware delivered to Project site. Promptly replace products damaged during shipping.
B. Tag each item or package separately with identification coordinated with final door hardware schedule, and include installation instructions, templates, and necessary fasteners with each item or package. Deliver each article of hardware in manufacturer's original packaging.
C. Maintain manufacturer-recommended environmental conditions throughout storage and installation periods.
D. Provide secure lock-up for door hardware delivered to Project. Control handling and installation of hardware items so that completion of Work will not be delayed by hardware losses both before and after installation.
E. Handle hardware in manner to avoid damage, marring, or scratching. Correct, replace or repair products damaged during Work. Protect products against malfunction due to paint, solvent, cleanser, or any chemical agent.
F. Deliver keys to manufacturer of key control system for subsequent delivery to Owner.

1.06 COORDINATION

A. Coordinate layout and installation of floor-recessed door hardware with floor construction. Cast anchoring inserts into concrete.
B. Installation Templates: Distribute for doors, frames, and other work specified to be factory or shop 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.
C. Security: Coordinate installation of door hardware, keying, and access control with Owner's security consultant.

D. Electrical System Roughing-In: Coordinate layout and installation of electrified door hardware with connections to power supplies and building safety and security systems.
E. Existing Openings: Where existing doors, frames and/or hardware are to remain, field verify existing functions, conditions and preparations and coordinate to suit opening conditions and to provide proper door operation.

1.07 WARRANTY

A. Manufacturer's standard form in which manufacturer agrees to repair or replace components of door hardware that fail in materials or workmanship within published warranty period.

1. Warranty does not cover damage or faulty operation due to improper installation, improper use or abuse.
2. Warranty Period: Beginning from date of Substantial Completion, for durations indicated in manufacturer's published listings.

a. Mechanical Warranty
1) Locks
a) Schlage ND Series: 10 years
2) Exit Devices
a) Von Duprin: 3 years
3) Closers
a) LCN 4000 Series: 30 years

b. Electrical Warranty
1) Locks
a) Schlage: 1 year
2) Exit Devices
a) Von Duprin: 1 year

1.08 MAINTENANCE

A. Furnish complete set of special tools required for maintenance and adjustment of hardware, including changing of cylinders.
B. Turn over unused materials to Owner for maintenance purposes.

PART 2 - PRODUCTS

2.01 MANUFACTURERS

A. The Owner requires use of certain products for their unique characteristics and project suitability to ensure continuity of existing and future performance and maintenance standards. After investigating available product offerings, the Awarding Authority has elected to prepare proprietary specifications. These products are specified with the notation: "No Substitute."

1. Where "No Substitute" is noted, submittals and substitution requests for other products will not be considered.

B. Approval of manufacturers and/or products other than those listed as "Scheduled Manufacturer" or "Acceptable Manufacturers" in the individual article for the product category shall be in accordance with QUALITY ASSURANCE article, herein.
C. Approval of products from manufacturers indicated in "Acceptable Manufacturers" is contingent upon those products providing all functions and features and meeting all requirements of scheduled manufacturer's product.
D. Where specified hardware is not adaptable to finished shape or size of members requiring hardware, furnish suitable types having same operation and quality as type specified, subject to Architect's approval.

2.02 MATERIALS

A. Fabrication

1. Provide door hardware manufactured to comply with published templates generally prepared for machine, wood, and sheet metal screws. provide screws according to manufacturer's recognized installation standards for application intended.
2. Finish exposed screws to match hardware finish, or, if exposed in surfaces of other work, to match finish of this other work including prepared for paint surfaces to receive painted finish.
3. Provide concealed fasteners wherever possible for hardware units exposed when door is closed. Coordinate with "Metal Doors and Frames", "Flush Wood Doors", "Stile and Rail Wood Doors" to ensure proper reinforcements. Advise the Architect where visible fasteners, such as thru bolts, are required.

B. Modification and Preparation of Existing Doors: Where existing door hardware is indicated to be removed and reinstalled.

1. Provide necessary fillers, Dutchmen, reinforcements, and fasteners, compatible with existing materials, as required for mounting new opening hardware and to cover existing door and frame preparations.
2. Use materials which match materials of adjacent modified areas.
3. When modifying existing fire-rated openings, provide materials permitted by NFPA 80 as required to maintain fire-rating.

C. Provide screws, bolts, expansion shields, drop plates and other devices necessary for hardware installation.

1. Where fasteners are exposed to view: Finish to match adjacent door hardware material.

D. Cable and Connectors:

1. Where scheduled in the hardware sets, provide each item of electrified hardware and wire harnesses with number and gage of wires enough to accommodate electric function of specified hardware.
2. Provide Molex connectors that plug directly into connectors from harnesses, electric locking and power transfer devices.
3. Provide through-door wire harness for each electrified locking device installed in a door and wire harness for each electrified hinge, electrified continuous hinge, electrified pivot, and electric power transfer for connection to power supplies.

2.03 HINGES

A. Manufacturers and Products:

1. Scheduled Manufacturer and Product:

a. Ives 5BB series

2. Acceptable Manufacturers and Products:

a. Hager BB1191/1279 series
b. Stanley FBB series

B. Requirements:

1. Provide hinges conforming to ANSI/BHMA A156.1.
2. Provide five knuckle, ball bearing hinges.
3. 1-3/4 inch (44 mm) thick doors, up to and including 36 inches (914 mm) wide:

a. Exterior: Standard weight, bronze or stainless steel, 4-1/2 inches (114 mm) high
b. Interior: Standard weight, steel, 4-1/2 inches (114 mm) high

4. 1-3/4 inch (44 mm) thick doors over 36 inches (914 mm) wide:

a. Exterior: Heavy weight, bronze/stainless steel, 5 inches (127 mm) high
b. Interior: Heavy weight, steel, 5 inches (127 mm) high

5. 2 inches or thicker doors:

a. Exterior: Heavy weight, bronze or stainless steel, 5 inches (127 mm) high
b. Interior: Heavy weight, steel, 5 inches (127 mm) high

6. Adjust hinge width for door, frame, and wall conditions to allow proper degree of opening.
7. Provide three hinges per door leaf for doors 90 inches (2286 mm) or less in height, and one additional hinge for each 30 inches (762 mm) of additional door height.
8. Where new hinges are specified for existing doors or existing frames, provide new hinges of identical size to hinge preparation present in existing door or existing frame.
9. Hinge Pins: Except as otherwise indicated, provide hinge pins as follows:

a. Steel Hinges: Steel pins
b. Non-Ferrous Hinges: Stainless steel pins
c. Out-Swinging Exterior Doors: Non-removable pins
d. Out-Swinging Interior Lockable Doors: Non-removable pins
e. Interior Non-lockable Doors: Non-rising pins

10. Provide hinges with electrified options as scheduled in the hardware sets. Provide with number and gage of wires enough to accommodate electric function of specified hardware. Locate electric hinge at second hinge from bottom or nearest to electrified locking component. Provide mortar guard for each electrified hinge specified.

2.04 CONTINUOUS HINGES

A. Manufacturers:

1. Scheduled Manufacturer:

a. Ives

2. Acceptable Manufacturers:

a. Select
b. Roton

B. Requirements:

1. Provide aluminum geared continuous hinges conforming to ANSI/BHMA A156.26, Grade 1.
2. Provide aluminum geared continuous hinges, where specified in the hardware sets, fabricated from 6063-T6 aluminum.
3. Provide split nylon bearings at each hinge knuckle for quiet, smooth, self-lubricating operation.
4. Provide hinges capable of supporting door weights up to 450 pounds, and successfully tested for 1,500,000 cycles.
5. On fire-rated doors, provide aluminum geared continuous hinges classified for use on rated doors by testing agency acceptable to authority having jurisdiction.
6. Provide aluminum geared continuous hinges with electrified option scheduled in the hardware sets. Provide with number and gage of wires enough to accommodate electric function of specified hardware.
7. Provide hinges 1 inch (25 mm) shorter in length than nominal height of door, unless otherwise noted or door details require shorter length and with symmetrical hole pattern.

2.05 CYLINDRICAL LOCKS – GRADE 1

A. Manufacturers and Products:

1. Scheduled Manufacturer and Product:

a. Schlage ND series

B. Requirements:

1. Provide cylindrical locks conforming to ANSI/BHMA A156.2 Series 4000, Grade 1, and UL Listed for 3-hour fire doors.
2. Cylinders: Refer to "KEYING" article, herein.
3. Provide locks with standard 2-3/4 inches (70 mm) backset, unless noted otherwise, with 1/2-inch latch throw. Provide proper latch throw for UL listing at pairs.
4. Provide locksets with separate anti-rotation thru-bolts, and no exposed screws.
5. Provide independently operating levers with two external return spring cassettes mounted under roses to prevent lever sag.
6. Provide standard ASA strikes unless extended lip strikes are necessary to protect trim.
7. Provide electrified options as scheduled in the hardware sets.
8. Lever Trim: Solid cast levers without plastic inserts and wrought roses on both sides.

a. Lever Design: RHO

2.06 EXIT DEVICES

A. Manufacturers and Products:

1. Scheduled Manufacturer and Product:

a. Von Duprin 98/35A series

2. Acceptable Manufacturers and Products:

a. Precision APEX 2000 series
b. Falcon 24/25 series

B. Requirements:

1. Provide exit devices tested to ANSI/BHMA A156.3 Grade 1 and UL listed for Panic Exit or Fire Exit Hardware.
2. Cylinders: Refer to "KEYING" article, herein.
3. Provide smooth touchpad type exit devices, fabricated of brass, bronze, stainless steel, or aluminum, plated to standard architectural finishes to match balance of door hardware.
4. Touchpad must extend a minimum of one half of door width. No plastic inserts are allowed in touchpads.
5. Provide exit devices with deadlatching feature for security and for future addition of alarm kits and/or other electrified requirements.
6. Provide exit devices with weather resistant components that can withstand harsh conditions of various climates and corrosive cleaners used in outdoor pool environments.
7. Provide flush end caps for exit devices.
8. Provide exit devices with manufacturer's approved strikes.
9. Provide exit devices cut to door width and height. Install exit devices at height recommended by exit device manufacturer, allowable by governing building codes, and approved by Architect.
10. Mount mechanism case flush on face of doors or provide spacers to fill gaps behind devices. Where glass trim or molding projects off face of door, provide glass bead kits.
11. Provide cylinder or hex-key dogging as specified at non fire-rated openings.
12. Removable Mullions: 2 inches (51 mm) x 3 inches (76 mm) steel tube. Where scheduled as keyed removable mullion, provide type that can be removed by use of a keyed cylinder, which is self-locking when re-installed.
13. Provide factory drilled weep holes for exit devices used in full exterior application, highly corrosive areas, and where noted in hardware sets.
14. Provide electrified options as scheduled.
15. Top latch mounting: double- or single-tab mount for steel doors, face mount for aluminum doors eliminating requirement of tabs, and double tab mount for wood doors.
16. Provide exit devices with optional trim designs to match other lever and pull designs used on the project.

2.07 CYLINDERS

A. Manufacturers and Products:

1. Scheduled Manufacturer and Product:

    a. Schlage Everest 29 Primus XP

2. Acceptable Manufacturers and Products:

    a. No Substitute

B. Requirements:

1. Provide cylinders/cores, compliant with ANSI/BHMA A156.5; latest revision; cylinder face finished to match lockset, manufacturer's series as indicated. Refer to "KEYING" article, herein.
2. Provide cylinders in the below-listed configuration(s), distributed throughout the Project as indicated.

    a. High Security: dual-locking cylinder with permanent core requiring restricted, patented keyway. Dual-locking mechanism with interlocking finger pin(s) to check for patented features on keys.

3. Patent Protection: Cylinders/cores requiring use of restricted, patented keys, patent protected.
4. Nickel silver bottom pins.

2.08 KEYING

A. Scheduled System:

1. Existing factory registered system:

    a. Provide cylinders/cores keyed into Owner's existing factory registered keying system. Comply with guidelines in ANSI/BHMA A156.28, incorporating decisions made at keying conference.

B. Requirements:

1. Construction Keying:

    a. Replaceable Construction Cores.
        1) Provide temporary construction cores replaceable by permanent cores, furnished in accordance with the following requirements.
            a) 3 construction control keys
            b) 12 construction change (day) keys.
        2) Owner or Owner's Representative will replace temporary construction cores with permanent cores.

2. Permanent Keying:

    a. Provide permanent cylinders/cores keyed by the manufacturer according to the following key system.
        1) Master Keying system as directed by the Owner.

b. Forward bitting list and keys separately from cylinders, by means as directed by Owner. Failure to comply with forwarding requirements will be cause for replacement of cylinders/cores involved at no additional cost to Owner.
c. Provide keys with the following features:
    1) Material: Nickel silver; minimum thickness of .107-inch (2.3mm)
    2) Patent Protection: Keys and blanks protected by one or more utility patent(s).
    3) Geographically Exclusive: Where High Security or Security cylinders/cores are indicated, provide nationwide, geographically exclusive key system complying with the following restrictions.

d. Identification:
    1) Mark permanent cylinders/cores and keys with applicable blind code for identification. Do not provide blind code marks with actual key cuts.
    2) Identification stamping provisions must be approved by the Architect and Owner.
    3) Stamp cylinders/cores and keys with Owner's unique key system facility code as established by the manufacturer; key symbol and embossed or stamped with "DO NOT DUPLICATE" along with the "PATENTED" or patent number to enforce the patent protection.
    4) Failure to comply with stamping requirements will be cause for replacement of keys involved at no additional cost to Owner.
    5) Forward permanent cylinders/cores to Owner, separately from keys, by means as directed by Owner.

e. Quantity: Furnish in the following quantities.
    1) Change (Day) Keys: 3 per cylinder/core.
    2) Permanent Control Keys: 3.
    3) Master Keys: 6.

2.09 DOOR CLOSERS

A. Manufacturers and Products:

1. Scheduled Manufacturer and Product:

    a. LCN 4040XP series

2. Acceptable Manufacturers and Products:

    a. Corbin-Russwin DC8000 series
    b. Sargent 281 series

B. Requirements:

1. Provide door closers conforming to ANSI/BHMA A156.4 Grade 1 requirements by BHMA certified independent testing laboratory. ISO 9000 certify closers. Stamp units with date of manufacture code.
2. Provide door closers with fully hydraulic, full rack and pinion action with high strength cast iron cylinder, and full complement bearings at shaft.
3. Cylinder Body: 1-1/2-inch (38 mm) diameter with 5/8-inch (16 mm) diameter double heat-treated pinion journal.
4. Hydraulic Fluid: Fireproof, passing requirements of UL10C, and requiring no seasonal closer adjustment for temperatures ranging from 120 degrees F to -30 degrees F.

5. Spring Power: Continuously adjustable over full range of closer sizes, and providing reduced opening force as required by accessibility codes and standards.
6. Hydraulic Regulation: By tamper-proof, non-critical valves, with separate adjustment for latch speed, general speed, and backcheck.
7. Provide closers with solid forged steel main arms and factory assembled heavy-duty forged forearms for parallel arm closers.
8. Pressure Relief Valve (PRV) Technology: Not permitted.
9. Finish for Closer Cylinders, Arms, Adapter Plates, and Metal Covers: Powder coating finish which has been certified to exceed 100 hours salt spray testing as described in ANSI Standard A156.4 and ASTM B117, or has special rust inhibitor (SRI).
10. Provide special templates, drop plates, mounting brackets, or adapters for arms as required for details, overhead stops, and other door hardware items interfering with closer mounting.

2.10 PROTECTION PLATES

A. Manufacturers:

1. Scheduled Manufacturer:

a. Ives

2. Acceptable Manufacturers:

a. Burns
b. Trimco

B. Requirements:

1. Provide protection plates with a minimum of 0.050 inch (1 mm) thick, beveled four edges as scheduled. Furnish with sheet metal or wood screws, finished to match plates.
2. Sizes plates 2 inches (51 mm) less width of door on single doors, pairs of doors with a mullion, and doors with edge guards. Size plates 1 inch (25 mm) less width of door on pairs without a mullion or edge guards.
3. At fire rated doors, provide protection plates over 16 inches high with UL label.

2.11 OVERHEAD STOPS AND OVERHEAD STOP/HOLDERS

A. Manufacturers:

1. Scheduled Manufacturers:

a. Glynn-Johnson

2. Acceptable Manufacturers:

a. Rixson
b. Sargent

B. Requirements:

1. Provide overhead stop at any door where conditions do not allow for a wall stop or floor stop presents tripping hazard.
2. Provide friction type at doors without closer and positive type at doors with closer.

2.12 DOOR STOPS AND HOLDERS

A. Manufacturers:

1. Scheduled Manufacturer:

a. Ives

2. Acceptable Manufacturers:

a. Trimco
b. Burns

B. Provide door stops at each door leaf:

1. Provide wall stops wherever possible. Provide concave type where lockset has a push button of thumbturn.
2. Where a wall stop cannot be used, provide universal floor stops.
3. Where wall or floor stop cannot be used, provide overhead stop.
4. Provide roller bumper where doors open into each other and overhead stop cannot be used.

2.13 THRESHOLDS, SEALS, DOOR SWEEPS, AUTOMATIC DOOR BOTTOMS, AND GASKETING

A. Manufacturers:

1. Scheduled Manufacturer:

a. Zero International

2. Acceptable Manufacturers:

a. National Guard
b. Reese

B. Requirements:

1. Provide thresholds, weather-stripping, and gasketing systems as specified and per architectural details. Match finish of other items.
2. Smoke- and Draft-Control Door Assemblies: Where smoke- and draft-control door assemblies are required, provide door hardware that meets requirements of assemblies tested according to UL 1784 and installed in compliance with NFPA 105.
3. Provide door sweeps, seals, astragals, and auto door bottoms only of type where resilient or flexible seal strip is easily replaceable and readily available.

4. Size thresholds 1/2 inch (13 mm) high by 5 inches (127 mm) wide by door width unless otherwise specified in the hardware sets or detailed in the drawings.

2.14 SILENCERS

A. Manufacturers:

1. Scheduled Manufacturer:

a. Ives

2. Acceptable Manufacturers:

a. Burns
b. Trimco

B. Requirements:

1. Provide "push-in" type silencers for hollow metal or wood frames.
2. Provide one silencer per 30 inches (762 mm) of height on each single frame, and two for each pair frame.
3. Omit where gasketing is specified.

2.15 DOOR POSITION SWITCHES

A. Manufacturers:

1. Scheduled Manufacturer:

a. Schlage

2. Acceptable Manufacturers:

a. GE-Interlogix
b. Sargent

B. Requirements:

1. Provide recessed or surface mounted type door position switches as specified.
2. Coordinate door and frame preparations with door and frame suppliers. If switches are being used with magnetic locking device, provide minimum of 4 inches (102 mm) between switch and magnetic locking device.

2.16 FINISHES

A. FINISH: BHMA 626/652 (US26D); EXCEPT:

1. Hinges at Exterior Doors: BHMA 630 (US32D)
2. Aluminum Geared Continuous Hinges: BHMA 628 (US28)

3. Push Plates, Pulls, and Push Bars: BHMA 630 (US32D)
4. Protection Plates: BHMA 630 (US32D)
5. Overhead Stops and Holders: BHMA 630 (US32D)
6. Door Closers: Powder Coat to Match
7. Wall Stops: BHMA 630 (US32D)
8. Latch Protectors: BHMA 630 (US32D)
9. Weatherstripping: Clear Anodized Aluminum
10. Thresholds: Mill Finish Aluminum

B. FINISH: BHMA 643E/716 (US11); EXCEPT:

1. Door Closers: Powder Coat to Match.
2. Weatherstripping: Dark Bronze Anodized Aluminum.
3. Thresholds: Extruded Architectural Bronze, Oil-Rubbed

PART 3 - EXECUTION

3.01 EXAMINATION

A. Prior to installation of hardware, 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. Verify doors, frames, and walls have been properly reinforced for hardware installation.
B. Field verify existing doors and frames receiving new hardware and existing conditions receiving new openings. Verify that new hardware is compatible with existing door and frame preparation and existing conditions.
C. Examine roughing-in for electrical power systems to verify actual locations of wiring connections before electrified door hardware installation.
D. Submit a list of deficiencies in writing and proceed with installation only after unsatisfactory conditions have been corrected.

3.02 INSTALLATION

A. 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. Custom Steel Doors and Frames: HMMA 831.
3. Interior Architectural Wood Flush Doors: ANSI/WDMA I.S. 1A
4. Installation Guide for Doors and Hardware: DHI TDH-007-20

B. Install door hardware in accordance with NFPA 80, NFPA 101 and provide post-install inspection, testing as specified in section 1.03.E unless otherwise required to comply with governing regulations.
C. Install each hardware item in compliance with manufacturer's instructions and recommendations, using only fasteners provided by manufacturer.
D. Do not install surface mounted items until finishes have been completed on substrate. Protect all installed hardware during painting.
E. Set units level, plumb and true to line and location. Adjust and reinforce attachment substrate as necessary for proper installation and operation.

F. Drill and countersink units that are not factory prepared for anchorage fasteners. Space fasteners and anchors according to industry standards.
G. Install operating parts so they move freely and smoothly without binding, sticking, or excessive clearance.
H. Hinges: Install types and in quantities indicated in door hardware schedule but not fewer than quantity recommended by manufacturer for application indicated.
I. Lock Cylinders:

1. Install construction cores to secure building and areas during construction period.
2. Replace construction cores with permanent cores as indicated in keying section.
3. Furnish permanent cores to Owner for installation.

J. Wiring: Coordinate with Division 26, ELECTRICAL and Division 28 ELECTRONIC SAFETY AND SECURITY sections for:

1. Conduit, junction boxes and wire pulls.
2. Connections to and from power supplies to electrified hardware.
3. Connections to fire/smoke alarm system and smoke evacuation system.
4. Connection of wire to door position switches and wire runs to central room or area, as directed by Architect.
5. Connections to panel interface modules, controllers, and gateways.
6. Testing and labeling wires with Architect's opening number.

K. Door Closers: Mount closers on room side of corridor doors, inside of exterior doors, and stair side of stairway doors from corridors. Mount closers so they are not visible in corridors, lobbies and other public spaces unless approved by Architect.
L. Closer/Holders: Mount closer/holders on room side of corridor doors, inside of exterior doors, and stair side of stairway doors.
M. Power Supplies: Locate power supplies as indicated or, if not indicated, above accessible ceilings or in equipment room, or alternate location as directed by Architect.
N. Thresholds: Set thresholds in full bed of sealant complying with requirements specified in Division 07 Section "Joint Sealants."
O. 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 may impede traffic or present tripping hazard.
P. Perimeter Gasketing: Apply to head and jamb, forming seal between door and frame.
Q. Meeting Stile Gasketing: Fasten to meeting stiles, forming seal when doors are closed.
R. Door Bottoms and Sweeps: Apply to bottom of door, forming seal with threshold when door is closed.

3.03 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. Spring Hinges: Adjust to achieve positive latching when door can close freely from an open position of 30 degrees.
2. Electric Strikes: Adjust horizontal and vertical alignment of keeper to properly engage lock bolt.

3. Door Closers: Adjust sweep period to comply with accessibility requirements and requirements of authorities having jurisdiction.

B. Occupancy Adjustment: Approximately three to six months after date of Substantial Completion, examine and readjust each item of door hardware, including adjusting operating forces, as necessary to ensure function of doors and door hardware.

3.04 CLEANING AND PROTECTION

A. Clean adjacent surfaces soiled by door hardware installation.
B. Clean operating items per manufacturer's instructions to restore proper function and finish.
C. Provide final protection and maintain conditions that ensure door hardware is without damage or deterioration at time of Substantial Completion.

3.05 DOOR HARDWARE SCHEDULE

A. The intent of the hardware specification is to specify the hardware for interior and exterior doors, and to establish a type, continuity, and standard of quality. However, it is the door hardware supplier's responsibility to thoroughly review existing conditions, schedules, specifications, drawings, and other Contract Documents to verify the suitability of the hardware specified.
B. Discrepancies, conflicting hardware, and missing items are to be brought to the attention of the architect with corrections made prior to the bidding process. Omitted items not included in a hardware set should be scheduled with the appropriate additional hardware required for proper application.
C. Hardware items are referenced in the following hardware schedule. Refer to the above specifications for special features, options, cylinders/keying, and other requirements.

Abbreviation	Name
GLY	Glynn-Johnson Corp
IVE	H.B. Ives
LCN	Lcn Commercial Division
MIS	Misc - Out-Sourced Items
SCE	Schlage Electronic Security
SCH	Schlage Lock Company
VON	Von Duprin
ZER	Zero International Inc

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HARDWARE SET NO. 01 - SINGLE PUSH PULL - ALUMINUM DOOR

Provide each SGL door(s) with the following:

QTY		DESCRIPTION	CATALOG NUMBER		FINISH	MFR
1	EA	CONT. HINGE	224XY		628	IVE
1	EA	PUSH/PULL BAR	9190HD-10"-NO		630	IVE
1	EA	SURFACE CLOSER	4040XP		689	LCN
1	EA	MOUNTING PLATE	4040XP-18 SRT		689	LCN
1	EA	WALL STOP	WS406/407CCV		630	IVE

HARDWARE SET NO. 02 - SINGLE PUSH PULL - ALUMINUM DOOR - LOCKABLE

Provide each SGL door(s) with the following:

QTY		DESCRIPTION	CATALOG NUMBER		FINISH	MFR
1	EA	CONT. HINGE	224XY		628	IVE
1	EA	DEADBOLT	MS1850, TO SUIT DOOR		630	ADA
1	EA	MORTISE CYLINDER	20-062 X K510-711 36-082-018		626	SCH
1	EA	THUMB TURN CYLINDER	4066		628	ADA
1	EA	FSIC CORE	23-030 CKC EV D		626	SCH
1	EA	PUSH/PULL BAR	9190HD-10"-NO		630	IVE
1	EA	SURFACE CLOSER	4040XP		689	LCN
1	EA	MOUNTING PLATE	4040XP-18 SRT		689	LCN
1	EA	WALL STOP	WS406/407CCV		630	IVE

HARDWARE SET NO. 03 - RATED OUT L-BE SCUSH

Provide each PR door(s) with the following:

QTY		DESCRIPTION	CATALOG NUMBER		FINISH	MFR
6	EA	HINGE	5BB1HW 4.5 X 4.5		652	IVE
1	EA	FIRE EXIT HARDWARE	9827-EO-F-LBRAFL-499F		626	VON
1	EA	FIRE EXIT HARDWARE	9827-L-F-2SI-LBRAFL-06-499F		626	VON
2	EA	RIM CYLINDER	20-057 ICX		626	SCH
2	EA	FSIC CORE	23-030 CKC EV D		626	SCH
2	EA	SURFACE CLOSER	4040XP SCUSH		689	LCN
2	EA	KICK PLATE	8400 10" X 1" LDW B-CS		630	IVE
1	EA	GASKETING	488SBK PSA		BK	ZER

HARDWARE SET NO. 03.1 - RATED CUSH L-BE WS

Provide each SGL door(s) with the following:

QTY		DESCRIPTION	CATALOG NUMBER		FINISH	MFR
3	EA	HINGE	5BB1HW 4.5 X 4.5		652	IVE
1	EA	FIRE EXIT HARDWARE	98-L-BE-F-06		626	VON
1	EA	SURFACE CLOSER	4040XP CUSH		689	LCN
1	EA	KICK PLATE	8400 10" X 2" LDW B-CS		630	IVE
1	EA	GASKETING	488SBK PSA		BK	ZER

HARDWARE SET NO. 04 - RATED IN LOCKABLE OH

Provide each SGL door(s) with the following:

QTY		DESCRIPTION	CATALOG NUMBER		FINISH	MFR
1	EA	CLASSROOM LOCK	ND70TD RHO		626	SCH
1	EA	FSIC CORE	23-030 CKC EV D		626	SCH
1	EA	OH STOP	90S		630	GLY
1	EA	SURFACE CLOSER	4040XP		689	LCN
1	EA	MOUNTING PLATE	4040XP-18 SRT (IF TOP RAIL LESS THAN 3-3/4")		689	LCN
1	EA	KICK PLATE	8400 10" X 2" LDW B-CS		630	IVE
1	EA	GASKETING	488SBK PSA		BK	ZER

HARDWARE SET NO. 05 - RATED IN LOCKABLE OH

Provide each SGL door(s) with the following:

QTY		DESCRIPTION	CATALOG NUMBER		FINISH	MFR
1	EA	STOREROOM LOCK	ND80TD RHO		626	SCH
1	EA	FSIC CORE	23-030 CKC EV D		626	SCH
1	EA	SURFACE CLOSER	4040XP		689	LCN
1	EA	KICK PLATE	8400 10" X 2" LDW B-CS		630	IVE
1	EA	GASKETING	488SBK PSA		BK	ZER

HARDWARE SET NO. 06 - RATED IN LOCKABLE WS

Provide each SGL door(s) with the following:

QTY		DESCRIPTION	CATALOG NUMBER		FINISH	MFR
3	EA	HINGE	5BB1HW 4.5 X 4.5		652	IVE
1	EA	CLASSROOM LOCK	ND70TD RHO		626	SCH
1	EA	FSIC CORE	23-030 CKC EV D		626	SCH
1	EA	SURFACE CLOSER	4040XP		689	LCN
1	EA	KICK PLATE	8400 10" X 2" LDW B-CS		630	IVE
1	EA	WALL STOP	WS406/407CCV		630	IVE
1	EA	GASKETING	488SBK PSA		BK	ZER

HARDWARE SET NO. 06.1 - RATED OUT LOCKABLE WS

Provide each SGL door(s) with the following:

QTY		DESCRIPTION	CATALOG NUMBER		FINISH	MFR
3	EA	HINGE	5BB1HW 4.5 X 4.5 NRP		652	IVE
1	EA	STOREROOM LOCK	ND80TD RHO		626	SCH
1	EA	FSIC CORE	23-030 CKC EV D		626	SCH
1	EA	SURFACE CLOSER	4040XP EDA		689	LCN
1	EA	KICK PLATE	8400 10" X 2" LDW B-CS		630	IVE
1	EA	WALL STOP	WS406/407CCV		630	IVE
1	EA	GASKETING	488SBK PSA		BK	ZER

HARDWARE SET NO. 07 - PUSH PULL SCUSH

Provide each PR door(s) with the following:

QTY		DESCRIPTION	CATALOG NUMBER		FINISH	MFR
2	EA	CONT. HINGE	224XY		628	IVE
2	EA	PUSH PLATE	8200 4" X 16"		630	IVE
2	EA	PULL PLATE	8303 10" 4" X 16"		630	IVE
2	EA	SURFACE CLOSER	4040XP SCUSH		689	LCN
2	EA	KICK PLATE	8400 10" X 1" LDW B-CS		630	IVE
2	EA	SILENCER	SR64		GRY	IVE

HARDWARE SET NO. 08 - EXT NL X EO SCUSH AL

Provide each PR door(s) with the following:

QTY		DESCRIPTION	CATALOG NUMBER		FINISH	MFR
1	EA	CONT. HINGE	224XY		628	IVE
1	EA	CONT. HINGE	224XY TWP CON		628	IVE
1	EA	POWER TRANSFER	EPT10 CON		689	VON
1	EA	PANIC HARDWARE	9847-DT		626	VON
1	EA	ELEC PANIC HARDWARE	RX-LC-QEL-9847-NL-CON 24 VDC		626	VON
1	EA	RIM CYLINDER	20-057 ICX		626	SCH
1	EA	PRIMUS CORE	20-740 EV D		626	SCH
2	EA	SURFACE CLOSER	4040XP SCUSH		689	LCN
2	EA	PA MOUNTING PLATE	4040XP-18PA SRT		689	LCN
2	EA	CUSH SHOE SUPPORT	4040XP-30 SRT		689	LCN
2	EA	BLADE STOP SPACER	4040XP-61 SRT		689	LCN
2	EA	DOOR SWEEP	328BK		BK	ZER
1	EA	THRESHOLD	655A		A	ZER
1	EA	WIRE HARNESS	CON-XX-P LENGTH AS REQUIRED FOR USE WITH DOOR			SCH
1	EA	WIRE HARNESS	CON-6W FOR USE WITH HINGE			SCH
2	EA	DOOR CONTACT	7764		628	SCE
1	SET	WEATHERSTRIPPING	BY ALUM FRAME MANUFACTURER			MIS
1	EA	POWER SUPPLY	BY SECURITY CONTRACTOR			MIS
1	EA	CARD READER	BY SECURITY CONTRACTOR			MIS

OPERATIONAL DESCRIPTION: ALWAYS READY FOR IMMEDIATE EGRESS, ACCESS BY KEY OR CARD READER TO RETRACT LATCHBOLT, DOOR CONTACT AND REQUEST TO EXIT CONNECTED TO BUILDING SECURITY.

HARDWARE SET NO. EX-00 - EXISTING TO REMAIN

Provide each SGL door(s) with the following:

QTY		DESCRIPTION	CATALOG NUMBER	FINISH	MFR
	EA	EXISTING HARDWARE	TO REMAIN		MIS

HARDWARE SET NO. EX-00.1 - EXISTING TO REMAIN

Provide each PR door(s) with the following:

QTY		DESCRIPTION	CATALOG NUMBER	FINISH	MFR
	EA	EXISTING HARDWARE	TO REMAIN		MIS

HARDWARE SET NO. EX-01 - EXISTING DOOR AND FRAME - EXIT

Provide each SGL door(s) with the following:

QTY		DESCRIPTION	CATALOG NUMBER		FINISH	MFR
1	EA	FIRE EXIT HARDWARE	98-L-NL-F-06		626	VON
1	EA	RIM CYLINDER	20-057 ICX		626	SCH
1	EA	FSIC CORE	23-030 CKC EV D		626	SCH
1	EA	SURFACE CLOSER	4040XP EDA		689	LCN
1	EA	KICK PLATE	8400 10" X 2" LDW B-CS		630	IVE
1		REUSE EXISTING	MAG HOLD OPEN		626	UNK
1	EA	GASKETING	488SBK PSA		BK	ZER

HARDWARE SET NO. EX-01.1 - EXISTING DOOR AND FRAME - EXIT

Provide each SGL door(s) with the following:

QTY		DESCRIPTION	CATALOG NUMBER		FINISH	MFR
1	EA	FIRE EXIT HARDWARE	98-L-NL-F-06		626	VON
1	EA	RIM CYLINDER	20-057 ICX		626	SCH
1	EA	FSIC CORE	23-030 CKC EV D		626	SCH
1	EA	SURFACE CLOSER	4040XP EDA		689	LCN
1	EA	KICK PLATE	8400 10" X 2" LDW B-CS		630	IVE
1	EA	GASKETING	488SBK PSA		BK	ZER

HARDWARE SET NO. EX-01.2 - EXISTING DOOR AND FRAME - EXIT

Provide each SGL door(s) with the following:

QTY		DESCRIPTION	CATALOG NUMBER		FINISH	MFR
1	EA	FIRE EXIT HARDWARE	98-L-BE-F-06		626	VON
1	EA	RIM CYLINDER	20-057 ICX		626	SCH
1	EA	FSIC CORE	23-030 CKC EV D		626	SCH
1	EA	OH STOP	90S		630	GLY
1	EA	SURFACE CLOSER	4040XP		689	LCN
1	EA	MOUNTING PLATE	4040XP-18 SRT		689	LCN
1	EA	KICK PLATE	8400 10" X 2" LDW B-CS		630	IVE
1	EA	GASKETING	488SBK PSA		BK	ZER

HARDWARE SET NO. EX-02 - PAIR DOUBLE EGRESS - EXISTING DOOR AND FRAME - EXIT

Provide each PR door(s) with the following:

QTY		DESCRIPTION	CATALOG NUMBER		FINISH	MFR
2	EA	FIRE EXIT HARDWARE	98-EO-F		626	VON
2	EA	SURFACE CLOSER	4040XPT DE		689	LCN
4	EA	KICK PLATE	8400 10" X 1" LDW B-CS		630	IVE
2		REUSE EXISTING	MAG HOLD OPEN		626	UNK
1	EA	GASKETING	488SBK PSA		BK	ZER

HARDWARE SET NO. EX-03 - PAIR EXTERIOR - EXISTING DOOR AND FRAME - EXIT - ALARM

Provide each PR door(s) with the following:

QTY		DESCRIPTION	CATALOG NUMBER		FINISH	MFR
1	EA	REMOVABLE MULLION	KR4954		689	VON
2	EA	PANIC HARDWARE	98-EO		626	VON
3	EA	MORTISE CYLINDER	20-061 ICX X K510-730 36-083 36-082-037		622	SCH
3	EA	PRIMUS CORE	20-740 EV D		626	SCH
2	EA	SURFACE CLOSER	4040XP HCUSH		689	LCN
2	EA	EXIT ALARM	EAX-500			DET

HARDWARE SET NO. EX-03.1 - PAIR EXTERIOR - EXISTING DOOR AND FRAME - EXIT - ALARM

Provide each PR door(s) with the following:

QTY		DESCRIPTION	CATALOG NUMBER		FINISH	MFR
1	EA	PANIC HARDWARE	98-EO		626	VON
1	EA	PANIC HARDWARE	98-NL-OP-110MD		626	VON
1	EA	RIM CYLINDER	20-057 ICX		626	SCH
1	EA	MORTISE CYLINDER	20-061 ICX X K510-730 36-083 36-082-037		622	SCH
3	EA	PRIMUS CORE	20-740 EV D		626	SCH
2	EA	SURFACE CLOSER	4040XP HCUSH		689	LCN
2	EA	EXIT ALARM	EAX-500			DET

HARDWARE SET NO. EX-04 - PAIR EXISTING DOOR AND FRAME - EXIT

Provide each PR door(s) with the following:

QTY		DESCRIPTION	CATALOG NUMBER		FINISH	MFR
1	EA	FIRE EXIT HARDWARE	9827-EO-F-LBRAFL-499F		626	VON
1	EA	FIRE EXIT HARDWARE	9827-L-F-2SI-LBRAFL-06-499F		626	VON
2	EA	RIM CYLINDER	20-057 ICX		626	SCH
1	EA	FSIC CORE	23-030 CKC EV D		626	SCH
2	EA	SURFACE CLOSER	4040XP EDA		689	LCN

HARDWARE SET NO. EX-05 - SINGLE EXTERIOR - EXISTING DOOR AND FRAME 0 EXIT - ALARMED

Provide each SGL door(s) with the following:

QTY		DESCRIPTION	CATALOG NUMBER		FINISH	MFR
1	EA	PANIC HARDWARE	98-NL-OP-110MD		626	VON
1	EA	RIM CYLINDER	20-057 ICX		626	SCH
1	EA	MORTISE CYLINDER	20-061 ICX X K510-730 36-083 36-082-037		622	SCH
2	EA	PRIMUS CORE	20-740 EV D		626	SCH
1	EA	SURFACE CLOSER	4040XP HCUSH		689	LCN
1	EA	EXIT ALARM	EAX-500			DET

HARDWARE SET NO. EX-06 - SINGLE EXTERIOR - EXISTING DOOR AND FRAME - EXIT

Provide each SGL door(s) with the following:

QTY		DESCRIPTION	CATALOG NUMBER		FINISH	MFR
1	EA	PANIC HARDWARE	98-NL-OP-110MD		626	VON
1	EA	MORTISE CYLINDER	20-061 ICX X K510-730 36-083 36-082-037		622	SCH
2	EA	PRIMUS CORE	20-740 EV D		626	SCH
1	EA	SURFACE CLOSER	4040XP HCUSH		689	LCN

HARDWARE SET NO. EX-07 - PAIR EXISTING DOOR AND FRAME - PUSH PULL

Provide each PR door(s) with the following:

QTY		DESCRIPTION	CATALOG NUMBER		FINISH	MFR
2	EA	PUSH PLATE	8200 4" X 16"		630	IVE
2	EA	PULL PLATE	8303 10" 4" X 16"		630	IVE
2	EA	SURFACE CLOSER	4011T		689	LCN
2	EA	KICK PLATE	8400 10" X 1" LDW B-CS		630	IVE
2		REUSE EXISTING	MAG HOLD OPEN		626	UNK

HARDWARE SET NO. TGP-01 - SINGLE CARD READER - TGP EXTERIOR

Provide each SGL door(s) with the following:

QTY		DESCRIPTION	CATALOG NUMBER		FINISH	MFR
3	EA	WELD ON PIVOTS	PROVIDED X TGP			
1	EA	POWER TRANSFER	EPTL - PROVIDED X TGP		689	SEC
1	EA	ELEC FIRE EXIT HARDWARE	RX-QEL-35A-NL-F-386 24 VDC X TGP		628	VON
1	EA	RIM CYLINDER	20-057 ICX		626	SCH
1	EA	FSIC CORE	23-030 CKC EV D		626	SCH
1	EA	SURFACE CLOSER	4040XP CUSH		689	LCN
1	EA	FIRE RATED SEALS	PROVIDED X TGP			
1	SET	THRESHOLD	PROVIDED X TGP			
1	EA	DOOR CONTACT	7764		628	SCE
	EA	POWER SUPPLY	BY SECURITY CONTRACTOR			MIS
	EA	CARD READER	BY SECURITY CONTRACTOR			MIS

HARDWARE SET NO. TGP-01.1 - SINGLE CARD READER - TGP EXTERIOR

Provide each SGL door(s) with the following:

QTY		DESCRIPTION	CATALOG NUMBER		FINISH	MFR
3	EA	WELD ON PIVOTS	PROVIDED X TGP			
1	EA	POWER TRANSFER	EPTL - PROVIDED X TGP		689	SEC
1	EA	ELEC FIRE EXIT HARDWARE	RX-QEL-35A-L-NL-F-360-06 24 VDC		628	VON
1	EA	MORTISE CYLINDER	20-061 ICX X K510-730 36-083 36-082-037		622	SCH
1	EA	FSIC CORE	23-030 CKC EV D		626	SCH
1	EA	SURFACE CLOSER	4040XP CUSH		689	LCN
1	EA	FIRE RATED SEALS	PROVIDED X TGP			
1	SET	THRESHOLD	PROVIDED X TGP			
1	EA	DOOR CONTACT	7764		628	SCE
	EA	POWER SUPPLY	BY SECURITY CONTRACTOR			MIS
	EA	CARD READER	BY SECURITY CONTRACTOR			MIS

END OF SECTION

SECTION 08 80 00 – GLAZING

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 glazing for the following products, including those specified in other Sections where glazing requirements are specified by reference to this Section:
   1. Windows.
   2. Vision lites / Interior Borrowed Lites.
   3. Entrances and other doors.

B. Related Sections: The following sections contain requirements that relate to this Section.
   1. Division 06 Section "Rough Carpentry”
   2. Division 07 Section “Joint Sealants”
   3. Division 08 Sections "Aluminum Entrances & Storefronts" and "Flush Wood Doors"

C. This work includes all glazing, with the exception that at the East and West additions, the exterior glazing at windows, storefronts and curtainwalls is installed under separate envelope project.

1.3 DEFINITIONS

A. Interspace: Space between lites of an insulating-glass unit that contains dehydrated air or a specified gas.

B. Deterioration of Coated Glass: Defects developed from normal use that are attributed to the manufacturing process and not to causes other than glass breakage and practices for maintaining and cleaning coated glass contrary to manufacturer's written instructions. Defects include peeling, cracking, and other indications of deterioration in metallic coating.

C. Deterioration of Insulating Glass: Failure of hermetic seal under normal use that is attributed to the manufacturing process and not to causes other than glass breakage and practices for maintaining and cleaning insulating glass contrary to manufacturer's written instructions. Evidence of failure is the obstruction of vision by dust, moisture, or film on interior surfaces of glass.

D. Deterioration of Laminated Glass: Defects developed from normal use that are attributed to the manufacturing process and not to causes other than glass breakage and practices for maintaining and cleaning laminated glass contrary to manufacturer's written instructions. Defects include edge separation, delamination materially obstructing vision through glass, and blemishes exceeding those allowed by referenced laminated-glass standard.

1.4 PERFORMANCE REQUIREMENTS

A. General: Provide glazing systems that are produced, fabricated, and installed to withstand normal thermal movement, wind loading, and impact loading (where applicable), without failure including loss or glass breakage attributable to the following: defective manufacture, fabrication, and installation; failure of sealants or gaskets to remain watertight and airtight; deterioration of glazing materials; and other defects in construction.

B. Glass Design: Glass thicknesses indicated on Drawings are for detailing only. Confirm glass thicknesses by analyzing Project loads and in-service conditions. Provide glass lites for the various size openings in the thicknesses and strengths (annealed or heat-treated) to meet or exceed the following criteria:
   1. Minimum glass thicknesses of lites, whether composed of annealed or heat-treated glass, are selected so the worst-case probability of failure does not exceed the following:
      a. 8 lites per 1000 for lites set vertically or not over 15 degrees off vertical and under wind action. Determine minimum thickness of monolithic annealed glass according to ASTM E 1300. For other than monolithic annealed glass, determine thickness per glass manufacturer's standard method of analysis including applying adjustment factors to ASTM E 1300 based on type of glass.

C. Normal thermal movement results from the following maximum change (range) in ambient and surface temperatures acting on glass-framing members and glazing components. Base engineering calculation on materials' actual surface temperatures due to both solar heat gain and nighttime sky heat loss.
   1. Temperature Change (Range): 120 F deg, ambient; 180 F deg, material surfaces.

1.5 SUBMITTALS

A. General: Submit the following according to Conditions of Contract and Division 1 Specification Sections.

B. Product data for each glass product and glazing material indicated.

C. Glazing Schedule: List glass types and thicknesses for each size opening and location. Use same designations indicated on Drawings.

D. Samples for verification purposes of 12-inch square samples of each type of glass indicated except for clear monolithic glass products, and 12-inch long samples of each color required (except black) for each type of sealant or gasket exposed to view. Install sealant or gasket sample between two strips of material representative in color of the adjoining framing system.

E. Product certificates signed by glazing materials manufacturers certifying that their products comply with specified requirements.
   1. Separate certifications are not required for glazing materials bearing manufacturer's permanent labels designating type and thickness of glass, provided labels represent a quality control program of a recognized certification agency or independent testing agency acceptable to authorities having jurisdiction.

F. Compatibility and adhesion test reports from sealant manufacturer indicating that glazing materials were tested for compatibility and adhesion with glazing sealants. Include sealant manufacturer's interpretation of test results relative to sealant performance and recommendations for primers and substrate preparation needed for adhesion.

G. Compatibility test report from manufacturer of insulating glass edge sealant indicating that glass edge sealants were tested for compatibility with other glazing materials including sealants, glazing tape, gaskets, setting blocks, and edge blocks.

H. Product test reports for each type of glazing sealant and gasket indicated, evidencing compliance with requirements specified.

I. Maintenance data for glass and other glazing materials to include in Operating and Maintenance Manual specified in Division 1.

1.6 QUALITY ASSURANCE

A. Glazing Publications: Comply with published recommendations of glass product manufacturers and organizations below, except where more stringent requirements are indicated. Refer to these publications for glazing terms not otherwise defined in this Section or in referenced standards.
   1. FGMA Publications: "FGMA Glazing Manual."
   2. SIGMA Publications: TM-3000 "Vertical Glazing Guidelines."

B. Safety Glass: Products complying with ANSI Z97.1 and testing requirements of 16 CFR Part 1201 for Category II materials.
   1. Subject to compliance with requirements, provide safety glass permanently marked with certification label of Safety Glazing Certification Council (SGCC) or other certification agency acceptable to authorities having jurisdiction.

C. Fire-Resistive Glazing Products for Door Assemblies: Glazing for assemblies that comply with NFPA 80 and that are listed and labeled by a testing and inspecting agency acceptable to authorities having jurisdiction, for fire-protection ratings indicated, based on testing to NFPA 257.

D. Fire-Resistive Glazing Products for Window Assemblies: Glazing for assemblies that comply with NFPA 80 and that are listed and labeled by a testing and inspecting agency acceptable to authorities having jurisdiction, for fire-protection ratings indicated, based on testing to NFPA 257.

E. Safety Glazing Products: Comply with testing requirements in 16CFR 1201
   1. Subject to compliance with requirements, obtain safety glazing products permanently marked with certification label of the Safety Glazing Certification Council or another certification agency acceptable to authorities having jurisdiction.
   2. Where glazing units, including Kind FT glass and laminated glass, are specified in Part 2 articles for glazing lites more than 9 sq. ft (0.84 sq. m) in exposed surface area of one side, provide glazing products that comply with Category II materials, for lites 9 sq. ft (0.84 sq. m) or less in exposed surface area on one side, provide glazing products that comply with Category I or II materials, except for hazardous locations where Category II materials are required by 16 CFR 1201 and regulations of authorities having jurisdiction.

F. Insulating Glass Certification Program: Provide insulating glass units permanently marked either on spacers or at least one component lite of units with appropriate certification label of inspecting and testing agency indicated below:
   1. Insulating Glass Certification Council (IGCC).
   2. Associated Laboratories, Inc. (ALI).
   3. National Certified Testing Laboratories (NCTL).

G. Glazier Qualifications: Engage an experienced glazier who has completed glazing similar in material, design, and extent to that indicated for Project with a record of successful in-service performance.

H. Single-Source Responsibility for Glass: Obtain glass from one source for each product indicated below:

1. Primary glass of each (ASTM C 1036) type and class indicated.
2. Heat-treated glass of each (ASTM C 1048) condition indicated.
3. Insulating glass of each construction indicated.
4. Fire resistive glass (ASTM E119) of each type and class indicated.

I. Single-Source Responsibility for Glazing Accessories: Obtain glazing accessories from one source for each product and installation method indicated.

1.7 DELIVERY, STORAGE, AND HANDLING

A. Protect glazing materials to comply with manufacturer's directions and as needed to prevent damage to glass and glazing materials from condensation, temperature changes, direct exposure to sun, or other causes.

B. Where insulating glass units will be exposed to substantial altitude changes, comply with insulating glass fabricator's recommendations for venting and sealing to avoid hermetic seal ruptures.

1.8 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 (4.4 deg C).

1.9 WARRANTY

A. General: Warranties specified in this Article shall not deprive the Owner of other rights the Owner may have under other provisions of the Contract Documents and will be in addition to and run concurrent with other warranties made by the Contractor under requirements of the Contract Documents.

B. Manufacturer's Special Warranty for Coated-Glass Products: Manufacturer's standard form in which coated-glass manufacturer agrees to replace coated-glass units that deteriorate within specified warranty period. Deterioration of coated glass is defined as defects developed from normal use that are not attributed to glass breakage or to maintaining and cleaning coated glass contrary to manufacturer's written instructions. Defects include peeling, cracking, and other indications of deterioration in coating.

1. Warranty Period: 10 years from date of Substantial Completion.

C. Manufacturer's Special Warranty on Laminated Glass: Manufacturer's standard form in which laminated-glass manufacturer agrees to replace laminated-glass units that deteriorate within specified warranty period. Deterioration of laminated glass is defined as defects developed from normal use that are not attributed to glass breakage or to maintaining and cleaning laminated glass contrary to manufacturer's written instructions. Defects include edge separation, delamination materially

obstructing vision through glass, and blemishes exceeding those allowed by referenced laminated-glass standard.

1. Warranty Period: 10 years from date of Substantial Completion.

D. Manufacturer's Special Warranty on Insulating Glass: Manufacturer's standard form in which insulating-glass manufacturer agrees to replace insulating-glass units that deteriorate within specified warranty period. Deterioration of insulating glass is defined as failure of hermetic seal under normal use that is not attributed to glass breakage or to maintaining and cleaning insulating glass contrary to manufacturer's written instructions. Evidence of failure is the obstruction of vision by dust, moisture, or film on interior surfaces of glass.

1. Warranty Period: 10 years from date of Substantial Completion.

PART 2 - PRODUCTS

2.1 GLASS PRODUCTS

A. NOTE: ALL GLASS USED SHALL BE SAFETY GLASS MEETING REQUIREMENTS FOR CPSC 16 CFR 1201.

B. Annealed Float Glass: ASTM C 1036, Type I (transparent glass, flat), Class as indicated below, and Quality q3 (glazing select). Minimum ¼ inch thick.
1. Class 1 (clear) unless otherwise indicated.

C. Heat-Treated Float Glass: ASTM C 1048, Type I (transparent glass, flat), Class 1 (clear), Quality q3 (glazing select), kind as indicated below. Minimum ¼ inch thick.
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. For coated vision glass, comply with requirements for Condition C (other uncoated glass).
5. Provide Kind FT (fully tempered) float glass in place of annealed or Kind HS (heat-strengthened) float glass where safety glass is indicated

D. Sputter-Coated Float Glass: ASTM C 1376, float glass with metallic-oxide or -nitride coating deposited by vacuum deposition process after manufacture and heat treatment (if any), and complying with other requirements specified.

E. 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. Interlayer: Polyvinyl butyral of thickness indicated with a proven record of no tendency to bubble, discolor, or lose physical and mechanical properties after laminating glass lites and installation
   a. For polyvinyl butyral interlayers, laminate lites in autoclave with heat and pressure.
2. Laminating process: Fabricate laminated glass to produce glass free of foreign substances and air or glass pockets.

F. 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 HS (heat-strengthened) float glass in place of annealed 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.
   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. Polyisobutylene and polysulfide.
      b. Polyisobutylene and hot-melt butyl.
      c. Polyisobutylene and silicone.
      d. Polyisobutylene and polyurethane
   5. Spacer Specifications: Manufacturer's standard spacer material and construction.
   6. Spacer Specifications: Manufacturer's standard spacer material and construction complying with the following requirements:
      a. Spacer Material: Aluminum with clear anodic finish.
      b. Corner Construction: Manufacturer's standard corner construction.
   7. Low “E” Glass: Provide nominal 1” insulated glass comprised of inner ¼” pane of clear glass with Low “E” coating, ½” air space, outer ¼” pane of clear glass
   8. Winter U-value: .31
   9. Solar reflectance: 29%
   10. Sealed insulating glass units shall be in conformance to ASTM E 774-92; permanent IGCC certification label for CBA rating level.

2.2 FIRE-RATED GLAZING PRODUCTS

A. Laminated Ceramic Glazing Material: Proprietary Category II safety glazing product in the form of 2 lites of clear ceramic glazing material laminated together to produce a laminated lite of 5/16-inch (8-mm) nominal thickness; polished on both surfaces; weighing 4 lb/sq. ft. (19.5 kg/sq. m); and as follows:
   1. Fire-Protection Rating: As indicated for the assembly in which glazing material is installed, and permanently labeled by a testing and inspecting agency acceptable to authorities having jurisdiction.
   2. Polished on both surfaces, transparent.
   3. Approved products: Fire lite plus premium or approved equal.
   4. Provide glazing resistant to heat rate of rise transfer, compliant with ASTM E 119, where required.

2.3 GLAZING SEALANTS

A. General:

   1. Compatibility: Provide glazing sealants that are compatible with one another and with other materials they will contact, including glass products, seals of insulating-glass units, and glazing channel substrates, under conditions of service and application, as demonstrated by sealant manufacturer based on testing and field experience.

2. Suitability: Comply with sealant and glass manufacturers' written instructions for selecting glazing sealants suitable for applications indicated and for conditions existing at time of installation.
3. Colors of Exposed Glazing Sealants: As selected by Architect from manufacturer's full range.

B. Glazing Sealant: Neutral-curing silicone glazing sealant complying with ASTM C 920, Type S, Grade NS, Class 100/50, Use NT.

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; 790.
b. GE Advanced Materials - Silicones; SilPruf LM SCS2700.
c. May National Associates, Inc.; Bondaflex Sil 290.
d. Pecora Corporation; 890.
e. Sika Corporation, Construction Products Division; SikaSil-C990.
f. Tremco Incorporated; Spectrem 1.

2. Applications: For weather seal.

C. Glazing Sealant: Neutral-curing silicone glazing sealant complying with ASTM C 920, Type S, Grade NS, Class 25, Use NT.

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; 799.
b. GE Advanced Materials - Silicones; UltraGlaze SSG4000
c. May National Associates, Inc.; Bondaflex Sil 200 GPN or Bondaflex Sil 201 FC.
d. Polymeric Systems, Inc.; PSI-631.
e. Schnee-Morehead, Inc., an ITW company; SM5731 Poly-Glaze Plus.
f. Tremco Incorporated; Proglaze SSG or Tremsil 600.

2. Applications: For structural seal.

D. Glazing Sealant: Acid-curing silicone glazing sealant complying with ASTM C 920, Type S, Grade NS, Class 25, Use NT.

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; 795.
b. General Electric; Siliglaze-II 2800
c. Tremco Incorporated; Spectrum 2

2. Applications: Fire and Safety Rated Glazing

3. Glazing Sealants for Fire-Rated Glazing Products: Products that are approved by testing agencies that listed and labeled fire-resistant glazing products with which they are used for applications and fire-protection ratings indicated.

2.4 GLAZING TAPES

A. Back-Bedding Mastic Glazing Tape: 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 by tape and glass manufacturers for application indicated, packaged on rolls with a release paper backing, and complying with AAMA 800 for products indicated below:
   1. AAMA 806.1.

B. Expanded Cellular Glazing Tape: Closed-cell, polyvinyl chloride foam tape, factory coated with adhesive on both surfaces, packaged on rolls with release liner protecting adhesive, and complying with AAMA 800 for product 810.5.

C. Available Products: Subject to compliance with requirements, glazing tape that may be incorporated in the Work include, but is not limited to, the following:
   1. Back-Bedding Mastic Glazing Tape Without Spacer Rod:
      a. Dyna-Seal, Pecora Corp.
      b. PTI 626 Architectural Sealant Tape, Protective Treatments, Inc.
      c. S-M 5710 H.P Poly-Glaze Tape Sealant, Schnee-Morehead, Inc.
      d. SST-800 Tape, Tremco, Inc.
   2. Expanded Cellular Glazing Tape:
      a. Norseal V-980 Closed-Cell Glazing Tape, Norton Company.

2.5 GLAZING GASKETS

A. 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.

B. 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. EPDM, ASTM C 864.
   2. Silicone, ASTM C 1115.
   3. Thermoplastic polyolefin rubber, ASTM C 1115.
   4. Any material indicated above.

C. 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. EPDM.
   2. Silicone.
   3. Thermoplastic polyolefin rubber.
   4. Any material indicated above.

D. Available Manufacturers: Subject to compliance with requirements, manufacturers offering products that may be incorporated in the work include, but are not limited to, the following companies.
   1. Lock-Strip Gaskets:
      a. Stanlock Div., Griffith Rubber Mills.
   2. Preformed Gaskets:
      a. Advanced Elastomer Systems, L.P.
      b. Schnee-Morehead, Inc.
      c. Tremco, Inc.

2.6 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 involved for glazing application indicated, and with a proven record of compatibility with surfaces contacted in installation.

B. Cleaners, Primers and Sealers: Type recommended by sealant or gasket manufacturer.

C. Setting Blocks: Elastomeric material with a Shore A durometer hardness of 85 plus or minus 5.

D. Spacers: Elastomeric blocks or continuous extrusions with a Shore 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. Cylindrical Glazing Sealant Backing: ASTM C 1330, Type O (open-cell material), of size and density to control glazing sealant depth and otherwise produce optimum glazing sealant performance.

G. Perimeter Insulation for Fire-Resistive Glazing: Product that is approved by testing agency that listed and labeled fire-resistant glazing product with which it is used for application and fire-protection rating indicated.

H. Plastic Foam Joint Fillers: Preformed, compressible, resilient, nonstaining, nonextruding, nonoutgassing, strips of closed-cell plastic foam of density, size, and shape to control sealant depth and otherwise contribute to produce optimum sealant performance.

2.7 FABRICATION OF GLASS AND OTHER GLAZING PRODUCTS

A. Fabricate glazing units in sizes required to fit 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 to produce square edges with slight chamfers at junctions of edges and faces.

C. Grind smooth and polish exposed glass edges and corners.

PART 3 - EXECUTION

3.1 GLAZING SCHEDULE

A. Type G1 – 45min Fire Rated, Clear Laminated Safety Glass (Interior U.O.N.)

B. Type G2 – Clear Insulated Laminated Tempered Safety Glass with Security Film (Exterior U.O.N.)

C. Type G3 – Clear Laminated Safety Glass (Interior U.O.N.)

D. Type G4 – Clear Ballistic Glass (Interior U.O.N.)

E. Type G5 – Clear Insulated Laminated Tempered Safety Glass (Exterior U.O.N.)

F. Type G6 – Clear Insulated Ballistic Glass (Exterior U.O.N.)

3.2 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. 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.

C. Do not proceed with glazing until unsatisfactory conditions have been corrected.

3.3 PREPARATION

A. Clean glazing channels and other framing members receiving glass immediately before glazing. Remove coatings that are not firmly bonded to substrates.

3.4 GLAZING, GENERAL

A. Comply with combined recommendations of manufacturers of glass, sealants, gaskets, and other glazing materials, except where more stringent requirements are indicated, including those in referenced glazing publications.

B. Glazing channel dimensions as indicated on Drawings provide necessary bite on glass, minimum edge and face clearances, and adequate sealant thicknesses, with reasonable tolerances. Adjust as required by Project conditions during installation.

C. Protect glass from edge damage during handling and installation as follows:
   1. Use a rolling block in rotating glass units to prevent damage to glass corners. Do not impact glass with metal framing. Use suction cups to shift glass units within openings; do not raise or drift glass with a pry bar. Rotate glass lites with flares or bevels on bottom horizontal edges so edges are located at top of opening, unless otherwise indicated by manufacturer's label.
   2. Remove damaged glass from Project site and legally dispose of off site. Damaged glass is glass with edge damage or other imperfections that, when installed, weaken glass and impair performance and appearance.

D. Apply primers to joint surfaces where required for adhesion of sealants, as determined by preconstruction sealant-substrate testing.

E. Install elastomeric setting blocks in sill rabbets, sized and located to comply with referenced glazing standard, 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.

3.5 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 in one continuous length. Do not stretch tapes to make them fit opening.

C. Where framing joints are vertical, cover these joints by applying tapes to heads and sills first and then to jambs. Where framing joints are horizontal, cover these 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 just before each lite is installed.

F. 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.

3.6 GASKET GLAZING (DRY)

A. Fabricate compression gaskets in lengths recommended by gasket manufacturer to fit openings exactly, with stretch allowance during installation.

B. Secure compression gaskets in place with joints located at corners to compress gaskets producing a weather tight seal without developing bending stresses in glass. Seal gasket joints with sealant recommended by gasket manufacturer.

C. Install gaskets so they protrude past face of glazing stops.

3.7 SEALANT GLAZING (WET)

A. Install continuous spacers between glass lites and glazing stops to maintain glass face clearances and to prevent sealant from extruding into glass channel weep systems until sealants cure. Secure spacers 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. Install pressurized gaskets to protrude slightly out of channel to eliminate dirt and moisture pockets.

3.8 LOCK-STRIP GASKET GLAZING

A. Comply with ASTM C 716 and gasket manufacturer's printed recommendations. Provide supplementary wet seal and weep system unless otherwise indicated.

3.9 CLEANING AND PROTECTION

A. Protect exterior glass from breakage 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 including weld splatter. If, despite such protection, contaminating substances do come into contact with glass, remove them immediately as recommended 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 build-up of dirt, scum, alkali deposits, or stains, and remove as recommended by glass manufacturer.

D. Remove and replace glass that is broken, chipped, cracked, abraded, or damaged in any way, including natural causes, accidents and vandalism, during construction period.

E. Wash glass on both faces in each area of Project not more than 4 days prior to date scheduled for inspections that establish date of Substantial Completion. Wash glass as recommended by glass manufacturer.

3.10 WASTE MANAGEMENT

A. Coordinate with Section 01 74 19.
   1. Separate and recycle cut-offs and waste materials and material packaging in accordance with Waste Management Plan and to the maximum extent economically feasible and place in designated areas for recycling.
   2. Set aside and protect materials suitable for reuse and/or remanufacturing.
   3. Separate and fold up metal banding; flatten and place along with other metal scrap for recycling in designated area.

END OF SECTION 08 80 00

SECTION 08 83 00 - 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. The work performed under this Section includes the performance criteria, materials, production, and erection of Mirrors for the project and consists of the provision of all plant, materials, labor and equipment and the like necessary and/or required for the complete execution of all Mirrors as required by schedules, keynotes and drawings, as specified herein, and as may be required by conditions and authorities having jurisdiction including, but not limited to the following:

1. Tempered glass mirrors qualifying as safety glazing.

B. Related Sections:

1. Division 08 "Glazing" for glass with reflective coatings used for vision and spandrel lites.

1.3 ACTION SUBMITTALS

A. Product Data: For each type of product indicated.

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.

B. Shop Drawings: Include mirror elevations, edge details, mirror hardware, and attachments to other work.

C. Samples: For each type of the following products:

1. Mirrors: 12 inches (300 mm) square, including edge treatment on two adjoining edges.
2. Mirror Clips: Full size.
3. Mirror Trim: 12 inches (300 mm) long.

1.4 INFORMATIONAL SUBMITTALS

A. Qualification Data: For qualified Installer.

B. Product Certificates: For each type of mirror and mirror mastic, from manufacturer.

C. Preconstruction Test Reports: From mirror manufacturer indicating that mirror mastic was tested for compatibility and adhesion with mirror backing film and substrates on which mirrors are installed.

D. Warranty: Sample of special warranty.

1.5 CLOSEOUT SUBMITTALS

A. Maintenance Data: For mirrors to include in maintenance manuals.

1.6 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 Mirrors: Obtain mirrors from single source from single manufacturer.

C. Source Limitations for Mirror Accessories: Obtain mirror glazing accessories from single source.

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: For tempered mirrors, provide products 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 film 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 moisture, 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.

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.

B. Mirror shall be installed flush with tile.

1.9 WARRANTY

A. Special Warranty: Manufacturer's standard form in which mirror manufacturer agrees to replace mirrors that deteriorate within specified warranty period. Deterioration of mirrors is defined as defects developed from normal use that are not attributed to mirror breakage or to maintaining and cleaning mirrors contrary to manufacturer's written instructions. Defects include discoloration, black spots, and clouding of the silver film.

1. Warranty Period: 10 years from date of Substantial Completion.

PART 2 - PRODUCTS

2.1 SILVERED FLAT GLASS MIRRORS

A. Refer to Restroom and Accessory Schedule for toilet room mirror bases of design.

B. Where mirror product is not specifically noted otherwise, furnish and install glass Mirrors, General: ASTM C 1503**;** manufactured using copper-free, low-lead mirror coating process.

1. Manufacturers: Subject to compliance with requirements, provide products by one of the following:

a. Arch Aluminum & Glass Co., Inc.
b. Donisi Mirror Company.
c. Gardner Glass, Inc.
d. Guardian Industries.
e. Independent Mirror Industries, Inc.
f. Lenoir Mirror Company. National Glass Industries.
g. Stroupe Mirror Co., Inc.
h. Sunshine Mirror; Westshore Glass Corp.
i. Virginia Mirror Company, Inc.
j. Walker Glass Co., Ltd.

C. Tempered Clear Glass: Mirror Glazing Quality, for blemish requirements; and comply with ASTM C 1048 for Kind FT, Condition A, tempered float glass before silver coating is applied.

1. Nominal Thickness: 6.0 mm.

2.2 MISCELLANEOUS MATERIALS

A. Setting Blocks: Elastomeric material with a Shore, Type A 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, asbestos-free, 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.

1. Manufacturers: Subject to compliance with requirements, provide products by one of the following:

a. Franklin International; Titebond Division.
b. Laurence, C. R. Co., Inc.
c. Macco Adhesives; Liquid Nails Division.
d. OSI Sealants, Inc.
e. Palmer Products Corporation.
f. Pecora Corporation.
g. Royal Adhesives & Sealants; Gunther Mirror Mastics Division.
h. Sommer & Maca Industries, Inc.

2. Adhesive shall have a VOC content of not more than 70 g/L when calculated according to 40 CFR 59, Subpart D (EPA Method 24).

D. Film Backing for Safety Mirrors: Film backing and pressure-sensitive adhesive; both compatible with mirror backing paint as certified by mirror manufacturer.

2.3 MIRROR HARDWARE

A. 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).

a. Products: Subject to compliance with requirements, provide one of the following:

1) Laurence, C. R. Co., Inc.; CRL Standard "J" Channel.
2) Sommer & Maca Industries, Inc.; Aluminum Shallow Nose "J" Moulding Lower Bar.
3) Sommer & Maca Industries, Inc.; Heavy Gauge Aluminum Shallow Nose "J" Moulding Lower Bar.

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).

    a. Products: Subject to compliance with requirements, provide one of the following:

        1) Laurence, C. R. Co., Inc.; CRL Deep "J" Channel.
        2) Sommer & Maca Industries, Inc.; Aluminum Deep Nose "J" Moulding Upper Bar.
        3) Sommer & Maca Industries, Inc.; Heavy Gauge Aluminum Deep Nose "J" Moulding Lower Bar.

3. Finish: Clear bright anodized.

B. Fasteners: Fabricated of same basic metal and alloy as fastened metal and matching it in finished color and texture where fasteners are exposed.

C. 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 for applications on inside face of exterior walls and where indicated.

2.4 FABRICATION

A. Mirror Sizes: To suit Project conditions, and before tempering**,** cut mirrors to final sizes and shapes.

B. Cutouts: Fabricate cutouts before tempering for notches and holes in mirrors without marring visible surfaces. Locate and size cutouts so they fit closely around penetrations in mirrors.

C. Mirror Edge Treatment: Rounded polished.

1. Seal edges of mirrors with edge sealer after edge treatment to prevent chemical or atmospheric penetration of glass coating.
2. Require mirror manufacturer to perform edge treatment and sealing in factory immediately after cutting to final sizes.

D. Film-Backed Safety Mirrors: Apply film backing with adhesive coating over mirror backing paint as recommended in writing by film-backing manufacturer to produce a surface free of bubbles, blisters, and other imperfections.

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 of the Work.

B. Verify compatibility with and suitability of substrates, including compatibility of mirror mastic with existing finishes or primers.

C. Proceed with 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 substrates 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. Mirrors shall be installed flush with face of tile.

C. 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.

D. Wall-Mounted Mirrors: Install mirrors with mastic and mirror hardware. 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.

1. Top and Bottom Aluminum J-Channels: Provide setting blocks 1/8 inch (3 mm) thick by 4 inches (100 mm) long at quarter points. To prevent trapping water, provide, between setting blocks, two slotted weeps not less than 1/4 inch (6.4 mm) wide by 3/8 inch (9.5 mm) long at bottom channel.
2. Install mastic as follows:

    a. Apply barrier coat to mirror backing where approved in writing by manufacturers of mirrors and backing material.
    b. Apply mastic to comply with mastic manufacturer's written instructions for coverage and to allow air circulation between back of mirrors and face of mounting surface.
    c. After mastic is applied, align mirrors and press into place while maintaining a minimum air space of 1/8 inch (3 mm) between back of mirrors and mounting surface.

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.

D. Wash exposed surface of mirrors not more than four days before date scheduled for inspections that establish date of Substantial Completion. Wash mirrors as recommended in writing by mirror manufacturer.

3.5 WASTE MANAGEMENT

A. Coordinate with Section 01 74 19.

1. Separate and recycle cut-offs and waste materials and material packaging in accordance with Waste Management Plan and to the maximum extent economically feasible and place in designated areas for recycling.
2. Set aside and protect materials suitable for reuse and/or remanufacturing.
3. Separate and fold up metal banding; flatten and place along with other metal scrap for recycling in designated area

END OF SECTION 08 83 00

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SECTION 08 87 17 - SAFETY AND SECURITY GLAZING FILMS

PART 1 GENERAL

1.01 SECTION INCLUDES

A. Glazing film applied to existing and new glazing assemblies.

B. New Glazing: Factory or shop install film to glazing before installation in frames.

C. Glazing assemblies to receive film are indicated on drawings.

1.02 RELATED REQUIREMENTS

A. Section 08 11 13 - Hollow Metal Doors and Frames: New doors with glazing to receive film.

B. Section 08 41 13 - aluminum entrances and storefronts: New glazing to receive film.

D. Section 08 80 00 - Glazing: New glazing to received film (as indicated on drawings).

1.03 ABBREVIATIONS AND ACRONYMS

A. CFR - Code of Federal Regulations.

B. GSA - General Services Administration.

1.04 REFERENCE STANDARDS

A. 16 CFR 1201 - Safety Standard for Architectural Glazing Materials; current edition.

B. ANSI Z97.1 - American National Standard for Safety Glazing Materials Used in Buildings - Safety Performance Specifications and Methods of Test; 2015.

C. ASTM C1184 - Standard Specification for Structural Silicone Sealants; 2014.

D. ASTM D882 - Standard Test Method for Tensile Properties of Thin Plastic Sheeting; 2012.

E. ASTM E84 - Standard Test Method for Surface Burning Characteristics of Building Materials; 2016.

F. GSA TS01 - Standard Test Method for Glazing and Window Systems Subject to Dynamic Overpressure Loadings; General Services Administration; 2003.

1.05 SUBMITTALS

A. See Section 01 30 00 - Administrative Requirements, for submittal procedures.

B. Product Data: Manufacturer's data sheets on each product to be used, including:
   1. Record of product certification for safety requirements.
   2. Preparation instructions and recommendations.
   3. Storage and handling requirements and recommendations.
   4. Installation methods.

C. Shop Drawings: Detailing installation of film, anchoring accessories, and sealant.

D. Samples: For each film product to be used, minimum size 4 inches by 6 inches, representing actual product, color, and patterns.

E. Samples, Supplemental Anchors: Where supplemental anchors are necessary to achieve specified performance submit detailed information in accordance with substitution procedures; include two samples, minimum length 2 inches.

F. Test Reports: Detailed reports of full-scale chamber tests to specified criteria, using assemblies identical to those required for this project.

G. Specimen Warranty.

1.06 QUALITY ASSURANCE

A. Manufacturer Qualifications: Glazing film manufacturer specializing in manufacture of safety glazing films with minimum 10 years successful experience.

B. Installer Qualifications: Certified by glazing film manufacturer.

1.07 DELIVERY, STORAGE, AND HANDLING

A. Store products in manufacturer's unopened packaging until ready for installation.

B. Store and dispose of solvent-based materials, and materials used with solvent-based materials, in accordance with requirements of authorities having jurisdiction.

1.08 FIELD CONDITIONS

A. Maintain environmental conditions (temperature, humidity, and ventilation) within limits recommended by manufacturer for optimum results. Do not install products under environmental conditions outside manufacturer's absolute limits.

1.09 WARRANTY

A. See Section 01 78 00 - Closeout Submittals, for additional warranty requirements.

B. Provide 10 year manufacturer's replacement warranty to cover film against peeling, cracking, discoloration, and deterioration.

PART 2 PRODUCTS

2.01 MANUFACTURERS

A. Basis of Design: ArmoredOne 23 mil #AOTSF23, by Armored One LLC, 386 N Midler Ave, Syracuse, NY 13206, www.armoredone.com/contact/

D. Substitutions: See Section 01 60 00 - Product Requirements.

2.02 SAFETY AND SECURITY GLAZING FILM

A. Safety Glazing: Retrofit existing glazing assemblies to provide impact resistance complying with ANSI Z97.1 and 16 CFR 1201, Category II.
   1. 1/4 inch thick clear annealed glass.
   2. 1” insulated safety glass
   3. Surface applied film.
   4. Requiring no supplemental anchoring devices.

2.03 MATERIALS

A. Security Glazing Film:

   1. Transparent polyester film for permanent bonding to glass.

2. Final installed product must be a minimum of 0.023 inches (23 Mil) thick.
   a. Installing multiple layers of thinner film to accomplish the required thickness is not allowed.
3. Adhesive Type: Pressure sensitive.
4. Tensile Strength: ASTM D-882, 32,000 psi minimum.
5. Breaking Strength: ASTM D-882, 640 lbs. / inch.
6. Elongation at Break: ASTM D-882, 230%
7. Haze: ASTM D1003, <4%
8. Color b: ASTM D2244, 4.2
9. Visible Light Transmission: 87%
10. Visible Light Reflected (Int): 12%
11. Visible Light Reflected (Ext): 12%
12. UV Block:>99%
13. Total Solar Energy Reflected: 11%
14. Total Solar Energy Transmitted: 77%
15. Total Solar Energy Absorbed: 12%
16. Shading Coefficient: 0.93
17. Total Solar Energy Rejected: 19%
18. Solar Heat Gain Coefficient: 0.81
19. U-Value Winter: 1.03
20. K-Value Winter: 5.85
21. Glare Reduction: 3%
22. Surface Burning Characteristics: Flame spread index of 25, maximum, and smoke developed index of 450, maximum, when tested in accordance with ASTM E84 (Class A).

B. Retrofit existing glazing assemblies to provide impact resistance and forced/attack resistance complying with WEY-SA-C1, ANSI Z97. I and CPSC 16 CFR 1201 Category II, ASTM E330, UL972, EN356 P4A, and GSA Level C as specified:

C. Provide supplemental anchoring system as required to meet forced entry resistance requirements.

D. Light Transmission of Film Applied on 1/4-inch-Thick Clear Annealed Glass:
   1. Visible light Transmittance: 86 percent.

E. Anchoring System: DOW 995 or GE SCS2000 SilPruf Structural Sealant with high impact styrene trim.

PART 3 EXECUTION

3.1 EXAMINATION

A. Field -Applied Film: Verify that existing conditions are adequate for proper application and performance of film.

B. Examine glass and frames. Verify that existing conditions are adequate for proper application and performance of film.

C. Verify glass is not cracked, chipped, broken, or damaged.

D. Verify that frames are securely anchored and free of defects.

E. If substrate preparation is the responsibility of another installer, notify Architect of unsatisfactory preparation before proceeding.

3.2 PREPARATION

A. Clean glass of dust, dirt, paint, oil, grease, mildew, mold, and other contaminants that would inhibit adhesion.

B. Immediately prior to applying film, thoroughly wash glass with neutral cleaning solution.

C. Protect adjacent surfaces.

D. Do not begin installation until substrates have been properly prepared.

3.3 INSTALLATION

A. Do not apply glazing film when surface temperature is less that 40 degrees F or if precipitation is imminent.

B. Install in accordance with manufacturer's instructions, without air bubbles, wrinkles, streaks, bands, thin spots, pinholes, or gaps, as required to achieve specified performance.

C. Accurately cut film with straight edges to required sizes allowing 1/16 inch to 1/8 inch gap at perimeter of glazed panel unless otherwise required by anchorage method.

D. Seams: Seam film only as required to accommodate material sizes; form seams vertically without overlaps and gaps; do not install with horizontal seams.

E. Supplemental Anchors: Install in accordance with manufacturer's instructions and shop drawings.

F. Clean glass and anchoring accessories following installation. Remove excess sealants and other glazing materials from adjacent finished surfaces.

G. Remove labels and protective covers.

3.4 PROTECTION

A. Protect installed products until completion of project.

B. Touch-up, repair or replace damaged products before Date of Substantial Completion.

END OF SECTION

SECTION 09 22 16 - NON-STRUCTURAL METAL 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. 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.

B. Related Requirements:

1. None

1.3 ACTION SUBMITTALS

A. Product Data: For each type of product.

1.4 INFORMATIONAL SUBMITTALS

A. Evaluation Reports: For dimpled steel studs and runners and firestop tracks, 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.

2.2 FRAMING SYSTEMS

A. Framing Members, General: Comply with ASTM C 754 for conditions indicated.

1. Steel Sheet Components: Comply with ASTM C 645 requirements for metal unless otherwise indicated.
2. Protective Coating: ASTM A 653/A 653M, G40 (Z120), Coating with equivalent corrosion resistance of ASTM A 653/A 653M, G40 (Z120), hot-dip galvanized unless otherwise indicated.

B. Studs and Runners: ASTM C 645. Use either steel studs and runners or dimpled steel studs and runners.

1. Steel Studs and Runners:

a. Thickness: 20 ga. **Unless otherwise indicated**
b. Depth: As indicated on Drawings.

C. 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- (51-mm-) 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 (305 mm) of the top of studs to provide lateral bracing.
2. Double-Runner System: ASTM C 645 top runners, inside runner with 2-inch- (51-mm-) deep flanges in thickness not less than indicated for studs and fastened to studs, and outer runner sized to friction fit inside runner.
3. Deflection Track: Steel sheet top runner manufactured to prevent cracking of finishes applied to interior partition framing resulting from deflection of structure above; in thickness not less than indicated for studs and in width to accommodate depth of studs.

a. Products: Subject to compliance with requirements, provide one of the following or approved equal:

1) Dietrich Metal Framing; SLP-TRK Slotted Deflection Track.
2) MBA Building Supplies; FlatSteel Deflection Track or Slotted Deflecto Track.
3) Steel Network Inc. (The); VertiTrack VTD Series.
4) Superior Metal Trim; Superior Flex Track System (SFT).
5) Telling Industries; Vertical Slip Track.

D. Firestop Tracks: Top runner manufactured to allow partition heads to expand and contract with movement of the structure while maintaining continuity of fire-resistance-rated assembly indicated; in thickness not less than indicated for studs and in width to accommodate depth of studs.

1. Products: Subject to compliance with requirements, provide one of the following, or approved equal:

a. Fire Trak Corp.; Fire Trak System.
b. Grace Construction Products; FlameSafe FlowTrak System.

E. Flat Strap and Backing Plate: Steel sheet for blocking and bracing in length and width indicated.

1. Minimum Base-Metal Thickness: 0.0219 inch (0.556 mm).

F. Cold-Rolled Channel Bridging: Steel, 0.053-inch (1.34-mm) minimum base-metal thickness, with minimum 1/2-inch- (13-mm-) wide flanges.

1. Depth: As indicated on Drawings.
2. Clip Angle: Not less than 1-1/2 by 1-1/2 inches (38 by 38 mm), 0.068-inch- (1.72-mm-) thick, galvanized steel.

G. Hat-Shaped, Rigid Furring Channels: ASTM C 645.

1. Minimum Base-Metal Thickness: 0.0219 inch (0.556 mm).
2. Depth: 7/8 inch (22.2 mm).

H. Resilient Furring Channels: 1/2-inch- (13-mm-) deep, steel sheet members designed to reduce sound transmission.

1. Configuration: Asymmetrical or hat shaped.

I. Cold-Rolled Furring Channels: 0.053-inch (1.34-mm) uncoated-steel thickness, with minimum 1/2-inch- (13-mm-) wide flanges.

1. Depth: As indicated on Drawings.
2. Furring Brackets: Adjustable, corrugated-edge type of steel sheet with minimum uncoated-steel thickness of 0.033 inch (0.8 mm).
3. Tie Wire: ASTM A 641/A 641M, Class 1 zinc coating, soft temper, 0.062-inch- (1.59-mm-) diameter wire, or double strand of 0.048-inch- (1.21-mm-) diameter wire.

J. Z-Shaped Furring: With slotted or nonslotted web, face flange of 1-1/4 inches (32 mm), wall attachment flange of 7/8 inch (22 mm), minimum uncoated-metal thickness of 0.018 inch (0.45 mm), and depth required to fit insulation thickness indicated.

2.3 SUSPENSION SYSTEMS

A. Tie Wire: ASTM A 641/A 641M, Class 1 zinc coating, soft temper, 0.062-inch- (1.59-mm-) diameter wire, or double strand of 0.048-inch- (1.21-mm-) diameter wire.

B. Hanger Attachments to Concrete:

1. Anchors: Fabricated from corrosion-resistant materials with holes or loops for attaching wire hangers and capable of sustaining, without failure, a load equal to 5 times that imposed by construction as determined by testing according to ASTM E 488 by an independent testing agency.
2. Powder-Actuated Fasteners: Suitable for application indicated, fabricated from corrosion-resistant materials with clips or other devices for attaching hangers of type indicated, and capable of sustaining, without failure, a load equal to 10 times that imposed by

construction as determined by testing according to ASTM E 1190 by an independent testing agency.

C. Wire Hangers: ASTM A 641/A 641M, Class 1 zinc coating, soft temper, 0.16 inch (4.12 mm) in diameter.

D. Flat Hangers: Steel sheet, 1 by 3/16 inch (25 by 5 mm) by length indicated.

E. Carrying Channels: Cold-rolled, commercial-steel sheet with a base-metal thickness of 0.053 inch (1.34 mm) and minimum 1/2-inch- (13-mm-) wide flanges.

F. Furring Channels (Furring Members):

1. Cold-Rolled Channels: 0.053-inch (1.34-mm) uncoated-steel thickness, with minimum 1/2-inch- (13-mm-) wide flanges, 3/4 inch (19 mm) deep.
2. Steel Studs and Runners: ASTM C 645.
3. Dimpled Steel Studs and Runners: ASTM C 645.
4. Hat-Shaped, Rigid Furring Channels: ASTM C 645, 7/8 inch (22 mm) deep.
5. Resilient Furring Channels: 1/2-inch- (13-mm-) deep members designed to reduce sound transmission.

G. 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, available products that may be incorporated into the Work include, but are not limited to, the following:

a. Armstrong World Industries, Inc.; Drywall Grid Systems.
b. Chicago Metallic Corporation; Drywall Grid System.
c. USG Corporation; Drywall Suspension System.

2.4 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 (3.2 mm) 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 (610 mm) 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 (406 mm) o.c. unless otherwise indicated.
2. Multilayer Application: 16 inches (406 mm) o.c. unless otherwise indicated.
3. Tile Backing Panels: 16 inches (406 mm)] o.c. unless otherwise indicated.

B. Where studs are installed directly against exterior masonry walls or dissimilar metals at exterior walls, install isolation strip between studs and exterior wall.

C. Install studs so flanges within framing system point in same direction.

D. 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 (13-mm) 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. Sound-Rated Partitions: Install framing to comply with sound-rated assembly indicated.
6. 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 (150 mm) o.c.

E. Direct Furring:

1. Screw to wood framing.
2. Attach to concrete or masonry with stub nails, screws designed for masonry attachment, or powder-driven fasteners spaced 24 inches (610 mm) o.c.

F. Z-Furring Members:

1. Erect insulation, specified in Section 072100 "Thermal Insulation," vertically and hold in place with Z-furring members spaced 24 inches (610 mm) o.c.
2. Except at exterior corners, securely attach narrow flanges of furring members to wall with concrete stub nails, screws designed for masonry attachment, or powder-driven fasteners spaced 24 inches (610 mm) o.c.
3. At exterior corners, attach wide flange of furring members to wall with short flange extending beyond corner; on adjacent wall surface, screw-attach short flange of furring channel to web of attached channel. At interior corners, space second member no more than 12 inches (305 mm) from corner and cut insulation to fit.

G. Installation Tolerance: Install each framing member so fastening surfaces vary not more than 1/8 inch (3 mm) 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 (1219 mm) o.c.
2. Carrying Channels (Main Runners): 48 inches (1219 mm) o.c.
3. Furring Channels (Furring Members): 16 inches (406 mm) 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. Flat Hangers: Secure to structure, including intermediate framing members, by attaching to inserts, eye screws, or other devices and fasteners that are secure and appropriate for structure and hanger, and in a manner that will not cause hangers to deteriorate or otherwise fail.
5. Do not attach hangers to steel roof deck.
6. Do not attach hangers to permanent metal forms. Furnish cast-in-place hanger inserts that extend through forms.
7. Do not attach hangers to rolled-in hanger tabs of composite steel floor deck.
8. Do not connect or suspend steel framing from ducts, pipes, or conduit.

D. Fire-Resistance-Rated Assemblies: Wire tie furring channels to supports.

E. Seismic Bracing: Sway-brace suspension systems with hangers used for support.

F. 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.

G. Installation Tolerances: Install suspension systems that are level to within 1/8 inch in 12 feet (3 mm in 3.6 m) measured lengthwise on each member that will receive finishes and transversely between parallel members that will receive finishes.

3.6 WASTE MANAGEMENT

A. Coordinate with Section 017423.

1. Separate and recycle cut-offs and waste materials and material packaging in accordance with Waste Management Plan and to the maximum extent economically feasible and place in designated areas for recycling.
2. Set aside and protect materials suitable for reuse and/or remanufacturing.
3. Separate and fold up metal banding; flatten and place along with other metal scrap for recycling in designated area.

END OF SECTION 092216

SECTION 09 29 00 - GYPSUM BOARD

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 performance criteria, materials, production, and erection of gypsum board for the project. The work performed under this Section consists of the provision of all plant, materials, labor and equipment and the like necessary and/or required for the complete execution of all gypsum board as required by this section, schedules, keynotes and drawings including, but not limited to the following.

1. Interior gypsum board.
2. Moisture resistant gypsum board (all wet locations and as tile backer)
3. Trim.

B. Related Requirements:
1. Section 09 22 16 "Non-Structural Metal Framing" for non-structural framing and suspension systems that support gypsum board panels.

1.3 PERFORMANCE REQUIREMENTS

A. Structural Performance of Ceiling Suspension Systems: Ceiling suspension systems and cantilevered ceiling soffits shall withstand the effects of gravity and seismic effects.

1.4 ACTION SUBMITTALS

A. Product Data: For each type of product.

B. Shop Drawings for Gypsum Board Ceiling Systems: Include reflected ceiling plans, drawn to scale, on which the following items are shown and coordinated with each other, and as reviewed by a qualified professional engineer using input from installers of the items involved:.

1. Layout of all ceilings/soffits with dimensions based on as-built construction
2. Gypsum board ceiling suspension-system members.
3. Miscellaneous metal/steel framing sizing for soffits and cantilevers
4. Method of attaching hangers to building structure.

a. Furnish layouts and sizing for cast-in-place anchors, clips, metal framing, miscellaneous steel shapes, and other ceiling attachment devices whose installation is specified in other Sections.

5. Size and location of initial access modules for suspended gypsum board ceilings and soffits.
6. Ceiling-mounted items including lighting fixtures, diffusers, grilles, speakers, sprinklers, access panels, and special moldings.
7. Minimum Drawing Scale: 1/8 inch = 1 foot (1:96) for layout drawings, 1 inch = 1 foot for detail drawings

C. Evaluation Reports: For each ceiling suspension system and anchor and fastener type, from ICC-ES.

D. Field quality-control reports.

E. Samples: For the following products:

1. Trim Accessories: Full-size Sample in 12-inch- (300-mm-) long length for each trim accessory indicated.
2. Textured Finishes: 12” x 12” sample for each textured finish indicated and on same backing indicated for Work.

1.5 QUALITY ASSURANCE

A. Mockups: Before beginning gypsum board installation, install mockups of at least 100 sq. ft. (9 sq. m) in surface area to demonstrate aesthetic effects and set quality standards for materials and execution.

1. Install mockups for the following:

a. Each level of gypsum board finish indicated for use in exposed locations.
b. Each texture finish indicated.

2. Apply or install final decoration indicated, including painting and wallcoverings, on exposed surfaces for review of mockups.
3. Simulate finished lighting conditions for review of mockups.
4. Subject to compliance with requirements, approved mockups may become part of the completed Work if undisturbed at time of Substantial Completion.

1.6 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.

1.7 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.

PART 2 - Indications that panels are mold damaged include, but are not limited to, fuzzy or splotchy surface contamination and discoloration 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 the following:

1. National Gypsum Company
2. American Gypsum.
3. CertainTeed Corp.
4. Georgia-Pacific Gypsum LLC.
5. Lafarge North America Inc.
6. USG Corporation.

B. Gypsum Wallboard: ASTM C 1396/C 1396M.

1. Thickness: 5/8 inch (12.7 mm).
2. Long Edges: Tapered.

C. Gypsum Board, Type X: ASTM C 1396/C 1396M.

1. Thickness: 5/8 inch (15.9 mm).
2. Long Edges: Tapered.

D. Flexible Gypsum Board: ASTM C 1396/C 1396M. 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 (6.4 mm).
2. Long Edges: Tapered.

E. Gypsum Ceiling Board: ASTM C 1396/C 1396M.

1. Thickness: 1/2 inch (12.7 mm).
2. Long Edges: Tapered.

A. Abuse-Resistant Gypsum Board: ASTM C 1629/C 1629M. **(At all whiteboard walls)**

1. Products Paper Faced, ASTM C 1396: Subject to compliance with requirements, available products that may be incorporated into the Work include, but are not limited to, the following:
   a. National Gypsum Company; Hi-Abuse XP.
2. Products Glass-Mat Faced, ASTM C 1658: Subject to compliance with requirements, available products that may be incorporated into the Work include, but are not limited to, the following:
   a. National Gypsum Company; eXP Interior Extreme AR Gypsum Panel.
3. Core**:** 5/8 inch (15.9 mm), Type X.
4. Long Edges: Tapered.
5. Mold Resistance: ASTM D 3273, score of 10 as rated according to ASTM D 3274.
6. Surface Abrasion Resistance: Level 3 in accordance with ASTM C 1629.
7. Indentation Resistance: Level 1 in accordance with ASTM C 1629.
8. Soft Body Impact Resistance: Level 2 in accordance with ASTM C 1629.

B. Impact-Resistant Gypsum Board: ASTM C 1629/C 1629M.

1. Products Paper Faced, ASTM C 1396: Subject to compliance with requirements, available products that may be incorporated into the Work include, but are not limited to, the following:
   a. National Gypsum Company; Hi-Impact XP.
2. Products Glass-Mat Faced, ASTM C 1658: Subject to compliance with requirements, available products that may be incorporated into the Work include, but are not limited to, the following:
   a. Georgia-Pacific Gypsum LLC; DensArmor Plus Impact-Resistant Interior Panel.
   b. National Gypsum Company; eXP Interior Extreme IR Gypsum Panel.
3. Core**:** 5/8 inch (15.9 mm), Type X.
4. Long Edges: Tapered.
5. Mold Resistance: ASTM D 3273, score of 10 as rated according to ASTM D 3274.
6. Surface Abrasion Resistance: Level 3 in accordance with ASTM C 1629.
7. Indentation Resistance: Level 1 in accordance with ASTM C 1629.

8. Soft Body Impact Resistance: Level 3 in accordance with ASTM C 1629.
9. Hard Body Impact Resistance: Level 2 in accordance with ASTM C 1629.

C. Moisture- and Mold-Resistant Gypsum Board: ASTM C 1396/C 1396M. With moisture- and mold-resistant core and paper surfaces. **(At all bathroom locations)**

1. Core: 5/8 inch (15.9 mm), Type X.
2. Long Edges: Tapered.
3. Mold Resistance: ASTM D 3273, score of 10 as rated according to ASTM D 3274.

D. Glass-Mat Interior Gypsum Board: ASTM C 1658/C 1658M. With fiberglass mat laminated to both sides. Specifically designed for interior use, where indicated on Drawings. Retain "Products" Subparagraph and list of manufacturers and products below to require specific products or a comparable product from other manufacturers. **(At all plumbing walls, with or without tile)**

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. Georgia-Pacific Gypsum LLC; DensArmor Plus.
    b. National Gypsum Company; eXP Interior Extreme.

2. Core: 5/8 inch, Type X.
3. Long Edges: Tapered.
4. Mold Resistance: ASTM D 3273, score of 10 as rated according to ASTM D 3274.

2.4 TRIM ACCESSORIES

A. Interior Trim: ASTM C 1047.

1. Material: Galvanized or aluminum-coated steel sheet, rolled zinc, plastic, or paper-faced galvanized steel sheet.
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.

2.5 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.

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.
5. Skim Coat: For final coat of Level 5 finish, use setting-type, sandable topping compound.

2.6 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 (0.84 to 2.84 mm) thick.

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 product by one of the following:

    a. Accumetric LLC; BOSS 824 Acoustical Sound Sealant.
    b. Grabber Construction Products; Acoustical Sealant GSC.

c. Pecora Corporation
d. Specified Technologies, Inc.; Smoke N Sound Acoustical Sealant.
e. 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).

F. Thermal Insulation: As specified in Section 07 21 00 "Thermal Insulation."

G. Vapor Retarder: As specified in Section 07 21 00 "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 and Gypsum Association GA 214-10.

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 (1.5 mm) 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. (0.7 sq. m) 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- (6.4- to 9.5-mm-) 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- (6.4- to 12.7-mm-) 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. Wallboard Type: As indicated on Drawings.
2. Type X: As indicated on Drawings and at all fire rated assemblies.
3. Flexible Type: As indicated on Drawings.
4. Ceiling Type: As indicated on Drawings.
5. Abuse-Resistant Type: At interior of exterior walls and whiteboard walls.
6. Impact-Resistant Type: At lobbies, entries and corridors
7. Moisture- and Mold-Resistant Type: As indicated on Drawings and at all wet areas and as tile backer.
8. Glass-Mat Interior Type: At all plumbing wall with or without tile.

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 horizontally (perpendicular 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. On Z-furring members, apply gypsum panels vertically (parallel to framing) with no end joints. Locate edge joints over furring members.
4. 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 (400 mm) 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. On Z-furring members, apply base layer vertically (parallel to framing) and face layer either vertically (parallel to framing) or horizontally (perpendicular to framing) with vertical joints offset at least one furring member. Locate edge joints of base layer over furring members.
4. 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- (300-mm-) 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 (400 mm) o.c. Center gypsum board face layer over joints in base layer, and fasten to studs with screws spaced 12 inches (300 mm) o.c.

3.4 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 at locations indicated on Drawings and 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. Bullnose Bead: Use at outside corners.

3. LC-Bead: Use at exposed panel edges.
4. L-Bead: Use where indicated.
5. U-Bead: Use at exposed panel edges and where indicated.
6. Curved-Edge Cornerbead: Use at curved openings.

3.5 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 and Gypsum Association GA 214-10:

1. Level 1:

   a. All joints and interior angles shall have tape set in joint compound. Surface shall be free of excess joint compound. Minor tool marks and ridges are acceptable:

      1) At ceiling plenum areas, concealed areas, behind metal lockers, behind built-in millwork, and where indicated.

2. Level 2:

   a. All joints and interior angles shall have tape embedded in joint compound and wiped with joint knife leaving a thin coating of joint compound over all joints and interior angles. Fastener heads and accessories shall be covered with a coat of joint compound. Surface shall be free of excess joint compound. Minor tools marks and ridges are acceptable. Joint compound applied over the body of the tape at the time of tape embedment shall be considered a separate coat of joint compound and shall satisfy the conditions of this level:

      1) At gypsum panels that are substrate for tile or acoustical tile, and where indicated on Drawings.

3. Level 3:

   a. All joints and interior angles shall have tape embedded in joint compound and shall be immediately wiped with joint knife leaving a thin coating of joint compound over all joints and interior angles. One additional coat of joint compound shall be applied over all joints and interior angles. Fastener heads and accessories shall be covered with two separate coats of joint compound. All joint compound shall be smooth and free of tool marks and ridges:

1) At panel surfaces receiving medium- or heavy-textured finishes before painting, or heavy wallcoverings where lighting conditions are not critical, and where indicated on Drawings.

4. Level 4:

a. All joints and interior angles shall have tape embedded in joint compound and shall be immediately wiped with joint knife leaving a thin coating of joint compound over all joints and interior angles. Two separate coats of joint compound shall be applied over all flat joints and one separate coat of joint compound shall be applied over interior angles. Fastener heads and accessories shall be covered with three separate coats of joint compound. All joint compound shall be smooth and free of tool marks and ridges. Prepared surfaces shall be coated with drywall primer prior to application of final finishes:

1) At panel surfaces receiving light-textured finishes, wallcoverings, and flat paints, and at panel surfaces that will be exposed to view unless otherwise indicated. This is generally the standard exposed finish, unless noted otherwise. Not recommended where glossy or semi-glass enamel paints are specified.

b. Primer and its application to surfaces are specified in other Section 099123 “Painting.”

5. Level 5:

a. All joints and interior angles shall have tape embedded in joint compound and shall be immediately wiped with joint knife leaving a thin coating of joint compound over all joints and interior angles. Two separate coats of joint compound shall be applied over all flat joints and one separate coat of joint compound shall be applied over interior angles. Fastener heads and accessories shall be covered with three separate coats of joint compound. A thin skim coat of joint compound trowel applied, or a material manufactured especially for this purpose and applied in accordance with manufacturer’s recommendations, applied to entire surface. The surface shall be smooth and free of tool marks and ridges. Prepared surfaces shall be coated with drywall primer prior to application of final finishes:

1) At panel surfaces receiving gloss and semigloss enamels and other surfaces subject to severe lighting, and where indicated on Drawings.

b. Primer and its application to surfaces are specified in other Section 099123 “Painting.”

3.6 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.

3.7 WASTE MANAGEMENT

A. Coordinate with Section 01 74 19.

1. Separate and recycle cut-offs and waste materials and material packaging in accordance with Waste Management Plan and to the maximum extent economically feasible and place in designated areas for recycling.
2. Set aside and protect materials suitable for reuse and/or remanufacturing.
3. Separate and fold up metal banding; flatten and place along with other scrap for recycling.

END OF SECTION 09 29 00

SECTION 09 30 13 - CERAMIC TILE

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. Ceramic tile.
   2. Porcelain tile.
   3. Stone thresholds installed as part of tile installations.

B. Related Sections include the following:
   1. Division 9 Section "Gypsum Board Assemblies" for glass mat, water resistant gypsum backing board installed in gypsum wallboard assemblies.

1.3 PERFORMANCE REQUIREMENTS

A. Static Coefficient of Friction: 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 0.6.

B. Load-Bearing Performance: For ceramic tile installed on walkway surfaces, provide installations rated for the following load-bearing performance level based on testing assemblies according to ASTM C 627 that are representative of those indicated for this Project:
   1. Moderate: Passes cycles 1 through 10.

1.4 SUBMITTALS

A. Product Data: For each type of tile, mortar, grout, and other products specified.

B. Shop Drawings: For the following:
   1. Tile patterns and locations.
   2. Widths, details, and locations of expansion, contraction, control, and isolation joints in tile substrates and finished tile surfaces.

C. Tile Samples for Initial Selection: Manufacturer's color charts consisting of actual tiles or sections of tiles showing the full range of colors, textures, and patterns available for each type and composition of tile indicated. Include Samples of accessories involving color selection.

D. Samples for Verification: Of each item listed below, prepared on Samples of size and construction indicated. Where products involve normal color and texture variations, include Sample sets showing the full range of variations expected.
   1. Each type and composition of tile and for each color and texture required, at least 12 inches square, mounted on braced cementitious backer units, and with grouted joints using product complying with specified requirements and approved for completed work in color or colors selected by Architect.
   2. Full-size units of each type of trim and accessory for each color required.
   3. Stone thresholds in 6-inch lengths.

E. Product Certificates: Signed by manufacturers certifying that the products furnished comply with requirements.

F. Qualification Data: For firms and persons specified in the "Quality Assurance" Article to demonstrate their capabilities and experience. Include lists of completed projects with project names and addresses, names of architects and owners, and other information specified.

G. Setting Material Test Reports: Indicate and interpret test results for compliance of tile-setting and -grouting products with specified requirements.

1.5 QUALITY ASSURANCE

A. Installer Qualifications: Engage an experienced installer who has completed tile installations similar in material, design, and extent to that indicated for this Project and with a record of successful in-service performance.

B. Source Limitations for Tile: Obtain each color, grade, finish, type, composition, and variety of tile from one source with resources to provide products from the same production run for each contiguous area of consistent quality in appearance and physical properties without delaying the Work.

C. Source Limitations for Setting and Grouting Materials: Obtain ingredients of a uniform quality for each mortar, adhesive, and grout component from a single manufacturer and each aggregate from one source or producer.

D. Source Limitations for Other Products: Obtain each of the following products specified in this Section from one source and by a single manufacturer for each product:
   1. Stone thresholds.
   2. Joint sealants.

1.6 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 requirement of ANSI A137.1 for labeling sealed tile packages.

B. Prevent damage or contamination to materials by water, freezing, foreign matter, and other causes.

C. Handle tile with 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.

1.7 PROJECT CONDITIONS

A. Environmental Limitations: Do not install tile until construction in spaces is completed and ambient temperature and humidity conditions are being maintained to comply with referenced standards and manufacturer's written instructions.

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:
   1. Tile Products:
      a. American Olean Tile Company.
      b. Crossville Tile
      c. ProSpec LLC.
      d. Dal-Tile Corporation.
      e. Emser Tile
      f. Stone Source
      g. Horizon Tile

B. Tile-Setting and -Grouting Materials:
      a. American Olean Tile Company.
      b. ProSpec LLC.
      c. Bostik.
      d. Dal-Tile Corporation.
      e. Laticrete International, Inc.
      f. Mapei Corporation.

2.2 PRODUCTS, GENERAL

A. ANSI Ceramic Tile Standard: Provide tile that complies with ANSI A137.1, "Specifications for Ceramic Tile," for types, compositions, and other characteristics indicated.
   1. Provide tile complying with Standard Grade requirements, unless otherwise indicated.

B. ANSI Standards for Tile Installation Materials: Provide materials complying with ANSI standards referenced in "Setting Materials" and "Grouting Materials" articles.

C. Colors, Textures, and Patterns: Where manufacturer's standard products are indicated for tile, grout, and other products requiring selection of colors, surface textures, patterns, and other appearance characteristics, provide specific products or materials complying with the following requirements:
   1. See Finish Schedule for exact tile product information.

D. Factory Blending: For tile exhibiting color variations within the ranges selected during Sample submittals, blend tile in the factory and package so tile units taken from one package show the same range in colors as those taken from other packages and match approved Samples.

E. Mounting: Where factory-mounted tile is required, provide back- or edge-mounted tile assemblies as standard with manufacturer, unless another mounting method is 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 these kinds of installations and has a record of successful in-service performance.

2.3 WALL TILE

A. Porcelain Wall Tile Basis of Design: Crossville “Alaska” & Dal-Tile “Color Wave” tile complying with the following requirements:

   1. Composition: Porcelain.
   2. Module Size: Varies. Refer to Finish Schedule
   3. Thickness: 5/16 inch.
   4. Colors: As noted on finish schedule.
   5. Pattern and Borders: Contrasting color patterns and borders as directed by the Architect

B. Trim Units: Provide tile trim units to match color and characteristics of adjoining flat tile and to comply with the following requirements:
   1. Size: As indicated, coordinated with sizes and coursing of adjoining flat tile where applicable.
   2. Shapes: As follows, selected from manufacturer's standard shapes:
      a. Round Incorner Base for Thin-Set Mortar Installations: Coved.
      b. 2x8 bullnose where specified on Finish Schedule.
      c. Wainscot Cap for Thin-Set Mortar Installations: Stainless steel trim.
      d. External Corners for Thin-Set Mortar Installations: Stainless steel trim.
      e. Internal Corners: Field-butted square corners, except with coved base and cap angle pieces designed to member with stretcher shapes.

2.4 STONE THRESHOLDS

A. General: Provide stone thresholds that are uniform in color and finish, fabricated to sizes and profiles indicated to provide transition between tile surfaces and adjoining finished floor surfaces.
   1. Fabricate thresholds to heights indicated, but not more than 1/2 inch above adjoining finished floor surfaces, with transition edges beveled on a slope of no greater than 1:2.

B. Marble Thresholds: Provide marble thresholds complying with ASTM C 503 requirements for exterior use and with a minimum abrasive-hardness value of 10 per ASTM C 241.
   1. As selected from manufacturer’s standard colors and finishes.

2.5 SETTING MATERIALS

A. Organic Adhesive: ANSI A136.1, Type I as recommended by manufacturer.

B. Tile Setting Adhesive: Elastomeric, waterproof, liquid applied.

2.6 GROUTING MATERIALS

A. Dry-Set Grout: ANSI A118.6, color as selected from the manufacturer's standard range of colors.

2.7 ELASTOMERIC SEALANTS

A. General: Provide manufacturer's standard chemically curing, elastomeric sealants of base polymer and characteristics indicated that comply with applicable requirements of Division 7 Section "Joint Sealants."

B. Colors: Provide colors of exposed sealants to match colors of grout in tile adjoining sealed joints, unless otherwise indicated.

C. Walls: One-Part, Mildew-Resistant Silicone Sealant: ASTM C 920; Type S; Grade NS; Class 25; Uses NT, G, A, and, as applicable to nonporous joint substrates indicated, O; formulated with fungicide, intended for sealing interior ceramic tile joints and other nonporous substrates that are subject to in-service exposures of high humidity and temperature extremes.

D. Floors: Multipart, Pourable Urethane Sealant for Use T: ASTM C 920; Type M; Grade P; Class 25; Uses T, M, A, and, as applicable to joint substrates indicated, O.

E. Available Products: Subject to compliance with requirements, products which may be incorporated into the Work include, but are not limited to, the following:
   1. One-Part, Mildew-Resistant Silicone Sealants:
      a. Dow Corning 786; Dow Corning Corporation.
      b. Sanitary 1700; GE Silicones.
      c. Pecora 898 Sanitary Silicone Sealant; Pecora Corp.
      d. Rhodorsil 6B White; Rhone-Poulenc, Inc.
      e. Tremsil 600 White; Tremco, Inc.
   2. Multipart, Pourable Urethane Sealants:
      a. Chem-Calk 550; Bostik.
      b. Vulkem 245; Mameco International, Inc.
      c. NR-200 Urexpan; Pecora Corp.
      d. THC-900; Tremco, Inc.

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.

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.

2.10 FINISHING AND EDGE PROTECTION FOR WALLS

A. Install stainless steel edge trim at horizontal and vertical corners of tile installations. Profiles for each location to be selected by Architect.

B. Basis of Design: Schluter Systems, Plattsburgh, N.Y.
   1. Bullnose
   2. Straight profile with anchoring leg
   3. Rounded outer corner with anchoring leg

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 from oil, waxy films, and curing compounds; and within flatness tolerances required by referenced ANSI A108 series of tile installation standards for installations indicated.
   2. 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 before installing tile.
   3. Verify that joints and cracks in tile substrates are coordinated with tile joint locations; if not coordinated, adjust latter in consultation with Architect.

B. Do not proceed with installation until unsatisfactory conditions have been corrected.

3.2 PREPARATION

A. Remove coatings, including curing compounds, and other substances that contain soap, wax, oil, or silicone and are incompatible with tile-setting materials by using a terrazzo or concrete grinder, a drum sander, or a polishing machine equipped with a heavy-duty wire brush.

B. Provide concrete substrates for tile floors installed with dry-set or latex-portland cement mortars that comply with flatness tolerances specified in referenced ANSI A108 series of tile installation standards for installations indicated.

1. Use trowelable leveling and patching compounds per tile-setting material manufacturer's written instructions to fill cracks, holes, and depressions.
2. Remove protrusions, bumps, and ridges by sanding or grinding.

C. Blending: For tile exhibiting color variations within the ranges selected during Sample submittals, verify that tile has been blended in the factory and packaged so tile units taken from one package show the same range in 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 INSTALLATION, GENERAL

A. ANSI Tile Installation Standards: Comply with parts of ANSI A108 series of tile installation standards in "Specifications for Installation of Ceramic Tile" that apply to types of setting and grouting materials and to methods indicated.

B. TCA Installation Guidelines: TCA's "Handbook for Ceramic Tile Installation." Comply with required TCA installation methods.

C. Extend tile work into recesses and under or behind equipment and fixtures to form a complete covering without interruptions, unless otherwise indicated. Terminate work neatly at obstructions, edges, and corners without disrupting pattern or joint alignments.

D. 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.

E. Jointing Pattern: Lay tile in grid pattern, unless otherwise indicated. Align joints when adjoining tiles on floor, base, walls, and trim are the same size. Lay out tile work and center tile fields in both directions in each space or on each wall area. Adjust to minimize tile cutting. Provide uniform joint widths, unless otherwise indicated.
1. For tile mounted in sheets (if any), make joints between tile sheets the same width as joints within tile sheets so joints between sheets are not apparent in finished work.

F. Lay out tile wainscots to next full tile beyond dimensions indicated.

G. Expansion Joints: Locate expansion joints and other sealant-filled joints, including control, contraction, and isolation joints, where indicated during installation of setting materials, mortar beds, and tile. Do not saw-cut joints after installing tiles.
1. Locate joints in tile surfaces directly above joints in concrete substrates.

H. Grout tile to comply with the requirements of the following tile installation standards:
1. For ceramic tile grouts (sand-portland cement, dry-set, commercial portland cement, and latex-portland cement grouts), comply with ANSI A108.10.

3.4 WALL TILE INSTALLATION

A. Install types of tile designated for wall installations to comply with TCA installation methods and ANSI setting-bed standards.

B. Joint Widths: Install tile on walls with the following joint widths:
   1. Ceramic Mosaic Tile: 1/16 inch.
   2. Wall Tile: 1/16 inch.

3.5 EDGE PROTECTION INSTALLATION FOR WALLS

A. Install as per manufacturer's instructions as an integral component during wall tile installation.

3.6 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 latex-portland cement grout residue from tile as soon as possible.
   2. Unglazed tile may be cleaned with acid solutions only when permitted by tile and grout manufacturer's written instructions, but no sooner than 10 days after installation. Protect metal surfaces, cast iron, and vitreous plumbing fixtures from effects of acid cleaning. Flush surface with clean water before and after cleaning.

B. Finished Tile Work: Leave finished installation clean and free of cracked, chipped, broken, unbonded, and otherwise defective tile work.

C. Provide final protection and maintain conditions, in a manner acceptable to manufacturer and Installer that ensure tile is without damage or deterioration at the time of Substantial Completion.
   1. When recommended by tile manufacturer, apply a protective coat of neutral protective cleaner to completed tile walls and floors. Protect installed tile work with kraft paper or other heavy covering during construction period to prevent staining, damage, and wear.
   2. Prohibit foot and wheel traffic from tiled floors for at least 7 days after grouting is completed.

D. Before final inspection, remove any cleaner from tile surfaces.

3.7 WASTE MANAGEMENT

A. Coordinate with Section 01 74 19.

   1. Separate and recycle cut-offs and waste materials and material packaging in accordance with Waste Management Plan and to the maximum extent economically feasible and place in designated areas for recycling.
   2. Set aside and protect materials suitable for reuse and/or remanufacturing.
   3. Separate and fold up metal banding; flatten and place along with other scrap for recycling.

END OF SECTION 09 30 13

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

Drawings and general conditions of Contract, including General and Supplementary Conditions and Divisions-1 Specification sections apply to work of this section.

1.2 SUMMARY

A. Section Includes

1. Acoustical ceiling panels
2. Exposed grid suspension system
3. Wire hangers, fasteners, main runners, cross tees, and wall angle moldings
4. Perimeter Trim

B. Related Selections

1. Section 09 51 00 - Acoustical Ceilings
2. Section 09 53 00 - Acoustical Ceiling Suspension Assemblies
3. Section 09 20 00 - Plaster and Gypsum Board
4. Section 02 42 00 - Removal and Salvage of Construction Materials
5. Divisions 23 - HVAC Air Distribution
7. Division 26 - Electrical

C. Alternates

1. Prior Approval: Unless otherwise provided for in the Contract documents, proposed product substitutions may be submitted no later than TEN (10) working days prior to the date established for receipt of bids. Acceptability of a proposed substitution is contingent upon the Architect's review of the proposal for acceptability and approved products will be set forth by the Addenda. If included in a Bid are substitute products that have not been approved by Addenda, the specified products shall be provided without additional compensation.

2. Submittals that do not provide adequate data for the product evaluation will not be considered. The proposed substitution must meet all requirements of this section, including but not necessarily limited to, the following: Single source materials suppliers (if specified in Section 1.5); Underwriters' Laboratories Classified Acoustical performance; Panel design, size, composition, color, and finish; Suspension system component profiles and sizes; Compliance with the referenced standards.

1.3 REFERENCES

A. American Society for Testing and Materials (ASTM):

1. ASTM A 1008 Standard Specification for Steel, Sheet, Cold Rolled, Carbon, Structural, High-Strength Low-Alloy and High-Strength Low-Alloy with Improved Formability

2. ASTM A 641 Standard Specification for Zinc-Coated (Galvanized) Carbon Steel Wire
3. ASTM A 653 Standard Specification for Steel Sheet, Zinc-Coated (Galvanized) by the Hot-Dip Process
4. ASTM C 423 Sound Absorption and Sound Absorption Coefficients by the Reverberation Room Method
5. ASTM C 635 Standard Specification for Metal Suspension Systems for Acoustical Tile and Lay-in Panel Ceilings
6. ASTM C 636 Recommended Practice for Installation of Metal Ceiling Suspension Systems for Acoustical Tile and Lay-in Panels
7. ASTM D 3273 Standard Test Method for Resistance to Growth of Mold on the Surface of Interior Coatings in an Environmental Chamber
8. ASTM E 84 Standard Test Method for Surface Burning Characteristics of Building Materials
9. ASTM E 119 Standard Test Methods for Fire Tests of Building Construction and Material

A. Armstrong Fire Guard Products

10. ASTM E 580 Installation of Metal Suspension Systems in Areas Requiring Moderate Seismic Restraint
11. ASTM E 1111 Standard Test Method for Measuring the Interzone Attenuation of Ceilings Systems
12. ASTM E 1414 Standard Test Method for Airborne Sound Attenuation Between Rooms Sharing a Common Ceiling Plenum
13. ASTM E 1264 Classification for Acoustical Ceiling Products

B. International Building Code

C. ASHRAE Standard 62.1-2004, Ventilation for Acceptable Indoor Air Quality

D. NFPA 70 National Electrical Code

E. ASCE 7 American Society of Civil Engineers, Minimum Design Loads for Buildings and Other Structures

F. International Code Council-Evaluation Services - AC 156 Acceptance Criteria for Seismic Qualification Testing of Non-structural Components

G. International Code Council-Evaluation Services Report - Seismic Engineer Report

1. ESR 1308 - Armstrong Suspension Systems

H. International Association of Plumbing and Mechanical Officials - Seismic Engineer Report

1. 0244 - Armstrong Single Span Suspension System

I. California Department of Public Health CDPH/EHLB Emission Standard Method Version 1.1 2010

J. LEED - Leadership in Energy and Environmental Design is a set of rating systems for the design, construction, operation, and maintenance of green buildings

1.4 SYSTEM DESCRIPTION

Continuous/Wall-to-Wall

1.5 SUBMITTALS

A. Product Data: Submit manufacturer's technical data for each type of acoustical ceiling unit and suspension system required.

B. Samples: Minimum 6 inch x 6 inch samples of specified acoustical panel; 8 inch long samples of exposed wall molding and suspension system, including main runner and 4 foot cross tees.

C. Shop Drawings: Layout and details of acoustical ceilings show locations of items that are to be coordinated with or supported by the ceilings.

D. Certifications: Manufacturer's certifications that products comply with specified requirements, including laboratory reports showing compliance with specified tests and standards. For acoustical performance, each carton of material must carry an approved independent laboratory classification of NRC, CAC, and AC.

E. If the material supplied by the acoustical subcontractor does not have an Underwriter's Laboratory classification of acoustical performance on every carton, subcontractor shall be required to send material from every production run appearing on the job to an independent or NVLAP approved laboratory for testing, at the architect's or owner's discretion. All products not conforming to manufacturer's current published values must be removed, disposed of and replaced with complying product at the expense of the Contractor performing the work.

1.6 QUALITY ASSURANCE

A. Single-Source Responsibility: Provide acoustical panel units and grid components by a single manufacturer.

1. Fire Performance Characteristics: Identify acoustical ceiling components with appropriate markings of applicable testing and inspecting organization.

2. Surface Burning Characteristics: As follows, tested per ASTM E 84 and complying with ASTM E 1264 Classification.

3. Fire Resistance: As follows tested per ASTM E119 and listed in the appropriate floor or roof design in the Underwriters Laboratories Fire Resistance Directory

B. Acoustical Panels: As with other architectural features located at the ceiling, may obstruct or skew the planned fire sprinkler water distribution pattern through possibly delay or accelerate the activation of the sprinkler or fire detection systems by channeling heat from a fire either toward or away from the device. Designers and installers are advised to consult a fire protection engineer, NFPA 13, or their local codes for guidance where automatic fire detection and suppression systems are present.

C. Coordination of Work: Coordinate acoustical ceiling work with installers of related work including, but not limited to building insulation, gypsum board, light fixtures, mechanical systems, electrical systems, and sprinklers.

1.7 DELIVERY, STORAGE AND HANDLING

A. Deliver acoustical ceiling units to project site in original, unopened packages and store them in a fully enclosed space where they will be protected against damage from moisture, direct sunlight, surface contamination, and other causes.

B. Before installing acoustical ceiling units, permit them to reach room temperature and a stabilized moisture content.

C. Handle acoustical ceiling units carefully to avoid chipping edges or damaged units in any way.

1.8 PROJECT CONDITIONS

A. Space Enclosure:

HumiGuard Plus Ceilings: Building areas to receive ceilings shall be free of construction dust and debris. Products with HumiGuard Plus performance and hot dipped galvanized steel, aluminum or stainless steel suspension systems can be installed up to 120°F (49°C) and in spaces before the building is enclosed, where HVAC systems are cycled or not operating. Cannot be used in exterior applications where standing water is present or where moisture will come in direct contact with the ceiling.

1.9 ALTERNATE CONSTRUCTION WASTE DISPOSAL

A. Ceiling material being reclaimed must be kept dry and free from debris

B. Contact the Armstrong Recycle Center a consultant will verify the condition of the material and that it meets the Armstrong requirements for recycling. The Armstrong consultant with provide assistance to facilitate the recycling of the ceiling.

1.10 WARRANTY

A. Acoustical Panel: Submit a written warranty executed by the manufacturer, agreeing to repair or replace panels that fail within the warranty period. Failures include, but are not limited to the following:

1. Acoustical Panels: Sagging and warping

2. Grid System: Rusting and manufacturer's defects

B. Warranty Period:

1. Acoustical panels: Ten (10) years from date of substantial completion.

2. Grid: Ten (10) years from date of substantial completion.

3. Acoustical panels and grid systems with HumiGuard Plus or HumiGuard Max performance supplied by one source manufacturer is Thirty (30) years from date of substantial completion.

C. The Warranty shall not deprive the Owner of other rights the Owner may have under other provisions of the Contract Documents and will be in addition to and run concurrent with other warranties made by the Contractor under the requirements of the Contract Documents.

1.11 MAINTENANCE

A. Extra Materials: Deliver extra materials to Owner. Furnish extra materials described below that match products installed. Packaged with protective covering for storage and identified with appropriate labels.

1. Acoustical Ceiling Units: Furnish quality of full-size units equal to 5.0 percent of amount installed.

2. Exposed Suspension System Components: Furnish quantity of each exposed suspension component equal to 2.0 percent of amount installed.

PART 2 - PRODUCTS

2.1 MANUFACTURERS

A. Ceiling Panels:

1. Hunter Douglas Woodwright Linear Box Series

B. Suspension Systems:

1. Armstrong World Industries, Inc.

C: Perimeter Systems

1. Armstrong World Industries, Inc.

2.2.1 ACOUSTICAL CEILING UNITS

A. Acoustical Panels Type AP

1. Surface Texture: Fine
2. Composition: Fiberglass
3. Color: Per Drawings
4. Size: Per drawings
5. Noise Reduction Coefficient(NRC): ASTM C 423; Classified with UL label on product carton 0.95.
6. Ceiling Attenuation Class (CAC) :
7. Sabin: N/A
8. Articulation Class (AC): ASTM E 1111; 190
9. Flame Spread: ASTM E 1264; Class A (UL)
10. Dimensional Stability: HumiGuard Plus
11. Recycle Content: Post-Consumer - 12% Pre-Consumer Waste - 59%, if possible.

2.3.1 METAL SUSPENSION SYSTEMS

A. Components: Main beams and cross tees, base metal and end detail, fabricated from commercial quality hot dipped galvanized steel complying with ASTM A 653. Main beams and cross tees are double-web steel construction with exposed flange design. Exposed surfaces chemically cleansed, capping pre-finished galvanized steel in baked polyester paint. Main beams and cross tees shall have rotary stitching.

a. Structural Classification: ASTM C 635 Intermediate Duty

b. Color: White and match the actual color of the selected ceiling tile, unless noted otherwise.

c. Acceptable Product: Suprafine XL 9/16" Exposed Tee as manufactured by Armstrong World Industries

B. Attachment Devices: Size for five times design load indicated in ASTM C 635, Table 1, Direct Hung unless otherwise indicated.

C. Wire for Hangers and Ties: ASTM A 641, Class 1 zinc coating, soft annealed, with a yield stress load of at least time three design load, but not less than 12 gauge.

D. Edge Moldings and Trim

PART 3 - EXECUTION

3.1 EXAMINATION

A. Do not proceed with installation until all wet work such as concrete, terrazzo, plastering and painting has been completed and thoroughly dried out, unless expressly permitted by manufacturer's printed recommendations. (Exception: HumiGuard Max Ceilings)

3.2 PREPARATION

A. Measure each ceiling area and establish layout of acoustical units to balance border widths at opposite edges of each ceiling. Avoid use of less than half width units at borders, and comply with reflected ceiling plans. Coordinate panel layout with mechanical and electrical fixtures.

B. Coordination: Furnish layouts for preset inserts, clips, and other ceiling anchors whose installation is specified in other sections.

1. Furnish concrete inserts and similar devices to other trades for installation well in advance of time needed for coordination of other work.

3.3 INSTALLATION

A. Follow manufacturer installation instructions.

B. Install suspension system and panels in accordance with the manufacturer's instructions, and in compliance with ASTM C 636 and with the authorities having jurisdiction.

C. Suspend main beam from overhead construction with hanger wires spaced 4-0 on center along the length of the main runner. Install hanger wires plumb and straight.

D. Install wall moldings at intersection of suspended ceiling and vertical surfaces. Miter corners where wall moldings intersect or install corner caps.

E. For reveal edge panels: Cut and reveal or rabbet edges of ceiling panels at border areas and vertical surfaces.

F. Install acoustical panels in coordination with suspended system, with edges resting on flanges of main runner and cross tees. Cut and fit panels neatly against abutting surfaces. Support edges by wall moldings.

3.4 ADJUSTING AND CLEANING

A. Replace damaged and broken panels.

B. Clean exposed surfaces of acoustical ceilings, including trim, edge moldings, and suspension members. Comply with manufacturer's instructions for cleaning and touch up of minor finish damage. Remove any ceiling products that cannot be successfully cleaned and or repaired. Replace with attic stock or new product to eliminate evidence of damage.

C. Before disposing of ceilings, contact the Armstrong Recycling Center at 877-276-7876, select option #1 then #8 to review with a consultant the condition and location of building where the ceilings will be removed. The consultant will verify the condition of the material and that it meets the Armstrong requirements for recycling. The Armstrong consultant with provide assistance to facilitate the recycle of the ceiling.

END OF SECTION 09 50 00

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SECTION 09 51 23 - ACOUSTICAL CEILING TILES

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 performance criteria, materials, production, and erection of continuous/wall-to-wall acoustical tile ceilings for the project. The work performed under this Section consists of the provision of all plant, materials, labor and equipment and the like necessary and/or required for the complete execution of all acoustical tile ceilings as required by the this section, schedules, keynotes and drawings, including, but not limited to the following:

1. Acoustical tiles for ceilings.
2. Exposed grid suspension systems.
3. Wire hangers, fasteners, main runners, cross tees, and wall angle moldings.
4. Perimeter trim

1.3 PRE-INSTALLATION MEETINGS

A. Pre-installation Conference: Conduct conference at Project site.

1.4 ACTION SUBMITTALS

A. Product Data: For each type of product.

B. Samples: For each exposed product and for each color and texture specified, 6-inches- (150-mm-) in size.

C. Samples for Initial Selection: For components with factory-applied color finishes.

D. Samples for Verification: For each component indicated and for each exposed finish required, prepared on Samples of size indicated below.

1. Acoustical Tile: Set of full-size Samples of each type, color, pattern, and texture.
2. Concealed Suspension-System Members: 6-inch- (150-mm-) long Sample of each type.
3. Exposed Moldings and Trim: Set of 6-inch- (150-mm-) long Samples of each type and color.

1.5 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-system members.
2. Method of attaching hangers to building structure.

a. Furnish layouts for cast-in-place anchors, clips, and other ceiling attachment devices whose installation is specified in other Sections.

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. Minimum Drawing Scale: 1/8 inch = 1 foot (1:96).

B. Qualification Data: For testing agency.

C. Product Test Reports: For each acoustical tile ceiling, for tests performed by manufacturer and witnessed by a qualified testing agency.

D. Evaluation Reports: For each acoustical tile ceiling suspension system and anchor and fastener type, from ICC-ES.

E. Field quality-control reports.

1.6 CLOSEOUT SUBMITTALS

A. Maintenance Data: For finishes 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. Acoustical Ceiling Units: Full-size tiles equal to **2** percent of quantity installed.
2. Suspension-System Components: Quantity of each concealed grid and exposed component equal to **2** percent of quantity installed.

1.8 QUALITY ASSURANCE

A. Testing Agency Qualifications: Qualified according to the National Voluntary Laboratory Accreditation Program (NVLAP) for testing indicated.

B. Single-Source Responsibility: Provide acoustical panel units and grid components by a single manufacturer.

C. Acoustical Panels: As with other architectural features located at the ceiling, may obstruct or skew the planned fire sprinkler water distribution pattern through possibly delay or accelerate the activation of the sprinkler or fire detection systems by channeling heat from a fire either toward or away from the device. Designers and installers are advised to consult a fire protection engineer, NFPA 13, or their local codes for guidance where automatic fire detection and suppression systems are present.

D. Coordination of Work: Coordinate acoustical ceiling work with installers of related work including, but not limited to building insulation, gypsum board, light fixtures, mechanical systems, electrical systems, and sprinklers.

E. 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 ceiling area 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.

1.9 DELIVERY, STORAGE, AND HANDLING

A. Deliver acoustical tiles, 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 tiles, permit them to reach room temperature and a stabilized moisture content.

C. Handle acoustical tiles carefully to avoid chipping edges or damaging units in any way.

1.10 WARRANTY

A. Acoustical Panel: Submit a written warranty executed by the manufacturer, agreeing to repair or replace panels that fail within the warranty period. Failures include, but are not limited to the following:
1. Acoustical Panels: Sagging and warping
2. Grid System: Rusting and manufacturer's defects
3.

B. Warranty Period:
1. Acoustical panels: Ten (10) years from date of substantial completion.
2. Grid: Ten (10) years from date of substantial completion.
3. Acoustical panels and grid systems with HumiGuard Plus or HumiGuard Max performance supplied by one source manufacturer is Thirty (30) years from date of substantial completion.

C. The Warranty shall not deprive the Owner of other rights the Owner may have under other provisions of the Contract Documents and will be in addition to and run concurrent with other warranties made by the Contractor under the requirements of the Contract Documents.

1.11 FIELD CONDITIONS

A. Environmental Limitations: Do not install acoustical tile 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. Pressurized Plenums: Operate ventilation system for not less than 48 hours before beginning acoustical tile ceiling installation.

PART 2 - PRODUCTS

2.1 PERFORMANCE REQUIREMENTS

A. Seismic Performance: Acoustical ceiling shall withstand the effects of earthquake motions determined according to ASCE/SEI 7.

1. Design and size components to withstand seismic loads in accordance with the minimum established by ASTM C636.

B. Surface-Burning Characteristics: Comply with ASTM E 84; testing by a qualified testing agency. Identify products with appropriate markings of applicable testing agency.

1. Flame-Spread Index: Comply with ASTM E 1264 for Class A materials.
2. Smoke-Developed Index: 50 or less.

C. Fire-Resistance Ratings: Comply with ASTM E 119; testing by a qualified testing agency. Identify products with appropriate markings of applicable testing agency.

1. Indicate design designations from UL's "Fire Resistance Directory" or from the listings of another qualified testing agency.

2.2 ACOUSTICAL TILES, GENERAL

A. Source Limitations: Obtain each type of acoustical ceiling tile and supporting suspension system from single source from single manufacturer.

B. Recycled Content: Postconsumer recycled content plus one-half of preconsumer recycled content not less than 25 percent (refer to specific acoustic tile).

C. Acoustical Tile Standard: Provide manufacturer's standard tiles 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 (400 mm) away from test surface according to ASTM E 795.

D. Acoustical Tile Colors and Patterns: Match appearance characteristics indicated for each product type.

1. Where appearance characteristics of acoustical tiles 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.

E. Provide glass-fiber based panels made with binder containing no urea formaldehyde.

2.3 ACOUSTICAL TILES

A. Basis-of-Design Product: Subject to compliance with requirements, provide Armstrong Industries products as indicated on Drawings or comparable product by one of the following:
1. CertainTeed Corp.
2. USG Interiors, Inc.; Subsidiary of USG Corporation.

B. ACT-1: Armstrong Optima Tegular, 3257 (Classrooms/Corridors or as indicated in drawings)
1. Surface Texture: Fine.
2. Composition: Fiberglass.
3. Color: White.
4. Size: 24IN x 48IN
5. Edge Profile: Square Tegular 9/16IN for interface with Suprafine XL 9/16" Exposed Tee grid.
6. Noise Reduction Coefficient(NRC): ASTM C 423; Classified with UL label on product carton 0.95.
7. Ceiling Attenuation Class (CAC)
8. Sabin: N/A
9. Articulation Class (AC): ASTM E 1111; 190.
10. Flame Spread: ASTM E 1264; Class A (UL).
11. Light Reflectance White Panel: ASTM E 1477; 0.90.
12. Dimensional Stability: HumiGuard Plus.
13. Recycle Content: Post-Consumer - 12% Pre-Consumer Waste - 59%.

C. ACT-2: Armstrong Cirrus High NRC, 565 (As indicated in drawings)
1. Surface Texture: Medium.
2. Composition: Mineral Fiber
3. Color: White.
4. Size: 24IN x 48IN
5. Edge Profile: Square Lay-In for interface with AL Prelude 15/16” Exposed Tee grid.

6. Noise Reduction Coefficient(NRC): ASTM C 423; Classified with UL label on product carton 0.75.
7. Ceiling Attenuation Class (CAC) ASTM C 1414; Classified with UL label (class A) on product carton; minimum rating = 35
8. Sabin: N/A
9. Articulation Class (AC): ASTM E 1111; 190.
10. Flame Spread: ASTM E 1264; Class A (UL).
11. Light Reflectance White Panel: ASTM E 1477; 0.86.
12. Dimensional Stability: HumiGuard Plus.
13. Anti Mold/ Mildew & Bacteria: Totally inorganic product
14. Recycle Content: 67%

D. ACT-3: Armstrong Formations Curves Cloud Kits, (As indicated in drawings)
1. Tile: Armstrong Ultima 2x2
2. Surface Texture: Medium.
3. Composition: Mineral Fiber
4. Color: White.
5. Size: Varies. Refer to drawings.
6. Edge Profile: Square Lay-In for interface with AL Prelude 15/16” Exposed Tee grid.
7. Suspension System and trim colors: 3 colors (Mist, Pacific & Rainstorm)
8. Axiom Trim: Vector for Formations 2”
9. Ceiling Attenuation Class (CAC) ASTM C 1414; Classified with UL label (class A) on product carton; minimum rating = 35
10. Sabin: N/A
11. Articulation Class (AC): ASTM E 1111; 190.
12. Flame Spread: ASTM E 1264; Class A (UL).
13. Light Reflectance White Panel: ASTM E 1477; 0.86.
14. Dimensional Stability: HumiGuard Plus.

2.4 METAL SUSPENSION SYSTEMS, GENERAL

A. Recycled Content: Postconsumer recycled content plus one-half of preconsumer recycled content not less than 25 percent.

B. Metal Suspension-System Standard: Provide manufacturer's standard metal suspension systems of types, structural classifications, and finishes indicated that comply with applicable requirements in ASTM C 635/C 635M.

C. 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. Size: Select wire diameter so its stress at three times hanger design load (ASTM C 635/C 635M, Table 1, "Direct Hung") will be less than yield stress of wire, but provide not less than 0.135-inch- (3.5-mm-) diameter wire.

D. Flat Hangers: Mild steel, zinc coated or protected with rust-inhibitive paint.

E. Angle Hangers: Angles with legs not less than 7/8 inch (22 mm) wide; formed with 0.04-inch- (1-mm-) thick, galvanized-steel sheet complying with ASTM A 653/A 653M, G90 (Z275) coating designation; with bolted connections and 5/16-inch- (8-mm-) diameter bolts.

F. Seismic Struts: Manufacturer's standard compression struts designed to accommodate lateral forces.

G. Seismic Clips: Manufacturer's standard seismic clips designed and spaced to secure acoustical tiles in-place.

2.5 METAL SUSPENSION SYSTEM

A. Basis-of-Design Product: Subject to compliance with requirements, Armstrong product or provide comparable product by one of the following:

1. Armstrong World Industries, Inc.
2. USG Interiors, Inc.; Subsidiary of USG Corporation.

B. Pair suspension systems with the following ACT and ATC types:
1. ACT-1: 9/16 inch Suprafine XL.
2. ACT-2: AL Prelude 15/16” Exposed Tee grid.
3. ACT-3: AL Prelude 15/16” Exposed Tee grid.

C. Direct-Hung, Double-Web Suspension System Components: Main beams and cross tees, base metal and end detail, fabricated from commercial quality hot dipped galvanized steel complying with ASTM A 653. Main beams and cross tees are double-web steel construction with exposed flange design. Exposed surfaces chemically cleansed, capping prefinished galvanized steel in baked polyester paint. Main beams and cross tees shall have rotary stitching.
   a. Structural Classification: ASTM C 635 Intermediate Duty
   b. Color: White and match the actual color of the selected ceiling tile, unless noted otherwise.
   c. Acceptable Product: Suprafine XL 9/16" Exposed Tee as manufactured by Armstrong World Industries

D. Attachment Devices: Size for five times design load indicated in ASTM C 635, Table 1, Direct Hung unless otherwise indicated.

E. Wire for Hangers and Ties: ASTM A 641, Class 1 zinc coating, soft annealed, with a yield stress load of at least time three design load, but not less than 12 gauge.
   1. Access: Upward and end pivoted or side pivoted, with initial access openings of size indicated below and located throughout ceiling within each module formed by main and cross runners, with additional access available by progressively removing remaining acoustical tiles.

2.6 METAL EDGE MOLDINGS AND TRIM

A. Manufacturers – Basis of Design: Subject to compliance with requirements, Armstrong product or provide comparable product by one of the following:
   1. USG Interiors, Inc.; Subsidiary of USG Corporation.

B. Products – 2" Axiom trim, or equal

C. Roll-Formed, Sheet-Metal Edge Moldings and Trim: Type and profile indicated or, if not indicated, manufacturer's standard moldings for edges and penetrations complying 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 tile 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.

2.7 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.

   2. Acoustical Sealant for Concealed Joints:

      a. Henkel Corporation; OSI Sealants Pro-Series SC-175 Rubber Base Sound Sealant.
      b. Pecora Corporation; AIS-919.
      c. Tremco, Inc.; Tremco Acoustical Sealant.

B. Acoustical Sealant: Manufacturer's standard sealant 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.

   1. Exposed and Concealed Joints: Nonsag, paintable, nonstaining latex sealant.
   2. Concealed Joints: Nondrying, nonhardening, nonskinning, nonstaining, gunnable, synthetic-rubber sealant.
   3. Acoustical sealant shall have a VOC content of 250 g/L or less when calculated according to 40 CFR 59, Subpart D (EPA Method 24).

2.8 MISCELLANEOUS MATERIALS

A. Acoustical Tile Adhesive: Type recommended by acoustical tile manufacturer, bearing UL label for Class 0-25 flame spread.

1. Adhesive shall have a VOC content of 50 g/L or less when calculated according to 40 CFR 59, Subpart D (EPA Method 24).

B. Staples: 5/16-inch- (8-mm-) long, divergent-point staples.

PART 3 - EXECUTION

3.1 EXAMINATION

A. Examine substrates, areas, and conditions, including structural framing and substrates to which acoustical tile ceilings attach or abut, with Installer present, for compliance with requirements specified in this and other Sections that affect ceiling installation and anchorage and for compliance with requirements for installation tolerances and other conditions affecting performance of the Work.

B. Examine acoustical tiles before installation. Reject acoustical tiles that are wet, moisture damaged, or mold damaged.

C. Proceed with installation only after unsatisfactory conditions have been corrected.

3.2 PREPARATION

A. Testing Substrates: Before installing adhesively applied tiles on wet-placed substrates such as cast-in-place concrete or plaster, test and verify that moisture level is below tile manufacturer's recommended limits.

B. Measure each ceiling area and establish layout of acoustical tiles to balance border widths at opposite edges of each ceiling. Avoid using less-than-half-width tiles at borders, and comply with layout shown on reflected ceiling plans.

3.3 INSTALLATION OF SUSPENDED ACOUSTICAL TILE CEILINGS

A. General: Install acoustical panel ceilings to comply with ASTM C 636/C 636M and seismic design requirements indicated, according to 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. Secure flat, angle, channel, and rod hangers to structure, including intermediate framing members, by attaching to inserts, eye screws, or other devices that are secure and appropriate for both the structure to which hangers are attached and the type of hanger involved. Install hangers in a manner that will not cause them to deteriorate or fail due to age, corrosion, or elevated temperatures.
6. Do not support ceilings directly from permanent metal forms or 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.
7. 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.
8. Do not attach hangers to steel deck tabs.
9. Do not attach hangers to steel roof deck. Attach hangers to structural members.
10. Space hangers not more than 48 inches (1200 mm) o.c. along each member supported directly from hangers unless otherwise indicated; provide hangers not more than 8 inches (200 mm) from ends of each member.
11. 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 tile ceiling area and where necessary to conceal edges of acoustical tiles.

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 (400 mm) o.c. and not more than 3 inches (75 mm) from ends, leveling with ceiling suspension system to a tolerance of 1/8 inch in 12 feet (3.2 mm in 3.6 m). 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. Arrange directionally patterned acoustical tiles as follows:

1. As indicated on reflected ceiling plans.

G. Install acoustical tiles in coordination with suspension system and exposed moldings and trim. Place splines or suspension-system flanges into kerfed edges so tile-to-tile joints are closed by double lap of material.

1. Fit adjoining tile to form flush, tight joints. Scribe and cut tile for accurate fit at borders and around penetrations through tile.
2. Hold tile field in compression by inserting leaf-type, spring-steel spacers between tile and moldings, spaced 12 inches (305 mm) o.c.
3. Protect lighting fixtures and air ducts to comply with requirements indicated for fire-resistance-rated assembly.

3.4 FIELD QUALITY CONTROL

A. Special Inspections: Owner will engage a qualified special inspector to perform the following special inspections:

1. Compliance of seismic design.

B. Testing Agency: Owner will engage a qualified testing agency to perform tests and inspections and prepare test reports.

C. Perform the following tests and inspections of completed installations of acoustical tile ceiling hangers and anchors and fasteners in successive stages and when installation of ceiling suspension systems on each floor has reached 20 percent completion but no tiles have been installed. Do not proceed with installations of acoustical tile ceiling hangers for the next area until test results for previously completed installations of acoustical tile ceiling hangers show compliance with requirements.

1. Within each test area, testing agency will select one of every 10 power-actuated fasteners and postinstalled anchors used to attach hangers to concrete and will test them for 200 lbf (890 N) of tension; it will also select one of every two postinstalled anchors used to attach bracing wires to concrete and will test them for 440 lbf (1957 N) of tension.
2. When testing discovers fasteners and anchors that do not comply with requirements, testing agency will test those anchors not previously tested until 20 pass consecutively and then will resume initial testing frequency.

D. Acoustical tile ceiling hangers and anchors and fasteners will be considered defective if they do not pass tests and inspections.

E. Prepare test and inspection reports.

3.5 CLEANING

A. Clean exposed surfaces of acoustical tile ceilings, including trim and edge moldings. Comply with manufacturer's written instructions for cleaning and touchup of minor finish damage. Remove and replace tiles and other ceiling components that cannot be successfully cleaned and repaired to permanently eliminate evidence of damage.

3.6 WASTE MANAGEMENT

A. Coordinate with Section 01 74 19.

1. Separate and recycle cut-offs and waste materials and material packaging in accordance with Waste Management Plan and to the maximum extent economically feasible and place in designated areas for recycling.
2. Set aside and protect materials suitable for reuse and/or remanufacturing.
3. Separate and fold up metal banding; flatten and place along with other metal scrap for recycling in designated area.

END OF SECTION 09 51 23

SECTION 09 65 13 - RESILIENT BASE AND 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. This section includes the performance criteria, materials, production, and erection of resilient base and accessories for the project. The work performed under this Section consists of the provision of all plant, materials, labor and equipment and the like necessary and/or required for the complete execution of all resilient base and accessories as required by this section, schedules, keynotes and drawings, including, but not limited to the following:

1. Resilient base.
2. Resilient molding accessories.

1.3 ACTION SUBMITTALS

A. Product Data: For each type of product.

B. Samples: For each exposed product and for each color and texture specified, not less than 12 inches (300 mm) long.

C. Samples for Initial Selection: For each type of product indicated.

D. Samples for Verification: For each type of product indicated and for each color, texture, and pattern required in manufacturer's standard-size Samples, but not less than 12 inches (300 mm) long.

E. Product Schedule: For resilient base and accessory products. Use same designations indicated on Drawings.

1.4 MAINTENANCE MATERIAL SUBMITTALS

A. No extra material to be purchased for purpose of attic stock. All left over material from construction to constitute attic stock – store, maintain and protect accordingly. Package with protective covering for storage and identified with labels describing contents.

1.5 DELIVERY, STORAGE, AND HANDLING

A. Store resilient products and installation materials in dry spaces protected from the weather, with ambient temperatures maintained within range recommended by manufacturer, but not less than 50 deg F (10 deg C) or more than 90 deg F (32 deg C).

1.6 FIELD CONDITIONS

A. Maintain ambient temperatures within range recommended by manufacturer, but not less than 70 deg F (21 deg C) or more than 95 deg F (35 deg C), in spaces to receive resilient products during the following time periods:

1. 48 hours before installation.
2. During installation.
3. 48 hours after installation.

B. After installation and until Substantial Completion, maintain ambient temperatures within range recommended by manufacturer, but not less than 55 deg F (13 deg C) or more than 95 deg F (35 deg C).

C. Install resilient products after other finishing operations, including painting, have been completed.

PART 2 - PRODUCTS

2.1 PERFORMANCE REQUIREMENTS

A. FloorScore Compliance: Resilient base shall comply with requirements of FloorScore certification.

2.2 THERMOPLASTIC-RUBBER BASE

A. Basis of Design: Subject to compliance with requirements, provide Tarkett; Baseworks 4 ” **or** comparable products by one of the following:

1. Mannington
2. Armstrong World Industries, Inc.
3. Burke Mercer Flooring Products, Division of Burke Industries Inc.
4. Flexco.
5. Mondo Rubber International, Inc.
6. Nora Systems, Inc.
7. Roppe Corporation, USA.
8. VPI, LLC, Floor Products Division.

B. Product Standard: Tarkett Baseworks Cove Base.

1. Group: I (solid, homogeneous).
2. Style and Location:
    1) Profile: 4” Cove

C. Thickness: 5/16"(7.94 mm).

D. Height: 4 "

E. Lengths: Length shall not be less than 1/3 of the length of a wall but not less than 3’-0 whichever is longer.

F. Outside Corners: Pre-Mitered.

G. Inside Corners: Pre-Mitered.

H. Colors: Black See Drawings

2.3 RUBBER MOLDING ACCESSORY

A. Manufacturers: Subject to compliance with requirements, provide products by one of the following:
1. Tarkett
2. Mannington
3. Roppe Corporation, USA.
4. VPI, LLC, Floor Products Division.

B. Description: Rubber cap for cove carpet; cap for cove resilient flooring; carpet bar for tackless installations; carpet edge for glue-down applications; nosing for carpet; nosing for resilient flooring; reducer strip for resilient flooring; joiner for tile and carpet; transition strips.

C. Profile and Dimensions: As indicated.

D. Locations: Provide rubber molding accessories in areas indicated.

E. Colors and Patterns: As selected by Architect from full range of industry colors.

2.4 INSTALLATION MATERIALS

A. Trowelable Leveling and Patching Compounds: Latex-modified, portland cement based or blended hydraulic-cement-based formulation provided or approved by resilient-product manufacturer for applications indicated.

B. Adhesives: Water-resistant type recommended by resilient-product manufacturer for resilient products and substrate conditions indicated.

1. Adhesives shall have a VOC content of 50 g/L or less except that adhesive for rubber stair treads shall have a VOC content of 60 g/L or less.

C. Metal Edge Strips: Extruded aluminum with mill finish of width shown, of height required to protect exposed edges of flooring, and in maximum available lengths to minimize running joints.

PART 3 - EXECUTION

3.1 EXAMINATION

A. Examine substrates, with Installer present, for compliance with requirements for maximum 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.

1. Installation of resilient products indicates acceptance of surfaces and conditions.

3.2 PREPARATION

A. Prepare substrates according to manufacturer's written instructions to ensure adhesion of resilient products.

B. Concrete Substrates for Resilient Stair Accessories: Prepare horizontal surfaces 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, oil, or silicone, using mechanical methods recommended by manufacturer. Do not use solvents.
3. Alkalinity and Adhesion Testing: Perform tests recommended by manufacturer. Proceed with installation only after substrate alkalinity falls within range on pH scale recommended by manufacturer in writing, but not less than 5 or more than 9 pH.
4. Moisture Testing: Proceed with installation only after substrates pass testing according to manufacturer's written recommendations, but not less stringent than the following:

    a. Perform anhydrous calcium chloride test according to ASTM F 1869. Proceed with installation only after substrates have maximum moisture-vapor-emission rate of 3 lb of water/1000 sq. ft. (1.36 kg of water/92.9 sq. m) in 24 hours.
    b. Perform relative humidity test using in situ probes according to ASTM F 2170. Proceed with installation only after substrates have maximum 75 percent relative humidity level.

C. Fill cracks, holes, and depressions in substrates with trowelable leveling and patching compound; remove bumps and ridges to produce a uniform and smooth substrate.

D. Do not install resilient products until they are the same temperature as the space where they are to be installed.

1. At least 48 hours in advance of installation, move resilient products and installation materials into spaces where they will be installed.

E. Immediately before installation, sweep and vacuum clean substrates to be covered by resilient products.

3.3 RESILIENT BASE INSTALLATION

A. Comply with manufacturer's written instructions for installing resilient base.

B. Apply resilient base to walls, columns, pilasters, casework and cabinets in toe spaces, and other permanent fixtures in rooms and areas where base is required.

C. Install resilient base in lengths as long as practical without gaps at seams and with tops of adjacent pieces aligned.

D. Tightly adhere resilient base to substrate throughout length of each piece, with base in continuous contact with horizontal and vertical substrates.

E. Do not stretch resilient base during installation.

F. On masonry surfaces or other similar irregular substrates, fill voids along top edge of resilient base with manufacturer's recommended adhesive filler material.

G. Preformed Corners: Install preformed corners before installing straight pieces.

H. Job-Formed Corners:

1. Outside Corners: Use straight pieces of maximum lengths possible and form with returns not less than 3 inches (76 mm) in length.

a. Form without producing discoloration (whitening) at bends.

2. Inside Corners: Use straight pieces of maximum lengths possible and form with returns not less than 3 inches (76 mm) in length.

a. Miter or cope corners to minimize open joints.

3.4 RESILIENT ACCESSORY INSTALLATION

A. Comply with manufacturer's written instructions for installing resilient accessories.

B. Resilient Stair Accessories:

1. Use stair-tread-nose filler to fill nosing substrates that do not conform to tread contours.

2. Tightly adhere to substrates throughout length of each piece.
3. For treads installed as separate, equal-length units, install to produce a flush joint between units.

C. Resilient Molding Accessories: Butt to adjacent materials and tightly adhere to substrates throughout length of each piece. Install reducer strips at edges of floor covering that would otherwise be exposed.

3.5 CLEANING AND PROTECTION

A. Comply with manufacturer's written instructions for cleaning and protecting resilient products.

B. Perform the following operations immediately after completing resilient-product installation:

1. Remove adhesive and other blemishes from exposed surfaces.
2. Sweep and vacuum horizontal surfaces thoroughly.
3. Damp-mop horizontal surfaces to remove marks and soil.

C. Protect resilient products from mars, marks, indentations, and other damage from construction operations and placement of equipment and fixtures during remainder of construction period.

D. Cover resilient products subject to wear and foot traffic until Substantial Completion.

3.6 WASTE MANAGEMENT

A. Coordinate with Section 01 74 19.

1. Separate and recycle cut-offs and waste materials and material packaging in accordance with Waste Management Plan and to the maximum extent economically feasible and place in designated areas for recycling.
2. Set aside and protect materials suitable for reuse and/or remanufacturing.
3. Separate and fold up metal banding; flatten and place along with other scrap for recycling.

END OF SECTION 09 65 13

SECTION 09 65 19 - RESILIENT 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. This section includes the performance criteria, materials, production, and erection of resilient tile flooring, and rubber stair treads for the project. The work performed under this Section consists of the provision of all plant, materials, labor and equipment and the like necessary and/or required for the complete execution of all floor tile as required by this section.

1.3 ACTION SUBMITTALS

A. Product Data: For each type of product.

B. Samples: Full-size units of each color and pattern of floor tile required.

C. Product Schedule: Use same designations indicated on Drawings.

1.4 CLOSEOUT SUBMITTALS

A. Maintenance Data: For each type of flooring to include in maintenance manuals.

1.5 MAINTENANCE MATERIAL SUBMITTALS

A. Furnish extra material that match products installed and that are packaged with protective covering for storage and identified with labels describing contents.
   1. Floor tile: Furnish one box for every 50 boxes or a fraction thereof of each type, color and pattern of floor tile installed.

1.6 QUALITY ASSURANCE

A. Installer Qualifications: A qualified installer who employs workers for this Project who are competent in techniques required by manufacturer for floor tile installation and seaming method indicated.

1. Engage an installer who employs workers for this Project who are trained or certified by floor tile manufacturer for installation techniques required.

B. Fire-Test-Response Characteristics: Provide products with the following fire-test-response characteristics as determined by testing identical products per test method indicated below by a testing and inspecting agency acceptable to authorities having jurisdiction.
1. Critical Radiant Flux: 0.45 W/sq. cm or greater when tested per ASTM E 648.
2. Smoke Density: Maximum specific optical density of 450 or less when tested per ASTM E 662.

C. 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 mockups for flooring including resilient base and accessories.

a. Size: Minimum 100 sq. ft. (9.3 sq. m) for each type, color, and pattern in locations directed by Architect.

2. Approval of mockups does not constitute approval of deviations from the Contract Documents contained in mockups unless Architect specifically approves such deviations in writing.
3. 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. Store flooring and installation materials in dry spaces protected from the weather, with ambient temperatures maintained within range recommended by manufacturer, but not less than 50 deg F (10 deg C) or more than 90 deg F (32 deg C). Store floor tiles on flat surfaces.

1.8 FIELD CONDITIONS

A. Maintain ambient temperatures within range recommended by manufacturer, but not less than 70 deg F (21 deg C) or more than 95 deg F (35 deg C) in spaces to receive floor tile during the following time periods:

1. 48 hours before installation.
2. During installation.
3. 48 hours after installation.

B. After installation and until Substantial Completion, maintain ambient temperatures within range recommended by manufacturer, but not less than 55 deg F (13 deg C) or more than 95 deg F (35 deg C).

C. Close spaces to traffic during flooring installation.

D. Close spaces to traffic for 48 hours after flooring installation.

E. Install flooring after other finishing operations, including painting, have been completed.

F. Do not install resilient flooring over concrete slabs until they are sufficiently cured and dry to achieve a bond with the adhesive in accordance with the manufacturer's recommended bond and moisture tests.

1.9 EXTRA MATERIALS

A. Furnish extra material described below, before installation begins, that match products installed and that are packaged with protective covering for storage and identified with labels describing contents.
   1. Luxury Vinyl Tile: Full size units equal to 10 percent of amount installed for each type indicated but not less than 100 square feet.

PART 2 - PRODUCTS

2.1 RESILIENT VINYL TILE.

A. Vinyl Composition Floor Tile: Products complying with ASTM F 1066.

B. Luxury Vinyl Tile (LVT): Provide vinyl composition floor tile (Composition 1, non-asbestos) complying with the following Available Products; MANNINGTON or approved equal.
   1. Pattern: STRAND, STRUCTURE, GROOVE
   2. Color: PER DRAWINGS
   3. Class: Class 3 (through-pattern tile).
   4. Wearing Surface: Smooth.
   5. Thickness:
   6. Size: PER DRAWINGS

2.2 RESILIENT SHEET FLOORING.

A. Sheet Flooring: Products complying with ASTM F 2034.

B. Linoleum Sheet Flooring: Provide vinyl composition floor tile (Composition 1, non-asbestos) complying with the following Available Products; Forbo Marmoleum or approved equal.
   1. Pattern: Piano
   2. Color: PER DRAWINGS
   3. Class: Class 1 (through-pattern).
   4. Wearing Surface: Smooth.
   5. Thickness:
   6. Size: PER DRAWINGS

2.3 RUBBER TILE FLOORING

A. Resilient rubber athletic flooring.

B. Basis of Design: Subject to compliance with requirements, provide the product indicated on drawings or comparable product to the following:
   1. “Aspire” by PLAE:
      a. Material: Virgin EPDM rubber and recycled SBR rubber.
      b. Composition: Consists of three layers: EPDM rubber wear layer, dense SBR rubber shock absorption layer and footed SBR rubber base layer. Wear layer provides aesthetic slip resistance surface for maximum safety. SBR layer provide shock absorption and cushioning.
      c. Surface: Hammered
      d. Back of Tile: Double-sanded smooth
      e. Tile Size: 2x2
      f. Thickness: 1inch
      g. Color: See drawings
   2. Source Quality: Obtain recycled rubber resilient flooring materials from a single manufacturer.

2.4 INSTALLATION MATERIALS

A. Trowelable Leveling and Patching Compounds: Latex-modified, portland cement based or blended hydraulic-cement-based formulation provided or approved by floor tile manufacturer for applications indicated.

B. Adhesives: Water-resistant type recommended by manufacturer to suit resilient products and substrate conditions indicated.

C. Edge Strips: Provide resilient transition and/or reducer strips to match flooring, as required to accommodate changes in floor heights and/or materials.

D. Adhesives for Solid Vinyl Tile: As recommended by manufacturer to meet site conditions.
   1. Basis of design:
      a. Tarkett 800 Pressure Sensitive Adhesive
      b. Tarkett 940 Two-Part Polyurethane Adhesive
      c. Tarkett 120 SpraySmart Adhesive (up to 7 pounds moisture \ 85% relative humidity and less than 11 pH)

E. Adhesives for Solid Sheet Flooring: As recommended by manufacturer to meet site conditions.
   1. Basis of design:
      a. Forbo L885
      b. Forbo Sustain 1195
      c. Forbo Sustain 1299
      d. Forbo Sustain 100
      e. Forbo 660

F. Floor Polish: Provide protective, liquid floor-polish products recommended by floor tile manufacturer.

PART 3 - EXECUTION

3.1 EXAMINATION

A. Examine substrates, with Installer present, for compliance with requirements for maximum 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 floor tile.

B. Proceed with installation only after unsatisfactory conditions have been corrected.

3.2 PREPARATION

A. Prepare substrates according to floor tile manufacturer's written instructions to ensure adhesion of resilient products.

B. Concrete Substrates: Prepare according to manufacturer’s written instructions to ensure adhesion of resilient flooring.

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, oil, or silicone, using mechanical methods recommended by floor tile manufacturer. Do not use solvents.
3. Alkalinity and Adhesion Testing: Perform tests recommended by floor tile manufacturer. Proceed with installation only after substrate alkalinity falls within range on pH scale recommended by manufacturer in writing, but not less than 5 or more than 9 pH.
4. Moisture Testing: Proceed with installation only after substrates pass testing according to floor tile manufacturer's written recommendations, but not less stringent than the following:

    a. Perform anhydrous calcium chloride test according to ASTM F 1869. Proceed with installation only after substrates have maximum moisture-vapor-emission rate of 5 lb of water/1000 sq. ft. in 24 hours.
    b. Perform relative humidity test using in situ probes according to ASTM F 2170. Proceed with installation only after substrates have a maximum 75 percent relative humidity level.

C. Fill cracks, holes, and depressions in substrates with trowelable leveling and patching compound; remove bumps and ridges to produce a uniform and smooth substrate.

D. For wood subfloors, verify the following:
1. Underlayment over subfloor complies with requirements specified in Division 6 Section "Rough Carpentry."
2. Underlayment surface is free of irregularities and substances that may interfere with adhesive bond, show through surface, or stain flooring.

E. Floor covering shall not be installed over expansion joints.

F. Do not install floor tiles until they are the same temperature as the space where they are to be installed.

1. At least 48 hours in advance of installation, move resilient floor tile and installation materials into spaces where they will be installed.

G. Do not proceed with installation until unsatisfactory conditions have been corrected.

H. Immediately before installation, sweep and vacuum clean substrates to be covered by resilient floor tile.

3.3 FLOOR TILE INSTALLATION

A. Comply with manufacturer's written instructions for installing floor tile.

B. Lay out floor 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 in pattern indicated.

C. Match floor tiles for color and pattern by selecting tiles from cartons in the same sequence as manufactured and packaged, if so numbered. Discard broken, cracked, chipped, or deformed tiles.

1. Lay tiles with grain running in one direction in pattern of colors and sizes indicated.

D. Scribe, cut, and fit floor tiles to butt neatly and tightly to vertical surfaces and permanent fixtures including built-in furniture, cabinets, pipes, outlets, and door frames.

E. Extend floor tiles into toe spaces, door reveals, closets, and similar openings. Extend floor tiles to center of door openings.

F. Maintain reference markers, holes, and openings that are in place or marked for future cutting by repeating on floor tiles as marked on substrates. Use chalk or other nonpermanent marking device.

G. Install floor tiles on covers for telephone and electrical ducts, building expansion-joint covers, and similar items in finished floor areas. Maintain overall continuity of color and pattern between pieces of tile installed on covers and adjoining tiles. Tightly adhere tile edges to substrates that abut covers and to cover perimeters.

H. Adhere floor tiles to flooring substrates using a full spread of adhesive applied to substrate to produce a completed installation without open cracks, voids, raising and puckering at joints, telegraphing of adhesive spreader marks, and other surface imperfections.

3.4 CLEANING AND PROTECTION

A. Comply with manufacturer's written instructions for cleaning and protecting floor tile.

B. Perform the following operations immediately after completing floor tile installation:

1. Remove adhesive and other blemishes from exposed surfaces.
2. Sweep and vacuum surfaces thoroughly.
3. Damp-mop surfaces to remove marks and soil.

C. Protect floor tile from mars, marks, indentations, and other damage from construction operations and placement of equipment and fixtures during remainder of construction period.

D. Floor Polish, in areas specified: Remove soil, adhesive, and blemishes from floor tile surfaces before applying liquid floor polish.

1. Apply two coat(s).

E. Cover floor tile until Substantial Completion.

3.5 WASTE MANAGEMENT

A. Coordinate with Section 01 74 19.

1. Separate and recycle cut-offs and waste materials and material packaging in accordance with Waste Management Plan and to the maximum extent economically feasible and place in designated areas for recycling.
2. Set aside and protect materials suitable for reuse and/or remanufacturing.
3. Separate and fold up metal banding; flatten and place along with other scrap for recycling.

END OF SECTION 09 65 19

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SECTION 09 67 23 - RESINOUS FLOORING

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

A. Drawings and general provisions of Contract, including General and Supplementary Conditions and Division 1 Specification Sections, apply to this Section.

1.2 SUMMARY

A. Definitions: Resinous flooring includes penetrating, moisture tolerant, two-component epoxy primer, a high performance, three-component mortar consisting of epoxy resin, curing agent and selected, graded aggregates blended with inorganic pigments, a two-component, general service epoxy coating and a selected, graded aggregate.

B. Related Work
   1. Division 3 Self Leveling Toppings
   2. Division 7 Section Joint Sealers

1.3 SUBMITTALS

A. Product Data: Submit manufacturer's technical data, installation instructions, and general recommendations for each resinous flooring material required. Include certification indicating compliance of materials with requirements.

B. Samples: Submit, for verification purposes, 4-inch square samples of each type of resinous flooring required, applied to a rigid backing, in color and finish indicated.
   1. For initial selection of colors and finishes, submit manufacturer's color charts showing full range of colors and finishes available.

1.4 QUALITY ASSURANCE

A. Single Source Responsibility: Obtain primary resinous flooring materials including primers, resins, hardening agents, finish or sealing coats from a single manufacturer with not less than ten years of successful experience in manufacturing and installing principal materials described in this section. Contractor shall have completed at least five projects of similar size and complexity; Stonhard, Palma, or approved equal. Provide secondary materials only of type and from source recommended by manufacturer of primary materials.

B. Pre-Installation Conference
   1. General contractor shall arrange a meeting not less than thirty days prior to starting work.
   2. Attendance
      a. General Contractor

b. Architect/Owner's Representative
c. Manufacturer/Installer's Representative

C. ISO 9002: All materials, including primers, resins, curing agents, finish coats, aggregates and sealants are manufactured and tested under an ISO 9002 registered quality system.

1.5 DELIVERY, STORAGE AND HANDLING

A. Material shall be delivered to job site and checked by flooring contractor for completeness and shipping damage prior to job start.

B. All materials used shall be factory pre-weighed and pre-packaged in single, easy to manage batches to eliminate on site mixing errors. No on site weighing or volumetric measurements allowed.

C. Material shall be stored in a dry, enclosed area protected from exposure to moisture. Temperature of storage area shall be maintained between 60 and 85°F/16 and 30°C.

1.6 PROJECT CONDITIONS

A. Concrete substrate shall be properly cured for a minimum of 30 days. A vapor barrier must be present for concrete subfloors on or below grade, or as indicated based on manufacturer’s requirements and slab moisture content. Otherwise, an osmotic pressure resistant grout must be installed prior to the resinous flooring.

B. Utilities, including electric, water, heat (air temperature between 60 and 85°F/16 and 30°C) and finished lighting to be supplied by General Contractor.

C. Job area to be free of other trades during, and for a period of 24 hours, after floor installation.

D. Protection of finished floor from damage by subsequent trades shall be the responsibility of the General Contractor.

1.7 WARRANTY

A. Manufacturer shall furnish a single, written warranty covering both material and workmanship for a period of one (1) full year from date of installation.

PART 2 - PRODUCTS

2.1 COLORS

A. Colors: Per finish schedule

2.2 EPOXY FLOORING & BASE

A. Basis of Design: Dur-A-Flex, Inc., 95 Goodwin Street, East Hartford, CT 06108, Phone: (860) 528-9838, Fax: (860) 528-2802 Or Approved Equal

B. System Materials:
   a. Primer: Dur-A-Flex, Inc, Dur-A-Glaze #4 WB resin and hardener.
   b. First Broadcast Coat: Dur-A-Flex, Inc, Dur-A-Gard OPF resin and hardener.
      i. Chips: Dur-A-Flex, Inc. Macro Decorative Colored Chips.
   c. Second Broadcast and Grout Coat: Dur-A-Flex, Inc. Dur-A-Glaze #4 resin and Water Clear hardener.
      ii. Chips: Dur-A-Flex, Inc. Macro Decorative Colored Chips.
   d. Grout coat: Dur-A-Flex, Inc. Dur-A-Glaze #4 resin and Water Clear hardener.
   e. Topcoat: Dur-A-Flex, Inc. Armor Top resin, hardener and grit.

C. Patch Materials
   a. Shallow Fill and Patching: Use Dur-A-Flex, Inc. Dur-A-Glaze #4 Cove Rez.
   b. Deep Fill and Sloping Material (over ¼ inch): Use Dur-A-Flex, Inc. Dur-A-Crete.

D. PRODUCT REQUIREMNTS:

1. Physical Properties: Provide flooring system in which physical properties of topping including aggregate, when tested in accordance with standards or procedures referenced below, are as follows:

A. Primer	Dur-A-Glaze #4 WB
1. Percent Solids	56 %
2. VOC	2 g/L
3. Bond Strength to Concrete ASTM D 4541	550 psi, substrates fails
4. Hardness, ASTM D 3363	3H
5. Elongation, ASTM D 2370	9 %
6. Flexibility (1/4: Cylindrical mandrel), ASTM D 1737	Pass
7. Impact Resistance, MIL D-2794	>160
6. Abrasion Resistance ASTM D 4060, CS 17 wheel, 1,000 g Load	30 mg loss

B. Broadcast Coat	Dur-A-Gard OPF
1. Percent Solids	100 %
2. VOC	59 g/L
3. Compressive Strength, ASTM D 695	16,000 psi
4. Tensile Strength, ASTM D 638	3,800 psi
5. Flexural Strength, ASTM D 790	4,000 psi
6. Abrasion Resistance, ASTM D 4060 C-10 Wheel, 1,000 gm load, 1,000 cycles	35 mg loss
7. Flame Spread/NFPA-101, ASTM E 84	Class A
8. Impact Resistance MIL D-3134	0.025 inch Max
9. Water Absorption. MIL D-3134	Pass

10.	Potlife @ 70 F	20-25 minutes

C. Broadcast Coat and Grout Coat — Dur-A-Glaze #4 Water Clear

1.	Percent Solids	100 %
2.	VOC	3.8 g/L
3.	Compressive Strength, ASTM D 695	11,200 psi
4.	Tensile Strength, ASTM D 638	2,100 psi
5.	Flexural Strength, ASTM D 790	5,100 psi
6.	Abrasion Resistance, ASTM D 4060 C-10 Wheel, 1,000 gm load, 1,000 cycles	29 mg loss
7.	Flame Spread/NFPA-101, ASTM E 84	Class A
8.	Impact Resistance MIL D-24613	0.0007 inches, no cracking or delamination
9.	Water Absorption. MIL D-24613	Nil
10.	Potlife @ 70 F	20 minutes

D. Topcoat — Armor Top

1.	Percent Solids		95 %
2.	VOC		0 g/L
3.	Tensile Strength, ASTM D 2370		7,000 psi
4.	Adhesion, ASTM 4541		Substrate Failure
5.	Hardness, ASTM D 3363		4H
6.	60^0 Gloss ASTM D 523		70
7.	Abrasion Resistance, ASTM D4060	Gloss	Satin
	CS 17 wheel (1,000 g load) 1,000 cycles	4	8 mg loss with grit
		10	12 mg loss without grit
8.	Pot Life, 70 F, 50% RH		2 Hours
9.	Full Chemical Resistance		7 days

2. Other manufacturers as approved by Architect.

2.3 JOINT SEALANT MATERIALS

A. Type produced by manufacturer of resinous flooring system for type of service and joint condition indicated.

PART 3 - EXECUTION

3.1 PREPARATION

A. Substrate: Concrete preparation shall be by mechanical means and include use of a scabbler, scarifier or shot blast machine for removal of bond inhibiting materials such as curing compounds or laitance.

3.2 APPLICATION

A. General: Apply each component of resinous flooring system in compliance with manufacturer's directions to produce a uniform monolithic wearing surface of thickness indicated, uninterrupted except at divider strips, sawn joints or other types of joints (if any), indicated or required.

B. Primer: Mix and apply primer over properly prepared substrate with strict adherence to manufacturer's installation procedures and coverage rates. Coordinate timing of primer application with application of troweled mortar to ensure optimum adhesion between resinous flooring materials and substrate.

C. Troweled Mortar: Mix mortar material according to manufacturer's recommended procedures. Uniformly spread mortar over substrate using manufacturer's specially designed screed box adjusted to manufacturer's recommended height. Hand trowel apply mixed material over freshly primed substrate using stainless steel finishing trowels.

D. Coating/Texture: Remove any surface imperfections by lightly abrading and vacuuming the floor surface. Mix coating and texture according to manufacturer's recommended procedures. Squeegee apply and backroll textured coating with strict adherence to manufacturer's installation procedures and coverage rates.

3.3 FIELD QUALITY CONTROL

A. The right is reserved to invoke the following material testing procedure at any time, and any number of times during period of flooring application.

B. The Owner will engage service of an independent testing laboratory to sample materials being used on the job site. Samples of material will be taken, identified and sealed, and certified in presence of Contractor.

C. Testing laboratory will perform tests for any of characteristics specified, using applicable testing procedures referenced herein, or if none referenced, in manufacturer's product data.

D. If test results show materials being used do not comply with specified requirements, Contractor may be directed by Owner to stop work; remove non-complying materials; pay for testing; reapply flooring materials to properly prepared surfaces which had previously been coated with unacceptable materials.

3.4 CURING, PROTECTION AND CLEANING

A. Cure resinous flooring materials in compliance with manufacturer's directions, taking care to prevent contamination during stages of application and prior to completion of curing process. Close area of application for a minimum of 24 hours.

B. Protect resinous flooring materials from damage and wear during construction operation. Where temporary covering is required for this purpose, comply with manufacturer's recommendations for protective materials and method of application. General Contractor is responsible for protection and cleaning of surfaces after final coats.

C. Cleaning: Remove temporary covering and clean resinous flooring just prior to final inspection. Use cleaning materials and procedures recommended by resinous flooring manufacturer.

3.5 WASTE MANAGEMENT

A. Coordinate with Division 01.

1. Separate and recycle cut-offs and waste materials and material packaging in accordance with Waste Management Plan and to the maximum extent economically feasible and place in designated areas for recycling.
2. Set aside and protect materials suitable for reuse and/or remanufacturing.
3. Separate and fold up metal banding; flatten and place along with other metal scrap for recycling in designated area.

END OF SECTION 09 67 23

SECTION 09 72 00 - WALL COVERINGS

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. Wallpaper.

1.3 ALLOWANCES

A. See Section 01 21 00 "Allowances" for description of allowances affecting items specified in this Section.

1.4 UNIT PRICES

A. See Section 01 22 00 "Unit Prices" for description of unit prices affecting items specified in this Section.

1.5 ALTERNATES

A. See Section 01 23 00 "Alternates" for description of alternates affecting items specified in this Section.

1.6 PREINSTALLATION MEETINGS

A. Preinstallation Conference: Conduct conference at Project site

1.7 ACTION SUBMITTALS

A. Product Data: For each type of product.

1. Include data on physical characteristics, durability, fade resistance, and fire-test-response characteristics.

B. Shop Drawings: Show location and extent of each wall-covering type. Indicate pattern placement seams and termination points.

C. Samples: For each type of wall covering and for each color, pattern, texture, and finish specified, full width by 6 inches long in size.

1. Wall-Covering Sample: From same production run to be used for the Work, with specified treatments applied.
   a. Show complete pattern repeat.
   b. Mark top and face of fabric.

D. Samples for Initial Selection: For each type of wall covering.

E. Samples for Verification: For each type of wall covering and for each color, pattern, texture, and finish specified, full width by 36 inches long in size.

1. Wall-Covering Sample: From same production run to be used for the Work, with specified treatments applied.
   a. Show complete pattern repeat.
   b. Mark top and face of fabric.

1.8 INFORMATIONAL SUBMITTALS

A. Product Test Reports: For each wall covering, for tests performed by a qualified testing agency.

1.9 CLOSEOUT SUBMITTALS

A. Maintenance Data: For wall coverings to include in maintenance manuals.

1.10 MAINTENANCE MATERIAL SUBMITTALS

A. Furnish extra materials, from the same production run, that match products installed and that are packaged with protective covering for storage and identified with labels describing contents.

1. Wall-Covering Materials: For each type, color, texture, and finish, full width by length to equal to **5** percent of amount installed.

1.11 QUALITY ASSURANCE

A. Mockups: Build mockups to verify selections made under Sample submittals and to demonstrate aesthetic effects and to set quality standards for installation.

1. Build mockups for each type of wall covering on each substrate required. Comply with requirements in ASTM F1141 for appearance shading characteristics.
2. Approval of mockups does not constitute approval of deviations from the Contract Documents contained in mockups unless Architect specifically approves such deviations in writing.
3. Subject to compliance with requirements, approved mockups may become part of the completed Work if undisturbed at time of Substantial Completion.

1.12 FIELD 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 HVAC system is operating and maintaining ambient temperature and humidity conditions at levels intended for occupants after Project completion during the remainder of the construction period.

B. Lighting: Do not install wall covering until lighting that matches conditions intended for occupants after Project completion 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 PERFORMANCE REQUIREMENTS

A. Fire-Test-Response Characteristics: As determined by testing identical wall coverings applied with identical adhesives to substrates in accordance with test method indicated below by a qualified testing agency. Identify products with appropriate markings of applicable testing agency.

1. Surface-Burning Characteristics: Comply with ASTM E84; testing by a qualified testing agency. Identify products with appropriate markings of applicable testing agency.
   a. Flame-Spread Index: 25 or less.
   b. Smoke-Developed Index: 50 or less.

2.2 WALLPAPER

A. Basis of Design: Maharam or Approved equal

B. Description: Provide wallpaper in rolls from same production run and that complies with ASTM F793/F793M.

1. Category: III, Decorative with High Serviceability

C. Width: 52 inches

D. Repeat: 18 ¼” V, 52” H

E. Mildew Resistance: Rating of zero or 1 when tested in accordance with ASTM G21.

F. Colors, Textures, and Patterns: As selected by Architect from manufacturer's full range. See drawings.

2.3 ACCESSORIES

A. Adhesive: Mildew-resistant, nonstaining, adhesive, for use with specific wall covering and substrate application indicated and as recommended in writing by wall-covering manufacturer.

B. Primer/Sealer: Mildew resistant, complying with requirements in Section 09 91 00 "Painting" and recommended in writing by primer/sealer and wall-covering manufacturers for intended substrate.

C. Metal Primer: Interior ferrous metal primer complying with[requirements in Section 09 91 00 "Painting" and recommended in writing by primer and wall-covering manufacturers for intended substrate.

D. Wall Liner: Nonwoven, synthetic underlayment and adhesive as recommended in writing by wall-covering manufacturer.

E. Seam Tape: As recommended in writing by wall-covering manufacturer.

PART 3 - EXECUTION

3.1 EXAMINATION

A. Examine substrates and conditions, with Installer present, for compliance with requirements for installation surfaces being true in plane and vertical and horizontal alignment, 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, and mildew.

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 plaster to cure for at least 90 days. Neutralize areas of high alkalinity. Apply primer/sealer as recommended in writing by primer/sealer manufacturer and wall-covering manufacturer.
3. Metals: If not factory primed, clean and apply metal primer as recommended in writing by metal-primer manufacturer and wall-covering manufacturer.
4. Gypsum Board: Apply primer/sealer as recommended in writing by primer/sealer manufacturer and wall-covering manufacturer.
5. Painted Surfaces:
    a. Check for pigment bleeding. Apply primer/sealer to areas susceptible to pigment bleeding as recommended in writing by primer/sealer manufacturer.
    b. Sand gloss, semigloss, and eggshell finishes with fine sandpaper.

D. Remove hardware and hardware accessories, electrical plates and covers, light fixture trims, and similar items.

E. Acclimatize wall-covering materials by removing them from packaging in the installation areas not less than 24 hours before installation.

3.3 INSTALLATION OF WALL LINER

A. Install wall liner, without gaps or overlaps. Form smooth wrinkle-free surface for finished installation. Do not begin wall-covering installation until wall liner has dried.

3.4 INSTALLATION OF WALL COVERING

A. Comply with wall-covering manufacturers' written installation instructions applicable to products and applications indicated.

B. Cut wall-covering strips in roll number sequence. Change the roll numbers at partition breaks and corners.

C. Install strips in same order as cut from roll.

1. For solid-color, even-texture, or random-match wall coverings, reverse every other strip.

D. Install wall covering without lifted or curling edges and without visible shrinkage.

E. Match pattern [72 inches] <Insert dimension> above the finish floor.

F. Install seams vertical and plumb at least 6 inches from outside corners and [3 inches] [6 inches] from inside corners unless a change of pattern or color exists at corner. Horizontal seams are not permitted.

G. Trim edges and seams for color uniformity, pattern match, and tight closure. Butt seams without overlaps or gaps between strips.

H. Fully bond wall covering to substrate. Remove air bubbles, wrinkles, blisters, and other defects.

3.5 CLEANING

A. Remove excess adhesive at 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 09 72 00

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SECTION 09 91 00 - PAINTING

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 performance criteria, materials, production, and erection of surface preparation and the application of paint systems for the project. The work performed under this Section consists of the provision of all plant, materials, labor and equipment and the like necessary and/or required for the complete execution of all surface preparation and the application of paint systems as required by the this section, schedules, keynotes and drawings, including, but not limited to the following substrates:

1. Concrete.
2. Concrete masonry units (CMU).
3. Steel.
4. Cast iron.
5. Galvanized metal.
6. Aluminum (not anodized or otherwise coated).
7. Wood.
8. Gypsum board.
9. Plaster.
10. Spray-textured ceilings.
11. ASJ insulation covering.

B. Related Requirements:

1. Division 05 "Structural Steel Framing" for shop priming of metal substrates with primers specified in this Section.

1.3 DEFINITIONS

A. Gloss Level 1 G! Matte or Flat Finish: Not more than 5 units at 60 degrees and 10 units at 85 degrees, according to ASTM D 523.

B. Gloss Level G2 Velvet Finish: Not more than 10 units at 60 degrees and 10 to 35 units at 85 degrees, according to ASTM D 523.

C. Gloss Level G3 Eggshell Finish: 10 to 25 units at 60 degrees and 10 to 35 units at 85 degrees, according to ASTM D 523.

D. Gloss Level G4 Satin Finish: 20 to 35 units at 60 degrees and not less than 35 units at 85 degrees, according to ASTM D 523.

E. Gloss Level G5 Semi-Gloss Finish: 35 to 70 units at 60 degrees, according to ASTM D 523.

F. Gloss Level G6 Gloss Finish: 70 to 85 units at 60 degrees, according to ASTM D 523.

G. Gloss Level G7 High-Gloss Finish: More than 85 units at 60 degrees, according to ASTM D 523.

1.4 ACTION SUBMITTALS

A. Product Data: For each type of product. Include preparation requirements and application instructions.

B. Samples for Initial Selection: For each type of topcoat product.

C. Samples for Verification: For each type of paint system and in each color and gloss of topcoat.

1. Submit Samples on rigid backing, 8 inches square.
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.

D. 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.
3. VOC content.

1.5 MAINTENANCE MATERIAL SUBMITTALS

A. No extra material to be purchased for purpose of attic stock. All left over material from construction to constitute attic stock – store, maintain and protect accordingly. Package with protective covering for storage and identified with labels describing contents.

1.6 QUALITY ASSURANCE

A. Mockups: Apply mockups of each paint 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 surface to represent surfaces and conditions for application of each paint system specified in Part 3.

a. Vertical and Horizontal Surfaces: Provide samples of at least 100 sq. ft. (9 sq. m).
b. Other Items: Architect will designate items or areas required.

2. Final approval of color selections will be based on mockups.

a. If preliminary color selections are not approved, apply additional mockups of additional colors selected by Architect at no added cost to Owner.

3. Approval of mockups does not constitute approval of deviations from the Contract Documents contained in mockups unless Architect specifically approves such deviations in writing.
4. 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. 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 (7 deg C).

1. Maintain containers in clean condition, free of foreign materials and residue.
2. Remove rags and waste from storage areas daily.

1.8 FIELD CONDITIONS

A. Apply paints only when temperature of surfaces to be painted and ambient air temperatures are between 50 and 95 deg F (10 and 35 deg C).

B. Do not apply paints when relative humidity exceeds 85 percent; at temperatures less than 5 deg F (3 deg C) above the dew point; or to damp or wet surfaces.

PART 2 - PRODUCTS

2.1 MANUFACTURERS

A. Manufacturers: Subject to compliance with requirements, provide products by the following:

1. Akzo Nobel
2. Benjamin Moore & Co.
3. ICI Paints.
4. Kelly-Moore Paints.
5. Mastercoating technologies – Zolatone
6. PPG Architectural Finishes, Inc.
7. Sherwin-Williams Company (The)
8. Insl-X

2.2 PAINT, GENERAL

A. MPI Standards: Provide products that comply with MPI standards indicated and that are listed in its "MPI Approved Products List."

B. 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.

C. VOC Content: Products shall comply with VOC limits of authorities having jurisdiction and, for interior paints and coatings applied at Project site, the following VOC limits, exclusive of colorants added to a tint base, when calculated according to 40 CFR 59, Subpart D (EPA Method 24).

1. Flat Paints and Coatings: 50 g/L.
2. Nonflat Paints and Coatings: 150 g/L.
3. Dry-Fog Coatings: 400 g/L.
4. Primers, Sealers, and Undercoaters: 200 g/L.
5. Anticorrosive and Antirust Paints Applied to Ferrous Metals: 250 g/L.
6. Zinc-Rich Industrial Maintenance Primers: 340 g/L.
7. Pretreatment Wash Primers: 420 g/L.
8. Floor Coatings: 100 g/L.
9. Shellacs, Clear: 730 g/L.
10. Shellacs, Pigmented: 550 g/L.

D. Colors: As indicated in a finish schedule.

2.3 BLOCK FILLERS

A. Block Filler, Latex, Interior/Exterior: MPI #4.

1. Glidden Professional – Concrete Coatings Block Filler Interior / Exterior Primer.
2. Akzo Nobel.
3. Sherwin Williams – Preprite – Interior / Exterior Block filler.

2.4 PRIMERS/SEALERS

A. Primer Sealer, Latex, Interior: MPI #50.

1. Product by one of the approved manufacturers found in the MPI list.

B. Primer, Alkali Resistant, Water Based: MPI #3.

1. Product by one of the approved manufacturers found in the MPI list.

C. Primer Sealer, Interior, Institutional Low Odor/VOC: MPI #149.

1. Product by one of the approved manufacturers found in the MPI list.

D. Primer, Latex, for Interior Wood: MPI #39.

1. Product by one of the approved manufacturers found in the MPI list.

E. Primer Sealer, Alkyd, Interior: MPI #45.

1. Product by one of the approved manufacturers found in the MPI list.

F. Primer Sealer, Alkyd, Interior: MPI #69 (Gymnasium Ceiling).

1. Product by one of the approved manufacturers found in the MPI list.

G. Primer, Bonding, Water Based: MPI #17.

1. Product by one of the approved manufacturers found in the MPI list.

H. Primer, Bonding, Solvent Based: MPI #69.

1. Product by one of the approved manufacturers found in the MPI list.

I. Wood-Knot Sealer: Sealer recommended in writing by topcoat manufacturer for use in paint systems indicated.

2.5 METAL PRIMERS

A. Primer, Rust-Inhibitive, Water Based: MPI #107.

1. Product by one of the approved manufacturers found in the MPI list.

B. Primer, Alkyd, Anti-Corrosive, for Metal: MPI #79.

1. Product by one of the approved manufacturers found in the MPI list.

C. Primer, Alkyd, Quick Dry, for Metal: MPI #76.

1. Product by one of the approved manufacturers found in the MPI list.

D. Primer, Galvanized, Water Based: MPI #134.

1. Product by one of the approved manufacturers found in the MPI list.

E. Primer, Vinyl Wash: MPI #80.

1. Product by one of the approved manufacturers found in the MPI list.

F. Primer, Quick Dry, for Aluminum: MPI #95.

1. Product by one of the approved manufacturers found in the MPI list.

2.6 WATER-BASED PAINTS

A. Latex, Interior, Institutional Low Odor/VOC, Flat (Gloss Level 1): MPI #143.

1. Product by one of the approved manufacturers found in the MPI list.

B. Latex, Interior, Institutional Low Odor/VOC, (Gloss Level 2): MPI #144.

1. Product by one of the approved manufacturers found in the MPI list.

C. Latex, Interior, Institutional Low Odor/VOC, (Gloss Level 3): MPI #145.

1. Product by one of the approved manufacturers found in the MPI list.

D. Latex, Interior, Institutional Low Odor/VOC, Semi-Gloss (Gloss Level 5): MPI #147.

1. Product by one of the approved manufacturers found in the MPI list.

E. Acrylic, Interior, Institutional Low Odor/VOC, Multicolor MPI # 112.

1. Product by one of the approved manufacturers found in the MPI list.

F. Light Industrial Coating, Exterior, Water Based, Semi-Gloss (Gloss Level 5): MPI #163.

1. Product by one of the approved manufacturers found in the MPI list.

2.7 SOLVENT-BASED PAINTS

A. Alkyd, Interior, (Gloss Level 3): MPI #51.

1. Product by one of the approved manufacturers found in the MPI list.

B. Alkyd, Interior, (Flat) Spray Applied Dry Fall : MPI #118 (Gymnasium Ceiling)

C. Alkyd, Interior, Semi-Gloss (Gloss Level 5): MPI #47.

1. Product by one of the approved manufacturers found in the MPI list.

D. Alkyd, Quick Dry, Semi-Gloss (Gloss Level 5): MPI #81.

1. Product by one of the approved manufacturers found in the MPI list.

2.8 DRY FOG/FALL COATINGS

A. Interior Alkyd Dry Fog/Fall: MPI #118.

1. Basis-of-Design Product: Coronado Paint; Superkote 5000Alkyd Dryfall 105-1/131-1 or equal.

2. VOC Content: E Range of E2.

2.9 FLOOR COATINGS

A. Sealer, Water Based, for Concrete Floors: MPI #99.

1. Product by one of the approved manufacturers found in the MPI list.

2.10 SOURCE QUALITY CONTROL

A. Testing of Paint Materials: Owner reserves the right to invoke the following procedure:

1. Owner will engage the services of a qualified testing agency to sample paint materials. Contractor will be notified in advance and may be present when samples are taken. If paint 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 coatings if test results show materials being used do not comply with product requirements. Contractor shall remove noncomplying paint materials from Project site, pay for testing, and repaint surfaces painted with rejected materials. Contractor will be required to remove rejected materials from previously painted surfaces if, on repainting with complying materials, the two paints 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.

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. Gypsum Board Substrates: Verify that finishing compound is sanded smooth.

D. Plaster Substrates: Verify that plaster is fully cured.

E. Proceed with coating application only after unsatisfactory conditions have been corrected.

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. Concrete Substrates: Remove release agents, curing compounds, 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.

E. Steel Substrates: Remove rust, loose mill scale, and shop primer, if any. Clean using methods recommended in writing by paint manufacturer but not less than the following:

1. SSPC-SP 2, "Hand Tool Cleaning."
2. SSPC-SP 3, "Power Tool Cleaning."
3. SSPC-SP 7/NACE No. 4, "Brush-off Blast Cleaning."
4. SSPC-SP 11, "Power Tool Cleaning to Bare Metal."

F. Shop-Primed Steel Substrates: Clean field welds, bolted connections, and abraded areas of shop paint, and paint exposed areas with the same material as used for shop priming to comply with SSPC-PA 1 for touching up shop-primed surfaces.

G. 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.

H. Aluminum Substrates: Remove loose surface oxidation.

I. 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.

J. Cotton or Canvas Insulation Covering Substrates: Remove dust, dirt, and other foreign material that might impair bond of paints to substrates.

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:

1. Paint the following work where exposed in equipment rooms:

a. Equipment, including panelboards and switch gear.
b. Uninsulated metal piping.
c. Uninsulated plastic piping.
d. Pipe hangers and supports.
e. Metal conduit.
f. Plastic conduit.
g. Tanks that do not have factory-applied final finishes.
h. Duct, equipment, and pipe insulation having cotton or canvas insulation covering or other paintable jacket material.

2. 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.

3. Paint portions of internal surfaces of metal ducts, without liner, behind air inlets and outlets that are visible from occupied spaces.

4. Do not paint in mechanical rooms except as noted in 3.3.E.1.

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 PAINTING SCHEDULE

A. Concrete Substrates, Nontraffic Surfaces:

1. Institutional Low-Odor/VOC Latex System:

    a. Prime Coat: Primer sealer, interior, institutional low odor/VOC**,** MPI #149.
    b. Intermediate Coat: Latex, interior, institutional low odor/VOC, matching topcoat.
    c. Topcoat: Latex, interior, institutional low odor/VOC, (Gloss Level 2), MPI #144.

B. Concrete Substrates, Traffic Surfaces:

1. Water-Based Clear Sealer System:

    a. First coat: Sealer, solvent based, for concrete floors, MPI #99.
    b. Topcoat: Sealer, solvent based, for concrete floors, MPI #104.

C. CMU Substrates:

1. Institutional Low-Odor/VOC Latex System:

    a. Block Filler: Block filler, latex, interior/exterior, MPI #4.
    b. Intermediate Coat: Latex, interior, institutional low odor/VOC, matching topcoat.
    c. Topcoat: Latex, interior, institutional low odor/VOC, (Gloss Level 2), MPI #144.

D. Steel Substrates:

1. Quick-Drying Enamel System:

    a. Prime Coat: Primer, alkyd, quick dry, for metal, MPI #76.
    b. Intermediate Coat: Alkyd, quick dry, matching topcoat.
    c. Topcoat: Alkyd, quick dry, semi-gloss (Gloss Level 5), MPI #81.

E. Galvanized-Metal Substrates:

1. Institutional Low-Odor/VOC Latex System:

    a. Prime Coat: Primer, galvanized, water based, MPI #134.
    b. Intermediate Coat: Latex, interior, institutional low odor/VOC, matching topcoat.
    c. Topcoat: Latex, interior, institutional low odor/VOC, (Gloss Level 2), MPI #144.

F. Aluminum (Not Anodized or Otherwise Coated) Substrates:

1. Institutional Low-Odor/VOC Latex System:

    a. Prime Coat: Primer, quick dry, for aluminum, MPI #95.
    b. Intermediate Coat: Latex, interior, institutional low odor/VOC, matching topcoat.
    c. Topcoat: Latex, interior, institutional low odor/VOC, (Gloss Level 2), MPI #144.

G. Wood Substrates: Including wood trim, architectural woodwork, doors, wood-based panel products.

1. Institutional Low-Odor/VOC Latex System:

a. Prime Coat: Primer, latex, for interior wood, MPI #39.
b. Intermediate Coat: Latex, interior, institutional low odor/VOC, matching topcoat.
c. Topcoat: Latex, interior, institutional low odor/VOC, (Gloss Level 2), MPI #144.

H. Fiberglass and Plastic Substrates:

1. Institutional Low-Odor/VOC Latex System:

a. Prime Coat: Primer, bonding, water based, MPI #17.
b. Prime Coat: Primer, bonding, solvent based, MPI #69.
c. Intermediate Coat: Latex, interior, institutional low odor/VOC, matching topcoat.
d. Topcoat: Latex, interior, institutional low odor/VOC, (Gloss Level 2), MPI #144.

I. Gypsum Board and Plaster Substrates:

1. Institutional Low-Odor/VOC Latex System:

a. Prime Coat: Primer sealer, interior, institutional low odor/VOC, MPI #149.
b. Intermediate Coat: Latex, interior, institutional low odor/VOC, matching topcoat.
c. Topcoat: Latex, interior, institutional low odor/VOC, (Gloss Level 2), MPI #144.

2. Institutional Low-Odor/VOC Acrylic System:

a. Prime Coat: SP203Stain Acrylic Drywall Primer, Master Coating Technologies.
b. Intermediate Coat: Acrylic Interior, Institutional Low Odor/VOC, Multi-color, Master Coating Technologies., #MPI #112.
c. Finish Coat: Acrylic Interior, Institutional Low Odor/VOC, Multi-color, Master Coating Technologies., #MPI #112.

J. Cotton or Canvas and ASJ Insulation-Covering Substrates: Including pipe and duct coverings.

1. Institutional Low-Odor/VOC Latex System:

a. Prime Coat: Primer sealer, latex, interior, MPI #50.
b. Intermediate Coat: Latex, interior, institutional low odor/VOC, matching topcoat.
c. Topcoat: Latex, interior, institutional low odor/VOC, (Gloss Level 2), MPI #144.

3.7 WASTE MANAGEMENT

A. Coordinate with Section 01 74 19.

1. Separate and recycle cut-offs and waste materials and material packaging in accordance with Waste Management Plan and to the maximum extent economically feasible and place in designated areas for recycling.

2. Set aside and protect materials suitable for reuse and/or remanufacturing.

3. Separate and fold up metal banding; flatten and place along with other metal scrap for recycling in designated area.

END OF SECTION 09 50 00

SECTION 10 21 00 - TOILET PARTITIONS

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 toilet compartments and screens as follows:
   1. Type: Solid-plastic.
   2. Compartment Style: Overhead braced and floor anchored.

B. Related Sections include the following:
   1. Division 5 Section "Metal Fabrications" for supports that attach units to overhead structural system.
   2. Division 10 "Toilet and Bath Accessories" for toilet paper holders, grab bars, purse shelves, and similar accessories.

1.3 SUBMITTALS

A. Product Data: For each type and style of toilet compartment and screen specified. Include details of construction relative to materials, fabrication, and installation. Include details of anchors, hardware, and fastenings.

B. Shop Drawings: For fabrication and installation of toilet compartment and screen assemblies. Include plans, elevations, sections, details, and attachments to other work.
   1. Show locations of reinforcement and cutouts for compartment-mounted toilet accessories.

C. Samples for Initial Selection: Manufacturer's color charts consisting of sections of actual units showing the full range of colors, textures, and patterns available for each type of compartment or screen indicated.

D. Samples for Verification: Of each compartment or screen color and finish required, prepared on 6-inch-square Samples of same thickness and material indicated for Work.

1.4 PROJECT CONDITIONS

A. Field Measurements: Verify dimensions in areas of installation by field measurements before fabrication and indicate measurements on Shop Drawings. Coordinate fabrication schedule with construction progress to avoid delaying the Work.
   1. Established Dimensions: Where field measurements cannot be made without delaying the Work, establish dimensions and proceed with fabricating units without field measurements. Coordinate supports, adjacent construction, and fixture locations to ensure actual dimensions correspond to established dimensions.

SECTION 10 14 00 - SIGNAGE

PART 1 - GENERAL

1.1 SUMMARY

A. Section includes identifying devices.

1.2 SUBMITTALS

A. See Division 1 – General Requirements for submittal procedures.

B. Product Data: Manufacturer's printed literature for each type of sign, indicating sign styles, font, foreground and background colors, locations, overall dimensions.

C. Signage Schedule: Provide information sufficient to completely define each sign for fabrication, including room number, room name, other text to be applied, sign and letter sizes, fonts and colors.
   1. When room numbers to appear on signs differ from those on the drawings, include drawing room number on schedule.
   2. When content of signs is indicated to be determined later, request such information from Owner through Architect at least 2 months prior to start of fabrication; upon request, submit preliminary schedule.
   3. Submit for approval by Owner through Architect prior to fabrication.

D. Samples: Submit three samples of each type of sign, of size similar to that required for project, illustrating sign style, font and method of attachment.
   1. Selection Samples: Where colors are not specified, submit three sets of color selection charts or chips.
   2. Verification Samples: Submit samples showing colors selected

E Manufacturer's Installation Instructions: Submit installation template and attachment devices.

1.3 QUALIFICATIONS

A. Manufacturer: Company specializing in manufacturing Products specified in this section with minimum three years documented experience.

1.4 DELIVERY, STORAGE, AND HANDLING

A. Package signs as required to prevent damage before installation.

B. Package room and door signs in sequential order of installation, labeled by floor and building.

C. Store adhesive attachment tape at ambient room temperatures.

1.5 ENVIRONMENTAL REQUIREMENTS

A. Do not install signs when ambient temperature is lower than recommended by manufacturer.

B. Maintain this minimum temperature during and after installation of signs.

PART 2 PRODUCTS

2.1 CAST ALUMINUM LETTERS

A. Provide cast aluminum letters with text and locations as indicated on Drawings.
1. Material: 214 or 514 aluminum alloy.
2. Finish: Sand-blasted edges. Paint as per finish schedule.
4. Letter Style: Century Gothic Upper Case, Bold
5. Mounting: Concealed Studs, with stainless steel spacers.

B. Manufacturers
1. The Southwell Co., San Antonio, TX 78291
2. Andco Industries Corp., Greensboro, NC 27410
3. Matthews International Corp., Pittsburgh, PA 15212
4. Signs and Decal Corp., Brooklyn, NY 11211

2.2 EXTERIOR WALL SIGNS (At Handicapped Entrances)- NOT USED

A. Access entrance symbol sign, Black duranodic aluminum frame. Insert size 9" x 9". Insert shall have a raised 4" accessibility symbol with the verbal description, “Entrance” using 1" Gill Sans upper case letters directly below and followed by Grade 2 braille.

2.3 INTERIOR SIGNS

A. Manufacturers:
1. Ark Ramos
2. Mohawk Sign Systems, Inc.
3. Seton Identification Products.
4. Substitutions: See Division 1 - General Requirements for submittal procedures.

2.4 SIGNAGE APPLICATIONS

A. Accessibility Compliance: All signs are required to comply with ADAAG and ANSI/CC A117.1 and applicable building codes,

B. Room and Door Signs: Provide a sign for every doorway, whether it has a door or not, excluding corridors, lobbies and similar open areas.

2.5 GRAPHIC PROCESS

A. Tactile characters shall be raised the required 1/32" inches from sign face. Glue-on letters or etched backgrounds are not acceptable.

B. All text shall be accompanied by Grade 2 braille. Braille shall be separated ½" from the corresponding raised characters or symbols. Grade 2 braille translation to be provided by signage manufacturer.

C. All letters, numbers and/or symbols shall contrast with their background, either light characters on a dark background or dark characters on a light background. Characters and background shall have a non-glare finish.

D. Plaque material shall be Special Purpose SP125 decorative thermosetting high pressure laminate. Material to be 1/8” thick laminate with a melamine resin surface and a phenolic resin core which provides resistance to abrasion, stains, alcohol, solvents, boiling water, and heat. The material shall be NEMA rated and have flammability and smoke values that meet the standards for flammability of interior materials.

E. Background color as selected by architect from manufacturer’s actual color samples.

2.6 ACCESSIBILITY GUIDELINES FOR SIGNAGE

A. Room Identification Signs: Signs which designate permanent rooms or spaces shall comply with the following guidelines:
1. Raised Copy - Letters and numerals shall be raised 1/32" upper case, sans serif or simple serif typestyle.
2. Character Height - Raised characters shall be at least 5/8" high, but no higher than 2".
3. Symbols - Symbols shall be accompanied by the equivalent verbal description placed directly below the symbol. The border dimension of the symbol shall be 6" minimum in height.
4. Braille Tags - Grade 2 Braille shall be on all signs, as required.
5. Colors - The characters and backgrounds of all signs shall be of matte or other non-glare finish. Characters and symbols shall contrast with light characters on a dark background or dark characters on a light background. Colors to be as selected by the Architect from the manufacturer's standard colors.
6. Mounting - Signs shall be installed on the wall adjacent to the latch side of the door. If there is no space on the latch side of the door, including double leaf doors, signs shall be placed on the nearest adjacent wall. Mounting height shall be so that the baseline of the tactile copy is located between 48” at the lowest point to 60” at the highest point. . Mounting location for such signage shall be so that a person may approach within three inches of signage without encountering protruding objects or standing within the swing of a door.

B. Directional and Information Signs: Signs which provide direction to, or information about functional spaces of the building shall comply with the same guidelines as those set for Room Identification Signs with the following additions and exceptions.
1. Character Proportion - Letters and numerals on sign shall have a width to height ratio between 3:5 and 1:1 and a stroke width to height ratio between 1:5 and 1:10.
2. Character Height - Characters and numbers on signs shall be sized according to the viewing distance from which they are to be read. The minimum height is measured using an upper case X. Lower case characters are permitted. Any signs that are suspended

or projected overhead shall have characters at least three inches high and shall maintain a minimum clearance of 80 inches from finished floor.
3. Raised Copy - Directional and Informational signs are NOT required to use raised copy or braille tags.

PART 3 EXECUTION

3.1 EXAMINATION

A. Verify existing conditions before starting Work.

3.2 INSTALLATION

A. Install in accordance with manufacturer's instructions.

B. Install neatly, with horizontal edges level.

C. Sign Locations:
1. Room and Door Signs: Locate on wall at latch side of door. The sign shall be mounted so that the baseline of the tactile copy shall be between 48" at the lowest point to 60" at the highest point above finished floor.
2. If no location is indicated, obtain Owner/s instructions.
3. Maximum Occupancy Signs posted in Assembly spaces in a conspicuous place near the main or exit access doorway.

D. Protect from damage until Substantial Completion; repair or replace damaged items.

3.3 WASTE MANAGEMENT

A. Coordinate with Division 01

1. Separate and recycle cut-offs and waste materials and material packaging in accordance with Waste Management Plan and to the maximum extent economically feasible and place in designated areas for recycling.

2. Set aside and protect materials suitable for reuse and/or remanufacturing.

3. Separate and fold up metal banding; flatten and place along with other metal scrap for recycling in designated area.

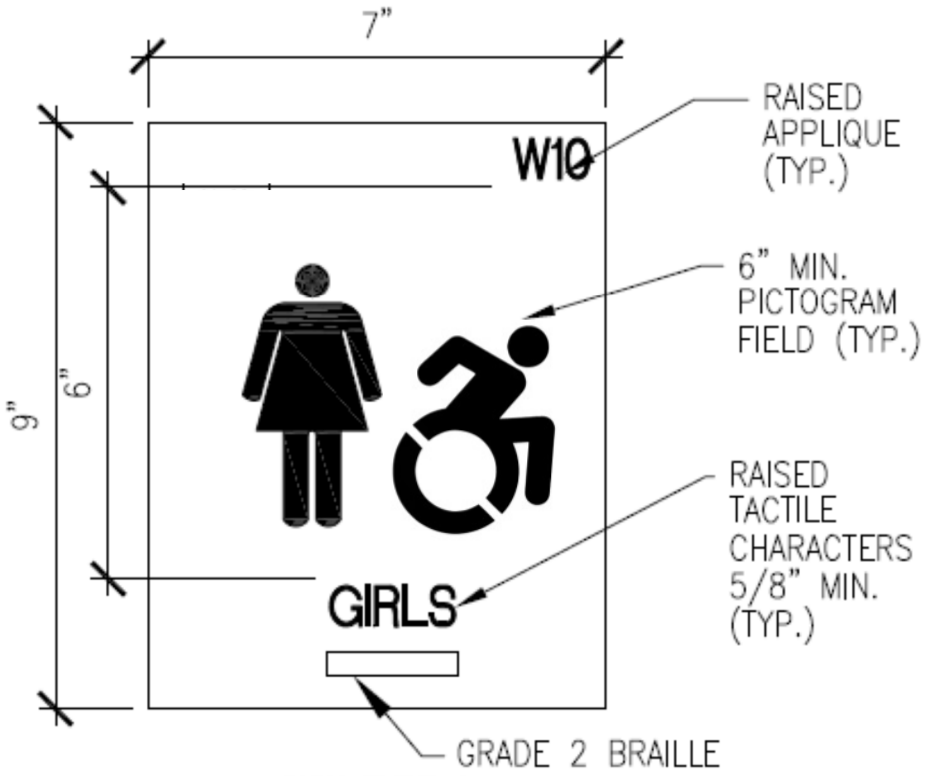
ROOM NUMBER.
RAISED TACTILE
CHARACTERS
5/8” MIN (TYP.)

GRADE 2 BRAILLE

ROOM NAME.
RAISED TACTILE
CHARACTERS
5/8” MIN (TYP.)

HIGH SCHOOL CLASSROMS 6”X12”

NTS



TOILET ROOMS
NTS

END OF SECTION 10 14 00

PART 2 - PRODUCTS

2.1 MANUFACTURERS

A. Manufacturers: Subject to compliance with requirements, provide products by one of the following:
   1. Scranton Products
   2. General Partitions Mfg. Corp.
   3. Bradley Corp.

2.2 MATERIALS

A. General: Provide materials that have been selected for surface flatness and smoothness. Exposed surfaces that exhibit pitting, seam marks, roller marks, stains, discolorations, telegraphing of core material, or other imperfections on finished units are unacceptable.

B. Solid-Plastic, Provide units with eased edges and with minimum 1-inch-thick doors and panels, and 1-1/4 inch pilasters. Provide units with Class B flame spread rating under ASTM E84, with smoke developed less than 450. Provide color as follows:
   1. Color: One color in each room as selected by Architect from manufacturer's full range of colors.

C. Pilaster Shoes and Sleeves (Caps): ASTM A 666, Type 302 or 304 stainless steel, not less than 0.0312 inch thick and 3 inches high, finished to match hardware.

D. Full-Height (Continuous) Brackets: Manufacturer's standard design for attaching panels and screens to walls and pilasters of the following material:
   1. Material: Stainless steel.

E. Hardware and Accessories: Manufacturer's standard design, heavy-duty operating hardware and accessories of the following material:
   1. Material: Chrome-plated, nonferrous, cast zinc alloy (zamac) or clear-anodized aluminum.

F. Overhead Bracing: Manufacturer's standard continuous, extruded-aluminum head rail with antigrip profile in manufacturer's standard finish.

G. Anchorages and Fasteners: Manufacturer's standard exposed fasteners of stainless steel or chrome-plated steel or brass, finished to match hardware, with theft-resistant-type heads. Provide sex-type bolts for through-bolt applications. For concealed anchors, use hot-dip galvanized or other rust-resistant, protective-coated steel.

2.3 FABRICATION

A. General: Provide standard doors, panels, screens, and pilasters fabricated for compartment system. Provide units with cutouts and drilled holes to receive compartment-mounted hardware, accessories, and grab bars, as indicated.

B. Overhead-Braced-and-Floor-Anchored Compartments: Provide manufacturer's standard corrosion-resistant supports, leveling mechanism, fasteners, and anchors at pilasters to suit floor conditions. Make provisions for setting and securing continuous head rail at top of each pilaster. Provide shoes at pilasters to conceal supports and leveling mechanism.

C. Doors: Unless otherwise indicated, provide 24-inch-wide in-swinging doors for standard toilet compartments and 36-inch-wide out-swinging doors with a minimum 32-inch-wide clear opening for compartments indicated to be handicapped accessible.
   1. Hinges: Manufacturer's standard self-closing type that can be adjusted to hold door open at any angle up to 90 degrees.
   2. Latch and Keeper: Manufacturer's standard surface-mounted latch unit with combination rubber-faced door strike and keeper designed for emergency access. Provide units that comply with accessibility requirements of authorities having jurisdiction at compartments indicated to be handicapped accessible.
   3. Coat Hook: Manufacturer's standard combination hook and rubber-tipped bumper, sized to prevent door from hitting compartment-mounted accessories.
   4. Door Bumper: Manufacturer's standard rubber-tipped bumpers at out-swinging doors or entrance screen doors.
   5. Door Pull: Manufacturer's standard unit that complies with accessibility requirements of authorities having jurisdiction at out-swinging doors. Provide units on both sides of doors at compartments indicated to be handicapped accessible.

PART 3 - EXECUTION

3.1 INSTALLATION

A. General: Comply with manufacturer's written installation instructions. Install units rigid, straight, plumb, and level. Provide clearances of not more than 1/2 inch between pilasters and panels and not more than 1 inch between panels and walls. Secure units in position with manufacturer's recommended anchoring devices.

B. Overhead-Braced-and-Floor-Anchored Compartments: Secure pilasters to floor and level, plumb, and tighten. Secure continuous head rail to each pilaster with not less than 2 fasteners. Hang doors and adjust so tops of doors are parallel with overhead brace when doors are in closed position.

3.2 ADJUSTING AND CLEANING

A. Hardware Adjustment: Adjust and lubricate hardware according to manufacturer's written instructions for proper operation. Set hinges on in-swinging doors to hold open approximately 30 degrees from closed position when unlatched. Set hinges on out-swinging doors and swing doors in entrance screens to return to fully closed position.

B. Provide final protection and maintain conditions that ensure toilet compartments and screens are without damage or deterioration at the time of Substantial Completion.

3.3 WASTE MANAGEMENT

A. Coordinate with Section 01 74 19.

1. Separate and recycle cut-offs and waste materials and material packaging in accordance with Waste Management Plan and to the maximum extent economically feasible and place in designated areas for recycling.
2. Set aside and protect materials suitable for reuse and/or remanufacturing.
3. Separate and fold up metal banding; flatten and place along with other scrap for recycling.

END OF SECTION 10 21 00

SECTION 10 28 00 – TOILET AND BATH 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. The work performed under this Section includes the performance criteria, materials, production, and erection of toilet, bath and laundry accessories for the project and consists of the provision of all plant, materials, labor and equipment and the like necessary and/or required for the complete execution of all toilet, bath and laundry accessories as required by schedules, keynotes and drawings, as specified herein, and as may be required by conditions and authorities having jurisdiction including, but not limited to the following:

1. Toilet room accessories.
2. Underlavatory guards.
3. Custodial accessories.

B. Related Sections:
1. Division 09 "Ceramic Tile"

1.3 ACTION 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. Samples: Full size, for each accessory item to verify design, operation, and finish requirements.

1. Approved full-size Samples will be returned and may be used in the Work.

C. Product Schedule: Indicating types, quantities, sizes, and installation locations by room of each accessory required.

1. Identify locations using room designations indicated.
2. Identify products using designations indicated.

1.4 INFORMATIONAL SUBMITTALS

A. Warranty: Sample of special warranty.

1.5 CLOSEOUT SUBMITTALS

A. Maintenance Data: For toilet and bath accessories to include in maintenance manuals.

1.6 QUALITY ASSURANCE

A. Source Limitations: For products listed together in the same Part 2 articles, obtain products from single source from single manufacturer.

B. 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.

1.7 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.

1.8 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: 20 years from date of Substantial Completion.

PART 2 - PRODUCTS

2.1 MATERIALS

A. Stainless Steel: ASTM A 666, Type 304, 0.031-inch (0.8-mm) minimum nominal thickness unless otherwise indicated.

B. Brass: ASTM B 19, flat products; ASTM B 16/B 16M, rods, shapes, forgings, and flat products with finished edges; or ASTM B 30, castings.

C. Steel Sheet: ASTM A 1008/A 1008M, Designation CS (cold rolled, commercial steel), 0.036-inch (0.9-mm) minimum nominal thickness.

D. Galvanized-Steel Sheet: ASTM A 653/A 653M, with G60 (Z180) hot-dip zinc coating.

E. Galvanized-Steel Mounting Devices: ASTM A 153/A 153M, 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 TOILET/ SHOWER ROOM ACCESSORIES – See Accessory Schedule on drawings

A. Basis-of-Design Product: Subject to compliance with requirements, provide product indicated on Drawings or comparable product by one of the following:
1. American Specialties, Inc.
2. A&J Washroom Accessories, Inc.
3. Bobrick Washroom Equipment, Inc.
4. Bradley Corporation.
5. GAMCO Specialty Accessories; a division of Bobrick Washroom Equipment, Inc.
6. Tubular Specialties Manufacturing, Inc.

2.3 UNDERLAVATORY GUARDS

A. Basis-of-Design Product: Subject to compliance with requirements, provide product indicated on Drawings or comparable product by one of the following:

1. Plumberex Specialty Products, Inc.
2. Truebro by IPS Corporation.

B. Underlavatory Guard:

1. Basis-of-Design Product: ISP Corp Truebro Lav Guard 2.
2. Description: Insulating pipe covering for supply and drain piping assemblies that prevent direct contact with and burns from piping; allow service access without removing coverings.
3. Material and Finish: Antimicrobial, molded plastic, white.

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 (1112 N), 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.

3.3 WASTE MANAGEMENT

A. Coordinate with Division 01.

1. Separate and recycle cut-offs and waste materials and material packaging in accordance with Waste Management Plan and to the maximum extent economically feasible and place in designated areas for recycling.
2. Set aside and protect materials suitable for reuse and/or remanufacturing.
3. Separate and fold up metal banding; flatten and place along with other metal scrap for recycling in designated area.

END OF SECTION 10 28 00

SECTION 10 44 13 - FIRE EXTINGUISHER CABINETS

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. The work performed under this Section includes the performance criteria, materials, production, and erection of Fire Extinguisher Cabinets for the project and consists of the provision of all plant, materials, labor and equipment and the like necessary and/or required for the complete execution of all Fire Extinguisher Cabinets as required by schedules, keynotes and drawings, as specified herein, and as may be required by conditions and authorities having jurisdiction.

B. Related Sections:

1. Division 10: "Fire Extinguishers."

1.3 ACTION SUBMITTALS

A. Product Data: For each type of product indicated.

B. Shop Drawings: For fire protection cabinets. Include plans, elevations, sections, details, and attachments to other work.

C. Samples: For each exposed product and for each color and texture specified.

D. Product Schedule: For fire protection cabinets. Coordinate final fire protection cabinet schedule with fire extinguisher schedule to ensure proper fit and function.

1.4 CLOSEOUT SUBMITTALS

A. Maintenance data: For fire protection cabinets to include in maintenance manuals.

1.5 QUALITY ASSURANCE

A. Fire-Rated, Fire Protection Cabinets: Listed and labeled to comply with requirements in ASTM E 814 for fire-resistance rating of walls where they are installed.

B. Coordinate size of fire protection cabinets to ensure that type and capacity of fire extinguishers indicated are accommodated.

C. Coordinate sizes and locations of fire protection cabinets with wall depths.

D. Pre-installation Conference: Conduct conference at Project site.

1. Review methods and procedures related to fire protection cabinets including, but not limited to, the following:
   a. Schedules and coordination requirements.

1.6 COORDINATION

A. Coordinate size of fire protection cabinets to ensure that type and capacity of fire extinguishers indicated are accommodated.

B. Coordinate size of fire protection cabinets to ensure that type and capacity of fire hoses, hose valves, and hose racks indicated are accommodated.

C. Coordinate sizes and locations of fire protection cabinets with wall depths.

1.7 SEQUENCING

A. Apply decals or vinyl lettering on field painted, fire protection cabinets after painting is complete.

PART 2 - PRODUCTS

2.1 MATERIALS

A. Cold-Rolled Steel Sheet: ASTM A 1008/A 1008M, Commercial Steel (CS), Type B.

B. Aluminum: Alloy and temper recommended by aluminum producer and manufacturer for type of use and finish indicated, and as follows:

1. Sheet: ASTM B 209 (ASTM B 209M).

2. Extruded Shapes: ASTM B 221 (ASTM B 221M).

C. Stainless-Steel Sheet: ASTM A 666, Type 304.

D. Tempered Break Glass: ASTM C 1048, Kind FT, Condition A, Type I, Quality q3, 1.5 mm thick.

2.2 FIRE PROTECTION CABINET

A. Cabinet Type: Suitable for fire extinguisher, FEC and hose, rack, valve, and extinguisher, FAC.

1. Products: Subject to compliance with requirements, provide one of the following:
   a. Fire End & Croker Corporation.
   b. J. L. Industries, Inc., a division of Activar Construction Products Group.

c. Kidde Residential and Commercial Division, Subsidiary of Kidde plc.
d. Larsen's Manufacturing Company.
e. Modern Metal Products, Division of Technico Inc.
f. Moon-American.
g. Potter Roemer LLC.
h. Watrous Division, American Specialties, Inc.

B. Cabinet Construction: Where cabinets are located if fire rated walls, provide “Fire-FX” option for cabinet construction.

1. Fire-Rated Cabinets: Construct fire-rated cabinets with double walls fabricated from 0.0428-inch- (1.1-mm-) thick, cold-rolled steel sheet lined with minimum 5/8-inch- (16-mm-) thick, fire-barrier material. Provide factory-drilled mounting holes.

C. Cabinet Material: Steel sheet.

D. Recessed Cabinet: Cabinet box recessed in walls of sufficient depth to suit style of trim indicated. **(NOT USED)**

1. Exposed Flat Trim: One-piece combination trim and perimeter door frame overlapping surrounding wall surface with exposed trim face and wall return at outer edge (backbend).

E. Semirecessed Cabinet: One-piece combination trim and perimeter door frame overlapping surrounding wall surface with exposed trim face and wall return at outer edge (backbend).

1. Rolled-Edge Trim: 2-1/2-inch (64-mm) and 4-inch (102-mm).backbend depth. Coordinate with wall thicknesses.

F. Surface Mounted Cabinet: Cabinet box surface mounted on walls. **(NOT USED)**

1. Exposed Trim: One-piece combination trim and perimeter door frame overlapping surrounding wall surface with exposed trim face and wall return at outer edge (backbend).

G. Cabinet Trim Material: Same material and finish as door.

H. Door Material: Steel sheet.

I. Door Style: Fully glazed vertical panel with frame.

J. Door Glazing: Tempered break glass.

K. Door Hardware: Manufacturer's standard door-operating hardware of proper type for cabinet type, trim style, and door material and style indicated.

L. Accessories:

1. Mounting Bracket: Manufacturer's standard steel, designed to secure fire extinguisher to fire protection cabinet, of sizes required for types and capacities of fire extinguishers indicated, with plated or baked-enamel finish.

2. Break-Glass Strike: Manufacturer's standard metal strike, complete with chain and mounting clip, secured to cabinet.

3. Door Lock: Cam lock that allows door to be opened during emergency by pulling sharply on door handle.

4. Identification: Lettering complying with authorities having jurisdiction for letter style, size, spacing, and location. Locate as directed by Architect.
   a. Identify fire extinguisher in fire protection cabinet with the words "FIRE EXTINGUISHER."
      1) Location: Applied to cabinet glazing.
      2) Application Process: Silk-screened.
      3) Lettering Color: White.
      4) Orientation: Vertical and Horizontal per location.

M. Finishes:

1. Manufacturer's standard baked-enamel paint or powder coat for the following:
   a. Exterior of cabinet door, and trim, except for those surfaces indicated to receive another finish.
   b. Interior of cabinet and door.

2.3 FABRICATION

A. Fire Protection Cabinets: Provide manufacturer's standard box (tub), with trim, frame, door, and hardware to suit cabinet type, trim style, and door style indicated. Miter and weld joints and grind smooth.

PART 3 - EXECUTION

3.1 INSTALLATION

A. Examine walls and partitions for suitable framing depth and blocking where recessed and semirecessed cabinets will be installed and prepare recesses as required by type and size of cabinet and trim style.

B. Install fire protection cabinets in locations and at mounting heights indicated or, if not indicated, at heights acceptable to authorities having jurisdiction.

C. Fire Protection Cabinets: Fasten cabinets to structure, square and plumb.

D. Identification: Apply decals at locations indicated.

E. Adjust fire protection cabinet doors to operate easily without binding. Verify that integral locking devices operate properly.

F. Replace fire protection cabinets that have been damaged or have deteriorated beyond successful repair by finish touchup or similar minor repair procedures.

3.2 WASTE MANAGEMENT

A. Coordinate with Section 01 74 19.

1. Separate and recycle cut-offs and waste materials and material packaging in accordance with Waste Management Plan and to the maximum extent economically feasible and place in designated areas for recycling.
2. Set aside and protect materials suitable for reuse and/or remanufacturing.
3. Separate and fold up metal banding; flatten and place along with other scrap for recycling.

END OF SECTION 10 44 13

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SECTION 10 44 16 - FIRE EXTINGUISHERS

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 portable, hand-carried fire extinguishers and mounting brackets for fire extinguishers.

B. Related Requirements:

1. Division 10 "Fire Extinguisher Cabinets."

1.3 PREINSTALLATION MEETINGS

A. Pre-installation Conference: Conduct conference at Project site.

1. Review methods and procedures related to fire extinguishers including, but not limited to, the following:

a. Schedules and coordination requirements.

1.4 ACTION SUBMITTALS

A. Product Data: For each type of product. 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.

1.5 INFORMATIONAL SUBMITTALS

A. Warranty: Sample of special warranty.

1.6 CLOSEOUT SUBMITTALS

A. Operation and maintenance data.

1.7 COORDINATION

A. Coordinate type and capacity of fire extinguishers with fire-protection cabinets to ensure fit and function.

1.8 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 PERFORMANCE REQUIREMENTS

A. NFPA Compliance: Fabricate and label fire extinguishers to comply with NFPA 10, "Portable Fire Extinguishers."

B. Fire Extinguishers: Listed and labeled for type, rating, and classification by an independent testing agency acceptable to authorities having jurisdiction.

1. Provide fire extinguishers approved, listed, and labeled by FM Global.

2.2 PORTABLE, HAND-CARRIED FIRE EXTINGUISHERS

A. Fire Extinguishers: Type, size, and capacity for each fire-protection cabinet and mounting bracket indicated.

1. Manufacturers: Subject to compliance with requirements, provide products by one of the following available manufacturers offering products that may be incorporated into the Work include, but are not limited to, the following:

a. Guardian Fire Equipment, Inc.
b. JL Industries, Inc.; a division of the Activar Construction Products Group.
c. Larsens Manufacturing Company.

2. Instruction Labels: Include pictorial marking system complying with NFPA 10, Appendix B, and bar coding for documenting fire-extinguisher location, inspections, maintenance, and recharging.

C. Multi-Purpose Dry Chemical Type: UL-rated 4-A:60-B:C, 10 lb. nominal capacity, in enameled steel container, for Class A, Class B and Class C fires.

a. Provide multi-purpose dry chemical type ABC extinguishers except where otherwise noted.

2.3 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 or red black baked-enamel finish.

1. Manufacturers: Subject to compliance with requirements, provide products by the following provide products by one of the following available manufacturers offering products that may be incorporated into the Work include, but are not limited to, the following:

a. Guardian Fire Equipment, Inc.
b. JL Industries, Inc.; a division of the Activar Construction Products Group.
c. Larsens Manufacturing Company.

B. Identification: Lettering complying with authorities having jurisdiction for letter style, size, spacing, and location. Locate as indicated by Architect.

1. Identify bracket-mounted fire extinguishers with the words "FIRE EXTINGUISHER" in red letter decals applied to mounting surface.

a. Orientation: Vertical.

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. Examine fire extinguishers for proper charging and tagging.

1. Remove and replace damaged, defective, or undercharged fire extinguishers.

B. 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.

C. Mounting Brackets: Fasten mounting brackets to surfaces, square and plumb, at locations indicated.

3.3 WASTE MANAGEMENT

A. Coordinate with Section 01 74 19.

1. Separate and recycle cut-offs and waste materials and material packaging in accordance with Waste Management Plan and to the maximum extent economically feasible and place in designated areas for recycling.
2. Set aside and protect materials suitable for reuse and/or remanufacturing.
3. Separate and fold up metal banding; flatten and place along with other scrap for recycling.

END OF SECTION 10 44 16

SECTION 11 16 00 - BULLET RESISTANT FIBERGLASS PANELS

PART 1 GENERAL

1.1 REFERENCE
The publication below forms a part of this specification.
UNDERWRITERS LABORATORY UL 752 9th Edition
Standard for Bullet Resisting Equipment dated Jan. 27,1995

1.2 SUBMITTALS
The following shall be submitted in accordance with Sections 01340 and the SPECIAL CONTRACT REQUIREMENTS: Submit for approval prior to fabrication catalog cuts, brochures, specifications, UL LISTING VERIFICATION, proof of possession of PRODUCT LIABILITY INSURANCE in an amount not less than five million U.S. dollars, and printed data in sufficient detail to indicate compliance with the contract documents and the manufacturer's instructions for the installation of Bullet Resistant Fiberglass.

1.3 DESIGN
Through the design, manufacturing technique and material application the Bullet Resistant Fiberglass shall be of the "non-ricochet type". This design is intended to permit the encapture and retention of an attacking projectile lessening the potential of a random injury or lateral penetration.

1.4 DELIVERY, STORAGE AND HANDLING
Deliver the materials to the project with the manufacturer’s UL Labels intact and legible. Handle the material with care to prevent damage. Store the materials inside under cover, stack flat and off the floor.

1.5 WARRANTY
All materials and workmanship shall be warranted against defects for a period of one (1) year from the date of receipt at the project site.

PART 2 PRODUCTS

2.01 MANUFACTURERS

A. Basis of Design: ArmorCore 13070 Level 3 = 3/4” Ballistic Fiberglass Panels – multiple layer woven ballistic grade fiberglass panels by Waco Composites. www.armorcore.com

D. Substitutions: See Section 01 60 00 - Product Requirements.

2.1 BULLET RESISTANT FIBERGLASS MATERIAL
The panels shall be made of multiple layers of starch-oil woven roving ballistic grade fiberglass cloth impregnated with a thermoset polyester resin and compressed into flat rigid sheets. The production technique and materials used shall provide the controlled internal delamination to permit the encapture of a penetrating projectile. Panels shall be UL Listed (BRF100/BRF200/BRF300).

Bullet Resistant Fiberglass panels shall be UL Listed (BRF300).

2.2 SECURITY LEVEL
The Bullet Resistant Fiberglass must be UL Listed Rated for Level 3.

2.3 SUBSTITUTIONS

Other UL Listed bullet resistant fiberglass products are acceptable if in compliance with all requirements of this specification. Alternate products must be submitted to the architect for approval.

PART 3 EXECUTION

3.1 SUPPORTING MEMBERS

Prior to installing the bullet resistive material, the contractor shall verify that all supports have been installed as required by the contract documents and the architectural drawings.

3.2 JOINTS

All joints shall be reinforced by a back-up layer of bullet resistive material. The bullet resistance of the joint, as reinforced, shall be at least equal to that of the panel. Minimum width of reinforcing layer at joint shall be 4". (2" on each panel side or a 2" minimum overlap per side)

3.3 INSTALLATION

Panels shall be installed in accordance with the manufacturer's printed recommendations. Panels shall be adhered using an industrial adhesive, mastic, screws or bolts. Method of application shall maintain the bullet resistive rating at junctures with the concrete floor slab, the concrete roof slab, the bullet resistive door frames, the bullet resistive window frames, and all required penetrations.

END OF SECTION

SECTION 12 36 61 - SIMULATED STONE 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. This section includes the performance criteria, materials, production, and erection of simulated stone countertops for the project. The work performed under this Section consists of the provision of all plant, materials, labor and equipment and the like necessary and/or required for the complete execution of all simulated stone countertops as required by this section, schedules, keynotes and drawings, including, but not limited to the following:

1. Solid-surface-material window sills and aprons

1.3 ACTION SUBMITTALS

A. Product Data: For sills.

B. Shop Drawings: For sills. Show materials, finishes, edge and backsplash profiles, methods of joining, and cutouts for plumbing fixtures.

C. Samples for Initial Selection: For each type of material exposed to view.

D. Samples for Verification: For the following products:

1. Material, 6 inches (150 mm) square.

1.4 PROJECT CONDITIONS

A. Field Measurements: Verify dimensions by field measurements before fabrication is complete.

1.5 COORDINATION

A. Coordinate locations of penetrations.

PART 2 - PRODUCTS

2.1 SOLID-SURFACE-MATERIAL

A. Sills: 3/4-inch- (19-mm-) thick, solid surface material

B. Apron: 3/4-inch- (19-mm-) thick, solid surface material.

C. Fabrication: Fabricate in one piece with shop-applied edges and backsplashes unless otherwise indicated. Comply with solid-surface-material manufacturer's written instructions for adhesives, sealers, fabrication, and finishing.

D. Adhesives: Adhesives shall not contain urea formaldehyde.

E. Solid Surface Material: Homogeneous solid sheets of filled plastic resin complying with ANSI SS1.

1. Manufacturers: Subject to compliance with requirements, provide products by one of the following:
   a. Corian- Basis of Design
   b. Dupont – “Zodiaq” Quartz
   c. Formica Corporation.
   d. Wilsonart International.
2. Colors and Patterns: As indicated by manufacturer's designations.

2.2 FACTORY FABRICATION

A. Shop assembly

1. Fabricate components to greatest extent practical to sizes and shapes indicated, in accordance with approved shop drawings and manufacturer’s printed instructions and technical bulletins.
2. Form joints between components using manufacturer’s standard joint adhesive joints.
   a. Reinforce as required.
3. Provide factory cutouts for plumbing fittings and bath accessories as indicated on the drawings.
4. Rout and finish component edges with clean, sharp returns.
   a. Rout cutouts, radii and contours to template.
   b. Smooth edges.

PART 3 - EXECUTION

3.1 INSTALLATION

A. Install countertops level to a tolerance of 1/8 inch in 8 feet (3 mm in 2.4 m).

B. Fasten countertops by screwing through corner blocks of base units into underside of countertop. Pre-drill holes for screws as recommended by manufacturer. Align adjacent surfaces and, using adhesive in color to match sill, form seams to comply with manufacturer's written instructions. Carefully dress joints smooth, remove surface scratches, and clean entire surface.

1. Install aprons to comply with manufacturer's written instructions for adhesives, sealers, fabrication, and finishing.
2. Seal edges of cutouts in particleboard subtops by saturating with varnish.

C. Keep components and hands clean during installation.
1. Remove adhesives, sealants and other stains.
2. Components shall be clean on date of substantial completion

3.2 WASTE MANAGEMENT

A. Coordinate with Division 01.

1. Separate and recycle cut-offs and waste materials and material packaging in accordance with Waste Management Plan and to the maximum extent economically feasible and place in designated areas for recycling.
2. Set aside and protect materials suitable for reuse and/or remanufacturing.
3. Separate and fold up metal banding; flatten and place along with other metal scrap for recycling in designated area.

END OF SECTION 12 36 61

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SECTION 12 48 13 – ENTRANCE FLOOR MATS AND 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. This section includes the performance criteria, materials, production, and installation of entrance floor mats, including fibered roll goods, for the project. The work performed under this Section consists of the provision of all plant, materials, labor and equipment and the like necessary and/or required for the complete execution of all entrance floor mats as required by the this section.

B. Related Sections:
1. Division 3 Cast-In-Place Concrete and Self-Leveling Toppings
2. Division 9 Floor Finishes

1.3 ACTION SUBMITTALS

A. Product Data: For each type of product.

B. Samples: Submit selection and verification samples of the floor mats.

C. Product Schedule: Use same designations indicated on Drawings.

1.4 INFORMATION SUBMITTALS

A. Test and Evaluation Reports

1. Product test reports: As required by Conditions of the Contract and Division 1 Regulatory Requirements Section, submit test certificates from an independent test laboratory showing compliance with specified performance characteristics and physical properties.

2. Compatibility and adhesion test reports: Submit test reports confirming adhesive's effectiveness with the product(s) specified.

3. Manufacturer Instructions: For specified products, submit latest editions of product supplier's installation and cleaning & maintenance instructions.

1.5 CLOSEOUT SUBMITTALS

A. Maintenance Data: For each type of floor mat to include in maintenance manuals.

1.6 QUALITY ASSURANCE

A. Installer: Installer shall be highly experienced in performing work of this section, having previous done fiber roll goods installation work similar to that required for this project.

B. Testing Agency: Agency(ies) shall be independent and qualified to perform the specified product tests.

1.7 DELIVERY, STORAGE, AND HANDLING

A. General: Comply with Division 1 Product Requirements Section

B. Delivery and Acceptance Requirements: Comply with the product supplier's ordering and lead time requirements to avoid construction delays, and to allow material to acclimatize as required in the specified product's installation instructions. Accept delivery of materials only if they are in unopened, undamaged packaging that bears the name and brand of the manufacturer/product supplier, project identification, and shipping and handling instructions.

C. Storage and Handling Requirements: Store material -- including any adhesive and accessories -- in the original packaging (as delivered) in areas that are enclosed and weather tight with the permanent HVAC system set at a temperature of between 65°F and 80°F for a minimum of 48 hours prior to commencement of installation. In addition, comply with storage and handling requirements listed on product packaging, and described in the latest edition of the product's installation instructions

1.8 FIELD CONDITIONS

A. Maintain ambient temperatures within range recommended by manufacturer, but not less than 65 deg F (21 deg C) or more than 80 deg F (35 deg C) during the following time periods:

1. 48 hours before installation.
2. During installation.
3. 48 hours after installation.

B. After installation and until Substantial Completion, maintain ambient temperatures within range recommended by manufacturer, but not less than 55 deg F (13 deg C) or more than 95 deg F (35 deg C).

PART 2 - PRODUCTS

2.1 HEAVY TRAFFIC MATTING – RECESSED IN FRAME

A. Basis of Design: Subject to compliance with requirements, provide the product indicated on drawings or comparable product to the following:
1. 3M "Nomad Z-Web Extreme Traffic Scraper Matting 9100"

a. Construction: Vinyl nonwoven continuous filament bonded together to form a durable, resilient mat. Unbacked to allow dirt to fall through.

Thickness: ASTM D418-68 – 0.46 inches
Weight: ASTM D-418 – 15 lbs./sq. yard

b. Performance: Physical properties of the entrance matting shall conform to the following minimums:

Microbiological Properties: ASTM G-21-70 Passes- inhibiting to fungal growth in the mat
Electrical Properties: AATCC 134 Static Propensity 1.2 kilovolts
Extended Use Temperature: -10F to 150F
NFSI High Traction Certification

B. Colors: As selected by Architect. Sizes as shown on drawings.

2.2 ACCESSORY PRODUCTS

A. Aluminum frame, seaming tape, matting edging, and matting adhesives as supplied by floor mat manufacturer for complete installation.

PART 3 - EXECUTION

3.1 EXAMINATION

A. Examine substrates, with Installer present, for compliance with requirements for maximum 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.

B. Proceed with installation only after unsatisfactory conditions have been corrected.

3.2 INSTALLATION

A. Comply with manufacturer's written instructions for installation.

B. Interface with Other Work: If transitions are required to and/or from the specified entrance matting, contact Mats Inc. for suitable transition material.

C. Sizes: Where not indicated otherwise, provide single unit for each mat installation, but do not exceed manufacturer's maximum size recommendation for units intended for removal and cleaning. Where possible, verify sizes by field measurement before shop fabrication.

D. Accessory selection: Where indicated for recessed or wall-to-wall applications provide aluminum framework as recommended by manufacturer.

E. Mats to be installed in recessed area. Ensure the space has the proper depth so that when the installation is complete, the top of the mat is flush with adjacent floor finish.

3.3 CLEANING AND PROTECTION

A. General: Clean up job site, including sweeping or dust mopping the floor to remove all dirt or grit, and put all waste in general contractor's dumpster. Follow overall cleaning guidelines described in Division 01.

B. Maintenance: Conduct a full initial maintenance following the latest edition of the manufacturer's maintenance instructions. Instruct owner's cleaning staff in proper maintenance procedures.

3.4 WASTE MANAGEMENT

A. Coordinate with Section 01 74 19.

1. Separate and recycle cut-offs and waste materials and material packaging in accordance with Waste Management Plan and to the maximum extent economically feasible and place in designated areas for recycling.
2. Set aside and protect materials suitable for reuse and/or remanufacturing.
3. Separate and fold up metal banding; flatten and place along with other scrap for recycling.

END OF SECTION 12 48 13

SECTION 14 42 00 – WHEELCHAIR LIFTS

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. The Work of this Section consists of the provision of all plant, labor, materials, equipment, testing and services necessary to complete the work of wheelchair lifts as shown on the schedules, keynotes, drawings, as specified herein, and as may be required by conditions and authorities having jurisdiction, including, but not limited to, the following:
   1. Commercial Unenclosed Vertical Platform Lift.

B. Related Sections:
   1. Division 01 Section “Building Commissioning Requirements”.
   2. Division 03 – Cast-in-place concrete existing floor/repair
   3. Division 04 – Unit Masonry
   4. Division 6 - Rough Carpentry
   5. Division 9 - Gypsum Board Assemblies.
   6. Division 9 - Resilient Flooring: Floor finish in cab.
   7. Division 9 - Paints and Coatings
   8. Division 16 Sections for electrical service for elevators to and including disconnect and fused switches at machine room.
   9. Division 16 Sections for standby power source, transfer switch, and connection from auxiliary contacts in transfer switch to controller.
   10. Division 16 Section "Voice and Data Communication Cabling" for telephone service to elevators.
   11. Division 21 - Detection and Alarm: Fire and smoke detectors and interconnecting devices.

1.3 REFERENCES

A. ASME A18.1 - American Society of Mechanical Engineers - Safety Standard for Platform and Stairway Chair Lifts.

B. ASME A17.1 - Safety Code for Elevators and Escalators.

C. ASME A17.5 - Elevator and Escalator Electrical Equipment.

D. ICC/ANSI A117.1 - Accessible and Usable Buildings and Facilities.

E. ADAAG - U.S. Architectural & Transportation Barriers Compliance Board's “Americans with Disabilities Act (ADA), Accessibility Guidelines for Buildings and Facilities”.

F. NFPA 70 - National Electric Code.

1.4 REQUIREMENTS OF REGULATORY AGENCIES

A. Fabrication and installation work in compliance with applicable jurisdictional authorities.

B. Provide wheelchair lifts in compliance with:
1. ASME A18.1 - Safety Standard for Platform Lifts and Stairway Chairlifts.
2. ASME A17.1 - Safety Code for Elevators and Escalators.
3. ASME A17.5 - Elevator and Escalator Electrical Equipment.
4. NFPA 70 - National Electric Code.

C. Seismic Design: In accordance with 2 seismic risk zone in accordance with CT State Building code.

D. File shop drawings and submissions with local authorities as the information is made available. Company pre-inspection and jurisdictional authority inspections and permits are to be made on timely basis as required.

1.5 SUBMITTALS

A. Submit under provisions of Section 01 33 00.

B. Product Data: Manufacturer's data sheets on each product to be used, including:
1. Preparation instructions and recommendations including preparation, storage and handling requirements.
2. Include complete description of performance and operating characteristics.
3. Show maximum and average power demands.

C. Shop Drawings: Survey of existing conditions is required. Provide a complete layout of lift equipment detailing dimensions and clearances as required, erection and anchorage requirements.
1. Include wiring diagrams for power, control and signal systems.

D. Selection Samples: For each finish product specified requiring selection of color or finish, two complete sets of color charts representing manufacturer's full range of available colors and patterns.

E. Verification Samples: for each finished product specified, two samples, minimum size 6 inches (150 mm) square, representing actual product color and pattern.

F. Minutes of preinstallation conference.

1.6 QUALITY ASSURANCE

A. Manufacturer Qualifications: Firm with minimum 10 years experience in manufacturing of wheelchair lifts, with evidence of experience with similar installations of type specified.

B. Source Limitations: Obtain wheelchair lifts through one source from a single manufacturer.
1. Provide major lift components, controllers, signal fixtures, door operators, car frames, cabs, and entrances, manufactured by a single manufacturer.

C. Installer Qualifications:
1. Execute work of this section only by a company that has adequate product liability insurance and that can demonstrate to Owner’s satisfaction that, within previous five years, it has

successfully completed at least three projects similar in scope and type to work required on this Project.

2. Skilled tradesmen shall be employees of the installing contractor approved by the manufacturer, with demonstrated ability to perform the work on a timely basis.

1.7 DELIVERY, STORAGE, AND HANDLING

A. Store products in manufacturer's unopened packaging until ready for installation.

B. Store components off the ground in a dry covered area, protected from adverse weather conditions.

C. Store and dispose of solvent-based materials, and materials used with solvent-based materials, in accordance with requirements of local authorities having jurisdiction.

1.8 PROJECT CONDITIONS

A. Maintain environmental conditions (temperature, humidity, and ventilation) within limits recommended by manufacturer for optimum results. Do not install systems under environmental conditions outside manufacturer's absolute limits.

B. Do not use wheelchair lifts for hoisting materials or personnel during construction period.

1.9 WARRANTY

A. Manufacturer shall warrant the wheelchair lift materials and workmanship for one year following Substantial Completion.

B. Extended Warranty: provide an extended manufacturer’s warranty for the entire warranty period covering the wheelchair lift materials and workmanship for the following additional extended period beyond the initial one year warranty:

1. Four additional years.

PART 2 - PRODUCTS

2.1 MANUFACTURERS

A. Basis of Design Product portable wheelchair lift: Subject to compliance with requirements, provide Ascension Virtuoso 5460P Model Series Vertical Portable Wheelchair Lift or comparable product by one of the following:

1. Ascension
2. Or approved equal

B. Requests for substitutions will be considered in accordance with provisions of Section 016000.

2.2 PORTABLE WHEELCHAIR LIFT

A. Capacity: 750 lbs (340 kg) rated capacity.

B. Weight of lift: 1025 pounds maximum [465 kg].

C. Vertical speed: seven (7) fpm (feet per minute) [2.1 m/min (meters per minute)].

D. Vertical travel: 12" to 60" [305 mm to 1524 mm], infinitely adjustable.

E. Standard platform gate configuration: the upper landing platform gate shall be left-hinged when facing the lift from the upper landing; the lower landing platform gate shall be right-hinged when facing the lift from the lower landing. Contact Ascension for custom platform gate configurations.

2.3 DIMENSIONS

A. Platform size: 36" x 54" [914 mm x 1372 mm] with 43" [1092 mm] high sidewalls and platform gates.

B. Space requirements (operational, storage, and transport): 44" [1117 mm] high (in the down position), 66" [1677 mm] long, 48" [1219 mm] wide.

C. No part of the lift shall stand over 44” [1117 mm] high when the platform is on the ground except when equipped with optional stage guard).

2.4 MATERIALS

A. The platform frame, base frame, and lifting device shall be constructed from ASTM A 36, AISI 1018, or AISI 1020 Steel.

B. The windows shall be fabricated from 1/4" [6 mm] thick high impact strength clear thermoplastic.

C. The safety skirt shall be constructed from rigid plastic.

2.5 FINISH

A. All metal components shall be thoroughly cleaned to remove any foreign substance. Exposed metal surfaces shall be finished with an oven-baked powder coating.

B. Standard color is black; contact Ascension for custom color selection.

2.6 DRIVE CONFIGURATION

A. Drive shall be direct-acting hydraulic.

B. Both sides of lift platform shall be supported evenly by means of synchronized hydraulic cylinders.

C. Hydraulic power unit shall be mounted on vibration-isolating supports designed to minimize vibration transmission and reduce frame-borne noise.

2.7 ELECTRICAL REQUIREMENTS

A. Electric power requirements shall be compatible with 120VAC, 60 hertz, single phase, 15 amp service (option: international electrical configurations available).

B. The lift shall be supplied with a three prong grounded electrical cord (20' [6.1 m] in length).

C. The lift shall contain a Ground Fault Circuit Interrupter (GFCI).

D. Motor shall be 1/2 hp, 115V AC single phase (international configurations available).

E. Control circuits shall be 12 VDC.

F. Electrical components shall be UL listed and CSA registered.

G. Electrical system shall be certified to ASME A17.5 by an independent testing laboratory.

2.8 SAFETY DEVICES

The lift shall be constructed to meet the applicable requirements of ADAAG, ASME A17.1-1996 or older (PART XX, SECTION 2000), ASME A18.1, and ANSI A117.1 as they would apply to a portable lifting device. The lift shall include the following safety features for protection of the passenger and general public.

A. Grounded electrical system.

B. 12 VDC operating controls.

C. Constant pressure operating switches.

D. Emergency stop button at passenger control station.

E. Electro-mechanical interlock to prevent accidental opening of lower landing platform gate.

F. Gate switches to prevent platform movement if either platform gate is open.

G. Lift platform stop height switch.

H. Safety skirt that completely encloses and protects the area under the lift platform.

I. 43" [1092 mm] high sidewalls and platform gates.J. Unobstructed view through transparent sidewalls and platform gates.

K. Grab bar extending full length of inside wall.

L. Slip resistant surfaces on platform floor and dock plate.

M. Structural safety factors as specified in ASME A18.1.

N. Self-closing platform gates.

2.9 PORTABILITY

A. Casters shall be easily attached to the platform for portability and stored in the base frame when not in use. Casters shall be 3½" [89 mm] in diameter and fabricated from hard rubber. The casters shall be capable of being installed without tools. When the casters are installed, the lift shall roll easily over any hard, smooth, level surface. The lift shall be capable of being moved by fork lift or truck.

2.10 OPERATING CHARACTERISTICS

A. Lift shall include three (3) constant pressure “UP/DOWN” switches, located outside of the platform at both ends and inside the platform.

B. The passenger control station shall be provided with a separate “PUSH TO STOP” emergency button. The emergency stop button shall prevent any operation of the lift when actuated.

C. The platform stop height shall be adjustable without the use of tools.

D. Opening the upper landing platform gate shall deploy a dock plate that rests on the upper landing surface. The dock plate shall provide a smooth transition between the platform and the upper landing. Closing the upper landing platform gate shall retract the dock plate.

E. The lower landing platform gate shall be provided with a mechanical interlock that prevents the platform gate from being opened whenever the platform is more than 2" [50 mm] above the full down position.

2.11 COMPRESSION CAPABILITY

A. The lift shall be capable of being compressed to 33" [838 mm] wide to facilitate relocation through a 36" [914 mm] wide doorway. An additional tool kit from Ascension is recommended to facilitate compression of the lift.

PART 3 - EXECUTION

3.1 INSTALLATION

A. Set up lift for operation as described in manufacturer’s operating manual.

B. If desired, lift may be anchored to floor surface using the 9/16” [14 mm] mounting holes provided in the base of the lift.

3.2 MAINTENANCE

A. Maintenance of the lift shall consist of regular cleaning as deemed necessary by the using facility. General inspection, maintenance, and lubrication shall be specified in the manufacturer’s service manual.

END OF SECTION 14 42 00

SECTION 210500 - COMMON WORK RESULTS FOR FIRE SUPPRESSION

PART 1 GENERAL

1.1 SECTION INCLUDES

A. Pipe, fittings, sleeves, escutcheons, seals, and connections for sprinkler systems.

1.2 REFERENCE STANDARDS

A. ASME A112.18.1 - Plumbing Supply Fittings; 2012.

B. ASME B16.1 - Gray Iron Pipe Flanges and Flanged Fittings: Classes 25, 125, and 250; 2010.

C. ASME B16.3 - Malleable Iron Threaded Fittings: Classes 150 and 300; 2011.

D. ASME B16.4 - Gray Iron Threaded Fittings: Classes 125 and 250; 2011.

E. ASME B16.5 - Pipe Flanges and Flanged Fittings NPS 1/2 Through NPS 24 Metric/Inch Standard; 2013.

F. ASME B16.9 - Factory-Made Wrought Buttwelding Fittings; 2012.

G. ASME B16.22 - Wrought Copper and Copper Alloy Solder-Joint Pressure Fittings; 2013.

H. ASME B16.25 - Buttwelding Ends; 2012.

I. ASTM A47/A47M - Standard Specification for Ferritic Malleable Iron Castings; 1999 (Reapproved 2014).

J. ASTM A234/A234M - Standard Specification for Piping Fittings of Wrought Carbon Steel and Alloy Steel for Moderate and High Temperature Service; 2015.

K. ASTM A269/A269M - Standard Specification for Seamless and Welded Austenitic Stainless Steel Tubing for General Service; 2015.

L. AWS D1.1/D1.1M - Structural Welding Code - Steel; 2015.

M. AWWA C110/A21.10 - Ductile-Iron and Gray-Iron Fittings; 2012.

N. AWWA C111/A21.11 - Rubber-Gasket Joints for Ductile-Iron Pressure Pipe and Fittings; 2012.

O. AWWA C151/A21.51 - Ductile-Iron Pipe, Centrifugally Cast; 2009.

P. FM (AG) - FM Approval Guide; current edition.

Q. NFPA 13 - Standard for the Installation of Sprinkler Systems; 2016.

R. UL (DIR) - Online Certifications Directory; current listings at database.ul.com.

1.3 SUBMITTALS

A. Product Data: Provide manufacturer's catalog information. Indicate valve data and ratings.

B. Shop Drawings: Indicate pipe materials used, jointing methods, supports, and floor and wall penetration seals. Indicate installation, layout, weights, mounting and support details, and piping connections.

C. Shop Drawings:

1. Plans: Installation layouts; indicate pipe materials, sizes and internal diameters, and valve locations and sizes.

2. Details and Schedules: Indicate the following:

a. Jointing methods and piping connections.

b. Floor and wall penetration seals.

c. Mounting and support details, including data on supported weights.

3. Submit shop drawings to Fire Marshall for approval. Submit proof of approval to Engineer.

D. Project Record Documents: Record actual locations of components and tag numbering.

E. Operation and Maintenance Data: Include installation instructions and spare parts lists.

1.4 QUALITY ASSURANCE

A. Manufacturer Qualifications: Company specializing in manufacturing the Products specified in this section with minimum three years documented experience.

B. Installer Qualifications: Company specializing in performing work of the type specified in this section.

1. Minimum three years experience.

C. Welder Qualifications: Certify in accordance with AWS D1.1/D1.1M.

1. Provide certificate of compliance from authority having jurisdiction, indicating approval of welders.

D. Conform to FM (AG) and UL (DIR) requirements.

1.5 WARRANTY

A. Correct defective Work within a five year period after Date of Substantial Completion.

PART 2 PRODUCTS

2.1 ABOVE GROUND PIPING FOR WET PIPE SYSTEMS

A. Steel Pipe (for pressures up to 300 psig):

1. Welded or roll grooved:

a. Up to and including 5 inches: Schedule 10 ASTM A 795 for fire protection, ASTM A 53 or ASTM A 135 black iron or hot-dip zinc-coated (galvanized).

b. 6 inches: 0.134 inch wall thickness ASTM A 795 for fire protection, ASTM A 53 or ASTM A 135 black iron or hot-dip zinc-coated (galvanized).

c. 8 and 10 inch: 0.188 inch wall thickness ASTM A 795 for fire protection, ASTM A 53 or ASTM A 135 black iron or hot-dip zinc-coated (galvanized).

2. Threaded or cut groove fittings:

a. Up to and including 6 inches: Schedule 40 ASTM A 795 for fire protection, ASTM A 53 or ASTM A 135 black iron or hot-dip zinc-coated (galvanized).

b. Over 6 inches: Schedule 30 ASTM A 795 for fire protection, ASTM A 53 or ASTM A 135 black iron or hot-dip zinc-coated (galvanized).

3. Steel Fittings: ASME B16.9 wrought steel, buttwelded, ASTM A234/A234M wrought carbon steel or alloy steel, or ASME B16.5 steel flanges and fittings.

4. Cast Iron Fittings: ASME B16.1, flanges and flanged fittings and ASME B16.4, threaded fittings.

5. Malleable Iron Fittings: ASME B16.3, threaded fittings and ASTM A47/A47M.

6. Mechanical Grooved Couplings: Malleable iron housing clamps to engage and lock, "C" shaped elastomeric sealing gasket, steel bolts, nuts, and washers; galvanized for galvanized pipe.

7. Mechanical Formed Fittings: Carbon steel housing with integral pipe stop and O-ring pocked and O-ring, uniformly compressed into permanent mechanical engagement onto pipe.

8. Welders and/or welding machine operators shall, upon completion of each weld, stamp an imprint of their identification into the side of the pipe adjacent to each weld.

2.2 ESCUTCHEONS

A. Material:

1. Grade TP304, seamless tube, ASTM A269/A269M stainless steel.

2. Metals and Finish: Comply with ASME A112.18.1.

B. Construction:

1. One-piece for mounting on chrome-plated pipe and one-piece or split-pattern type elsewhere.

2. Internal spring tension devices or setscrews to maintain a fixed position against a surface.

2.3 PIPE HANGERS AND SUPPORTS

A. Hangers for Pipe Sizes 1/2 to 1-1/2 inch: Malleable iron, adjustable swivel, split ring.

B. Hangers for Pipe Sizes 2 inches and Over: Carbon steel, adjustable, clevis.

C. Wall Support for Pipe Sizes to 3 inches: Cast iron hook.

D. Wall Support for Pipe Sizes 4 inches and Over: Welded steel bracket and wrought steel clamp.

E. Vertical Support: Steel riser clamp.

F. Floor Support: Cast iron adjustable pipe saddle, lock nut, nipple, floor flange, and concrete pier or steel support.

PART 3 EXECUTION

3.1 INSTALLATION

A. Install sprinkler system and service main piping, hangers, and supports in accordance with NFPA 13.

B. Route piping in orderly manner, plumb and parallel to building structure. Maintain gradient.

C. Install piping to conserve building space, to not interfere with use of space and other work.

D. Inserts:

1. Provide inserts for placement in concrete formwork.

2. Provide inserts for suspending hangers from reinforced concrete slabs and sides of reinforced concrete beams.

3. Provide hooked rod to concrete reinforcement section for inserts carrying pipe over 4 inches.

4. Where concrete slabs form finished ceiling, locate inserts flush with slab surface.

5. Where inserts are omitted, drill through concrete slab from below and provide through-bolt with recessed square steel plate and nut above slab.

E. Provide auxiliary drains for all trapped sections of sprinkler piping created by any vertical pipe offsets.

3.2 CLEANING

A. Upon completion of work, clean all parts of the installation.

END OF SECTION

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SECTION 211300 - FIRE SUPPRESSION SPRINKLERS

PART 1 GENERAL

1.1 SECTION INCLUDES

A. Wet-pipe sprinkler system.

B. System design, installation, and certification.

1.2 REFERENCE STANDARDS

A. FM (AG) - FM Approval Guide; Factory Mutual Research Corporation; current edition.

B. ITS (DIR) - Directory of Listed Products; current edition.

C. NFPA 13 - Standard for the Installation of Sprinkler Systems; 2016.

D. UL (DIR) - Online Certifications Directory; current listings at database.ul.com.

1.3 SUBMITTALS

A. Product Data: Provide data on sprinklers, valves, and specialties, including manufacturers catalog information. Submit performance ratings, rough-in details, weights, support requirements, and piping connections.

B. Shop Drawings:

1. Plans: Installation layouts; indicate pipe materials, sizes and internal diameters, and valve locations and sizes.

2. Elevations: Riser diagrams; indicate pipe materials and sizes, and valve locations and sizes.

3. Submit preliminary layout of finished ceiling areas indicating only sprinkler locations coordinated with ceiling installation.

4. Indicate hydraulic calculations, detailed pipe layout, hangers and supports, sprinklers, components and accessories. Indicate system controls. Provide hydraulic calculations and design bearing the PE stamp of the engineer under whose supervision the work was designed.

5. Details and Schedules: Indicate the following:

a. Jointing methods and piping connections.

b. Floor and wall penetration seals.

c. Mounting and support details, including data on supported weights.

6. Submit shop drawings to authority having jurisdiction for approval. Submit proof of approval to Engineer.

7. Provide NFPA 13 “Contractor’s Material and Test Certificate for Aboveground Piping”.

8. Provide New York State Fire Code required Statement of Compliance for the fire protection system.

C. Project Record Documents: Record actual locations of sprinklers and deviations of piping from drawings. Indicate drain and test locations.

D. Manufacturer's Certificate: Certify that system has been tested and meets or exceeds specified requirements and code requirements.

E. Operation and Maintenance Data: Include components of system, servicing requirements, record drawings, inspection data, replacement part numbers and availability, and location and numbers of service depot.

F. Maintenance Materials: Furnish the following for Nanuet Union Free School District's use in maintenance of project.

1. Extra Sprinklers: Type and size matching those installed in quantity required by referenced NFPA design and installation standard.

2. Sprinkler Wrenches: For each sprinkler type.

3. Provide spare list in compliance with NFPA 13 (2007) 6.2.9.7:

a. The list shall include the following:

1) Sprinkler Identification Number (SIN) if equipped; or the manufacturer, model, orifice, deflector type, thermal sensitivity, and pressure rating

2) General description

3) Quantity of each type to be contained in the cabinet

4) Issue or revision date of the list

b. Verify spares match installation, as-builts and NFPA 13 certifications.

1.4 QUALITY ASSURANCE

A. Maintain one copy of referenced design and installation standard on site.

B. Conform to UL (DIR) requirements.

C. Design system under direct supervision of a Professional Engineer experienced in design of this type of work and licensed in New York. Provide shop drawing submittals bearing the PE stamp of the engineer under whose supervision the work was designed.

D. Manufacturer Qualifications: Company specializing in manufacturing the Products specified in this section with minimum three years documented experience.

E. Installer Qualifications: Company specializing in performing the work of this section with minimum 3 years experience and approved by manufacturer.

F. Equipment and Components: Provide products that bear {\rs\#1} label or marking.

G. Products Requiring Electrical Connection: Listed and classified by UL (DIR) as suitable for the purpose specified and indicated.

PART 2 PRODUCTS

2.1 SPRINKLER SYSTEM

A. Sprinkler System: Provide coverage for building areas noted. Refer to drawings for occupancy hazard classifications.

B. Storage Cabinet for Spare Sprinklers and Tools: Steel, located in boiler room adjacent to water service entrance area.

2.2 SPRINKLERS

A. Suspended Ceiling Type: Semi-recessed pendant type with matching push on escutcheon plate.

1. Response Type: Quick.
2. Coverage Type: Extended.
3. Finish: Brass.
4. Escutcheon Plate Finish: Enamel, color as selected.
5. Fusible Link: Fusible solder link type temperature rated for specific area hazard.

PART 3 EXECUTION

3.1 INSTALLATION

A. Install in accordance with referenced NFPA design and installation standard.

B. Install equipment in accordance with manufacturer's instructions.

C. Firestop all joints, penetrations within rated construction in compliance with the specification section 078413.

D. Place pipe runs to minimize obstruction to other work.

E. Place piping in concealed spaces above finished ceilings.

F. Hydrostatically test entire system.

G. Locate sprinklers minimum distances from heat sources for compliance with NFPA 13, as applicable.

3.2 SCHEDULES

A. System Hazard Areas:

1. Highview Elementary Ground Floor Toilet Rooms: Light Hazard

END OF SECTION

SECTION 220501 - BASIC PLUMBING MATERIALS AND METHODS

PART 1 GENERAL

1.1 SUMMARY

A. This section includes the following basic mechanical materials and methods to complement other Division 22 Sections.

1. Field-fabricated metal and wood equipment supports.
2. Water soluble flux.
3. Plumbing solder.
4. Installation requirements common to equipment specifications.
5. Firestopping (refer to specification section 078400).
6. Cutting and patching.
7. Touchup painting and finishing.
8. Demolition.

B. Pipe and pipe fitting materials are specified in piping system Sections.

1.2 DEFINITIONS

A. Pipe, pipe fittings, and piping include tube, tube fittings, and tubing.

B. Finished Spaces: Spaces other than mechanical and electrical equipment rooms furred spaces, pipe and duct shafts, unheated spaces immediately below the roof, spaces above ceilings, unexcavated spaces, crawl spaces and tunnels.

C. Exposed Interior Installations: Exposed to view indoors. Examples include finished occupied spaces and mechanical equipment rooms.

D. Exposed Exterior Installations: Exposed to view outdoors, or subject to outdoor ambient temperatures and weather conditions. Examples include rooftop locations.

E. Concealed Interior Installations: Concealed from view and protected from physical contact by building occupants. Examples include above ceilings and in duct shafts.

F. Concealed Exterior Installations: Concealed from view and protected from weather conditions and physical contact by building occupants, but subject to outdoor ambient temperatures. Examples include installations within unheated shelters.

1.3 REFERENCES

A. ASTM E 119 - Standard Test Methods for Fire Tests of Building Construction and Materials; 1997.

B. ASTM E 814 - Standard Test Method for Fire Tests of Through-Penetration Fire Stops; 1994b.

C. FM P7825 - Approval Guide; Factory Mutual Research Corporation; current edition.

D. UL (FRD) - Fire Resistance Directory; Underwriters Laboratories Inc.; current edition.

1.4 SUBMITTALS

A. Product Data: Provide product data for piping specialties.

B. Shop Drawings: Detailing fabrication and installation for metal and wood supports, and anchorage for plumbing materials and equipment.

C. Identification materials and devices.

D. Certificates: Welder certificates signed by the Contractor certifying that welders meet or exceed the requirements specified under the "Quality Assurance" Article.

E. Warranty: Submit manufacturer warranty and ensure that forms have been completed in Nanuet Union Free School District 's name and registered with manufacturer.

1.5 QUALITY ASSURANCE

A. Perform work in accordance with the Building Code of New York State.

B. Manufacturer Qualifications: Company specializing in manufacturing products specified in this section, with not less than three years of documented experience.

C. Installer Qualifications: Company specializing in performing the work of this section with minimum three years of experience.

D. Equipment Selection: Equipment of greater or larger power, dimensions, capacities, and ratings may be furnished provided such proposed equipment is approved in writing and connecting mechanical and electrical services, circuit breakers, conduit, motors, bases and equipment spaces are increased. No additional costs will be approved for these increases, if larger equipment is approved. If minimum energy ratings or efficiencies of the equipment are specified, the equipment must meet the design requirements and commissioning requirements.

1.6 PIPING DELIVERY, STORAGE, AND HANDLING

A. Deliver pipes and tubes with factory-applied end-caps. Maintain end-caps through shipping, storage, and handling to prevent pipe-end damage and prevent entrance of dirt, debris, and moisture.

B. Protect stored pipes and tubes from moisture and dirt. Elevate above grade. When stored inside, do not exceed structural capacity of the floor.

C. Protect flanges, fittings, and piping specialties from moisture and dirt.

D. Protect stored plastic pipes from direct sunlight. Support to prevent sagging and bending.

1.7 SEQUENCING AND SCHEDULING

A. Coordinate equipment installation with other building components.

B. Arrange for chases, slots, and openings in building structure during progress of construction to allow for plumbing installations.

C. Coordinate the installation of required supporting devices and set sleeves in poured-in-place concrete and other structural components as they are constructed.

D. Sequence, coordinate, and integrate installations of plumbing materials and equipment for efficient flow of the Work.

E. Coordinate connection of electrical services.

F. Coordinate connection of plumbing systems with utilities and services. Comply with requirements of governing regulations, landlord, franchised service companies, and controlling agencies.

G. Coordinate requirements for access panels and doors where plumbing items requiring access are concealed behind finished surfaces.

H. Coordinate installation of identifying devices after completing covering and painting where devices are applied to surfaces. Install identifying devices prior to installing acoustical ceilings and similar concealment.

PART 2 PRODUCTS

2.1 WATER SOLUBLE FLUX

A. Water Soluble Flux: Taramet Sterling(R) lead-free water soluble flux, conforming to ASTM B 813.

2.2 PLUMBING SOLDER

A. Plumbing Solder: Sterling® solder, ASTM B 32, Alloy Grade TC; 95 percent tin, 4.85 percent copper, 0.15 percent selenium.

1. Certified to comply with NSF 61.

2. Melting Temperature: 410 degrees F..

3. Tensile Strength: 7,130 psi.

4. Shear Strength: 5,979 psi.

5. Elongation Percent: 19.1.

6. Brinell Hardness: 15.1.

7. Burst Strength: 5,800 psi.

8. Pressure/Temperature Test Data on Copper Tube Assemblies comprised of 3 inch, 2 inch, 1 inch, 3/4 inch, and 1/2 inch Tubing with a Reducing Tee:

   a. No leaks at 180 degrees F., 200 psi, held for 2 minutes.

2.3 PIPE, PIPE FITTINGS, AND JOINING MATERIALS

A. Refer to individual piping system specification sections for pipe fitting materials and joining methods.

B. Pipe Threads: ASME B1.20.1 for factory threaded pipe and fittings.

C. Pipe Flange Gasket Materials: Suitable for thermal and chemical conditions of the contents of the piping system.

1. ASME B16.21, non-metallic, flat, asbestos-free, 1/8 inch maximum thickness, except where thickness or specific material is 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.

2. AWWA C110, rubber, flat-face, 1/8 inch thick, except where other thickness is indicated; and full-face or ring-type, except where type is indicated.

D. Flange Bolts and Nuts: ASME B18.2.1, carbon steel, except where other material is specified.

E. Welding Filler Metals: Comply with AWS D10.12 for welding materials appropriate for wall thickness and chemical analysis of steel pipe being welded.

2.4 PIPING SPECIALTIES

A. Escutcheons: Manufactured wall, ceiling, and floor plates; deep-pattern type where required to conceal protruding fittings and sleeves.

1. Inside Diameter: Closely fit around pipe, tube and insulation.

2. Outside Diameter: Completely cover opening.

3. Stamped Steel: One-piece, with set-screw and chrome-plated finish.

4. Cast-Iron Floor Plate: One-piece casting.

B. Dielectric Fittings: Assembly or fitting having insulating material isolating joined dissimilar metals to prevent galvanic action and stop corrosion.

1. Description: Combination of copper alloy and ferrous; threaded, solder, plain, and weld neck end types and matching piping system materials.

2. Insulating Material: Suitable for system fluid, pressure and temperature.

3. Dielectric Unions: Factory-fabricated, union assembly for 250-psig minimum working pressure at a 180 deg. F temperature.

PART 3 EXECUTION

3.1 PREPARATION

A. Ream pipe and tube ends. Remove burrs. Bevel plain end ferrous pipe.

B. Remove scale and dirt on inside and outside before assembly.

C. Prepare piping connections to equipment with flanges or unions.

D. Keep open ends of pipe free from scale and dirt. Whenever work is suspended during construction protect open ends with temporary plugs or caps.

3.2 INSTALLATION

A. Install in accordance with manufacturer's instructions.

B. Route piping in orderly manner, plumb and parallel to building structure, and maintain gradient.

C. Install piping to conserve building space and avoid interference with use of space.

D. Sleeve pipe passing through partitions, walls, and floors.

E. Install piping to allow for expansion and contraction without stressing pipe, joints, or connected equipment.

F. Inserts:

1. Provide inserts for placement in concrete formwork.

2. Provide inserts for suspending hangers from reinforced concrete slabs and sides of reinforced concrete beams.

3. Provide hooked rod to concrete reinforcement section for inserts carrying pipe over 4 inches.

4. Where concrete slabs form finished ceiling, locate inserts flush with slab surface.

5. Where inserts are omitted, drill through concrete slab from below and provide through-bolt with recessed square steel plate and nut above slab.

G. Pipe Hangers and Supports:

1. Install in accordance with ASME B31.9.

2. Support horizontal piping as scheduled.

3. Place hangers within 12 inches of each horizontal elbow.

4. Use hangers with 1-1/2 inch minimum vertical adjustment. Design hangers for pipe movement without disengagement of supported pipe.

5. Support vertical piping at every floor. Support riser piping independently of connected horizontal piping.

6. Where several pipes can be installed in parallel and at same elevation, provide multiple or trapeze hangers.

7. Provide copper plated hangers and supports for copper piping.

8. Prime coat exposed steel hangers and supports. Hangers and supports located in crawl spaces, pipe shafts, and suspended ceiling spaces are not considered exposed.

H. Provide clearance for installation of insulation and access to valves and fittings.

I. Provide access where valves and fittings are not exposed.

J. Where pipe support members are welded to structural building framing, scrape, brush clean, and apply one coat of zinc rich primer to welds.

K. Install valves with stems upright or horizontal, not inverted.

3.3 EQUIPMENT INSTALLATION - COMMON REQUIREMENTS

A. Install equipment to provide the maximum possible headroom where mounting heights are not indicated.

B. Install equipment according to approved submittal data. Portions of the Work are shown only in diagrammatic form. Refer conflicts to the Architect.

C. Install equipment level and plumb, parallel and perpendicular to other building systems and components in exposed interior spaces, except where otherwise indicated.

D. Install plumbing equipment to facilitate servicing, maintenance, and repair or replacement of equipment components. Connect equipment for ease of disconnecting, with minimum of interference with other installations. Extend grease fittings to an accessible location

E. Install equipment giving right-of-way to piping systems installed at a required slope.

3.4 ERECTION OF METAL SUPPORTS AND ANCHORAGE

A. Cut, fit, and place miscellaneous metal supports accurately in location, alignment, and elevation to support and anchor plumbing materials and equipment.

B. Field Welding: Comply with AWS D1.1 "Structural Welding Code--Steel."

3.5 CUTTING AND PATCHING

A. Cut, channel, chase, and drill floors, walls, partitions, ceilings, and other surfaces necessary for plumbing installations. Perform cutting by skilled mechanics of the trades involved.

B. Repair cut surfaces to match adjacent surfaces.

3.6 DEMOLITION

A. Disconnect, demolish, and remove work specified under Division 22 and as indicated.

B. Where pipe, breeching, insulation, or equipment to remain is damaged or disturbed, remove damaged portions and install new products of equal capacity and quality.

C. Accessible Work: Remove indicated exposed pipe and breeching in its entirety.

D. Removal: Remove indicated equipment from the project site.

E. Temporary Disconnection: Remove, store, clean, reinstall, reconnect, and make operational, equipment indicated for relocation.

END OF SECTION

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SECTION 220553 - IDENTIFICATION FOR PLUMBING PIPING AND EQUIPMENT

PART 1 GENERAL

1.1 SECTION INCLUDES

A. Tags.

B. Pipe markers.

1.2 REFERENCE STANDARDS

A. ASME A13.1 - Scheme for the Identification of Piping Systems; 2007.

B. ASTM D709 - Standard Specification for Laminated Thermosetting Materials; 2013.

1.3 SUBMITTALS

A. List: Submit list of wording, symbols, letter size, and color coding for mechanical identification.

B. Chart and Schedule: Submit valve chart and schedule, including valve tag number, location, function, and valve manufacturer's name and model number.

PART 2 PRODUCTS

2.1 PLUMBING COMPONENT IDENTIFICATION GUIDELINE

A. Pipe Markers: 3/4 inch diameter and higher.

2.2 IDENTIFICATION APPLICATIONS

A. Piping: Tags and Pipe Markers.

B. Valves: Tags.

2.3 TAGS

A. Metal Tags: Brass with stamped letters; tag size minimum 1-1/2 inch diameter with smooth edges.

B. Valve Tag Chart: Typewritten letter size list in anodized aluminum frame.

2.4 PIPE MARKERS

A. Comply with ASME A13.1.

B. Plastic Pipe Markers: Factory fabricated, flexible, semi- rigid plastic, preformed to fit around pipe or pipe covering; minimum information indicating flow direction arrow and identification of fluid being conveyed.

C. Plastic Tape Pipe Markers: Flexible, vinyl film tape with pressure sensitive adhesive backing and printed markings.

D. Identification Scheme, ASME A13.1:

1. Primary: External Pipe Diameter, Uninsulated or Insulated.

2. Secondary: Color scheme per fluid service.

a. Water; Potable, Cooling, Boiler Feed, and Other: White text on green background.

PART 3 EXECUTION

3.1 PREPARATION

A. Degrease and clean surfaces to receive adhesive for identification materials.

3.2 INSTALLATION

A. Install tags with corrosion resistant chain.

B. Install plastic pipe markers in accordance with manufacturer's instructions.

C. Install plastic tape pipe markers complete around pipe in accordance with manufacturer's instructions.

D. Use tags on piping 3/4 inch diameter and smaller.

1. Identify service, flow direction, and pressure.

2. Install in clear view and align with axis of piping.

3. Locate identification not to exceed 20 feet on straight runs including risers and drops, adjacent to each valve and Tee, at each side of penetration of structure or enclosure, and at each obstruction.

END OF SECTION

SECTION 220719 - PLUMBING PIPING INSULATION

PART 1 GENERAL

1.1 SECTION INCLUDES

A. Piping insulation.

B. Jackets and accessories.

1.2 REFERENCE STANDARDS

A. ANSI/ICC A117.1 - American National Standard for Accessible and Usable Buildings and Facilities; International Code Council; 1998.

B. ASTM C177 - Standard Test Method for Steady-State Heat Flux Measurements and Thermal Transmission Properties by Means of the Guarded-Hot-Plate Apparatus; 2013.

C. ASTM C195 - Standard Specification for Mineral Fiber Thermal Insulating Cement; 2007 (Reapproved 2013).

D. ASTM C449 - Standard Specification for Mineral Fiber Hydraulic-Setting Thermal Insulating and Finishing Cement; 2007 (Reapproved 2013).

E. ASTM C518 - Standard Test Method for Steady-State Thermal Transmission Properties by Means of the Heat Flow Meter Apparatus; 2010.

F. ASTM C547 - Standard Specification for Mineral Fiber Pipe Insulation; 2015.

G. ASTM C795 - Standard Specification for Thermal Insulation for Use in Contact with Austenitic Stainless Steel; 2008 (Reapproved 2013).

H. ASTM E84 - Standard Test Method for Surface Burning Characteristics of Building Materials; 2015a.

I. ASTM E96/E96M - Standard Test Methods for Water Vapor Transmission of Materials; 2014.

J. UL 723 - Standard for Test for Surface Burning Characteristics of Building Materials; Current Edition, Including All Revisions.

1.3 SUBMITTALS

A. Product Data: Provide product description, thermal characteristics, list of materials and thickness for each service, and locations.

B. Manufacturer's Instructions: Indicate installation procedures that ensure acceptable workmanship and installation standards will be achieved.

1.4 QUALITY ASSURANCE

A. Manufacturer Qualifications: Company specializing in manufacturing the Products specified in this section with not less than three years of documented experience.

B. Applicator Qualifications: Company specializing in performing the type of work specified in this section with minimum 3 years of experience.

C. Code Compliance: All insulation products provided on the contract shall be fully in compliance with all material and installation requirements of the New York State Energy Conservation Construction Code, latest addition with all amendments. Insulation products shall meet all "k" values and thicknesses as described in the Code.

1.5 REGULATORY REQUIREMENTS

A. Conform to maximum flame spread/smoke developed rating of 25/50 in accordance with ASTM E 84.

1.6 DELIVERY, STORAGE, AND HANDLING

A. Accept materials on site, labeled with manufacturer's identification, product density, and thickness.

1.7 FIELD CONDITIONS

A. Maintain ambient conditions required by manufacturers of each product.

B. Maintain temperature before, during, and after installation for minimum of 24 hours.

PART 2 PRODUCTS

2.1 REGULATORY REQUIREMENTS

A. Surface Burning Characteristics: Flame spread index/Smoke developed index of 25/50, maximum, when tested in accordance with ASTM E84, UL 723, ASTM E84, or UL 723.

2.2 PLUMBING FIXTURE SAFETY COVERS

A. Provide products that comply with the following:

1. Americans With Disabilities Act (ADA), Article 4.19.4.

2. ANSI/ICC A117.1, American National Standard for Accessible Buildings and Facilities.

3. Requirements of applicable building code.

B. Piping Safety Covers: Truebro Lav-Guard.

1. Characteristics: Three-piece molded assembly, minimum 1/8 inch wall thickness, with internal ribs to provide air space between piping and piping insulation jacket, molded to receive manufacturer's snap-clip fasteners.

2. Vinyl Material: Impact-resistant and stain-resistant molded closed-cell anti-microbial vinyl compound, UV-stable, non-fading, non yellowing; having the following performance characteristics:

    a. Burning Characteristics: 0 seconds Average Time of Burning (ATB), 0 mm Area of Burning (AEB), when tested in accordance with ASTM D 635.

    b. Thermal Conductivity: K-value 1.17, when tested in accordance with ASTM C 177.

    c. Indentation Hardness: 60, minimum, when tested in accordance with ASTM D 2240, using Type A durometer.

3. Trap Assembly Cover: Three-piece assembly, with removable clean-out nut enclosure.

4. Angle Stop Covers: Formed with hinged cap for access to valve without requiring cover removal.

5. Configurations: In accordance with manufacturer's product data for project piping configurations indicated on drawings.

6. Color: China White, gloss finish; paintable.

7. Fasteners: Manufacturer's standard re-usable snap-clip fasteners; wire-tie fasteners not permitted.

C. Lavatory Piping Enclosure: Truebro Lav-Shield.

1. Characteristics: One-piece rigid molded vinyl enclosure, minimum 1/8 inch wall thickness, factory-punched for manufacturer's wall fasteners.

2. Vinyl Material: Impact-resistant and stain-resistant molded closed-cell vinyl, having the following performance characteristics:

    a. Burning Characteristics: 0 seconds Average Time of Burning (ATB), 0 mm Area of Burning (AEB), when tested in accordance with ASTM D 635.

    b. Indentation Hardness: 69, minimum, when tested in accordance with ASTM D 2240, using Type A durometer.

3. Vinyl Color: China White, fine-textured finish; paintable.

4. Fasteners: Manufacturer's standard stainless steel wall fasteners with tamper-resistant heads.

2.3 GLASS FIBER

A. Insulation: ASTM C547and ASTM C795; semi-rigid, noncombustible, end grain adhered to jacket.

1. K Value: ASTM C177, 0.24 at 75 degrees F.

2. Maximum Service Temperature: 650 degrees F.

3. Maximum Moisture Absorption: 0.2 percent by volume.

B. Vapor Barrier Jacket: White Kraft paper with glass fiber yarn, bonded to aluminized film; moisture vapor transmission when tested in accordance with ASTM E96/E96M of 0.02 perm-inches.

C. Tie Wire: 0.048 inch stainless steel with twisted ends on maximum 12 inch centers.

D. Vapor Barrier Lap Adhesive: Compatible with insulation.

E. Insulating Cement/Mastic: ASTM C195; hydraulic setting on mineral wool.

F. Fibrous Glass Fabric:

1. Cloth: Untreated; 9 oz/sq yd weight.

2. Blanket: 1.0 lb/cu ft density.

3. Weave: 5 by 5.

G. Indoor Vapor Barrier Finish:

1. Cloth: Untreated; 9 oz/sq yd weight.

2. Vinyl emulsion type acrylic, compatible with insulation, black color.

H. Insulating Cement: ASTM C449.

2.4 JACKETS

A. PVC Plastic.

1. Jacket: One piece molded type fitting covers and sheet material, off-white color.

a. Minimum Service Temperature: 0 degrees F.

b. Maximum Service Temperature: 150 degrees F.

c. Moisture Vapor Permeability: 0.002 perm inch, maximum, when tested in accordance with ASTM E96/E96M.

d. Thickness: 10 mil.

e. Connections: Brush on welding adhesive.

2. Covering Adhesive Mastic: Compatible with insulation.

PART 3 EXECUTION

3.1 EXAMINATION

A. Verify that piping has been tested before applying insulation materials.

B. Verify that surfaces are clean and dry, with foreign material removed.

C. Verify that piping configurations are correct type for piping cover component configurations specified

3.2 INSTALLATION

A. Install in accordance with manufacturer's instructions.

B. Install in accordance with North American Insulation Manufacturers Association (NAIMA) National Insulation Standards.

C. Exposed Piping: Locate insulation and cover seams in least visible locations.

D. Insulated pipes conveying fluids below ambient temperature: Insulate entire system including fittings, valves, unions, flanges, strainers, flexible connections, and expansion joints.

E. Glass fiber insulated pipes conveying fluids below ambient temperature:

1. Provide vapor barrier jackets, factory-applied or field-applied. Secure with self-sealing longitudinal laps and butt strips with pressure sensitive adhesive. Secure with outward clinch expanding staples and vapor barrier mastic.

2. Insulate fittings, joints, and valves with molded insulation of like material and thickness as adjacent pipe. Finish with glass cloth and vapor barrier adhesive or PVC fitting covers.

F. For hot piping conveying fluids 140 degrees F or less, do not insulate flanges and unions at equipment, but bevel and seal ends of insulation.

G. Glass fiber insulated pipes conveying fluids above ambient temperature:

1. Provide standard jackets, with or without vapor barrier, factory-applied or field-applied. Secure with self-sealing longitudinal laps and butt strips with pressure-sensitive adhesive. Secure with outward clinch expanding staples.

2. Insulate fittings, joints, and valves with insulation of like material and thickness as adjoining pipe. Finish with glass cloth and adhesive or PVC fitting covers.

H. Inserts and Shields:

1. Application: Piping 1-1/2 inches diameter or larger.

2. Shields: Galvanized steel between pipe hangers or pipe hanger rolls and inserts.

3. Insert Location: Between support shield and piping and under the finish jacket.

4. Insert Configuration: Minimum 6 inches long, of same thickness and contour as adjoining insulation; may be factory fabricated.

5. Insert Material: Hydrous calcium silicate insulation or other heavy density insulating material suitable for the planned temperature range.

I. Continue insulation through walls, sleeves, pipe hangers, and other pipe penetrations. Finish at supports, protrusions, and interruptions. At fire separations, see Section 078400.

J. Pipe Exposed in Mechanical Equipment Rooms, Electric rooms and Finished Spaces: Finish with PVC jacket and fitting covers.

3.3 PROTECTION OF INSTALLED PRODUCTS

A. Do not allow damage to installed products by subsequent construction activities; protect products until Substantial Completion.

3.4 SCHEDULES

A. Plumbing Systems

1. Domestic Hot Water Supply:

a. Pipe Sizes 1-1/4 inches and less: 1 inch thick fiberglass.

b. Pipe Sizes 1-1/2 inches and greater: 1-1/2 inch thick fiberglass.

2. Domestic Cold Water:

a. Pipe Sizes 1-1/4 inches and less: 1/2 inch thick fiberglass.

b. Pipe Sizes 1-1/2 inches and greater: 1/2 inch thick fiberglass.

3. Plumbing Vents Within 10 feet of the Exterior: 1 inch thick fiberglass.

4. Lavatories/Sinks: Provide insulation per Part 2.2 of this section.

END OF SECTION

SECTION 221005 - PLUMBING PIPING

PART 1 GENERAL

1.1 SECTION INCLUDES

A. Sanitary waste piping, buried within 5 feet of building.

B. Sanitary waste piping, above grade.

C. Pipe, pipe fittings, specialties, and connections for piping systems.

1. Domestic water.

2. Natural gas piping, above grade.

3. Flanges, unions, and couplings.

4. Pipe hangers and supports.

5. Ball valves.

D. Backfill Materials.

1.2 REFERENCE STANDARDS

A. ASME B16.3 - Malleable Iron Threaded Fittings: Classes 150 and 300; 2011.

B. ASME B16.18 - Cast Copper Alloy Solder Joint Pressure Fittings; 2012.

C. ASME B16.22 - Wrought Copper and Copper Alloy Solder-Joint Pressure Fittings; 2013.

D. ASME B31.1 - Power Piping; 2014.

E. ASME B31.9 - Building Services Piping; 2014.

F. ASME BPVC-IV - Boiler and Pressure Vessel Code, Section IV - Rules for Construction of Heating Boilers; 2015.

G. ASME BPVC-IX - Boiler and Pressure Vessel Code, Section IX - Welding, Brazing, and Fusing Qualifications; 2015.

H. ASTM A53/A53M - Standard Specification for Pipe, Steel, Black and Hot-Dipped, Zinc-Coated, Welded and Seamless; 2012.

I. ASTM B68/B68M - Standard Specification for Seamless Copper Tube, Bright Annealed; 2011.

J. ASTM B 68M - Standard Specification for Seamless Copper Tube, Bright Annealed (Metric); 2011.

K. ASTM B75/B75M - Standard Specification for Seamless Copper Tube; 2011.

L. ASTM B 75M - Standard Specification for Seamless Copper Tube (Metric); 1999 (Reapproved 2005).

M. ASTM B88 - Standard Specification for Seamless Copper Water Tube; 2014.

N. ASTM B88M - Standard Specification for Seamless Copper Water Tube (Metric); 2013.

O. ASTM B813 - Standard Specification for Liquid and Paste Fluxes for Soldering of Copper and Copper Alloy Tube; 2010.

P. ASTM B828 - Standard Practice for Making Capillary Joints by Soldering of Copper and Copper Alloy Tube and Fittings; 2002 (Reapproved 2010).

Q. ASTM D2564 - Standard Specification for Solvent Cements for Poly(Vinyl Chloride) (PVC) Plastic Piping Systems; 2012.

R. ASTM D2665 - Standard Specification for Poly(Vinyl Chloride) (PVC) Plastic Drain, Waste, and Vent Pipe and Fittings; 2014.

S. ASTM D2729 - Standard Specification for Poly(Vinyl Chloride) (PVC) Sewer Pipe and Fittings; 2011.

T. ASTM D2855 - Standard Practice for Making Solvent-Cemented Joints with Poly(Vinyl Chloride) (PVC) Pipe and Fittings; 1996 (Reapproved 2010).

U. ASTM D3034 - Standard Specification for Type PSM Poly(Vinyl Chloride) (PVC) Sewer Pipe and Fittings; 2015.

V. ASTM E84 - Standard Test Method for Surface Burning Characteristics of Building Materials; 2015a.

W. CISPI 310 - Specification for Coupling for Use in Connection with Hubless Cast Iron Soil Pipe and Fittings for Sanitary and Storm Drain, Waste, and Vent Piping Applications; 2011.

X. ICC-ES AC01 - Acceptance Criteria for Expansion Anchors in Masonry Elements; 2012.

Y. ICC-ES AC106 - Acceptance Criteria for Predrilled Fasteners (Screw Anchors) in Masonry Elements; 2012.

Z. ICC-ES AC193 - Acceptance Criteria for Mechanical Anchors in Concrete Elements; 2013.

AA. ICC-ES AC308 - Acceptance Criteria for Post-Installed Adhesive Anchors in Concrete Elements; 2013.

BB. MSS SP-58 - Pipe Hangers and Supports - Materials, Design, Manufacture, Selection, Application, and Installation; 2009.

CC. MSS SP-110 - Ball Valves Threaded, Socket-Welding, Solder Joint, Grooved and Flared Ends; 2010.

DD. NSF 61 - Drinking Water System Components - Health Effects; 2014 (Errata 2015).

EE. NSF 372 - Drinking Water System Components - Lead Content; 2011.

FF. PPI TR-4 - PPI Listing of Hydrostatic Design Basis (HDB), Hydrostatic Design Stress (HDS), Strength Design Basis (SDB), Pressure Design Basis (PDB), and Minimum Required Strength (MRS) Ratings For Thermoplastic Piping Materials or Pipe; 2013.

GG. UL 723 - Standard for Test for Surface Burning Characteristics of Building Materials; Current Edition, Including All Revisions.

1.3 SUBMITTALS

A. Product Data: Provide data on pipe materials, pipe fittings, valves, and accessories. Provide manufacturers catalog information. Indicate valve data and ratings.

B. Sustainable Design Documentation: For soldered copper joints, submit installer's certification that the specified installation method and materials were used.

C. Piping Schedule: Provide schedule of piping applications and materials, indicating piping and fittings.

D. Piping Shop Drawings: Provide drawings of piping installation, indicating dimensioned locations, equipment, critical dimensions, elevations, sizes, systems, and valve locations.

1.4 QUALITY ASSURANCE

A. Perform work in accordance with New York State Building Code.

B. Perform work in accordance with New York State Plumbing Code.

C. Identify pipe with marking including size, ASTM material classification, ASTM specification, potable water certification, water pressure rating.

1.5 DELIVERY, STORAGE, AND HANDLING

A. Accept valves on site in shipping containers with labeling in place. Inspect for damage.

B. Provide temporary protective coating on cast iron and steel valves.

C. Provide temporary end caps and closures on piping and fittings. Maintain in place until installation.

D. Protect piping systems from entry of foreign materials by temporary covers, completing sections of the work, and isolating parts of completed system.

1.6 FIELD CONDITIONS

A. Do not install underground piping when bedding is wet or frozen.

PART 2 PRODUCTS

2.1 GENERAL REQUIREMENTS

A. Potable Water Supply Systems: Provide piping, pipe fittings, and solder and flux (if used), that comply with NSF 61 and NSF 372 for maximum lead content; label pipe and fittings.

B. Plenum-Installed Acid Waste Piping: Flame-spread index equal or below 25 and smoke-spread index equal or below 50 according to ASTM E84 or UL 723 tests.

2.2 SANITARY SEWER PIPING, BURIED WITHIN 5 FEET OF BUILDING

A. Cast Iron Pipe: ASTM A74 service weight.

1. All cast iron soil pipe and fittings shall be marked with the collective trademark of the Cast Iron Soil Pipe Institute (CISPI) and shall be listed by NSF International.

2. Fittings: Cast iron.

3. Joints: Hub-and-spigot, CISPI HSN compression type with ASTM C 564 neoprene gaskets.

B. PVC Pipe: ASTM D2665 or ASTM D3034.

1. Fittings: PVC.

2. Joints: Solvent welded, with ASTM D2564 solvent cement.

2.3 SANITARY SEWER PIPING, ABOVE GRADE

A. Cast Iron Pipe: CISPI 301, hubless, service weight.

1. All cast iron soil pipe and fittings shall be marked with the collective trademark of the Cast Iron Soil Pipe Institute (CISPI) and shall be listed by NSF International.

2. Fittings: Cast iron.

3. Joints: CISPI 310, neoprene gaskets and stainless steel clamp-and-shield assemblies.

B. PVC Pipe: ASTM D2729.

1. Fittings: PVC.

2. Joints: Solvent welded, with ASTM D2564 solvent cement.

2.4 PLUMBING VENT PIPING, ABOVE GRADE

A. Cast Iron Pipe: CISPI 301, hubless, service weight.

1. All cast iron soil pipe and fittings shall be marked with the collective trademark of the Cast Iron Soil Pipe Institute (CISPI) and shall be listed by NSF International.

2. Fittings: Cast iron.

3. Joints: CISPI 310, neoprene gaskets and stainless steel clamp-and-shield assemblies.

B. PVC Pipe: ASTM D 2665.

1. Fittings: PVC.

2. Joints: Solvent welded, with ASTM D 2564 solvent cement.

2.5 DOMESTIC WATER PIPING, ABOVE GRADE

A. Copper Tube for piping 4" and smaller: ASTM B88 (ASTM B88M), Type L (B), Drawn (H).

1. Fittings: ASME B16.18, cast copper alloy or ASME B16.22, wrought copper and bronze.

2. Hydraulic Press Fitting for Copper Tubing.

a. Acceptable Fittings:

1) ProPress by Viega, 301 N. Main, Wichita, KS 67202, (877) 843-4262, www.viega.com. NO SUBSTITUTIONS SHALL BE PERMITTED.

b. Operating Conditions:

1) Maximum Operating Pressure: 200 psi.

2) Operating Temperature Range: 0-250 degrees F.

3) Maximum Test Pressure: 600 psi.

4) Maximum Vacuum: 29.2 inches hg @ 68 degrees F.

c. Features:

1) Fittings: Copper and copper alloy conforming to material requirements of ASME B16.18 or ASME B16.22.

(a) Stainless Steel Grip Ring: Adds strength to the joint without collapsing the interior passageway.

2) No flame for soldering required for installation of fittings and valves.

3) Unpressed connections identified during pressure testing when water flows past sealing element.

4) Sealing Elements: Factory installed, EPDM.

5) Fittings that have been pressed can be rotated. If rotated more than 5 degrees, the fitting must be repressed to restore its resistance to rotational movement.

6) Extended fitting end lead allows for twice the retention grip surface, and assists with proper tube alignment.

7) Soldered adapter fittings are not allowed.

B. All materials used for installation related to the domestic water piping system shall be lead-free, including pipes, pipe fittings, plumbing fittings, and plumbing fixtures and conform to NSF/ANSI Standard 61, NSF/ANSI Standard 61 - Annex G, and NSF/ANSI Standard 372.

2.6 NATURAL GAS PIPING, ABOVE GRADE

A. Steel Pipe: ASTM A53/A53M Schedule 40 black.

1. Fittings:

a. ASME B16.3, malleable iron, or ASTM A234/A234M, wrought steel welding type.

b. Cold Press Mechanical Joint Fittings shall conform to material requirements of ASTM A420 or ASME B16.3 and performance criteria of IAPMO PS117. Sealing elements for press fittings shall be FKM. Sealing elements shall be factory installed or an alternative supplied by fitting manufacturer. Press ends shall have Smart Connect technology design. MegaPress fittings with the Smart Connect technology assure leakage of liquids and/or gases from inside the system past the sealing element of an unpressed connection. The function of this technology is to provide the installer quick and easy identification of connections which have not been pressed prior to putting the system into operation.

2. Joints:

a. NFPA 54, threaded or welded to ASME B31.1 or cold press mechanical joint fittings.

2.7 FLANGES, UNIONS, AND COUPLINGS

A. Unions for Pipe Sizes 3 Inches and Under:

1. Ferrous Pipe: Class 150 malleable iron threaded unions.

2. Copper Tube and Pipe: Class 150 bronze unions with soldered joints.

B. Flanges for Pipe Size Over 1 Inch:

1. Ferrous Pipe: Class 150 malleable iron threaded or forged steel slip-on flanges; preformed neoprene gaskets.

2. Copper Tube and Pipe: Class 150 slip-on bronze flanges; preformed neoprene gaskets.

2.8 PIPE HANGERS AND SUPPORTS

A. Provide hangers and supports that comply with MSS SP-58.

1. If type of hanger or support for a particular situation is not indicated, select appropriate type using MSS SP-58 recommendations.

2. Overhead Supports: Individual steel rod hangers attached to structure or to trapeze hangers.

3. Trapeze Hangers: Welded steel channel frames attached to structure.

4. Vertical Pipe Support: Steel riser clamp.

5. Floor Supports: Concrete pier or steel pedestal with floor flange; fixture attachment.

B. Plumbing Piping - Drain, Waste, and Vent:

1. Hangers for Pipe Sizes 1/2 Inch to 1-1/2 Inches: Malleable iron, adjustable swivel, split ring.

2. Hangers for all pipe sizes: Carbon steel, adjustable, clevis.

3. Hangers for Pipe Sizes 2 Inches and Over: Carbon steel, adjustable, clevis.

4. Wall Support for Pipe Sizes to 3 Inches: Cast iron hook.

5. Wall Support for Pipe Sizes 4 Inches and Over: Welded steel bracket and wrought steel clamp.

6. Floor Support: Cast iron adjustable pipe saddle, lock nut, nipple, floor flange, and concrete pier or steel support.

7. Copper Pipe Support: Carbon steel ring, adjustable, copper plated.

C. Plumbing Piping - Water:

1. Hangers for Pipe Sizes 1/2 Inch to 1-1/2 Inches: Malleable iron, adjustable swivel, split ring.

2. Hangers for Cold Pipe Sizes 2 Inches and Over: Carbon steel, adjustable, clevis.

3. Hangers for Hot Pipe Sizes 2 Inches to 4 Inches: Carbon steel, adjustable, clevis.

4. Wall Support for Pipe Sizes to 3 Inches: Cast iron hook.

5. Wall Support for Pipe Sizes 4 Inches and Over: Welded steel bracket and wrought steel clamp.

6. Floor Support for Cold Pipe: Cast iron adjustable pipe saddle, lock nut, nipple, floor flange, and concrete pier or steel support.

7. Floor Support for Hot Pipe Sizes to 4 Inches: Cast iron adjustable pipe saddle, locknut, nipple, floor flange, and concrete pier or steel support.

8. Copper Pipe Support: Carbon steel ring, adjustable, copper plated.

2.9 BALL VALVES

A. 2-inch and smaller: 2-piece, full port, bronze:

1. Body: ASTM B-124 brass.

2. Body End Piece: ASTM B-124 brass.

3. Ball: Chrome plated ASTM B-584 cast red bronze.

4. Seat Ring: Reinforced TFE.

5. Packing: TFE.

6. Stem: ASTM B-371 silicon bronze.

7. Ends: Soldered or hydraulic press.

B. All materials used for installation related to the domestic water piping system shall be lead-free, including pipes, pipe fittings, plumbing fittings, and plumbing fixtures and conform to NSF/ANSI Standard 61, NSF/ANSI Standard 61 - Annex G, and NSF/ANSI Standard 372.

2.10 BACKFILL MATERIALS

A. Select Fill:

1. Select fill shall be crushed stone, crushed gravel, or run of bank gravel that is free of clay, organics, snow, ice and friable or deleterious particles and meet the requirements of NYSDOT Standard Specifications, Select Fill, Item 203.06, having the following gradation requirements:

a. Sieve Size:

1) 4": 100 percent finer by weight.

2) No. 40: 0-70 percent finer by weight.

3) No; 200: 0-15 percent finer by weight.

PART 3 EXECUTION

3.1 EXAMINATION

A. Verify that excavations are to required grade, dry, and not over-excavated.

3.2 PREPARATION

A. Remove scale and dirt, on inside and outside, before assembly.

B. Prepare piping connections to equipment with flanges or unions.

3.3 EARTH EXCAVATION

A. All excavation work shall be executed to the lines and grades shown on the Drawings or as required to install the services as indicated on the drawings, unless directed otherwise by the Owner's Representative. All excavation shall be performed in such a manner as to minimize disturbance and maintain stability of subgrade soils and slopes. Special care shall be taken not to disturb the bottom of excavations and proposed bearing elevations and surfaces. Excavation to the final subgrade levels must be done by methods that minimize traffic on or disturbance to the subgrade.

B. The excavation equipment must be of such size and capacity sufficient to excavate the materials encountered and to the specified depths as shown.

C. The Contractor shall be responsible at all times for safe and prudent excavation operations so as to protect the workmen, utilities, structures, and adjacent property. The Contractor shall perform all excavation in accordance with OSHA standards. The Contractor shall observe all applicable local, state and federal requirements and acquire all necessary permits.

D. The Contractor shall bench or cut back excavated slopes, dewater and sheet, as necessary for stability, safety and protection of adjacent utilities, structures, and properties.

E. Subgrades and slopes which have been damaged or degraded as a result of Contractor's activities, or failure of the Contractor to properly protect them shall be repaired at the Contractor's expense as directed by the Owner's Representative.

F. Subgrades in which soft or unsuitable materials are encountered which are not a result of Contractor's operations or failure to protect subgrades shall be undercut and backfilled with appropriate fill as directed by the Owner's Representative.

G. All subgrades will be monitored and tested as determined necessary by the Owner's Representative. The Contractor, at the direction of the Owner's Representative, shall be required to proof roll subgrades. All proof rolling, if required, shall be done in the presence of the Owner's Representative.

H. No materials or fill shall be placed by the Contractor until the subgrades are observed and tested by the Owner's Representative.

3.4 FILLING AND BACKFILLING

A. The Contractor shall not place fill or backfill until underlying subgrades have been observed and tested as required by the Owner's Representative.

B. Materials shall be placed at the locations shown on the Drawings, and as directed by the Owner's Representative

C. Delivery and compaction of materials shall be made during the presence of the Owner's Representative and shall be subject to its review. This inspection by no means absolves the Contractor from responsibility to properly compact and test as specified.

D. Acceptance and/or rejection of materials placed and compacted shall be based upon in-place density test result requirements and other requirements as stated in these specifications.

E. Placement and Compaction:

1. Select fill shall be placed in maximum loose lift thicknesses of 9-inches. Select fill shall be compacted to a minimum of 95 percent of the maximum Modified Proctor density as determined by ASTM D1557.

2. Equipment used to compact select fill must be compatible with the material type, lift thickness, and constraints posed by size and configuration of excavated area being filled.

3.5 INSTALLATION

A. Install in accordance with manufacturer's instructions.

B. Provide non-conducting dielectric connections wherever jointing dissimilar metals.

C. Route piping in orderly manner and maintain gradient. Route parallel and perpendicular to walls.

D. Install piping to maintain headroom, conserve space, and not interfere with use of space.

E. Group piping whenever practical at common elevations.

F. Provide clearance in hangers and from structure and other equipment for installation of insulation and access to valves and fittings.

G. Provide access where valves and fittings are not exposed.

H. Install bell and spigot pipe with bell end upstream.

I. Provide rigid sway bracing at changes in direction greater than 45 degrees for pipe sizes 4 inches and larger.

J. Provide cleanouts at base of all vertical storm and sanitary risers.

K. Install valves with stems upright or horizontal, not inverted. See Section 220523.

L. Install water piping to ASME B31.9.

M. Copper Pipe and Tube: Make soldered joints in accordance with ASTM B828, using specified solder, and flux meeting ASTM B813; in potable water systems use flux also complying with NSF 61 and NSF 372.

N. PVC and CPVC Pipe: Make solvent-welded joints in accordance with ASTM D 2855.

O. Sleeve pipes passing through partitions, walls, and floors.

P. Inserts:

1. Provide inserts for placement in concrete formwork.

2. Provide inserts for suspending hangers from reinforced concrete slabs and sides of reinforced concrete beams.

3. Provide hooked rod to concrete reinforcement section for inserts carrying pipe over 4 inches.

4. Where concrete slabs form finished ceiling, locate inserts flush with slab surface.

5. Where inserts are omitted, drill through concrete slab from below and provide through-bolt with recessed square steel plate and nut above slab.

Q. Pipe Hangers and Supports:

1. Install in accordance with ASME B31.9.

2. Support horizontal piping as indicated.

3. Install hangers to provide minimum 1/2 inch space between finished covering and adjacent work.

4. Place hangers within 12 inches of each horizontal elbow.

5. Provide hanger below each P-trap on storm and sanitary piping systems.

6. Use hangers with 1-1/2 inch minimum vertical adjustment. Design hangers for pipe movement without disengagement of supported pipe.

7. Support vertical piping at every floor. Support riser piping independently of connected horizontal piping.

8. Where several pipes can be installed in parallel and at same elevation, provide multiple or trapeze hangers.

9. Provide copper plated hangers and supports for copper piping.

R. When installing more than one piping system material, ensure system components are compatible and joined to ensure the integrity of the system. Provide necessary joining fittings. Ensure flanges, union, and couplings for servicing are consistently provided.

3.6 EXCAVATING

A. Excavate to accommodate construction operations.

B. Notify Engineer of unexpected subsurface conditions and discontinue affected Work in area until notified to resume work.

C. Slope banks of excavations deeper than 4 feet to angle of repose or less until shored.

D. Do not interfere with 45 degree bearing splay of foundations.

E. Cut utility trenches wide enough to allow inspection of installed utilities.

F. Hand trim excavations. Remove loose matter.

G. Correct areas that are over-excavated and load-bearing surfaces that are disturbed.

H. Grade top perimeter of excavation to prevent surface water from draining into excavation.

I. Remove excavated material that is unsuitable for re-use from site.

J. Stockpile excavated material to be re-used in area designated on site .

K. Remove excess excavated material from site.

3.7 FILLING

A. Fill to contours and elevations indicated or required using unfrozen materials.

B. Fill up to finish grade elevations unless otherwise indicated.

C. Employ a placement method that does not disturb or damage other work.

D. Systematically fill to allow maximum time for natural settlement. Do not fill over porous, wet, frozen or spongy subgrade surfaces.

E. Maintain optimum moisture content of fill materials to attain required compaction density.

F. Soil Fill: Place and compact material in equal continuous layers not exceeding 12 inches compacted depth.

G. Correct areas that are over-excavated.

1. Other areas: Use general fill, flush to required elevation, compacted to minimum 97 percent of maximum dry density.

H. Reshape and re-compact fills subjected to vehicular traffic.

3.8 APPLICATION

A. Install unions downstream of valves and at equipment or apparatus connections.

B. Install ball valves for shut-off and to isolate equipment, part of systems, or vertical risers.

3.9 TOLERANCES

A. Drainage Piping: Establish invert elevations within 1/2 inch vertically of location indicated and slope to drain at minimum of 1/4 inch per foot slope for 3 inch and larger, 1/4 inch per foot slope for sizes smaller than 3 inch.

3.10 FIELD TESTS AND INSPECTIONS

A. Verify and inspect systems according to requirements by the Authority Having Jurisdiction. In the absence of specific test and inspection procedures proceed as indicated below.

B. Test Results: Document and certify successful results, otherwise repair, document, and retest.

3.11 DISINFECTION OF DOMESTIC WATER PIPING SYSTEM

A. Prior to starting work, verify system is complete, flushed, and clean.

B. Ensure acidity (pH) of water to be treated is between 7.4 and 7.6 by adding alkali (caustic soda or soda ash) or acid (hydrochloric).

C. Inject disinfectant, free chlorine in liquid, powder, tablet or gas form, throughout system to obtain 50 to 80 mg/L residual.

D. Bleed water from outlets to ensure distribution and test for disinfectant residual at minimum 15 percent of outlets.

E. Maintain disinfectant in system for 24 hours.

F. If final disinfectant residual tests less than 25 mg/L, repeat treatment.

G. Flush disinfectant from system until residual equal to that of incoming water or 1.0 mg/L.

H. Take samples no sooner than 24 hours after flushing, from 10 percent of outlets and from water entry, and analyze in accordance with AWWA C651.

3.12 FLUSHING AND DISINFECTING POTABLE WATER SYSTEMS

A. Flushing: The water service piping and distribution piping to all fixtures and outlets shall be flushed until the water runs clear and free of debris or particles. Faucet aerators or screens shall be removed during the flushing operations.

B. Disinfecting:

1. The water service piping and the hot and cold water distribution piping shall be disinfected after flushing and prior to use. The procedure used shall be as follows, or an approved equivalent:

a. All water outlets shall be posted to warn against use during disinfecting operations.

b. Disinfecting shall be performed by persons experienced in such work.

c. The water supply to the piping system or parts thereof being disinfected shall be valved-off from the normal water source to prevent the introduction of disinfecting agents into the well storage tank or portions of a system that are not being disinfected.

d. The piping shall be disinfected with a water-chlorine solution. During the injection of the disinfecting agent into the piping, each outlet shall be fully opened several times until a concentration of not less than 50 parts per million chlorine is present at every outlet. The solution shall be allowed to stand in the piping for at least 24 hours.

e. An acceptable alternate to the 50 ppm/24 hour procedure described above shall be to maintain a level of not less than 200 parts per million chlorine for not less than three hours. If this alternate procedure is used, the heavily concentrated chlorine shall not be allowed to stand in the piping system for more than 6 hours. Also, special procedures shall be used to dispose of the heavily concentrated chlorine in an environmentally acceptable and approved manner.

f. At the end of the required retention time, the residual level of chlorine at every outlet shall be not less than five parts per million. If the residual is less than five parts per million, the disinfecting procedure shall be repeated until the required minimum chlorine residual is obtained at every outlet.

g. After the required residual chlorine level is obtained at every outlet, the system shall be flushed to remove the disinfecting agent. Flushing shall continue until the chlorine level at every outlet is reduced to that of the incoming water supply.

h. Any faucet aerators or screens that were removed shall be reinstalled.

i. A certification of performance and laboratory test report showing the absence of coliform organisms shall be submitted to the Authority Having Jurisdiction upon satisfactory completion of the disinfecting operations.

2. The disinfecting procedures shall meet or exceed the requirements set forth in the American Water Works Association Standard C651-92, Disinfection of Water Mains.

3.13 TESTING OF DOMESTIC WATER PIPING

A. Preparation for Testing: Prepare piping as follows:

1. Leave joints uninsulated and exposed for examination during the test.

2. Flush system with clean water. Clean strainers.

3. Isolate equipment that is not to be subjected to the test pressure from the piping. If a valve is used to isolate the equipment, its closure shall be capable of sealing against the test pressure without damage to the valve.

4. Install relief valve set at a pressure no more than 1/3 higher than the test pressure, to protect against damage by expansion of liquid or other source of overpressure during the test.

B. Testing: Test domestic water piping as follows:

1. Leave joints uninsulated and exposed for examination during the test.

2. Test piping in accordance with New York State Building Code.

3. Test water service pipes and rough piping installations prior to covering or concealment.

4. Use ambient temperature water as the testing medium, except where there is a risk of damage due to freezing. Another liquid may be used if it is safe for the workmen and compatible with the piping system components.

5. Use vents installed at high points in the system to release trapped air while filling the system. Use drains installed at low points in the system for complete removal of the test liquid.

6. Examine system to ensure that equipment and components that cannot withstand test pressures are properly isolated. Examine test equipment to ensure tight connection and that low pressure filling lines have been disconnected.

7. Upon completion of a section of or the entire water supply system, the system, or portion completed, shall be tested and proved tight under a water pressure not less than the working pressure of the system; or by an air test of not less than 50 psi (344 kPa). The water utilized for tests shall be obtained from a potable source of supply. Isolate the system expansion tank from the tested system for the hydrostatic system

test. Isolate building plumbing fixtures from the tested system for the hydrostatic system test.

8. After the test pressure has been applied for at least 10 minutes, examine piping, joints, and connections for leakage. Eliminate leaks by tightening, repairing, or replacing components as appropriate, and repeat hydrostatic test until there are no leaks.

C. Testing: Test all Domestic Water connected Plumbing Fixtures as follows:

1. Prior to construction closeout, a lead test shall be done to the domestic water plumbing fixtures in accordance with the New York State Department of Health Codes, Rules and Regulations chapter 10 volume A-1a, subchapter G, Part 67. Draw samples shall be collected from all outlets, as defined in Subpart 67-4. Draw sample volume shall be 250 milliliters (mL), collected from each cold water outlet before any water is used. The water shall be motionless in the pipes for a minimum of 8 hours, but not more than 18 hours, before sample collection.

2. All draw samples shall be analyzed by a laboratory approved to perform such analyses by the New York State Department's Environmental Laboratory Approval Program (ELAP). A copy of the results shall be handed over the school's representative as well as included in any closeout documentation to the New York State Education Department.

3.14 TESTING DRAINAGE, WASTE AND VENT PIPING

A. Provide testing of the drainage, waste and vent piping of either air or water testing, as described below.

B. Preparation for Testing: Prepare piping as follows:

1. Leave joints uninsulated and exposed for examination during the test.

C. Test drainage, waste and vent piping as follows:

1. Test piping with either a water test in accordance with New York State Building Code, and as follows:

a. A water test shall be applied to the drainage system either in its entirety or in sections. If applied to the entire system, all openings in the piping shall be tightly closed, except the highest opening, and the system shall be filled with water to point of overflow. If the system is tested in sections, each opening shall be tightly plugged except the highest openings of the section under test, and each section shall be filled with water, but no section shall be tested with less than a 10-foot (3048 mm) head of water. In testing successive sections, at least the upper 10 feet (3048 mm) of the next preceding section shall be tested so that no joint or pipe in the building, except the uppermost 10 feet (3048 mm) of the system, shall have been submitted to a test of less than a 10-foot (3048 mm) head of water. The water shall be kept in the system, or in the portion

under test, for at least 15 minutes before inspection starts. The system shall then be tight at all points.

D. Completed sanitary drainage and vent systems:

1. After all plumbing fixtures have been installed and all traps have been filed with water, every part of the sanitary drainage and vent systems within the building walls shall be subjected to a final test as prescribed herein. For the duration of testing, flow of water in the system shall be halted and the building drain shall be sealed adjacent to its point of entry inside the building. If requested by the authority of jurisdiction, remove any cleanout plugs to ascertain that the testing is effective in all parts of the system.

2. The final test of the completed drainage and vent system shall be visual and in sufficient detail to determine compliance with the provisions of this code except that the plumbing shall be subjected to a smoke test where necessary for cause. Where the smoke test is utilized, it shall be made by filling all traps with water and then introducing into the entire system a pungent, thick smoke produced by one or more smoke machines. When the smoke appears at stack openings on the roof, the stack openings shall be closed and a pressure equivalent to a 1-inch water column (248.8 Pa) shall be maintained for 15 minutes before inspection starts.

3.15 TESTING OF DRAINAGE AND VENT SYSTEMS

A. Rough Plumbing:

1. Except for outside leaders and perforated or open jointed drain tile, the piping of plumbing drainage and venting systems shall be tested upon completion of the rough piping installation by water or air and proved watertight. The Authority Having Jurisdiction may require the removal of any cleanout plugs to ascertain if the pressure has reached all parts of the system. The following test method shall be used:

a. The water test shall be applied to the drainage system either in its entirety or in sections after rough piping has been installed. If applied to the entire system, all openings in the piping shall be tightly closed, except the highest opening, and the system filled with water to point of overflow. If the system is tested in sections, each opening shall be tightly plugged except the highest opening of the section under test, and each section shall be filled with water, but no section shall be tested with less than a 10-foot head of water. In testing successive sections at least the upper 10 feet of the next preceding section shall be tested, so that no joint or pipe in the building (except the uppermost 10 feet of the system) shall have been submitted to a test of less than 10-foot head of water. The water shall be kept in the system or in the portion under test for at least 15 minutes before inspection starts; the system shall then be tight at all points.

B. Finished Plumbing

1. When the rough plumbing has been tested in accordance with the paragraphs above, a final test of the finished plumbing system may be required to insure that the final fixture connections to the drainage system are gas-tight.

2. After the plumbing fixtures have been set and their traps filled with water, their connections shall be tested and proved gas and watertight. A final smoke or peppermint test shall b required, except in the case of a previous or site-inspected water or air tested system. If a smoke or peppermint test is required, the following test methods shall be employed:

    a. A smoke test shall be made by filling all traps with water and then re introducing into the entire system a pungent, thick smoke produced by one or more smoke machines. When the smoke appears at stack openings on the roof, they shall be closed and a pressure equivalent to a one-inch water column shall be developed and maintained for the period of the inspection.

    b. Where the Authority Having Jurisdiction, due to practical difficulties or hardships, finds that a smoke test cannot be performed, a peppermint test shall be substituted in lieu thereof. Such peppermint test shall be conducted by the introduction of two ounces of oil of peppermint into the roof terminal of every line or stack to be tested. The oil of peppermint shall be followed at once by ten quarts of hot (140 degrees F) water whereupon all roof vent terminals shall be sealed. A positive test, which reveals leakage, shall be the detection of the odor of peppermint at any trap or other point on the system. Oil of peppermint or person or clothes have come in contact with oil of peppermint shall be excluded from the test area.

3.16 INSPECTION, TESTING AND PURGING OF NATURAL GAS PIPING

A. General: Prior to acceptance and initial operation, all piping installations shall be inspected and pressure tested to determine that the materials, design, fabrication, and installation practices comply with the requirements of authority having jurisdiction.

1. Inspections: Inspection shall consist of visual examination, during or after manufacture, fabrication, assembly, or pressure tests as appropriate. Supplementary types of nondestructive inspection techniques, such as magnetic-particle, radiographic, ultrasonic, etc., shall not be required unless specifically listed herein or in the engineering design.

2. Repairs and additions: In the event repairs or additions are made following the pressure test, the affected piping shall be tested.

    a. EXCEPTION: Minor repairs or additions, provided the work is inspected and connections are tested with a noncorrosive leak-detecting fluid.

3. Section testing: A piping system shall be permitted to be tested as a complete unit or in sections. Under no circumstances shall a valve in a line be used as a bulkhead between gas in one section of the piping system and test medium in an adjacent

section, unless two valves are installed in series with a valved "telltale" located between these valves. A valve shall not be subjected to the test pressure unless it can be determined that the valve, including the valve closing mechanism, is designed to safely withstand the test pressure.

4. Regulators and valve assemblies. Regulator and valve assemblies fabricated independently of the piping system in which they are to be installed shall be permitted to be tested with inert gas or air at the time of fabrication.

B. Test medium: The test medium shall be air or an inert gas. Oxygen shall not be used.

C. Test preparation: Pipe joints, including welds, shall be left exposed for examination during the test. If the pipe end joints have been previously tested in accordance with this section, they shall be permitted to be covered or concealed.

1. Expansion joints: Expansion joints shall be provided with temporary restraints, if required, for the additional thrust load under test.

2. Equipment isolation: Equipment that is not to be included in the test shall be either disconnected from the piping or isolated by blanks, blind flanges, or caps. Flanged joints at which blinds are inserted to blank off other equipment during the test shall not be required to be tested.

3. Equipment disconnection: Where the piping system is connected to equipment or components designed for operating pressures of less than the test pressure, such equipment or equipment components shall be isolated from the piping system by disconnecting them and capping the outlet(s).

4. Valve isolation: Where the piping system is connected to equipment or components designed for operating pressures equal to or greater than the test pressure, such equipment shall be isolated from the piping system by closing the individual equipment shutoff valve(s).

5. Testing precautions: All testing of piping systems shall be done with due regard for the safety of employees and the public during the test. Bulkheads, anchorage, and bracing suitably designed to resist test pressures shall be installed if necessary. Prior to testing, the interior of the pipe shall be cleared of all foreign material.

D. Test Pressure measurement: Test pressure shall be measured with a manometer or with a pressure measuring device designed and calibrated to read, record, or indicate a pressure loss due to leakage during the pressure test period. The source of pressure shall be isolated before the pressure tests are made.

1. Test pressure: The test pressure to be used shall be no less than 1-1/2 times the proposed maximum working pressure, but not less than 3 psig (20 kPa gauge), irrespective of design pressure. Where the test pressure exceeds 125 psig (862 kPa

gauge), the test pressure shall not exceed a value that produces a hoop stress in the piping greater than 50 percent of the specified minimum yield strength of the pipe.

2. Test duration: Test duration shall be not less than 1/2 hour for each 500 cubic feet (14 m3) of pipe volume or fraction thereof. When testing a system having a volume less than 10 cubic feet (0.28 m3) or a system in a single-family dwelling, the test duration shall be permitted to be reduced to 10 minutes. For piping systems having a volume of more than 24,000 cubic feet (680 m3), the duration of the test shall not be required to exceed 24 hours.

E. Detection of leaks and defects: The piping system shall withstand the test pressure specified without showing any evidence of leakage or other defects. Any reduction of test pressures as indicated by pressure gages shall be deemed to indicate the presence of a leak unless such reduction can be readily attributed to some other cause.

1. Detection methods: The leakage shall be located by means of an approved combustible gas detector, a noncorrosive leak detection fluid, or an equivalent nonflammable solution. Matches, candles, open flames, or other methods that could provide a source of ignition shall not be used.

2. Corrections: Where leakage or other defects are located, the affected portion of the piping system shall be repaired or replaced and retested.

F. System and equipment leakage test: Leakage testing of systems and equipment shall be in accordance with the following:

1. Test gases: Fuel gas shall be permitted to be used for leak checks in piping systems that have been tested in accordance with requirements of this section.

2. Before turning gas on: Before gas is introduced into a system of new gas piping, the entire system shall be inspected to determine that there are no open fittings or ends and that all manual valves at outlets on equipment are closed and all unused valves at outlets are closed and plugged or capped.

3. Test for leakage: Immediately after the gas is turned on into a new system or into a system that has been initially restored after an interruption of service, the piping system shall be tested for leakage. If leakage is indicated, the gas supply shall be shut off until the necessary repairs have been made.

4. Placing equipment in operation: Gas utilization equipment shall be permitted to be placed in operation after the piping system has been tested and determined to be free of leakage and purged in accordance with the following table:

Nominal Pipe Size (inches)	Length of Piping Requiring Purging
3	> 30 feet
4	> 15 feet
6	> 10 feet

8 or larger	Any length

G. Purging: Purging of piping shall comply with the following:

1. Removal from service: Where gas piping is to be opened for servicing, addition, or modification, the section to be worked on shall be turned off from the gas supply at the nearest convenient point, and the line pressure vented to the outdoors, or to ventilated areas of sufficient size to prevent accumulation of flammable mixtures.

2. The remaining gas in this section of pipe shall be displaced with an inert gas as required by the following table:

Nominal Pipe Size (inches)	Length of Piping Requiring Purging
2-1/2	> 50 feet
3	> 30 feet
4	> 15 feet
6	> 10 feet
8 or larger	Any length

3. Placing in operation: Where piping full of air is placed in operation, the air in the piping shall be displaced with fuel gas, provided the piping does not exceed the length shown in the table below. The air can be safely displaced with fuel gas provided that a moderately rapid and continuous flow of fuel gas is introduced at one end of the line and air is vented out at the other end. The fuel gas flow shall be continued without interruption until the vented gas is free of air. The point of discharge shall not be left unattended during purging. After purging, the vent shall then be closed. Where required by the table below, the air in the piping shall first be displaced with an inert gas, and the inert gas shall then be displaced with fuel gas:

Nominal Pipe Size (inches)	Length of Piping Requiring Purging
3	> 30 feet
4	>15 feet
6	>10 feet
8 or larger	Any length

4. Discharge of purged gases: The open end of piping systems being purged shall not discharge into confined spaces or areas where there are sources of ignition unless precautions are taken to perform this operation in a safe manner by ventilation of the space, control of purging rate, and elimination of all hazardous conditions.

5. Placing equipment in operation: After the piping has been placed in operation, all equipment shall be purged and then placed in operation, as necessary.

3.17 VALVE INSTALLATIONS

A. General Application: Use ball valves for shut-off duty; ball for throttling duty. Refer to piping system specification sections for specific valve applications and arrangements.

B. Locate valves for easy access and provide separate support where necessary.

C. Install valves and unions for each item of equipment arranged to allow equipment removal without system shutdown. Unions are not required on flanged devices.

D. Install valves in horizontal piping with stem at or above the center of the pipe.

E. Install valves in a position to allow full stem movement.

3.18 SOLDER CONNECTIONS

A. Cut tube square and to exact lengths.

B. Clean end of tube to depth of valve socket with steel wool, sand cloth, or a steel wire brush to a bright finish. Clean valve socket in the same manner.

C. Apply a proper soldering flux in an even coat to inside of valve socket and outside of tube.

D. Insert tube into valve socket, making sure the end rests against the shoulder inside valve. Rotate valve or tube slightly to ensure even distribution of the flux.

E. Apply heat evenly to outside of valve around joint until solder will melt upon contact. Feed solder until it completely fills the joint around the tube. Avoid hot spots or overheating valve. Once the solder starts cooling, remove excess amounts around the joint with a cloth or brush.

3.19 THREADED CONNECTIONS

A. Note the internal length of threads in valve ends, and proximity of valve internal seat or wall, to determine how far pipe should be threaded into valve.

B. Align threads at point of assembly.

C. Apply appropriate tape or thread compound to the external pipe threads (except where dry seal threading is specified).

D. Assemble joint, wrench tight. Wrench on valve shall be on the valve end into which the pipe is being threaded.

3.20 PRESS FITTING CONNECTIONS FOR DOMESTIC WATER PIPING

A. Press connections: Copper and copper alloy press connections shall be made in accordance with the manufacturer’s installation instructions. The tubing shall be fully inserted into the fitting and the tubing marked at the shoulder of the fitting. The fitting alignment shall be checked against the mark on the tubing to assure the tubing is fully engaged (inserted) in the fitting. The joints shall be pressed using the tool(s) approved by the manufacturer.

3.21 FLANGED CONNECTIONS

A. Align flange surfaces parallel.

B. Assemble joints by sequencing bolt tightening to make initial contact of flanges and gaskets as flat and parallel as possible. Use suitable lubricants on bolt threads. Tighten bolts gradually and uniformly with a torque wrench.

3.22 SCHEDULES

A. Pipe Hanger Spacing:

1. Cast Iron Piping: 5 feet maximum horizontal spacing, 15 feet maximum vertical spacing. Where 10 foot lengths of cast iron piping are installed, maximum horizontal spacing may be increased to 10 feet. All cast iron joints shall be supported.

2. Copper Piping:

a. 1-1/4 inch diameter and smaller: 6 feet maximum horizontal spacing, 10 feet maximum vertical spacing.

b. 1-1/2 inch diameter and larger: 10 feet maximum horizontal spacing, 10 feet maximum vertical spacing.

3. PVC Pipe or Tubing: 4 feet maximum horizontal spacing, 10 feet maximum vertical spacing.

END OF SECTION

SECTION 221006 - PLUMBING PIPING SPECIALTIES

PART 1 GENERAL

1.1 SECTION INCLUDES

A. Floor Drains.

B. Cleanouts.

C. Water hammer arrestors.

D. Mixing valves.

E. Floor drain trap seals.

1.2 REFERENCE STANDARDS

A. ADA Standards - Americans with Disabilities Act (ADA) Standards for Accessible Design; 2010.

B. ASME A112.6.3 - Floor and Trench Drains; 2001 (R2007).

C. ASME A112.21.2M - Roof Drains; The American Society of Mechanical Engineers; 1983.

D. ASSE 1011 - Hose Connection Vacuum Breakers; 2004.

E. NEMA MG 1 - Motors and Generators; 2014.

F. NSF 2 - Food Equipment; 2014.

G. NSF 61 - Drinking Water System Components - Health Effects; 2014 (Errata 2015).

H. NSF 372 - Drinking Water System Components - Lead Content; 2011.

1.3 SUBMITTALS

A. Product Data: Provide component sizes, rough-in requirements, service sizes, and finishes.

B. Sustainable Design Documentation: Submit appropriate evidence that materials used in potable water systems comply with the specified requirements.

C. Shop Drawings: Indicate dimensions, weights, and placement of openings and holes.

D. Manufacturer's Instructions: Indicate Manufacturer's Installation Instructions: Indicate assembly and support requirements.

E. Sustainable Design Documentation: Submit appropriate evidence that materials used in potable water systems comply with the specified requirements.

F. Maintenance Data: Include installation instructions, spare parts lists, exploded assembly views.

1.4 QUALITY ASSURANCE

A. Manufacturer Qualifications: Company specializing in manufacturing the Products specified in this section with not less than three years documented experience.

PART 2 PRODUCTS

2.1 GENERAL REQUIREMENTS

A. Specialties in Potable Water Supply Systems: Provide products that comply with NSF 61 and NSF 372 for maximum lead content.

2.2 DRAINS

A. Floor Drain:

1. ASME A112.6.3; lacquered cast iron or stainless steel, two piece body with double drainage flange, weep holes, reversible clamping collar, and round, adjustable nickel-bronze strainer.

2.3 CLEANOUTS

A. Round Cleanouts at Interior Finished Floor Areas (DPCO):

1. Cast iron body with nickel bronze top, gasket seal, caulked outlet.

B. Cleanouts at Interior Finished Wall Areas (WCO):

1. Line type with lacquered cast iron body and round epoxy coated gasketed cover, and round stainless steel access cover secured with machine screw.

C. Cleanouts at Interior Unfinished Accessible Areas (CO): Calked or threaded type. Provide bolted stack cleanouts on vertical rainwater leaders.

2.4 WATER HAMMER ARRESTORS

A. Water Hammer Arrestors:

1. Stainless steel construction, bellows type sized in accordance with PDI-WH 201, precharged suitable for operation in temperature range minus 100 to 300 degrees F and maximum 250 psi working pressure.

2.5 MIXING VALVES

A. Point of Use, Fixture Thermostatic Mixing Valves

1. A Thermostatic Mixing Valve shall be installed on the hot water supply to the specified fixtures. The valve shall be ASSE Standard 1070 and IAPMO cUPC listed and control the temperature of the hot water. It shall have a Lead Free brass 4-port, “H” pattern body. Lead Free under counter thermostatic valves shall comply with state codes and standards, where applicable, requiring reduced lead content. The valve shall include integral check valves, integral screens and an adjustment nut with locking feature. The valve shall be provided with 3/8" (10mm) male compression or Quickconnect fittings.

2. The thermostatic mixing valves shall maintain and limit hot water to desired selectable temperature between 80°F and 110°F (27°C and 49°C) with flow rates as low as 0.25 gpm and as high as 2.25 gpm.

    a. For point of use mixing valves serving elementary schools, set outlet temperature to 100 degrees F.

3. Shall incorporate dual check valves to protect against cross-flow and integral screens to filter out debris.

    a. Lead Free Brass body construction.

    b. Shall Install easily between the stop valves and faucet.

    c. Shall Include tamper resistant locking nut to prevent accidental mis-adjustment.

    d. Built-in check valves shall prevent migration of hot water to cold and cold water to hot water piping.

    e. Shall be provided with cap for three port application.

    f. Provide with Integral strainer with 40 mesh stainless steel screens to filter out debris.

2.6 FLOOR DRAIN TRAP SEALS

A. Description: Push-fit EPDM or silicone fitting with a one-way membrane.

PART 3 EXECUTION

3.1 INSTALLATION

A. Install in accordance with manufacturer's instructions.

B. Extend cleanouts to finished floor or wall surface. Lubricate threaded cleanout plugs with mixture of graphite and linseed oil. Ensure clearance at cleanout for rodding of drainage system.

C. Install floor cleanouts at elevation to accommodate finished floor.

D. Install water hammer arrestors complete with accessible isolation valve on hot and cold water supply piping to lavatory sinks or water closets and urinals.

END OF SECTION

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SECTION 224000 - PLUMBING FIXTURES

PART 1 GENERAL

1.1 SECTION INCLUDES

A. Dual flush water closets.

B. Urinals.

C. Lavatories.

D. Sinks.

E. Fixture Sealant.

1.2 REFERENCE STANDARDS

A. ADA Standards - Americans with Disabilities Act (ADA) Standards for Accessible Design; 2010.

B. ASHRAE Std 18 - Methods of Testing for Rating Drinking-Water Coolers with Self-Contained Mechanical Refrigeration.; 2008.

C. ASME A112.6.1M - Supports for Off-the-Floor Plumbing Fixtures for Public Use; 1997 (Reaffirmed 2002).

D. ASME A112.18.1 - Plumbing Supply Fittings; 2012.

E. ASME A112.19.1 - Enamelled Cast Iron and Enamelled Steel Plumbing Fixtures; 2013.

F. ASME A112.19.2 - Ceramic Plumbing Fixtures; 2013.

G. ASME A112.19.4M - Porcelain Enameled Formed Steel Plumbing Fixtures; 1994 (R2004).

H. ASME A112.19.5 - Flush Valves and Spuds for Water Closets, Urinals, and Tanks; 2011.

I. ASSE 1070 - Performance Requirements for Water Temperature Limiting Devices; 2004.

J. ASTM E84 - Standard Test Method for Surface Burning Characteristics of Building Materials; 2015a.

K. NSF 61 - Drinking Water System Components - Health Effects; 2014 (Errata 2015).

L. NSF 372 - Drinking Water System Components - Lead Content; 2011.

1.3 SUBMITTALS

A. Product Data: Provide catalog illustrations of fixtures, sizes, rough-in dimensions, utility sizes, trim, and finishes.

B. Sustainable Design Documentation: Submit appropriate evidence that materials used in potable water systems comply with the specified requirements.

C. Sustainable Design Documentation: Submit appropriate evidence that materials used in potable water systems comply with the specified requirements.

D. Maintenance Data: Include fixture trim exploded view and replacement parts lists.

E. Warranty: Submit manufacturer warranty and ensure forms have been completed in Nanuet Union Free School District's name and registered with manufacturer.

1.4 QUALITY ASSURANCE

A. Manufacturer Qualifications: Company specializing in manufacturing the type of products specified in this section, with minimum three years of documented experience.

B. Potable water system components intended to dispense water for human consumption, including pipe and joining materials, shall comply with the following:

1. A weighted average lead content of not more than 0.25 percent as determined by NSF/ANSI 372.

2. NSF/ANSI 61.

C. Acceptance product marking: NSF®-61 and NSF®-372 (or NSF®-61-G) or other accepted certifier marks emonstrating third party certification with these requirements.

1.5 WARRANTY

A. Provide five year manufacturer warranty for electric water cooler.

PART 2 PRODUCTS

2.1 GENERAL REQUIREMENTS

A. Potable Water Systems: Provide plumbing fittings and faucets that comply with NSF 61 and NSF 372 for maximum lead content; label pipe and fittings.

2.2 DUAL FLUSH WATER CLOSETS

A. WC-1/WC-2:

1. Dual Flush, wall mounted, back outlet Vitreous china with antimicrobial ceramic glaze

2. Elongated front rim

3. 2-1/8" fully glazed trapway

4. High efficiency siphon jet flush action

5. Shipping Weight: 40 lbs.

6. Flushometer:

    a. Flush volume: 1.6/1.1 gpf

    b. Power type: hard wired

    c. Activation: Employs an infrared sensor with multiple-focused, lobular sensing fields for high and low target detection

    d. Valve: Diaphragm

    e. Fixture Connection: Top spud

    f. Automatically initiates a 1.1 gpf or 1.6 gpf flush based on how long the user remains in sensor range

    g. Buttons on top of the flush valve enable manual flushing with a full or reduced flush in case of power outage or at restroom visitor's discretion

    h. Three-second flush delay High copper, low zinc brass castings for dezincification resistance Fixed metering bypass and no external volume adjustment to ensure water conservation

    i. Valve body, Cover, Tailpiece and Control Stop shall be in compliance with ASTM Alloy Classification for Semi-Red Brass

    j. Valve shall be in compliance to the applicable sections of ASSE 1037.

B. Water Closet Carriers:

1. Narrow Wall horizontal siphon jet water closet carrier system, with high performance Dura-coated cast iron main fitting with hydro-mechanically optimized sweep, 4" no-hub connections, and extended 2" vent. Corrosion resistant, adjustable 3" dia. X 6" coupling with integral test cap, designed to increase flow velocity and line carry, and labor saving "Neo-Seal" bonded gasket optimizes flow performance while reducing installation steps. Complete system includes an adjustable, gasketed faceplate; floor mounted foot supports; fixture bolts, trim, and stud protectors. Narrow wall system shall comply with all applicable requirements of ASME A112.6.1M up to a 500 lbs maximum static load.

2.3 WALL HUNG URINALS (UR-1/UR-2)

A. 0.125 gpf (gallons per flush)

1. Vitreous china

2. Siphon Jet Action

3. 4 1/8" Back Outlet Rough-in

4. 3/4" top spud

5. 2" I.P.S. outlet flange and rubber gasket with integral trap

B. Shipping Weight: 39 lbs

C. Flush Valve:

1. Power type: hardwired
2. Valve: Diaphragm
3. Finish: Polished chrome
4. Courtesy Flush Override button
5. Includes 18” electrical cable
6. Flex Tube Diaphragm designed for improved life and reduced maintenance
7. Rubber Diaphragm with twin linear filtered bypass and vortex cleansing action
8. Employs an infrared sensor with multiple-focused, lobular sensing fields for high and low target detection
9. Latching Solenoid Operator
10. High copper, low zinc brass castings for dezincification resistance
11. Engineered Metal Cover with replaceable Lens Window
12. High Back Pressure Vacuum Breaker Flush Connection with One-piece Bottom Hex Coupling Nut
13. ADA Compliant Electronic Infrared Sensor for automatic “No Hands” operation
14. Adjustable Tailpiece
15. Line Powered with 6 VAC Step Down Transformer
16. 3/4” I.P.S. Screwdriver Angle Stop
17. Initial Set-up Range Indicator Light (first 10 minutes)
18. Sweat Solder Adapter with Cover Tube and Cast Wall Flange with Set Screw
19. Infrared Sensor with Multiple-focused, Lobular Sensing Fields for high and low target detection
20. High Copper, Low Zinc Brass Castings for Dezincification Resistance
21. Spud Coupling and Flange for 3/4” Top Spud Free Spinning, Vandal Resistant Stop Cap
22. Fixed metering bypass and no external volume adjustment to ensure water conservation

23. Valve body, Cover, Tailpiece and Control Stop shall be in compliance with ASTM Alloy Classification for Semi-Red Brass

24. Valve shall be in compliance to the applicable sections of ASSE 1037

D. Carriers:

1. ASME A112.6.1M; cast iron and steel frame with tubular legs, lugs for floor and wall attachment, threaded fixture studs for fixture hanger, bearing studs.

2.4 LAVATORIES

A. LAV-1/LAV-2:

1. Constructed of vitreous china

2. 21-1/4"L x 18-1/8"W

3. Wall-mount installation

4. Includes wall hanger

5. Drilled for concealed arm carrier

6. Faucet:

a. 0.5 GPM flow rate, aerated spray type, polished chrome finish, hardwired powered deck.

b. Modular One-piece Construction with all Concealed Components above deck

c. Automatic Self-adapting Sensor Technology

d. Magnetic Solenoid Valve

e. Water Supply Connection with Flexible High-pressure Hose and Strainer

f. Appropriate Mounting Hardware included

g. 6 Volt DC Plug-in Adapter

h. Power supply: hardwired

2.5 ALL-IN-ONE LAVATORY SYSTEM (LAV-3)

A. The basin shall be designed to direct water to a trench drain and features a 300 series stainless steel drain cap. The basin shall be constructed of natural quartz surface, polished natural quartz surface made from a blend of bio-based resin, natural quartz, granite, and other exotic minerals, Basin Finish-Mykonos.

B. Access panel shall be composed of black, powder-coated stainless steel. Water supplies, valves, waste assembly, and other optional items are concealed within the panel.

C. Bracket design allows for flexible stud or wall blocking anchor locations. Eliminates the need for in-wall carriers. IAPMO certified to meet or exceed ANSI load requirements.

D. Faucet Finish- Brushed Black Stainless, 0.50 gpm (1.90 Lpm), includes soap dispenser and faucet in a single piece casting.

E. Strainer and drain assembly system comes complete with 300 series stainless steel trench drain cap, tailpiece, and polypropylene P-trap. The multi-station system is configured with one drain and one set of supplies to reduce the cost associated with individual drains.

F. Power Supply: 120V 15A 12V DC adapter that plugs directly into the electrical outlet.

2.6 SINKS

A. Single Compartment Bowl

1. ASME A112.19.3; 31 by 22 by 11-5/8 inch outside dimensions 20 gauge, 0.0359 inch thick, Type 304 stainless steel, self rimming and undercoated, with ledge back drilled for trim.

2. Kitchen Faucets:

a. Single Handle Faucet with Pulldown Spray Head:

1) Minimum Spout Height: 17-1/8 inch.

2) Minimum Spout Reach: 8-3/4 inch.

3) Type: Deck-mount, high arc faucet with mounting plate.

4) Spray Functions: aerated spray at 1.5 gpm, maximum.

5) ASME A112.18.1, ADA Standards, and NSF 61 compliant assembly.

6) Materials: Ceramic disc-cartridge valve on brass body with polished chrome finish.

3. Single Compartment Bowl: {rs#1}; _____ by _____ by _____ inch outside dimensions 20 gauge, 0.0359 inch thick, Type 302 stainless steel, self rimming and undercoated, with ledge back drilled for trim.

4. Trim: ASME A112.18.1M; chrome plated brass supply with high rise swing spout, vandal proof water economy aerator with maximum flow, indexed lever handles.

5. Drain: 1-1/2 inch chromed brass drain.

B. Sinks KSK-2

1. Acceptable Manufacturers:

a. Elkay LR25221 (Basis of Design)

b. Eljer.

c. Kohler Company.

2. Single Compartment Bowl: ASME A112.19.3; 25 by 21-1/4 by 7-3/4 inch outside dimensions 18 gage, 0.0478 inch thick, Type 304 stainless steel, self rimming and undercoated, with ledge back drilled for trim.

a. Drain: 3-1/2 inch crumb cup and tailpiece.

3. Faucet: 1.5 GPM

a. Deck Mount Low Flow, Satin Stainless Steel, Lever Handle

b. Deck Clearance: 7-3/4"

c. Spout Reach: 8"

d. Spout Height: 13-3/4"

e. Hole Drillings: 1

f. Material: Stainless Steel

g. Valve Type: Ceramic Disc

h. Valve Connection: 3/8" Female Compression Hose Assembly

i. Faucet Hole Size (min): 1-1/2"

j. Countertop Thickness: 2-1/2

k. Spout Swing Rotation: 360°

2.7 FIXTURE SEALANT

A. Bathtub/Tile Sealant: White silicone; ASTM C 920, Uses M and A; single component, mildew resistant.

1. Applications: Use for: Joints between plumbing fixtures and floor and wall surfaces.

PART 3 EXECUTION

3.1 EXAMINATION

A. Verify that walls and floor finishes are prepared and ready for installation of fixtures.

B. Verify that electric power is available and of the correct characteristics.

C. Confirm that millwork is constructed with adequate provision for the installation of counter top lavatories and sinks.

3.2 PREPARATION

A. Rough-in fixture piping connections in accordance with minimum sizes indicated in fixture rough-in schedule for particular fixtures.

3.3 INSTALLATION

A. Install each fixture with trap, easily removable for servicing and cleaning.

B. Provide chrome plated rigid or flexible supplies to fixtures with loose key stops, reducers, and escutcheons.

C. Install components level and plumb.

D. Install and secure fixtures in place with wall supports and bolts.

E. Seal fixtures to wall and floor surfaces with sealant, color to match fixture.

F. Install handicap accessible fixtures at elevations required by ADA.

G. Install non-handicap accessible fixtures at elevations recommended by the manufacturer. Coordinate with Nanuet School District for height of fixtures to be utilized by students.

H. Seal fixtures to wall and floor surfaces with one-part, mildew resistant silicone sealant; Dow Corning 786, Dow Corning Tub and Ceramic, Pecora 898 Sanitary Silicone, General Electric Sanitary SCS1700, or Bostik Silicone Rubber Bathroom Caulk.

I. Solidly attach water closets to floor with lag screws. Lead flashing is not intended hold fixture in place.

3.4 INTERFACE WITH WORK OF OTHER SECTIONS

A. Review millwork shop drawings. Confirm location and size of fixtures and openings before rough-in and installation.

3.5 ADJUSTING

A. Adjust stops or valves for intended water flow rate to fixtures without splashing, noise, or overflow.

3.6 CLEANING

A. Clean plumbing fixtures and equipment.

3.7 PROTECTION

A. Protect installed products from damage due to subsequent construction operations.

B. Repair or replace damaged products before Date of Substantial Completion.

END OF SECTION

SECTION 230501 - BASIC HVAC MATERIALS AND METHODS

PART 1 GENERAL

1.1 SUMMARY

A. This section includes the following basic mechanical materials and methods to complement other Division 23 Sections.

1. Field-fabricated metal and wood equipment supports.
2. Water soluble flux.
3. Plumbing solder.
4. Installation requirements common to equipment specifications.
5. Firestopping (refer to specification section 078400).
6. Cutting and patching.
7. Touchup painting and finishing.
8. Demolition.
9. Mechanical System Commissioning
10. Mechanical Equipment Instruction

B. Pipe and pipe fitting materials are specified in piping system Sections.

1.2 DEFINITIONS

A. Pipe, pipe fittings, and piping include tube, tube fittings, and tubing.

B. Finished Spaces: Spaces other than mechanical and electrical equipment rooms furred spaces, pipe and duct shafts, unheated spaces immediately below the roof, spaces above ceilings, unexcavated spaces, crawl spaces and tunnels.

C. Exposed Interior Installations: Exposed to view indoors. Examples include finished occupied spaces and mechanical equipment rooms.

D. Exposed Exterior Installations: Exposed to view outdoors, or subject to outdoor ambient temperatures and weather conditions. Examples include rooftop locations.

E. Concealed Interior Installations: Concealed from view and protected from physical contact by building occupants. Examples include above ceilings and in duct shafts.

F. Concealed Exterior Installations: Concealed from view and protected from weather conditions and physical contact by building occupants, but subject to outdoor ambient temperatures. Examples include installations within unheated shelters.

1.3 SUBMITTALS

A. General: Submit the following according to the conditions of the Contract and Division 1 Specification Sections.

1. Product Data: Provide product data for piping specialties.

2. Shop Drawings: Detailing fabrication and installation for metal and wood supports, and anchorage for mechanical materials and equipment.

3. Identification materials and devices.

4. Certificates: Welder certificates signed by the Contractor certifying that welders meet or exceed the requirements specified under the "Quality Assurance" Article.

5. Warranty: Submit manufacturer warranty and ensure that forms have been completed in Nanuet Union Free School District's name and registered with manufacturer.

1.4 QUALITY ASSURANCE

A. Perform work in accordance with the Building Code of New York State.

B. Manufacturer Qualifications: Company specializing in manufacturing products specified in this section, with not less than three years of documented experience.

C. Installer Qualifications: Company specializing in performing the work of this section with minimum three years of experience.

D. Qualify welding processes and operators for structural steel according to AWS D1.1 "Structural Welding Code--Steel."

E. Qualify welding processes and operators for piping according to ASME "Boiler and Pressure Vessel Code," Section IX, "Welding and Brazing Qualifications."

1. Comply with provisions of ASME B31 Series "Code for Pressure Piping."

2. Certify that each welder has passed AWS qualification tests for the welding processes involved and that certification is current.

F. Equipment Selection: Equipment of greater or larger power, dimensions, capacities, and ratings may be furnished provided such proposed equipment is approved in writing and connecting mechanical and electrical services, circuit breakers, conduit, motors, bases and equipment spaces are increased. No additional costs will be approved for these increases, if larger equipment is approved. If minimum energy ratings or efficiencies of the equipment are specified, the equipment must meet the design requirements and commissioning requirements.

1.5 SEQUENCING AND SCHEDULING

A. Coordinate mechanical equipment installation with other building components.

B. Arrange for chases, slots, and openings in building structure during progress of construction to allow for mechanical installations.

C. Coordinate the installation of required supporting devices and set sleeves in poured-in-place concrete and other structural components as they are constructed.

D. Sequence, coordinate, and integrate installations of mechanical materials and equipment for efficient flow of the Work.

E. Coordinate connection of electrical services.

F. Coordinate connection of mechanical systems with utilities and services. Comply with requirements of governing regulations, landlord, franchised service companies, and controlling agencies.

G. Coordinate requirements for access panels and doors where mechanical items requiring access are concealed behind finished surfaces.

H. Coordinate installation of identifying devices after completing covering and painting where devices are applied to surfaces. Install identifying devices prior to installing acoustical ceilings and similar concealment.

PART 2 PRODUCTS

2.1 CONCRETE FOR EQUIPMENT PADS

A. Reinforcement

1. Welded Steel Wire Fabric: ASTM A 185, plain type.

a. Flat Sheets.

b. Mesh Size: 6 x 12.

2. Reinforcing Steel: ASTM A 615/A 615M Grade 40 (300).

a. Galvanized in accordance with ASTM A 767/A 767M, Class I.

3. Reinforcement Accessories:

a. Tie Wire: Annealed, minimum 16 gage.

B. Concrete Materials

1. Cement: ASTM C 150, Type I - Normal or Type II - Moderate Portland type.

2. Fine and Coarse Aggregates: ASTM C 33.

3. Fly Ash: ASTM C 618, Class F.

4. Air Entraining: ASTM C 260.

5. Water: Clean and not detrimental to concrete.

6. Prohibited Admixtures: Calcium chloride, thiocyanates, and admixtures containing more than 0.05 percent water soluble chloride ions by weight of cement for more than 0.3 percent thiocyanates by weight of cement are not permitted.

C. Concrete Accessories

1. Bonding Agent: ASTM C 1059, Type II acrylic non-redispersable type.

2. Epoxy Bonding System: ASTM C 881, type as required by project conditions.

3. Vapor Retarder: 6 mil thick clear polyethylene film, type recommended for below grade application.

4. Non-Shrink Grout: ASTM C 1107; premixed compound consisting of non-metallic aggregate, cement, water reducing and plasticizing agents.

a. Minimum Compressive Strength at 48 Hours: 2,400 psi.

5. Moisture-Retaining Cover: ASTM C 171; regular curing paper, white curing paper, clear polyethylene, white polyethylene, or white burlap-polyethylene sheet.

D. Joint Devices and Materials

1. Waterstops: Rubber type, COE CRD-C 513.

2. Joint Filler: Nonextruding, resilient asphalt impregnated fiberboard or felt, complying with ASTM D 1751, 1/4 inch thick and 4 inches deep ; tongue and groove profile.

2.2 WATER SOLUBLE FLUX

A. Water Soluble Flux: Taramet Sterling(R) lead-free water soluble flux, conforming to ASTM B 813.

2.3 PLUMBING SOLDER

A. Plumbing Solder: Sterling® solder, ASTM B 32, Alloy Grade TC; 95 percent tin, 4.85 percent copper, 0.15 percent selenium.

1. Certified to comply with NSF 61.

2. Melting Temperature: 410 degrees F..

3. Tensile Strength: 7,130 psi.

4. Shear Strength: 5,979 psi.

5. Elongation Percent: 19.1.

6. Brinell Hardness: 15.1.

7. Burst Strength: 5,800 psi.

8. Pressure/Temperature Test Data on Copper Tube Assemblies comprised of 3 inch, 2 inch, 1 inch, 3/4 inch, and 1/2 inch Tubing with a Reducing Tee:

   a. No leaks at 180 degrees F., 200 psi, held for 2 minutes.

2.4 PIPING SPECIALTIES

A. Escutcheons: Manufactured wall, ceiling, and floor plates; deep-pattern type where required to conceal protruding fittings and sleeves.

1. Inside Diameter: Closely fit around pipe, tube and insulation.

2. Outside Diameter: Completely cover opening.

3. Stamped Steel: One-piece, with set-screw and chrome-plated finish.

4. Cast-Iron Floor Plate: One-piece casting.

B. Dielectric Fittings: Assembly or fitting having insulating material isolating joined dissimilar metals to prevent galvanic action and stop corrosion.

1. Description: Combination of copper alloy and ferrous; threaded, solder, plain, and weld neck end types and matching piping system materials.

2. Insulating Material: Suitable for system fluid, pressure and temperature.

3. Dielectric Unions: Factory-fabricated, union assembly for 250-psig minimum working pressure at a 180 deg. F temperature.

PART 3 EXECUTION

3.1 PREPARATION

A. Ream pipe and tube ends. Remove burrs. Bevel plain end ferrous pipe.

B. Remove scale and dirt on inside and outside before assembly.

C. Prepare piping connections to equipment with flanges or unions.

D. Keep open ends of pipe free from scale and dirt. Whenever work is suspended during construction protect open ends with temporary plugs or caps.

3.2 INSTALLATION

A. Install in accordance with manufacturer's instructions.

B. Route piping in orderly manner, plumb and parallel to building structure, and maintain gradient.

C. Install piping to conserve building space and avoid interference with use of space.

D. Sleeve pipe passing through partitions, walls, and floors.

E. Install piping to allow for expansion and contraction without stressing pipe, joints, or connected equipment.

F. Inserts:

1. Provide inserts for placement in concrete formwork.

2. Provide inserts for suspending hangers from reinforced concrete slabs and sides of reinforced concrete beams.

3. Provide hooked rod to concrete reinforcement section for inserts carrying pipe over 4 inches.

4. Where concrete slabs form finished ceiling, locate inserts flush with slab surface.

5. Where inserts are omitted, drill through concrete slab from below and provide through-bolt with recessed square steel plate and nut above slab.

3.3 EQUIPMENT INSTALLATION - COMMON REQUIREMENTS

A. Install equipment to provide the maximum possible headroom where mounting heights are not indicated.

B. Install equipment according to approved submittal data. Portions of the Work are shown only in diagrammatic form. Refer conflicts to the Architect.

C. Install equipment level and plumb, parallel and perpendicular to other building systems and components in exposed interior spaces, except where otherwise indicated.

D. Install mechanical equipment to facilitate servicing, maintenance, and repair or replacement of equipment components. Connect equipment for ease of disconnecting, with minimum of interference with other installations. Extend grease fittings to an accessible location

E. Install equipment giving right-of-way to piping systems installed at a required slope.

3.4 PAINTING AND FINISHING

A. Damage and Touch Up: Repair marred and damaged factory-painted finishes with materials and procedures to match original factory finish

3.5 CONCRETE BASES

A. Construct concrete equipment bases of dimensions indicated, but not less than 4 inches (100 mm) larger than supported unit in both directions. Follow supported equipment manufacturer's setting templates for anchor bolt and tie locations.

B. Concrete materials, reinforcement, forms, and earth which will be in contact with fresh concrete shall be free from frost at the time of concrete placement

C. Bonding To Existing Concrete Slabs

1. Where more than one pad is required for a single piece of equipment, install 2 dowels in existing slab for each pad. Drill existing slab as required to install dowels 3 inches into the existing concrete. Grout dowels in the drilled holes.

2. Prior to placing concrete, thoroughly roughen and clean existing concrete slab. Saturate existing concrete surface with clean water. Immediately prior to depositing concrete for pad, apply a coat of cement grout over the existing damp concrete or allow existing concrete to dry and apply bonding agent (adhesive) over the existing concrete in accordance with manufacturer's printed instructions.

D. Installing Anchor Bolts and Sleeves

1. Install anchor bolts (with sleeves) for all bolt holes in equipment supports.

2. Accurately position and securely support anchor bolts and sleeves prior to placing concrete. Support head of bolt 1 inch above bottom of pad. Temporarily close open end of sleeves to prevent entry of concrete.

3. Grout anchor bolts in sleeves with cement grout or approved shrink-resistant grout after final positioning.

E. Reinforcing

1. Except where other reinforcement is shown on the Drawings, install welded wire fabric at mid-depth of each pad, extending to 1 inch from perimeter of pad.

F. Finishes

1. Formed Surfaces: Provide a smooth rubbed finish, with rounded or chamfered external corners, on all concrete surfaces exposed to view.

2. Unformed Surfaces: Provide a troweled finish on top surface of pads.

3.6 ERECTION OF METAL SUPPORTS AND ANCHORAGE

A. Cut, fit, and place miscellaneous metal supports accurately in location, alignment, and elevation to support and anchor mechanical materials and equipment.

B. Field Welding: Comply with AWS D1.1 "Structural Welding Code--Steel."

3.7 CUTTING AND PATCHING

A. Cut, channel, chase, and drill floors, walls, partitions, ceilings, and other surfaces necessary for mechanical installations. Perform cutting by skilled mechanics of the trades involved.

B. Repair cut surfaces to match adjacent surfaces.

3.8 MECHANICAL EQUIPMENT COMMISSIONING

A. Provide startup and commissioning services by factory-trained representatives of the equipment manufacturer for the following equipment:

1. Variable Refrigerant Volume Heat Pump Systems.

2. Controls.

B. Commissioning shall include the following:

1. Provide commissioning services for the equipment included in the contract, in accordance with SMACNA HVAC Systems Commissioning Manual; 1994.

2. Start-up the equipment specified and provide all manufacturer-recommended tests for startup of new installations.

3. Verify equipment operation under normal operating conditions through a complete range of equipment conditions from minimum through maximum equipment capacity.

4. Check operating condition and capacity of all required maintenance items, including, but not limited to oil, refrigerant or other consumables.

3.9 MECHANICAL EQUIPMENT INSTRUCTION

A. Provide instruction of the Owner's representatives for the duration specified below in operation and maintenance of the following equipment:

1. Pumps (minimum 2 hours).

2. Unit Ventilators (minimum 2 hours).

3. Variable Air Volume Air Terminal Units (minimum 2 hours).

4. Air Cooled Condensing Units (minimum 2 hours).

5. Cabinet Unit Heaters (minimum 1 hour).

6. Blower Coils (minimum 2 hours).

7. Rooftop Energy Recovery Ventilators (minimum 2 hours).

8. Hydronic Radiant Panels (minimum 2 hours).

9. Variable Refrigerant Volume heat pump and fan coil unit systems (minimum 4 hours).

10. Heating only fan coil units (minimum 2 hours).

11. Controls (minimum 8 hours).

12. Exhaust Fans (minimum 2 hours).

13. Kitchen Grease Hoods and associated controls (minimum 2 hours).

3.10 DEMOLITION

A. Disconnect, demolish, and remove work specified under Division 23 and as indicated.

B. Where pipe, breeching, insulation, or equipment to remain is damaged or disturbed, remove damaged portions and install new products of equal capacity and quality.

C. Accessible Work: Remove indicated exposed pipe and breeching in its entirety.

D. Removal: Remove indicated equipment from the project site.

E. Temporary Disconnection: Remove, store, clean, reinstall, reconnect, and make operational, equipment indicated for relocation.

END OF SECTION

SECTION 230516 - EXPANSION FITTINGS AND LOOPS FOR HVAC PIPING

PART 1 GENERAL

1.1 SECTION INCLUDES

A. Flexible pipe connectors.

B. Expansion Loops.

C. Expansion Compensators.

1.2 REFERENCE STANDARDS

A. ASTM A269/A269M - Standard Specification for Seamless and Welded Austenitic Stainless Steel Tubing for General Service; 2015.

B. EJMA (STDS) - EJMA Standards; Tenth Edition.

C. UL (DIR) - Online Certifications Directory; current listings at database.ul.com.

1.3 SUBMITTALS

A. Product Data:

1. Flexible Pipe Connectors: Indicate maximum temperature and pressure rating, face-to-face length, live length, hose wall thickness, hose convolutions per foot and per assembly, fundamental frequency of assembly, braid structure, and total number of wires in braid.

2. Expansion Joints/Loops: Indicate maximum temperature and pressure rating, and maximum expansion compensation.

B. Design Data: Indicate selection calculations.

C. Manufacturer's Instructions: Indicate manufacturer's installation instructions, special procedures, and external controls.

D. Project Record Documents: Record installed locations of flexible pipe connectors, expansion joints, anchors, and guides.

PART 2 PRODUCTS

2.1 FLEXIBLE PIPE CONNECTORS

A. Corrugated stainless steel hose with single layer of stainless steel exterior braiding or bronze hose and braid, minimum 12" Live Length for piping 2-1/2" and less, minimum 18" Live Length for 3" and 4" piping and minimum 24" of Live Length for piping 5" and over; for maximum working pressure of 500 psi.

B. Flexible metal braided connectors shall be installed in a straight line without offsets or twists. Support pipe without any load on flexible connectors.

C. Connectors for pipe sizes 2" and below shall have threaded ends, and connectors for pipe sizes 2-1/2" and larger shall be flanged. Connectors for copper piping shall have copper tube ends. Connectors shall be constructed of annular corrugations and butt-welded seams. Utilize connectors of 300 series stainless steel corrugated hose and braid and carbon steel welded-on end fittings for connection to steel piping. Connectors to be installed on copper piping shall be constructed of bronze hose and braid with copper end connections.

2.2 EXTERNALLY PRESSURIZED EXPANSION COMPENSATORS

A. The design shall incorporate a totally enclosed, externally pressurized 300 series stainless steel bellows that is protected from external damage by an external protective shroud designed for full line pressure.

B. On steel pipe models the bellows shall be isolated from flow impingement by an internal carbon steel sleeve. The internal sleeve for copper tube models shall be made of copper.

C. Steel pipe models shall have a 200 PSIG design operating pressure and 750 degrees F. Copper tube models shall have a 200 PSIG design operating pressure and 400 degrees F.

D. As a result of externally pressurized design, the operating pressure shall be transferred to the outside of the bellows through a gap in the internal guide flange and the housing (shroud).

E. Steel pipe models shall be supplied with male NPT threads and an internal anti-torque device. Cooper tube models are provided with female copper tube sweat ends.

F. The bellows shall be laminated (multi-ply) construction to provide a low spring rate with minimal stresses that assure extended life.

G. The externally pressurized design shall eliminate the need for one set of pipe guides on each side of the expansion compensator (4 pipe diameters from the expansion compensator) thus permitting the first set of guides to be at up to 14 pipe diameters from the expansion compensator.

H. Alternate end fittings may be provided based on application to mating piping, weld end or flanged ends.

2.3 EXPANSION JOINTS, HEATING WATER PIPING SYSTEMS

A. When indicated use flexible expansion "V" or "U" connectors of the size, type, and end fitting noted. "V" and "U" connectors shall be designed and constructed to accept motion in three planes (X, Y &Z), and to pass on no pressure thrust loads on the anchors. "V" and "U" connectors shall be installed in the neutral length listed on the manufacturer's diagrams, unless otherwise directed by the engineer. "V" and "U" connectors shall be positioned and supported per manufacturer's installation instructions. The "V" connectors shall consist of two flexible legs of metallic braided hose, two 45-degree elbows and a 90-

degree return elbow. The "U" connectors consist of two flexible sections of hose and braid, two 90 degree elbows and a 180 degree return equaling a 360 degree pipe change.

B. Flexible "V" and "U" connectors are rated for a minimum of 150 PSIG working pressure in all sizes. Flanged, weld type, threaded, or copper tube end fittings to be provided to match connecting pipe. "V" connectors shall be rated for 2, 3, or 4 inches of motion, as indicated on project drawings.

C. In expansion compensation situations, the V and U connector can be installed pre-compressed or pre-extended, only if the full range of motion will be encountered in only one direction. Larger connectors are supplied with shipping bars attached. These bars are tack welded on to maintain the proper designed length. The shipping bars need to be removed from the V or U after installation.

D. At least one pipe alignment guide shal be used within four pipe diameters on each side of the "V" loop.

2.4 REFRIGERANT PIPING EXPANSION LOOPS

A. General

1. Provide flexible hose expansion loop(s) as indicated on the contract drawings to accommodate any thermal expansion or contraction.

2. Flexible hose expansion loops shall be manufactured complete with two parallel sections of corrugated metal house, compatible braid, 180º return bend, with inlet and outlet connections. Field fabricated loops shall not be acceptable.

3. Flexible hose expansion loops shall impart no thrust loads to system support, anchors or building structure.

B. Products

1. Flexible hose expansion loops to be "**VRFMetraloop**" as manufactured by The Metraflex Company, Chicago, IL. OR EQUAL.

2. Corrugated Hose shall be Type 321 stainless Steel.

3. Braid shall be double layer of type 304 Stainless Steel.

4. Fittings shall be Sch 40 Schedule Type 304 Stainless in accordance with ASTM A240.

5. Copper pipe systems, the VRF Metraloop shall be equipped with a stainless-steel to copper conversion fitting with XHP copper stub ends.

6. Flexible hose expansion loops shall have a factory supplied; hanger / support lug located at the bottom of the 180º return.

7. UL 207 LISTED.

C. Execution

1. Install and guide per manufacturers' installation instructions and Mechanical Contractors Association of America "Guidelines for Quality Piping Installations".

2. Flexible hose expansion loop return fitting shall be supported to allow movement.

2.5 ACCESSORIES

A. Pipe Alignment Guides:

1. Two piece welded steel with enamel paint, bolted, with spider to fit standard pipe, frame with four mounting holes, clearance for insulation thickness required, minimum 2 inches travel.

B. Anchor Clamps:

1. Carbon steel, light weight anchor that clamps to pipe and shall be either bolted or welded to the structure.

2. Approximate spring force (in pounds) required for anchors by pipe size:

3. Pipe size ranges:

1) 3/4" pipe size and less: 41 pounds.

2) 1" pipe size: 46 pounds.

3) 1-1/8"/1-1/4" pipe size: 65 pounds.

4) 1-1/2" pipe size: 68 pounds.

5) 2" pipe size: 82 pounds.

6) 2-1/2" pipe size: 160 pounds.

7) 3" pipe size: 160 pounds.

8) 4" pipe size: 165 pounds.

9) 5" pipe size: 186 pounds.

PART 3 EXECUTION

3.1 INSTALLATION

A. Install in accordance with manufacturer's instructions.

B. Install in accordance with EJMA (Expansion Joint Manufacturers Association) Standards.

C. Install flexible pipe connectors on pipes connected to vibration isolated equipment. Provide line size flexible connectors.

D. Anchor pipe to building structure where indicated. Provide pipe guides so movement is directed along axis of pipe only. Erect piping such that strain and weight is not on cast connections or apparatus.

END OF SECTION

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SECTION 230519 - METERS AND GAUGES FOR HVAC PIPING

PART 1 GENERAL

1.1 SECTION INCLUDES

A. Pressure gauges and pressure gauge taps.

B. Thermometers and thermometer wells.

1.2 REFERENCE STANDARDS

A. ASME B40.100 - Pressure Gauges and Gauge Attachments; 2013.

B. ASTM E1 - Standard Specification for ASTM Liquid-in-Glass Thermometers; 2014.

C. ASTM E77 - Standard Test Method for Inspection and Verification of Thermometers; 2014.

D. UL 404 - Gauges, Indicating Pressure, for Compressed Gas Service; Current Edition, Including All Revisions.

1.3 QUALITY ASSURANCE

A. Provide meters and gages that are rated by the manufacturer for both the temperature and pressure of the duty for the intended systems.

1.4 SUBMITTALS

A. Product Data: Provide list that indicates use, operating range, total range and location for manufactured components.

B. Project Record Documents: Record actual locations of components and instrumentation.

PART 2 PRODUCTS

2.1 PRESSURE GAUGES

A. Pressure Gauges: ASME B40.100, UL 393 drawn steel case, phosphor bronze bourdon tube, rotary brass movement, brass socket, with front recalibration adjustment, black scale on white background.

1. Case: Steel with brass bourdon tube.

2. Size: 6 inch diameter.

3. Mid-Scale Accuracy: One percent.

4. Scale: Psi.

2.2 PRESSURE GAUGE TAPPINGS

A. Gauge Cock: Tee or lever handle, brass for maximum 150 psi.

B. Needle Valve: Brass, 1/4 inch NPT for minimum 150 psi.

C. Pulsation Damper: Pressure snubber, brass with 1/4 inch connections.

2.3 STEM TYPE THERMOMETERS

A. Thermometer: ASTM E 1, adjustable angle, mercury free, blue spirit fill, lens front tube, cast aluminum case with enamel finish, cast aluminum adjustable joint with positive locking device.

1. Size: 9 inch scale.

2. Window: Clear Lexan.

3. Stem: 3/4 inch NPT brass.

4. Accuracy: 2 percent per ASTM E77.

5. Calibration: Degrees F.

2.4 THERMOMETER SUPPORTS

A. Socket: Brass separable sockets for thermometer stems with or without extensions as required, and with cap and chain.

2.5 TEST PLUGS

A. Test Plug: 1/4 inch or 1/2 inch brass fitting and cap for receiving 1/8 inch outside diameter pressure or temperature probe with Nordel core for temperatures up to 350 degrees F.

PART 3 EXECUTION

3.1 INSTALLATION

A. Install in accordance with manufacturer's instructions.

B. Provide one pressure gauge per pump, installing taps before strainers and on suction and discharge of pump. Pipe to gauge.

C. Install pressure gauges with pulsation dampers. Provide gauge cock to isolate each gauge. Extend nipples to allow clearance from insulation.

D. Install gauges and thermometers in locations where they are easily read from normal operating level. Install vertical to 45 degrees off vertical.

E. Adjust gauges and thermometers to final angle, clean windows and lenses, and calibrate to zero.

3.2 SCHEDULE

A. Pressure Gauges, Location and Scale Range:

1. Pumps, 0 to 100 psi.

B. Pressure Gauge Tappings, Location:

1. Control valves 3/4 inch & larger - inlets and outlets.

2. In-duct hydronic reheat coils - inlets and outlets.

C. Stem Type Thermometers, Location and Scale Range:

1. Blower Coil and In-Duct heating water coil inlets and outlets, 30 to 240 degrees F.

D. Thermometer Sockets, Location:

1. Control valves 1 inch & larger - inlets and outlets.

END OF SECTION

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SECTION 230548 - VIBRATION CONTROLS FOR HVAC PIPING AND EQUIPMENT

PART 1 GENERAL

1.1 SECTION INCLUDES

A. Vibration isolators.

1.2 REFERENCE STANDARDS

A. ASCE 7 - Minimum Design Loads for Buildings and Other Structures; 2010, with 2013 Supplements and Errata.

B. ASHRAE (HVACA) - ASHRAE Handbook - HVAC Applications; 2015.

1.3 SUBMITTALS

A. Product Data:

1. Provide manufacturer's product literature documenting compliance with PART 2 PRODUCTS.

B. Shop Drawings:

1. Provide schedule of vibration isolator type with location and load on each.

C. Manufacturer's Instructions: Indicate installation instructions with special procedures and setting dimensions.

1.4 QUALITY ASSURANCE

A. Comply with applicable building code.

B. Perform design and installation in accordance with applicable codes.

C. Manufacturer Qualifications: Company specializing in manufacturing products specified in this section, with not less than 5 years of documented experience.

1. Member of Vibration Isolation and Seismic Control Manufacturers Association (VISCMA).

PART 2 PRODUCTS

2.1 ACCEPTABLE MANUFACTURERS

A. Kinetics Noise Control, Inc: www.kineticsnoise.com.

B. Mason Industries: www.mason-ind.com.

C. Vibration Eliminator Company, Inc: www.veco-nyc.com.

2.2 PERFORMANCE REQUIREMENTS

A. General:

1. All vibration isolators to conform to all uniform deflection and stability requirements under all operating loads.

2. Steel springs to function without undue stress or overloading.

3. Lateral to vertical stiffness ratio to not exceed 0.08 with spring deflection at minimum 75 percent of specified deflection.

2.3 VIBRATION ISOLATORS

A. General Requirements:

1. Resilient Materials for Vibration Isolators: Oil, ozone, and oxidant resistant.

2. Spring Elements for Spring Isolators:

a. Color code or otherwise identify springs to indicate load capacity.

b. Lateral Stability: Minimum lateral stiffness to vertical stiffness ratio of 0.8.

c. Designed to operate in the linear portion of their load versus deflection curve over deflection range of not less than 50 percent above specified deflection.

d. Designed to provide additional travel to solid of not less than 50 percent of rated deflection at rated load.

e. Selected to provide designed deflection of not less than 75 percent of specified deflection.

f. Selected to function without undue stress or overloading.

B. Vibration Isolators for Nonseismic Applications:

1. Restrained Spring Isolators, Nonseismic:

a. Description: Isolator assembly consisting of single or multiple free-standing, laterally stable steel spring(s) within a metal housing designed to prevent movement of supported equipment above an adjustable vertical limit stop.

b. Bottom Load Plate: Steel with nonskid elastomeric isolator pad with provisions for bolting to supporting structure as required.

c. Furnished with integral leveling device for positioning and securing supported equipment.

d. Provides constant free and operating height.

2. Spring Isolator Hangers, Nonseismic:

a. Description: Isolator assembly designed for installation in hanger rod suspension system utilizing single or multiple free-standing, laterally stable steel spring(s) in series with an elastomeric element for the lower hanger rod connection.

b. Designed to accommodate misalignment of bottom hanger rod up to 30 degrees (plus/minus 15 degrees) without short-circuiting of isolation.

C. Non-Seismic Type:

1. Rubber Mount or Hanger: Molded rubber designed for 0.4 inch deflection with threaded insert.

PART 3 EXECUTION

3.1 INSTALLATION

A. Install products in accordance with manufacturer's instructions.

B. Install anchors and fasteners in accordance with ICC Evaluation Services, LLC (ICC-ES) evaluation report conditions of use where applicable.

C. Secure fasteners according to manufacturer's recommended torque settings.

D. Install flexible piping connections to provide sufficient slack for vibration isolation and/or seismic relative displacements as indicated or as required.

E. Vibration Isolation Systems:

1. Spring Isolators:

a. Position equipment at operating height; provide temporary blocking as required.

b. Lift equipment free of isolators prior to lateral repositioning to avoid damage to isolators.

c. Level equipment by adjusting isolators gradually in sequence to raise equipment uniformly such that excessive weight or stress is not placed on any single isolator.

2. Isolator Hangers:

a. Use precompressed isolator hangers where required to facilitate installation and prevent damage to equipment utility connection provisions.

b. Locate isolator hangers at top of hanger rods in accordance with manufacturer's instructions.

3. Clean debris from beneath vibration-isolated equipment that could cause short-circuiting of isolation.

4. Use elastomeric grommets for attachments where required to prevent short-circuiting of isolation.

5. Adjust isolators to be free of isolation short circuits during normal operation.

6. Do not overtighten fasteners such that resilient material isolator pads are compressed beyond manufacturer's maximum recommended deflection.

3.2 INSTALLATION - GENERAL

A. Install in accordance with manufacturer's instructions.

B. Prior to making piping connections to equipment with operating weights substantially different from installed weights, block up equipment with temporary shims to final height. When full load is applied, adjust isolators to load to allow shim removal.

C. Support piping connections to equipment mounted on isolators using isolators or resilient hangers as follows:

1. Up to 4 Inches Pipe Size: First three points of support.

2. 5 to 8 Inches Pipe Size: First four points of support.

3.3 SCHEDULE

A. Pipe Isolation Schedule (open spring isolators).

1. 1 Inch Pipe Size: Isolate 120 diameters from equipment.

2. 2 Inch Pipe Size: Isolate 90 diameters from equipment.

3. 3 Inch Pipe Size: Isolate 80 diameters from equipment.

4. 4 Inch Pipe Size: Isolate 75 diameters from equipment.

5. 6 Inch Pipe Size: Isolate 60 diameters from equipment.

6. Equipment includes hydronic pumps, blower coils, air handling units and rooftop air handling units.

B. Equipment Isolation Schedule.

1. Cabinet Unit Heaters: Rubber in shear hangers, minimum 1/4 inches static deflection.

END OF SECTION

SECTION 230553 - IDENTIFICATION FOR HVAC PIPING AND EQUIPMENT

PART 1 GENERAL

1.1 SECTION INCLUDES

A. Nameplates.

B. Tags.

C. Stencils.

D. Pipe markers.

1.2 REFERENCE STANDARDS

A. ASME A13.1 - Scheme for the Identification of Piping Systems; 2007.

B. ASTM D709 - Standard Specification for Laminated Thermosetting Materials; 2013.

1.3 SUBMITTALS

A. List: Submit list of wording, symbols, letter size, and color coding for mechanical identification.

B. Chart and Schedule: Submit valve chart and schedule, including valve tag number, location, function, and valve manufacturer's name and model number.

C. Product Data: Provide manufacturers catalog literature for each product required.

D. Manufacturer's Installation Instructions: Indicate special procedures, and installation.

PART 2 PRODUCTS

2.1 IDENTIFICATION APPLICATIONS

A. Rooftop Energy Recovery Ventilators: Nameplates.

B. Blower Coils: Nameplates.

C. Air Cooled Condensing Units: Nameplates

D. Exhaust Fans: Nameplates.

E. VAV Boxes: Nameplates.

F. Heat Pumps: Nameplates.

G. Unit Ventilators: Nameplates.

H. Ductwork: Stencilled painting.

I. Piping: Pipe markers.

J. Pumps: Nameplates.

2.2 NAMEPLATES

A. Letter Color: White.

B. Letter Height: 1/4 inch.

C. Background Color: Black.

D. Plastic: Comply with ASTM D709.

2.3 TAGS

A. Plastic Tags: Laminated three-layer plastic with engraved black letters on light contrasting background color. Tag size minimum 1-1/2 inch diameter.

B. Metal Tags: Brass with stamped letters; tag size minimum 1-1/2 inch diameter with smooth edges.

C. Valve Tag Chart: Typewritten letter size list in anodized aluminum frame.

2.4 STENCILS

A. Stencils: With clean cut symbols and letters of following size:

1. Ductwork and Equipment: 2-1/2 inch high letters.

2.5 PIPE MARKERS

A. Color: Comply with ASME A13.1.

B. Plastic Pipe Markers: Factory fabricated, flexible, semi- rigid plastic, preformed to fit around pipe or pipe covering; minimum information indicating flow direction arrow and identification of fluid being conveyed.

C. Plastic Tape Pipe Markers: Flexible, vinyl film tape with pressure-sensitive adhesive backing and printed markings.

PART 3 EXECUTION

3.1 PREPARATION

A. Degrease and clean surfaces to receive adhesive for identification materials.

3.2 INSTALLATION

A. Install nameplates with corrosive-resistant mechanical fasteners, or adhesive. Apply with sufficient adhesive to ensure permanent adhesion and seal with clear lacquer.

B. Install tags with corrosion resistant chain.

C. Install plastic pipe markers in accordance with manufacturer's instructions.

D. Install plastic tape pipe markers complete around pipe in accordance with manufacturer's instructions.

E. Use tags on piping 3/4 inch diameter and smaller.

1. Identify service, flow direction, and pressure.

2. Install in clear view and align with axis of piping.

3. Locate identification not to exceed 20 feet on straight runs including risers and drops, adjacent to each valve and Tee, at each side of penetration of structure or enclosure, and at each obstruction.

F. Install ductwork with stencilled painting. Identify with air handling unit identification number and area served. Locate identification at air handling unit, at each side of penetration of structure or enclosure, and at each obstruction.

END OF SECTION

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SECTION 230593 - TESTING, ADJUSTING, AND BALANCING FOR HVAC

PART 1 GENERAL

1.1 SECTION INCLUDES

A. Testing, adjustment, and balancing of air systems.

B. Testing, adjustment, and balancing of hydronic and refrigerating systems.

C. Measurement of final operating condition of HVAC systems.

D. Sound measurement of equipment operating conditions.

E. Commissioning activities.

1.2 REFERENCE STANDARDS

A. AABC (NSTSB) - AABC National Standards for Total System Balance, 7th Edition; 2016.

B. NEBB (TAB) - Procedural Standards for Testing Adjusting Balancing of Environmental Systems; 2005, Seventh Edition.

1.3 SUBMITTALS

A. Installer Qualifications: Submit name of adjusting and balancing agency and TAB supervisor for approval within 30 days after award of Contract.

B. Certification: All reports submitted, whether progress reports or final reports shall be certified and shall bear the seal of the certification agency.

C. TAB Plan: Submit a written plan indicating the testing, adjusting, and balancing standard to be followed and the specific approach for each system and component.

1. Submit to Engineer.

2. Submit to the Commissioning Authority, Construction Manager, and HVAC controls contractor.

3. Submit six weeks prior to starting the testing, adjusting, and balancing work.

4. Include certification that the plan developer has reviewed Contract Documents, the equipment and systems, and the control system with the Engineer and other installers to sufficiently understand the design intent for each system.

5. Include at least the following in the plan:

a. List of all air flow, water flow, sound level, system capacity and efficiency measurements to be performed and a description of specific test procedures, parameters, formulas to be used.

b. Copy of field checkout sheets and logs to be used, listing each piece of equipment to be tested, adjusted and balanced with the data cells to be gathered for each.

c. Identification and types of measurement instruments to be used and their most recent calibration date.

d. Discussion of what notations and markings will be made on the duct and piping drawings during the process.

e. Final test report forms to be used.

f. Detailed step-by-step procedures for TAB work for each system and issue, including:

1) Diffuser proportioning.

2) Total flow calculations.

3) Rechecking.

g. Expected problems and solutions, etc.

h. Details of how TOTAL flow will be determined; for example:

1) Air: Sum of terminal flows via control system calibrated readings or via hood readings of all terminals, supply (SA) and return air (RA) pitot traverse, SA or RA flow stations.

2) Water: Pump curves, circuit setter, flow station, ultrasonic, etc.

i. Proposed selection points for sound measurements and sound measurement methods.

j. Methods for making coil or other system plant capacity measurements, if specified.

k. Time schedule for TAB work to be done in phases (by floor, etc.).

l. Time schedule for deferred or seasonal TAB work, if specified.

m. False loading of systems to complete TAB work, if specified.

n. Procedures for field technician logs of discrepancies, deficient or uncompleted work by others, contract interpretation requests and lists of completed tests (scope and frequency).

o. Procedures for formal deficiency reports, including scope, frequency and distribution.

D. Field Logs: Submit at least twice a week to the Commissioning Authority.

E. Control System Coordination Reports: Communicate in writing to the controls installer all setpoint and parameter changes made or problems and discrepancies identified during TAB that affect, or could affect, the control system setup and operation.

F. Final Report: Indicate deficiencies in systems that would prevent proper testing, adjusting, and balancing of systems and equipment to achieve specified performance.

1. Submit to the the Commissioning Authority, Construction Manager, and HVAC controls contractor within two weeks after completion of testing, adjusting, and balancing.

2. Revise TAB plan to reflect actual procedures and submit as part of final report.

3. Submit draft copies of report for review prior to final acceptance of Project. Provide final copies for Engineer and for inclusion in operating and maintenance manuals.

4. Include actual instrument list, with manufacturer name, serial number, and date of calibration.

5. Form of Test Reports: Where the TAB standard being followed recommends a report format use that; otherwise, follow ASHRAE Std 111.

6. Units of Measure: Report data in I-P (inch-pound) units only.

PART 2 PRODUCTS - NOT USED

PART 3 EXECUTION

3.1 GENERAL REQUIREMENTS

A. Perform total system balance in accordance with the following:

1. AABC (NSTSB), AABC National Standards for Total System Balance.

2. NEBB Procedural Standards for Testing Adjusting Balancing of Environmental Systems.

B. Begin work after completion of systems to be tested, adjusted, or balanced and complete work prior to Substantial Completion of the project.

C. TAB Agency Qualifications:

1. Company specializing in the testing, adjusting, and balancing of systems specified in this section.

2. Having minimum of three years documented experience.

3. Certified by the following:

a. AABC, Associated Air Balance Council: www.aabc.com/#sle; upon completion submit AABC National Performance Guaranty.

b. NEBB, National Environmental Balancing Bureau: www.nebb.org/#sle.

D. TAB Supervisor and Technician Qualifications: Certified by same organization as TAB agency.

3.2 EXAMINATION

A. Verify that systems are complete and operable before commencing work. Ensure the following conditions:

1. Systems are started and operating in a safe and normal condition.
2. Temperature control systems are installed complete and operable.
3. Proper thermal overload protection is in place for electrical equipment.
4. Final filters are clean and in place. If required, install temporary media in addition to final filters.
5. Duct systems are clean of debris.
6. Fans are rotating correctly.
7. Fire, smoke, combination fire/smoke and volume dampers are in place and open.
8. Air coil fins are cleaned and combed.
9. Access doors are closed and duct end caps are in place.
10. Air outlets are installed and connected.
11. Duct system leakage is minimized.
12. Hydronic systems are flushed, filled, and vented.
13. Pumps are rotating correctly.
14. Proper strainer baskets are clean and in place.
15. Service and balance valves are open.

B. Submit field reports. Report defects and deficiencies that will or could prevent proper system balance.

C. Beginning of work means acceptance of existing conditions.

3.3 PREPARATION

A. Hold a pre-balancing meeting at least one week prior to starting TAB work.

1. Require attendance by all installers whose work will be tested, adjusted, or balanced.

B. Provide instruments required for testing, adjusting, and balancing operations. Make instruments available to Engineer to facilitate spot checks during testing.

C. Provide additional balancing devices as required.

3.4 ADJUSTMENT TOLERANCES

A. Air Handling Systems: Adjust to within plus or minus 5 percent of design for supply systems and plus or minus 10 percent of design for return and exhaust systems.

B. Air Outlets and Inlets: Adjust total to within plus 10 percent and minus 5 percent of design to space. Adjust outlets and inlets in space to within plus or minus 5 percent of design.

C. Hydronic Systems: Adjust to within plus or minus 10 percent of design.

3.5 RECORDING AND ADJUSTING

A. Field Logs: Maintain written logs including:

1. Running log of events and issues.

2. Discrepancies, deficient or uncompleted work by others.

3. Contract interpretation requests.

4. Lists of completed tests.

B. Ensure recorded data represents actual measured or observed conditions.

C. Permanently mark settings of valves, dampers, and other adjustment devices allowing settings to be restored. Set and lock memory stops.

D. Mark on drawings the locations where traverse and other critical measurements were taken and cross reference the location in the final report.

E. After adjustment, take measurements to verify balance has not been disrupted or that such disruption has been rectified.

F. Leave systems in proper working order, replacing belt guards, closing access doors, closing doors to electrical switch boxes, and restoring thermostats to specified settings.

G. At final inspection, recheck random selections of data recorded in report. Recheck points or areas as selected and witnessed by the Nanuet Union Free School District.

3.6 AIR SYSTEM PROCEDURE

A. Adjust air handling and distribution systems to provide required or design supply, return, and exhaust air quantities at site altitude.

B. Make air quantity measurements in ducts by Pitot tube traverse of entire cross sectional area of duct.

C. Measure air quantities at air inlets and outlets.

D. Adjust distribution system to obtain uniform space temperatures free from objectionable drafts and noise.

E. Use volume control devices to regulate air quantities only to extend that adjustments do not create objectionable air motion or sound levels. Effect volume control by duct internal devices such as dampers and splitters.

F. Vary total system air quantities by adjustment of fan speeds. Provide drive changes required. Vary branch air quantities by damper regulation.

G. Provide system schematic with required and actual air quantities recorded at each outlet or inlet.

H. Measure static air pressure conditions on air supply units, including filter and coil pressure drops, and total pressure across the fan. Make allowances for 50 percent loading of filters.

I. Adjust outside air automatic dampers, outside air, return air, and exhaust dampers for design conditions.

J. Measure temperature conditions across outside air, return air, and exhaust dampers to check leakage.

K. Where modulating dampers are provided, take measurements and balance at extreme conditions. Balance variable volume systems at maximum air flow rate, full cooling, and at minimum air flow rate, full heating.

L. For variable air volume system powered units set volume controller to air flow setting indicated. Confirm connections properly made and confirm proper operation for automatic variable air volume temperature control.

M. At completion of fan balancing, replace the variable pitch fan sheaves with fixed sheaves sized to provide required air balance. Measure and record final air balance on the fan after installation of fixed sheaves.

3.7 WATER SYSTEM PROCEDURE

A. Adjust water systems to provide required or design quantities.

B. Use calibrated Venturi tubes, orifices, or other metered fittings and pressure gauges to determine flow rates for system balance. Where flow metering devices are not installed, base flow balance on temperature difference across various heat transfer elements in the system.

C. Adjust systems to provide specified pressure drops and flows through heat transfer elements prior to thermal testing. Perform balancing by measurement of temperature differential in conjunction with air balancing.

D. Effect system balance with automatic control valves fully open to heat transfer elements.

E. Effect adjustment of water distribution systems by means of balancing cocks, valves, and fittings. Do not use service or shut-off valves for balancing unless indexed for balance point.

F. Where available pump capacity is less than total flow requirements or individual system parts, full flow in one part may be simulated by temporary restriction of flow to other parts.

3.8 COMMISSIONING

A. Furnish to the Commissioning Authority, upon request, any data gathered but not shown in the final TAB report.

B. In the presence of the Commissioning Authority, verify that:

1. Final settings of all valves, splitters, dampers and other adjustment devices have been permanently marked.

2. The air system is being controlled to the lowest possible static pressure while still meeting design loads, less diversity; this shall include a review of TAB methods, established control setpoints, and physical verification of at least one leg from fan to diffuser having all balancing dampers wide open and that during full cooling of all terminal units taking off downstream of the static pressure sensor, the terminal unit on the critical leg has its damper 90 percent or more open.

3. The water system is being controlled to the lowest possible pressure while still meeting design loads, less diversity; this shall include a review of TAB methods, established control setpoints, and physical verification of at least one leg from the pump to the coil having all balancing valves wide open.

3.9 SCOPE

A. Test, adjust, and balance the following:

1. HVAC Pumps.

2. Air Cooled Condensing Units.

3. Variable Refrigerant Volume Heat Pump Systems.

4. Unit Ventilators.

5. Blower Coils.

6. Fan Coil Units.

7. Terminal Heat Transfer Units.

8. Rooftop Energy Recovery Ventilators

9. Kitchen Hoods

10. Fans.

11. Air Filters.

12. Air Inlets and Outlets.

3.10 MINIMUM DATA TO BE REPORTED

A. Electric Motors:

1. Manufacturer.

2. Model/Frame.

3. HP/BHP.

4. Phase, voltage, amperage; nameplate, actual, no load.

5. RPM.

6. Service factor.

7. Starter size, rating, heater elements.

8. Sheave Make/Size/Bore.

B. Pumps:

1. Identification/number.

2. Manufacturer.

3. Size/model.

4. Impeller.

5. Service.

6. Design flow rate, pressure drop, BHP.

7. Actual flow rate, pressure drop, BHP.

8. Discharge pressure.

9. Suction pressure.

10. Total operating head pressure.

11. Shut off, discharge and suction pressures.

12. Shut off, total head pressure.

C. Heat Pumps:

1. Identification/number.

2. Location.

3. Manufacturer.
4. Model number.
5. Serial number.
6. Entering DB air temperature, design and actual.
7. Leaving DB air temperature, design and actual.
8. Number of compressors.

D. Cooling Coils:

1. Identification/number.
2. Location.
3. Service.
4. Manufacturer.
5. Air flow, design and actual.
6. Entering air DB temperature, design and actual.
7. Entering air WB temperature, design and actual.
8. Leaving air DB temperature, design and actual.
9. Leaving air WB temperature, design and actual.
10. Saturated suction temperature, design and actual.
11. Air pressure drop, design and actual.

E. Heating Coils:

1. Identification/number.
2. Location.
3. Service.
4. Manufacturer.
5. Air flow, design and actual.
6. Water flow, design and actual.
7. Water pressure drop, design and actual.
8. Entering water temperature, design and actual.
9. Leaving water temperature, design and actual.

10. Entering air temperature, design and actual.
11. Leaving air temperature, design and actual.
12. Air pressure drop, design and actual.

F. Air Moving Equipment:

1. Location.
2. Manufacturer.
3. Model number.
4. Serial number.
5. Arrangement/Class/Discharge.
6. Air flow, specified and actual.
7. Return air flow, specified and actual.
8. Outside air flow, specified and actual.
9. Total static pressure (total external), specified and actual.
10. Inlet pressure.
11. Discharge pressure.
12. Fan RPM.

G. Return Air/Outside Air:

1. Identification/location.
2. Design air flow.
3. Actual air flow.
4. Design return air flow.
5. Actual return air flow.
6. Design outside air flow.
7. Actual outside air flow.
8. Return air temperature.
9. Outside air temperature.
10. Required mixed air temperature.
11. Actual mixed air temperature.

12. Design outside/return air ratio.

13. Actual outside/return air ratio.

H. Exhaust Fans:

1. Location.

2. Manufacturer.

3. Model number.

4. Serial number.

5. Air flow, specified and actual.

6. Total static pressure (total external), specified and actual.

7. Inlet pressure.

8. Discharge pressure.

9. Fan RPM.

I. Duct Traverses:

1. System zone/branch.

2. Duct size.

3. Area.

4. Design velocity.

5. Design air flow.

6. Test velocity.

7. Test air flow.

8. Duct static pressure.

9. Air temperature.

10. Air correction factor.

J. Duct Leak Tests:

1. Description of ductwork under test.

2. Duct design operating pressure.

3. Duct design test static pressure.

4. Duct capacity, air flow.

5. Maximum allowable leakage duct capacity times leak factor.
6. Test apparatus:
    a. Blower.
    b. Orifice, tube size.
    c. Orifice size.
    d. Calibrated.
7. Test static pressure.
8. Test orifice differential pressure.
9. Leakage.

K. Flow Measuring Stations:

1. Identification/number.
2. Location.
3. Size.
4. Manufacturer.
5. Model number.
6. Serial number.
7. Design Flow rate.
8. Design pressure drop.
9. Actual/final pressure drop.
10. Actual/final flow rate.
11. Station calibrated setting.

L. Terminal Unit Data:

1. Manufacturer.
2. Type, constant, variable, single, dual duct.
3. Identification/number.
4. Location.
5. Model number.
6. Size.

7. Minimum static pressure.
8. Minimum design air flow.
9. Maximum design air flow.
10. Maximum actual air flow.
11. Inlet static pressure.

M. Air Distribution Tests:

1. Air terminal number.
2. Room number/location.
3. Terminal type.
4. Terminal size.
5. Area factor.
6. Design velocity.
7. Design air flow.
8. Test (final) velocity.
9. Test (final) air flow.
10. Percent of design air flow.

N. Sound Level Reports:

1. Locations:
    a. High School:
        1) Art Classroom 110
        2) Music Room 105
        3) Band Room 107
        4) Conference Room 123
    b. Middle School:
        1) Music Room 58
        2) Resource Room 47
2. Octave bands - equipment off.

3. Octave bands - equipment on.

END OF SECTION

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SECTION 230713 - DUCT INSULATION

PART 1 GENERAL

1.1 SECTION INCLUDES

A. Duct insulation.

B. Duct liner.

C. Insulation jackets.

1.2 REFERENCE STANDARDS

A. ASTM C518 - Standard Test Method for Steady-State Thermal Transmission Properties by Means of the Heat Flow Meter Apparatus; 2010.

B. ASTM C553 - Standard Specification for Mineral Fiber Blanket Thermal Insulation for Commercial and Industrial Applications; 2013.

C. ASTM C612 - Standard Specification for Mineral Fiber Block and Board Thermal Insulation; 2014.

D. ASTM C916 - Standard Specification for Adhesives for Duct Thermal Insulation; 2014.

E. ASTM C1338 - Standard Test Method for Determining Fungi Resistance of Insulation Materials and Facings; 2008.

F. ASTM E84 - Standard Test Method for Surface Burning Characteristics of Building Materials; 2015a.

G. ASTM E96/E96M - Standard Test Methods for Water Vapor Transmission of Materials; 2014.

H. SMACNA (DCS) - HVAC Duct Construction Standards Metal and Flexible; 2005.

I. UL 723 - Standard for Test for Surface Burning Characteristics of Building Materials; Current Edition, Including All Revisions.

1.3 SUBMITTALS

A. Product Data: Provide product description, thermal characteristics, list of materials and thickness for each service, and locations.

B. Manufacturer's Instructions: Indicate installation procedures necessary to ensure acceptable workmanship and that installation standards will be achieved.

1.4 QUALITY ASSURANCE

A. Manufacturer Qualifications: Company specializing in manufacturing products of the type specified in this section with not less than three years of documented experience.

B. Applicator Qualifications: Company specializing in performing the type of work specified in this section, with minimum 3 years of experience and approved by manufacturer.

C. Code Compliance: All insulation products provided on the contract shall be fully in compliance with all material and installation requirements of the New York State Energy Conservation Construction Code, latest addition with all amendments. Insulation products shall meet all "k" values and thicknesses as described in the Code.

1.5 REGULATORY REQUIREMENTS

A. Materials: Flame spread/smoke developed rating of 25/50 in accordance with ASTM E 84.

1.6 DELIVERY, STORAGE, AND HANDLING

A. Accept materials on site in original factory packaging, labelled with manufacturer's identification, including product density and thickness.

B. Protect insulation from weather and construction traffic, dirt, water, chemical, and mechanical damage, by storing in original wrapping.

1.7 FIELD CONDITIONS

A. Maintain ambient temperatures and conditions required by manufacturers of adhesives, mastics, and insulation cements.

B. Maintain temperature during and after installation for minimum period of 24 hours.

PART 2 PRODUCTS

2.1 REGULATORY REQUIREMENTS

A. Surface Burning Characteristics: Flame spread index/Smoke developed index of 25/50, maximum, when tested in accordance with ASTM E84, UL 723, ASTM E84, or UL 723.

2.2 GLASS FIBER, FLEXIBLE

A. Manufacturer:

1. Knauf Insulation: www.knaufinsulation.com.

2. Johns Manville: www.jm.com.

3. Owens Corning Corporation: www.ocbuildingspec.com.

4. CertainTeed Corporation: www.certainteed.com.

B. Insulation: ASTM C553; flexible, noncombustible blanket.

1. K value: 0.36 at 75 degrees F, when tested in accordance with ASTM C518.
2. Maximum Service Temperature: 450 degrees F.
3. Maximum Water Vapor Absorption: 5.0 percent by weight.
4. Density: 1.50 pounds per cubic foot.

C. Vapor Barrier Jacket:

1. Kraft paper with glass fiber yarn and bonded to aluminized film.
2. Moisture Vapor Permeability: 0.029 ng/Pa s m (0.02 perm inch), when tested in accordance with ASTM E96/E96M.
3. Secure with pressure sensitive tape.

D. Vapor Barrier Tape:

1. Kraft paper reinforced with glass fiber yarn and bonded to aluminized film, with pressure sensitive rubber based adhesive.

E. Outdoor Vapor Barrier Mastic:

1. Vinyl emulsion type acrylic or mastic, compatible with insulation, black color.

F. Tie Wire: Annealed steel, 16 gauge, 0.0508 inch diameter.

2.3 GLASS FIBER, RIGID

A. Insulation: ASTM C612; rigid, noncombustible blanket.

1. K Value: 0.24 at 75 degrees F, when tested in accordance with ASTM C518.
2. Maximum Service Temperature: 450 degrees F.
3. Maximum Water Vapor Absorption: 5.0 percent.
4. Minimum Density: 3.0 lb/cu. ft.
5. Maximum Density: 8.0 lb/cu ft.

B. Vapor Barrier Jacket:

1. Kraft paper with glass fiber yarn and bonded to aluminized film.
2. Moisture Vapor Permeability: 0.029 ng/Pa s m (0.02 perm inch), when tested in accordance with ASTM E96/E96M.
3. Secure with pressure sensitive tape.

C. Vapor Barrier Tape:

1. Kraft paper reinforced with glass fiber yarn and bonded to aluminized film, with pressure sensitive rubber based adhesive.

D. Indoor Vapor Barrier Finish:

1. Cloth: Untreated; 9 oz/sq yd weight, glass fabric.

2. Vinyl emulsion type acrylic, compatible with insulation, black color.

2.4 JACKETS

A. Field Applied or Pre-Applied Vapor Barrier and Weather Proofing Jacket:

1. Field-applied or pre-applied protective finishing, operating within the range of -30°F (-23°C) and 300°F (149°C), will be jacketed with laminated, flexible, self-adhering, protective jacketing, vapor barrier and weather proofing membrane, having a high performance acrylic adhesive capable of installation with no additional mechanical attachment.

2. Material is to be VentureClad 1577CW (5ply) White finish selected based on availability and desired final appearance of insulated system.

3. Jacketing material is to have a maximum flame spread/smoke developed index of 10/20 per UL 723 test, a .0000 water vapor permeance rating per ASTM E-96, and mold inhibitors incorporated.

4. All products shall be UV stable.

2.5 GLASS FIBER DUCT LINER, RIGID

A. Insulation: ASTM C 612; rigid, noncombustible board with poly vinyl acetate polymer impregnated surface and edge coat.

1. 'K' value : ASTM C 1071 or ASTM C 518, maximum 0.27 at 75 degrees F.

2. Maximum service temperature: 250 degrees F.

3. Maximum Velocity on Coated Air Side: 5,000 fpm.

4. Minimum Noise Reduction Criteria: ASTM C 1071 0.45 for 1/2 inch thickness.

5. Minimum Noise Reduction Criteria: ASTM C 1071 0.70 for 1 inch thickness.

6. Minimum Noise Reduction Criteria: ASTM C 1071 0.85 for 1-1/2 inches thickness.

7. Minimum Noise Reduction Criteria: ASTM C 1071 0.90 for 2 inch thickness.

8. Fungus Resistance of Surface and Edge Coating: No visible growth, measured in accordance with ASTM G 21.

9. Density: 2.0 pounds per cubic foot.

B. Adhesive:

1. Waterproof, ASTM E 162 fire-retardant type.

C. Liner Fasteners: Galvanized steel, self-adhesive pad with integral head.

PART 3 EXECUTION

3.1 EXAMINATION

A. Test ductwork for design pressure prior to applying insulation materials.

B. Verify that surfaces are clean, foreign material removed, and dry.

3.2 INSTALLATION

A. Install in accordance with manufacturer's instructions.

B. Install in accordance with NAIMA National Insulation Standards.

C. Insulated Ducts Conveying Air Below Ambient Temperature:

1. Provide insulation with vapor barrier jackets.

2. Finish with tape and vapor barrier jacket.

3. Continue insulation through walls, sleeves, hangers, and other duct penetrations.

4. Insulate entire system, including fittings, joints, flanges, fire dampers, flexible connections, and expansion joints.

D. External Duct Insulation Application:

1. Secure insulation with vapor barrier with wires and seal jacket joints with vapor barrier adhesive or tape to match jacket.

2. Secure insulation without vapor barrier with staples, tape, or wires.

3. Install without sag on underside of duct. Use adhesive or mechanical fasteners where necessary to prevent sagging. Lift duct off trapeze hangers and insert spacers.

4. Seal vapor barrier penetrations by mechanical fasteners with vapor barrier adhesive.

5. Stop and point insulation around access doors and damper operators to allow operation without disturbing wrapping.

E. Duct Liner Application:

1. Adhere insulation with adhesive for 100 percent coverage.

2. Secure insulation with mechanical liner fasteners. Refer to SMACNA (DCS) for spacing.

3. Seal and smooth joints. Seal and coat transverse joints.

4. Seal liner surface penetrations with adhesive.

5. Duct dimensions indicated are net inside dimensions required for air-flow. Increase duct size to allow for insulation thickness.

3.3 SCHEDULES

A. New Supply Ducts connected to Barr MS RTU-2 (interior, concealed): 1-1/2" thick fiberglass flexible duct wrap insulation.

B. All New EXPOSED Supply Ducts (interior): Un-Insulated.

C. New Supply Ducts connected to Miller Elementary School RTU-2 (interior, concealed): 1-1/2" thick fiberglass flexible duct wrap insulation.

D. New Supply Ducts connected to High School Blower Coil units BC-HS-5 and BC-HS-6 (interior, concealed): 1" thick fiberglass flexible duct wrap insulation.

E. Rectangular Outside Air Ducts (interior, exposed):1-1/2" thick rigid glass fiber board insulation with field applied weather proofing jacketing.

F. Rectangular Outside Air Ducts (interior, concealed): 2" thick fiberglass flexible duct wrap insulation.

G. Air transfer Ductwork (concealed): 1/2" thick rigid glass fiber liner.

END OF SECTION

PART 1 GENERAL

1.1 SECTION INCLUDES

A. Equipment insulation.

B. Flexible removable and reusable blanket insulation.

1.2 REFERENCE STANDARDS

A. ASTM A666 - Standard Specification for Annealed or Cold-Worked Austenitic Stainless Steel Sheet, Strip, Plate, and Flat Bar; 2023.

B. ASTM B209 - Standard Specification for Aluminum and Aluminum-Alloy Sheet and Plate; 2014.

C. ASTM B209M - Standard Specification for Aluminum and Aluminum-Alloy Sheet and Plate (Metric); 2014.

D. ASTM C177 - Standard Test Method for Steady-State Heat Flux Measurements and Thermal Transmission Properties by Means of the Guarded-Hot-Plate Apparatus; 2019, with Editorial Revision (2023).

E. ASTM C449 - Standard Specification for Mineral Fiber Hydraulic-Setting Thermal Insulating and Finishing Cement; 2007 (Reapproved 2019).

F. ASTM C518 - Standard Test Method for Steady-State Thermal Transmission Properties by Means of the Heat Flow Meter Apparatus; 2021.

G. ASTM C534/C534M - Standard Specification for Preformed Flexible Elastomeric Cellular Thermal Insulation in Sheet and Tubular Form; 2023.

H. ASTM C553 - Standard Specification for Mineral Fiber Blanket Thermal Insulation for Commercial and Industrial Applications; 2013 (Reapproved 2019).

I. ASTM C1695 - Standard Specification for Fabrication of Flexible Removable and Reusable Blanket Insulation for Hot Service; 2022.

J. ASTM E84 - Standard Test Method for Surface Burning Characteristics of Building Materials; 2023c.

K. ASTM E96/E96M - Standard Test Methods for Gravimetric Determination of Water Vapor Transmission Rate of Materials; 2022a, with Editorial Revision (2023).

L. UL 723 - Standard for Test for Surface Burning Characteristics of Building Materials; Current Edition, Including All Revisions.

1.3 SUBMITTALS

A. Product Data: Provide product description, thermal characteristics, list of materials and thickness for equipment scheduled.

1.4 QUALITY ASSURANCE

A. Manufacturer Qualifications: Company specializing in manufacturing the products specified in this section with not less than three years of documented experience.

B. Applicator Qualifications: Company specializing in performing the type of work specified in this section with minimum 3 years of experience.

1.5 DELIVERY, STORAGE, AND HANDLING

A. Accept materials on site in original factory packaging, labeled with manufacturer's identification, including product density and thickness.

B. Protect insulation from weather and construction traffic, dirt, water, chemical, and mechanical damage, by storing in original wrapping.

1.6 FIELD CONDITIONS

A. Maintain ambient temperatures and conditions required by manufacturers of adhesives, mastics, and insulation cements.

B. Maintain temperature during and after installation for minimum period of 24 hours.

PART 2 PRODUCTS

2.1 REGULATORY REQUIREMENTS

A. Surface Burning Characteristics: Flame spread index/Smoke developed index of 25/50, maximum, when tested in accordance with ASTM E84, UL 723, ASTM E84, or UL 723.

2.2 FLEXIBLE REMOVABLE AND REUSABLE BLANKET INSULATION

A. Insulation: ASTM C553 Type V; flexible, noncombustible.

1. Comply with ASTM C1695.
2. K Value: 0.37 at 100 degrees F, when tested in accordance with ASTM C177 or ASTM C518.
3. Minimum Service Temperature: 32 degrees F.
4. Maximum Service Temperature: 500 degrees F.
5. Maximum Water Vapor Absorption: Less than 5.0 percent by weight.
6. Color: Green.
7. Weight: 7.65 oz/sq ft.
8. Effective Thickness: 1.25 plus/minus 0.25 inch.

PART 3 EXECUTION

3.1 EXAMINATION

A. Verify that equipment has been tested before applying insulation materials.

B. Verify that surfaces are clean and dry, with foreign material removed.

3.2 INSTALLATION

A. Install in accordance with manufacturer's instructions.

B. Factory Insulated Equipment: Do not insulate.

C. Exposed Equipment: Locate insulation and cover seams in least visible locations.

D. Apply insulation close to equipment by grooving, scoring, and beveling insulation. Fasten insulation to equipment with studs, pins, clips, adhesive, wires, or bands.

E. Fill joints, cracks, seams, and depressions with bedding compound to form smooth surface. On cold equipment, use vapor barrier cement.

F. For hot equipment containing fluids over 140 degrees F, insulate flanges and unions with removable sections and jackets.

G. Fiber glass insulated equipment containing fluids above ambient temperature; provide standard jackets, with or without vapor barrier, factory-applied or field-applied. Finish with glass cloth and adhesive.

H. Finish insulation at supports, protrusions, and interruptions.

I. Equipment Requiring Access for Maintenance, Repair, or Cleaning: Install insulation so it can be easily removed and replaced without damage.

3.3 SCHEDULE

A. Heating Systems:

1. In-Duct Heating Coils: 1.5" thick flexible, removable blanket insulation.

END OF SECTION

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SECTION 230719 - HVAC PIPING INSULATION

PART 1 GENERAL

1.1 SECTION INCLUDES

A. Piping insulation.

B. Jackets and accessories.

C. Engineered wall outlet seals and refrigerant piping insulation protection.

1.2 REFERENCE STANDARDS

A. ASTM A666 - Standard Specification for Annealed or Cold-Worked Austenitic Stainless Steel Sheet, Strip, Plate, and Flat Bar; 2015.

B. ASTM B209 - Standard Specification for Aluminum and Aluminum-Alloy Sheet and Plate; 2014.

C. ASTM B209M - Standard Specification for Aluminum and Aluminum-Alloy Sheet and Plate [Metric]; 2014.

D. ASTM C177 - Standard Test Method for Steady-State Heat Flux Measurements and Thermal Transmission Properties by Means of the Guarded-Hot-Plate Apparatus; 2013.

E. ASTM C195 - Standard Specification for Mineral Fiber Thermal Insulating Cement; 2007 (Reapproved 2013).

F. ASTM C449 - Standard Specification for Mineral Fiber Hydraulic-Setting Thermal Insulating and Finishing Cement; 2007 (Reapproved 2013).

G. ASTM C518 - Standard Test Method for Steady-State Thermal Transmission Properties by Means of the Heat Flow Meter Apparatus; 2010.

H. ASTM C533 - Standard Specification for Calcium Silicate Block and Pipe Thermal Insulation; 2013.

I. ASTM C534/C534M - Standard Specification for Preformed Flexible Elastomeric Cellular Thermal Insulation in Sheet and Tubular Form; 2014.

J. ASTM C547 - Standard Specification for Mineral Fiber Pipe Insulation; 2015.

K. ASTM C578 - Standard Specification for Rigid, Cellular Polystyrene Thermal Insulation; 2015a.

L. ASTM C585 - Standard Practice for Inner and Outer Diameters of Thermal Insulation for Nominal Sizes of Pipe and Tubing; 2010.

M. ASTM C795 - Standard Specification for Thermal Insulation for Use in Contact with Austenitic Stainless Steel; 2008 (Reapproved 2013).

N. ASTM D412 - Standard Test Methods for Vulcanized Rubber and Thermoplastic Elastomers--Tension; 2006a (Reapproved 2013).

O. ASTM D570 - Standard Test Method for Water Absorption of Plastics; 1998 (Reapproved 2010).

P. ASTM E84 - Standard Test Method for Surface Burning Characteristics of Building Materials; 2015a.

Q. ASTM E96/E96M - Standard Test Methods for Water Vapor Transmission of Materials; 2014.

R. ASTM G21 - Standard Practice for Determining Resistance of Synthetic Polymeric Materials to Fungi; 2015.

S. ASTM G153 - Standard Practice for Operating Enclosed Carbon Arc Light Apparatus for Exposure of Nonmetallic Materials; 2013.

T. UL 723 - Standard for Test for Surface Burning Characteristics of Building Materials; Current Edition, Including All Revisions.

1.3 SUBMITTALS

A. Product Data: Provide product description, thermal characteristics, list of materials and thickness for each service, and locations.

B. Manufacturer's Instructions: Indicate installation procedures that ensure acceptable workmanship and installation standards will be achieved.

1.4 QUALITY ASSURANCE

A. Manufacturer Qualifications: Company specializing in manufacturing the Products specified in this section with not less than three years of documented experience.

B. Applicator Qualifications: Company specializing in performing the type of work specified in this section with minimum 3 years of experience.

PART 2 PRODUCTS

2.1 REGULATORY REQUIREMENTS

A. Surface Burning Characteristics: Flame spread index/Smoke developed index of 25/50, maximum, when tested in accordance with ASTM E84, UL 723, ASTM E84, or UL 723.

2.2 GLASS FIBER, RIGID

A. Insulation: ASTM C547and ASTM C795; semi-rigid, noncombustible, end grain adhered to jacket.

1. Maximum Service Temperature: 650 degrees F.

2. Maximum Moisture Absorption: 0.2 percent by volume.

B. Vapor Barrier Jacket: White kraft paper with glass fiber yarn, bonded to aluminized film; moisture vapor transmission when tested in accordance with ASTM E96/E96M of 0.02 perm-inches.

C. Tie Wire: 0.048 inch stainless steel with twisted ends on maximum 12 inch centers.

D. Vapor Barrier Lap Adhesive: Compatible with insulation.

E. Insulating Cement/Mastic: ASTM C195; hydraulic setting on mineral wool.

F. Fibrous Glass Fabric:

1. Cloth: Untreated; 9 oz/sq yd weight.

2. Blanket: 1.0 lb/cu ft density.

3. Weave: 5 by 5.

G. Indoor Vapor Barrier Finish:

1. Cloth: Untreated; 9 oz/sq yd weight.

2. Vinyl emulsion type acrylic, compatible with insulation, black color.

H. Insulating Cement: ASTM C449.

2.3 FLEXIBLE ELASTOMERIC CELLULAR INSULATION

A. Insulation: Preformed flexible elastomeric cellular rubber insulation complying with ASTM C534/C534M Grade 1; use molded tubular material wherever possible.

1. Minimum Service Temperature: Minus 40 degrees F.

2. Maximum Service Temperature: 180 degrees F.

3. Connection: Waterproof vapor barrier adhesive.

B. Elastomeric Foam Adhesive: Air dried, contact adhesive, compatible with insulation.

2.4 JACKETS

A. PVC Plastic.

1. Jacket: One piece molded type fitting covers and sheet material, off-white color.

a. Minimum Service Temperature: 0 degrees F.

b. Maximum Service Temperature: 150 degrees F.

c. Moisture Vapor Permeability: 0.002 perm inch, maximum, when tested in accordance with ASTM E96/E96M.

d. Thickness: 10 mil.

e. Connections: Brush on welding adhesive.

2. Covering Adhesive Mastic: Compatible with insulation.

2.5 ENGINEERED WALL OUTLET SEALS AND REFRIGERANT PIPING INSULATION PROTECTION

A. Basis of Design: Airex Manufacturing, Inc; www.airexmfg.com/#sle.

1. Pipe Penetration Wall Seal: Airex Titan Outlet.

2. Refrigeration Pipe Insulation Protection System: Airex E-Flex Guard.

3. Pipe Penetration Wall Seal and Insulation Protection System: Airex Pro-System Kit.

B. Insulation Protection System: Refrigerant piping insulation PVC protective cover.

1. PVC Insulation Cover Color: White with full-length velcro fastener.

2. Weatherization and Ultraviolet Exposure Protection: Comply with ASTM G153.

3. Water/Vapor Permeability: Comply with ASTM E96/E96M.

4. Anti-Fungal and Anti-Microbial Resistance: Comply with ASTM G21.

5. Flame Spread and Smoke Development Rating of 24/450: Comply with ASTM E84 or UL 723.

6. Carbon Arc Light Exposure: Comply with ASTM G153.

7. Tensile Strength After UV Exposure and Water Immersion: Comply with ASTM D412.

8. Water Absorption of Plastics: Comply with ASTM D570.

9. Adhesive free.

PART 3 EXECUTION

3.1 EXAMINATION

A. Test piping for design pressure, liquid tightness, and continuity prior to applying insulation materials.

B. Verify that surfaces are clean and dry, with foreign material removed.

3.2 INSTALLATION

A. Install in accordance with manufacturer's instructions.

B. Install in accordance with NAIMA National Insulation Standards.

C. Exposed Piping: Locate insulation and cover seams in least visible locations.

D. Insulated Pipes Conveying Fluids Below Ambient Temperature:

1. Insulate entire system, including fittings, valves, unions, flanges, strainers, flexible connections, and expansion joints.

E. Glass Fiber Insulated Pipes Conveying Fluids Below Ambient Temperature:

1. Provide vapor barrier jackets, factory-applied or field-applied; secure with self-sealing longitudinal laps and butt strips with pressure sensitive adhesive. Secure with outward clinch expanding staples and vapor barrier mastic.

2. Insulate fittings, joints, and valves with molded insulation of like material and thickness as adjacent pipe. Finish with glass cloth and vapor barrier adhesive or PVC fitting covers.

F. For hot piping conveying fluids over 140 degrees F, insulate flanges and unions at equipment.

G. Glass Fiber Insulated Pipes Conveying Fluids Above Ambient Temperature:

1. Provide standard jackets, with or without vapor barrier, factory-applied, or field-applied. Secure with self-sealing longitudinal laps and butt strips with pressure-sensitive adhesive. Secure with outward clinch expanding staples.

2. Insulate fittings, joints, and valves with insulation of like material and thickness as adjoining pipe. Finish with glass cloth and adhesive or PVC fitting covers.

H. Inserts and Shields:

1. Application: Piping 1-1/2 inches diameter or larger.

2. Shields: Galvanized steel between pipe hangers or pipe hanger rolls and inserts.

3. Insert location: Between support shield and piping and under the finish jacket.

4. Insert Configuration: Minimum 6 inches long, of same thickness and contour as adjoining insulation; may be factory fabricated.

5. Insert Material: Hydrous calcium silicate insulation or other heavy density insulating material suitable for the planned temperature range.

I. Continue insulation through walls, sleeves, pipe hangers, and other pipe penetrations. Finish at supports, protrusions, and interruptions. At fire separations, refer to Section 078400.

J. Pipe Exposed in Mechanical Equipment Rooms, crawl spaces, piping tunnel areas, boiler rooms and Finished Spaces: Finish with PVC jacket and fitting covers.

3.3 SCHEDULE

A. Heating Systems:

1. Heating Hot Water:

a. Piping Size Range: Up to 1-1/4 inches: 1-1/2 inch thick glass fiber.

b. Piping Size 1-1/2 inches and larger: 2 inches thick glass fiber.

c. Run-outs to terminal units can be insulated with 1" thick glass fiber insulation for maximum length of 10-feet.

d. For heating water supply and return piping run-outs less than 1-1/2" in size routed within wall partitions, insulation shall be reduced to a thickness of 1 inch.

e. For heating water supply and return piping branches less than 1-1/2" in size routed above and below active fin tube elements within fin tube enclosure units, insulation shall be reduced to a thickness of 1/2 inch.

B. Cooling Systems:

1. Refrigerant:

a. Refrigerant Suction Piping:

1) Piping Size 1-1/2 inches and larger: 2 inches thick flexible elastomeric.

2) Piping Size Range: Up to 1-1/4 inches: 1-1/2 inch thick Piping Size Range.

b. Refrigerant Liquid Piping: 1 inch thick flexible elastomeric

c. Provide Airex EFlex Guard or equal refrigerant piping insulation protection system over each individual refrigerant liquid/refrigerant suction connection to each individual condensing unit system from the roof penetration to the Heat Pump Unit connection.

C. Other Systems:

1. Condensate Drain Piping: 1/2" thick glass fiber insulation.

END OF SECTION

SECTION 230923 - DIRECT-DIGITAL CONTROL SYSTEM FOR HVAC

PART 1 GENERAL

1.1 SCOPE OF WORK

A. General:

1. The existing School District's DDC is manufactured by Siemens Industry, Inc, which is the building's certified temperature control system. The products, control equipment, software, hardware, programming, graphics, wiring and conduit specified in this section shall be provided by Siemens Industry, Inc. All control system requirements specified in this section shall connect to the existing Siemens Industries, Inc. network system that exists on the Nanuet Union Free School District campus. The Board of Education of the Nanuet Free Union School District has decided to purchase controls components, engineering, programming and project management labor from Siemens Industry, Indc. All work specified within specification section 230923, and all temperature control work outlined on the drawings shall be manufactured by Siemens.

2. The work of this section shall include the furnishing and installing of a complete Building Management System (BMS). The BMS shall be an extension of the existing Siemens V6.0 of the Desigo CC Graphical Software at Nanuet Schools. Building Operating Personnel shall utilize existing Desigo workstation software to schedule and control the HVAC equipment. All controllers, sensors, and end devices shall match existing site DDC equipment as furnished by Siemens Industry, Inc..

3. Provide and Install all new graphics on DESIGO server

4. Verify operation of all new DESIGO graphics

5. The contractor shall include tuition for (2) multi-day training classes for up to (1) student per class delivered a Siemens Training Center.

6. The entire system shall be computer driven and shall employ Direct Digital Control (DDC) processes for energy management, equipment monitoring and control, utilizing open communications capabilities as herein specified.

7. The Building Automation System (BAS) manufacturer’s local corporate branch office shall furnish and install a fully integrated building automation system, incorporating direct digital control (DDC) for energy management, equipment monitoring and control, and subsystems with open communications capabilities as herein specified. To ensure the highest quality of long-term service, the use of an independent distributor, non-corporate branch office is not permissible.

8. Actuators for valves and dampers shall be electric.

9. Analog Outputs: All analog outputs referenced in the specifications or on the drawings shall be true modulating control signals activating devices with spring return features so that the end device fails into the normal position as described or indicated. Floating point type control accomplished by power-open and power-close signals using multiple digital outputs or pulse width modulation shall not be acceptable except for devices in which the sequences or the drawings specifically identify floating point operation. All devices indicated with normally open (NO) or normally closed (NC) positions shall feature spring return to the normal position upon loss of power or failure of signal.

10. Provide operator training to the Nanuet Union Free School District as described in Section 3.

11. Provide installation and calibration, supervision, adjustments, and fine tuning necessary for complete and fully operational system.

1.2 DDC SYSTEM DESCRIPTION

A. The entire Energy Management and Control System (EMCS) shall be comprised of a network of interoperable, stand-alone digital controllers communicating on an open protocol communication network. All information from the EMCS shall be available to local computers within the building via local Intranet and to remote computers or from multiple facilities via the Internet. The EMCS shall be capable of communicating to third party systems such as HVAC, lighting, energy metering, power management, clock displays, security, access control, fire-life safety systems and other building management related devices with open, interoperable communication capabilities.

B. All labor, material, equipment and software not specifically referred to herein or on the plans, that are required to meet the functional intent of this specification, shall be provided without additional cost to the Owner.

C. The intent of this specification is to provide open protocol field mounted Direct Digital controls. Open protocol, fully programmable, DDC controllers for each piece of mechanical equipment being controlled are mandatory. Controls that are “packaged” and supplied by the manufacturer are not acceptable. All systems as described in the sequence of operation shall be shown via dynamic Web based graphics with all pertinent system alarms for proper operation and maintenance.

D. Provide DDC controllers and all required field devices, sensors, and actuators, as specified herein, required for a complete and operating extension to the existing Apogee DDC System for the following equipment:

1. Integration to Unit Ventilator and Blower Coil Variable Refrigerant Volume (VRV) manufacturers furnished BACnet MS/TP compatible controls

2. Integration to kitchen grease hoood controls

3. Controls for VAV terminal units, heating coils, hydronic radiators/convectors, fan coil units, blower coil systems, air cooled condensing units, VRV heat pump systems, exhaust fans, unit ventilators

4. Representative Siemens zone temperature sensors as shown on the drawings

5. Integration into existing Insight Graphical Operators Workstation

E. To ensure installation of a product of the highest quality, the BAS manufacturer must be UL registered and ISO 9001:2000 registered under Automatic Controls for Regulating Commercial Environments and Appliances for The Design and Manufacture of Environmental Controls and Energy Management Products and ISO 14001:1996 Registered as an Energy Management System. Proof of ISO 9001:2000 and ISO 14001:1996 registration must be submitted prior to bid. Quality Management System Manual detailing the BAS manufacturer's ISO registered Quality Management System must be submitted with the manufacturer's submittal.

F. The installation of the control system shall be performed by the controls manufacturer's corporate branch office with the shop drawings, flow diagrams, bill of materials, component designation or identification number and sequence of operation all bearing the name of the manufacturer.

G. All materials and equipment used shall be standard components, regularly manufactured for this and/or other systems and not custom designed specially for this project. All systems and components shall have been thoroughly tested and proven in actual use for at least two years.

H. BAS manufacturer shall be responsible for all BAS and Temperature Control wiring for a complete and operable system. All wiring shall be done in accordance with all local and national codes. Systems shall be complete in all respects including thermostats, valves, dampers, relays, wiring, conduit, etc. to provide the functions described, regardless of whether or not thermostats, relays, etc., are specifically mentioned.

I. System Architecture:

1. Provide a twisted pair for DDC system communication with BACNet protocol between intelligent devices and controllers. All communications wiring shall be plenum rated.

2. Provide programming for graphical display of all contract control systems on the new DESIGO head end system.

1.3 CONTROL DIAGRAMS AND POINT SCHEDULES

A. The performance sequences described are provided to supplement the temperature control diagrams and point schedules as shown on the contract drawings. Where individual points are described in the diagrams and/or point schedules but are not required to meet the sequences specified, the points shall be included in the system as indicated on the drawings. All points shown on the drawings shall be provided whether or not they are required for the sequences. Additionally, provide all points which are required to meet the specified sequences, whether or not they are specifically identified on either the diagrams or the point schedules. The diagrams and point schedules are provided to enhance document clarity, and are not to be utilized to limit the hardware utilized in engineering the temperature control.

1.4 MANUFACTURER'S RECOMMENDATIONS

A. Where this specification does not describe installation procedures, or other equipment required to be in accordance with the recommendations of the manufacturer of the control system, provide those procedures and equipment without additional cost to the Owner as if it was explicitly specified in this contract. The contractor shall provide a complete and operable system which meets the recommendations of the equipment manufacturers.

1.5 REFERENCES

A. NFPA 70 - National Electrical Code; National Fire Protection Association; 2005.

B. UL-916 Energy Management Systems

C. ULC, UL Canadian Standards Association

D. FCC, Part 15, Subpart J, Class A Computing Devices

1.6 SUBMITTALS

A. Product Data: Provide data for each system component and software module.

B. Shop Drawings:

1. Indicate trunk cable schematic showing programmable control unit locations, and trunk data conductors.

2. List connected data points, including connected control unit and input device.

3. Indicate system graphics indicating monitored systems, data (connected and calculated) point addresses, and operator notations.

4. Show system configuration with peripheral devices, batteries, power supplies, diagrams, modems, and interconnections.

5. Indicate description and sequence of operation of operating, user, and application software.

6. Provide a complete point schedule demonstrating compliance with the point schedules included in the contract documents. Schedule format shall be such as to easily confirm that all the scheduled points are being provided.

7. Provide a copy of all proposed system graphics.

8. Schematics, sequences and flow diagrams.

9. Revised BAS architecture diagram indicating the new equipment.

10. Equipment data cut sheets

11. System schematics, including:

a. sequence of operations

b. point names

c. point addresses

d. interface wiring diagrams

e. panel layouts

f. system riser diagrams

12. Points schedule for each real point in the BAS, including: Tag, Point Type, System Name and Display Units.

13. Samples of Graphic Display screen types and associated menu penetrations to show hierarchy and functional interrelationships.

14. Detailed Bill of Material list for each Node, identifying quantity, part number, description, and optional features.

15. Control Damper Schedule including a separate line for each damper and a column for each of the damper attributes, including: Code Number, Fail Position, Damper Type, Damper Operator, Blade Type, Bearing Type, Seals, Duct Size, Damper Size, Mounting, and Actuator Type.

16. Control Valve Schedules including a separate line for each valve and a column for each of the valve attributes: Code Number, Configuration, Fail Position, Pipe Size, Valve Size, Body Configuration, Close off Pressure, Capacity, Valve CV, Calculated CV, Design Pressure, Actual Pressure, and Actuator Type.

17. Room schedue including a separate line for each unit ventilator indicating maximum airflow, minimum ventilation rate, and heating coil flow rate (where scheduled).

18. Room schedule including a separate line for each variable air volume terminal unit indicating maximum airflow, minimum airflow, minimum ventilation rate, and heating coil flow rate.

19. Details of all BAS interfaces and connections to the work of other trades.

20. Product data sheets for all products including software.

21. Training provided, including outlines for each session.

C. Manufacturer's Instructions: Indicate manufacturer's installation instructions for all manufactured components.

D. Project Record Documents: Record actual locations of control components, including control units, thermostats, and sensors.

1. Revise shop drawings to reflect actual installation and operating sequences.

2. Include submittals data in final "Record Documents" form.

E. Operation and Maintenance Data:

1. Include interconnection wiring diagrams complete field installed systems with identified and numbered, system components and devices.

2. Include keyboard illustrations and step-by-step procedures indexed for each operator function.

3. Include inspection period, cleaning methods, cleaning materials recommended, and calibration tolerances.

1.7 QUALITY ASSURANCE

A. Single Source Responsibility: The contractor shall be fully responsible for the proper operation of all control systems, including, but not limited to sensors and controls, and peripheral devices. After the installation, the contractor shall be responsible for the calibration of the system. The control system manufacturer shall be fully responsible for providing and loading the specified software packages, to include the loading of all necessary operational parameters. Any debugging of software problems shall be performed solely by the control system manufacturer.

B. Electrical Work and Safety Requirements:

1. Electrical work shall be in strict accordance with applicable NFPA, ANSI and UL requirements. Fully enclose or properly guard electrical wiring, terminal blocks and other high voltage contacts and mark to prevent accidental injury to personnel.

2. All wiring associated with and required by the control system (including power circuits as indicated on the drawings) shall be the responsibility of the contractor.

3. Comply with all the latest federal, state and local rules, regulations, ordinances having jurisdiction over this work, including OSHA requirements. These codes and standards shall supersede the specifications and drawings. All work under this contract shall be in accordance with the latest editions of the National Electrical Code (NEC) and the electric codes in the locale in which the work is being performed.

4. The term "wiring" shall be construed to include furnishing of wire, conduit, miscellaneous materials and labor as required for mounting and connecting electrical control devices, and providing electrical interlocks between equipment. Low voltage sensor wiring shall be installed per NEC and local codes.

C. Perform work in accordance with NFPA 70 and NFPA 90A.

D. Products Requiring Electrical Connection: Listed and classified by Underwriters Laboratories Inc., as suitable for the purpose specified and indicated.

E. The BAS system components shall match existing system components.

F. The BAS system shall be designed and installed, commissioned and serviced by manufacturer employed, factory trained personnel. Manufacturer shall have an in-place support facility within 30 miles of the site with technical staff, spare parts inventory and

necessary test and diagnostic equipment. Distributors or licensed installing contractors are not acceptable.

G. The manufacturer shall provide on site, experienced project manager for this work, responsible for direct supervision of the design, installation, start up and commissioning of the B.M.S.

H. Materials and equipment shall be the catalogued products of manufacturers regularly engaged in production and installation of automatic temperature control systems and shall be manufacturer's latest standard design that complies with the specification requirements.

I. All BAS peer-to-peer network controllers, central system controllers and local user displays shall be UL Listed under Standard UL 916, category PAZX; Standard ULC C100, category UUKL7; and under Standard UL 864, categories UUKL, UDTZ, and QVAX. and be so listed at the time of bid. All floor level controllers shall comply, at a minimum, with UL Standard UL 91 6category PAZX; Standard UL 864, categories UDTZ, and QVAX. and be so listed at the time of Bid.

J. DDC peer-to-peer controllers shall be compliant with the European EMC Directive, Standards EN 50081-2 and EN 50082-2, at the Industrial Levels. Additionally the equipment shall be compliant with the European LVD Directive and bear the CE mark in order to show compliance to both Directives.

K. All electronic equipment shall conform to the requirements of FCC Regulation, Part 15, Governing Radio Frequency Electromagnetic Interference and be so labeled.

L. The manufacturer of the building automation system shall provide documentation supporting compliance with ISO-9002 (Model for Quality Assurance in Production, Installation, and Servicing) and ISO-140001 (The application of well-accepted business management principles to the environment). The intent of this specification requirement is to ensure that the products from the manufacturer are delivered through a Quality System and Framework that will assure consistency in the products delivered for this project.

M. This system shall have a documented history of compatibility by design for a minimum of 15 years. Future compatibility shall be supported for no less than 10 years. Compatibility shall be defined as the ability to upgrade existing field panels to current level of technology, and extend new field panels on a previously installed network.

N. Compatibility shall be defined as the ability for any existing field panel microprocessor to be connected and directly communicate with new field panels without bridges, routers or protocol converters.

1.8 SYSTEM PERFORMANCE

A. Performance Standards. System shall conform to the following minimum standards over network connections. Systems shall be tested using manufacturer's recommended hardware and software for operator workstation (server and browser for web-based systems).

1. Graphic Display. A graphic with 20 dynamic points shall display with current data within 10 sec.

2. Graphic Refresh. A graphic with 20 dynamic points shall update with current data within 8 sec. and shall automatically refresh every 15 sec.

3. Multiple Alarm Annunciations. Each workstation on the network shall receive alarms within 5 sec of other workstations.

B. Coordination:

1. Coordinate location of temperature sensors, humidity sensors and other exposed control sensors with plans and room details before installation.

2. Coordinate installation of control dampers, taps, control valves, airflow stations, etc. with the mechanical contractor.

3. Coordinate BMS equipment with all relevant divisions including, but not limited to, Fire Alarm to achieve compatibility with equipment that interfaces with that system.

4. Coordinate BMS equipment to achieve compatibility with motor starters and annunciation devices.

5. Coordinate IP drops, network connections, user interfaces, firewall, etc. with Owner's IT representative.

6. Coordinate routing of network communication cabling with associated trades.

   a. Coordinate routing of network communication cabling with associated trades.

7. Controller shall support BACnet MS/TP or BACnet/IP.

C. The Application Specific Controller shall provide for control of each piece of equipment, including, but not limited to the following:

1. Variable Air volume (VAV)

2. Hot water and electric reheat Coils (RH)

3. Fan Coil Units (FCU)

4. Unit Ventilators

5. Heated ceiling panels

6. DX cooling coils

D. Each Application Specific Controller shall, at a minimum, be provided with:

1. Appropriate NEMA rated enclosure

2. Power supplies as required for all associated modules, sensors, actuators, etc.

3. Each controller measuring air volume shall include a differential pressure transducer

4. Approvals and standards: UL916 PAZX; CUL; FCC

E. Each Application Specific Controller shall continuously perform self-diagnostics on all hardware and secondary network communications. The Application Specific Controller shall provide both local and remote annunciation of any detected component failures or repeated failure to establish communication to the system.

F. Power Supply. The Application Specific controller shall be powered from a 24 VAC source and shall function normally under an operating range of -15% / +20%.

G. All controller configuration settings and programs shall be stored in non volatile memory. The controllers shall be able to return to full normal operation without user intervention after a power failure of unlimited duration.

H. Environment. The controllers shall function normally under ambient conditions of 23 to 122°F (-5 to 50°C) and 5% to 95% RH (non-condensing). Provide each controller with a suitable cover or enclosure to protect the circuit board assembly.

1.9 ALARM PROCESSING

A. Alarms shall be classified by their alarm type. The facility shall be provided for enabling and disabling each individual alarm on the system.

B. Once generated, the alarm shall be processed by its associated alarm type as defined in the I/O Point Schedules. The alarm types shall be as follows:

1. General Mismatch

2. Critical Mismatch

3. General Binary

4. Critical Binary

5. General Analog

6. Critical Analog

7. Alarm Inhibition

C. Consequential alarm suppression algorithms shall be provided to limit the alarms annunciated on the DDC System to those associated with the source of the initial alarm condition e.g. fire alarms shall not initiate mismatch alarms, restoration of power following a power failure shall not initiate mismatch alarms etc.

1.10 CONFIGURATION

A. Configuration data shall be stored in the DDC Controllers or the Terminal Unit Controllers. Configuration data shall include but not be limited to the following:

1. The unit applicable (deg F, GPM’s, inches, etc.).

2. The point identifier (minimum of 12 characters).

3. The point alarm message if applicable (minimum of 80 characters).

4. The point descriptor (minimum of 32 characters).

1.11 DDC STANDARD PROGRAMS

A. The device schedules included in this Specification provide details of inputs monitored and outputs controlled by the DDC System. All point types are described under Controllers elsewhere in this Specification. The DDC System shall allow for the following point functionality and standard programs to be available:

1. Point Override

2. Manual Start/Stop

3. Fixed Time Program

4. Optimum Start/Stop

5. Control Loops

6. Rotational Point

7. Run Time Totalization

8. KWH calculations

9. Anti-Short Cycling

10. Staggered Start

11. User Definable Software

12. General Control Requirements

1.12 INTEGRATIONS

A. The BMS shall utilize and be compatible with industry-standard integration protocols (BACnet and Modbus) for subsystem integration. Coordinate integration protocols with subsystem manufacturer.

B. In addition to the above, the BMS shall be integrated with all pump and fan VFDs via BACnet MS/TP or IP. All up to (20) software points shall be made available at the BMS for monitoring.

1.13 DELIVERY, STORAGE AND HANDLING

A. Provide factory-shipping cartons for each piece of equipment and control device. Maintain cartons through shipping, storage, and handling as required to prevent equipment damage. Store equipment and materials inside and protected from weather.

1.14 WARRANTY

A. Warranty the direct digital control system to be free from defects in workmanship and material for a period of one (1) year from completion of final commissioning. Warranty shall cover all costs for parts, labor, associated travel, and expenses for a period of twelve (12) months from completion of system demonstration.

B. Hardware and software personnel supporting this warranty agreement shall provide on-site or off-site service in a timely manner after failure notification to the vendor. The maximum acceptable response time to provide this service at the site shall be twenty-four (24) hours.

1.15 SPECIFICATION NOMENCLATURE

A. Acronyms used in this specification are as follows:

1. BAS Building Automation System
2. EMCS Energy Management and Control System
3. DDC Direct Digital Control
4. NAC Network Area Controller
5. IBCI nteroperable BACNet Controller
6. ASC Application Specific Controller
7. FUI Full User Interface
8. BUI Browser User Interface
9. POT Portable Operator’s Terminal
10. PMI Power Measurement Interface
11. LAN Local Area Network
12. WAN Wide Area Network
13. OOT Object Oriented Technology
14. PICS Product Interoperability Compliance Statement

PART 2 PRODUCTS

2.1 ACCEPTABLE MANUFACTURERS

A. The BMS shall be an extension of the existing Siemens BAS. The existing Siemens INSIGHT operator software shall be upgraded to DESIGO as part of this project.

B. Basis of Design

1. Siemens Desigo CC

    a. Siemens Industry, Inc., local NY/NJ Factory Branch Office

    b. Contact: Bert Vecchiarelli

        1) Email: bert.vecchiarelli@siemens.com

        2) Phone: (201) 454-3842

2.2 MATERIALS

A. All products used in this project installation shall be new and currently manufactured and shall have been applied in similar installations. Do not use this installation as a product test site unless explicitly approved in writing by Owner or Owner's representative. Spare parts shall be available for at least five years after completion of this contract.

2.3 DDC CONTROLLER FLOOR LEVEL NETWORK

A. This level communication shall support a family of application specific controllers and shall communicate with the peer to peer network through DDC Controllers for transmission of global data.

2.4 TIE-IN TO EXISTING SIEMENS BMS

A. Provide a SEAMLESS tie-in to the existing Siemens BMS. The tie-in shall include Direct Digital Control (DDC), historical data collection, archiving and alarm, energy and information management for all control points specified herein.

B. Tie-in to existing site BMS of all DDC equipment and points as specified in this section and as required in all other referenced sections and as required to complete the sequences of operation outlined herein. Tie-in shall be made via an extension of the existing BMS.

C. Provide new color graphics for all new systems specified in this contract.

D. Revisions to all existing BMS workstations as required to incorporate the additional control components provided under this section. Revisions shall include, but are not limited to, revised graphics, update of additional firmware and/or software as required to accommodate new points.

2.5 SYSTEM FUNCTIONS AND PERFORMANCE

A. The BMS shall be capable of accepting inputs (analog, digital, pulsed digital, thermistor, and RTD) from field devices, and of producing analog and digital outputs (4 - 20 mA DC, pulse width modulation, and 0-10 VDC) for control and monitoring functions in order to:

    1. Adjust control parameters for process-controlled variables.

    2. Initiate, define and acknowledge audible alarms.

    3. Start/stop motors and position valves and dampers.

4. Initiate shutdowns due to activation of safety devices.

5. Communicate with the servers and workstations.

2.6 SYSTEM ARCHITECTURE

A. The system architecture shall consist of a network of independent, standalone BACnet IP, BACnet MS/TP or Siemens P2/P1 based primary and unitary controllers. Each controller shall perform all specified control and monitoring functions independently. Failure of one (1) control unit shall have no effect upon any other unit in the network.

B. The system architecture shall be based on a modular PC network, utilizing industry standard operating systems, networks and protocols.

C. The system shall allow the distribution of system functions such as monitoring and control and graphical user interface etc. across the network to achieve maximum flexibility and performance.

D. Data communications protocol shall be BACnet and shall comply with ASHRAE 135.

E. Each DDC, unitary controller, server, and workstation shall communicate via TCP/IP or Siemens P1/P2.

F. Use fiber optic cabling for all Ethernet runs longer than 300 ft.

2.7 BUILDING AUTOMATION SYSTEM NETWORK - UTILIZE EXISTING SIEMENS BAS NETWORK.

A. The design of the BMS shall network the BMS server, operator workstations, primary control panels and secondary control panels. The network architecture shall consist of multiple network levels. Provide a peer-to-peer Primary Network to connect the existing server, operator workstation(s) and all primary control panels in the building for global system operation. Provide secondary networks to connect from each primary control panel to the secondary control panels of associated terminal equipment.

B. All networked control products provided for this project shall be comprised of an industry standard open protocol internetwork. Communication involving control components (i.e. all types of controllers and operator interfaces) shall conform to the ASHRAE 135 - BACnet standard. Networks and protocols proprietary to one company or distributed by one company are prohibited.

C. Controllers and software shall be BTL listed at the time of installation.

D. Primary control panels may be connected to the primary network via routers if this follows the standard architecture of a specified manufacturer. Provide additional controllers if required according to manufacturer’s standard architecture layout to achieve network functionality. Quantity and locations of routers, network controllers, and supervisory controllers to be coordinated with Engineer.

E. Access to system data shall not be restricted by the hardware configuration of the BMS. The hardware configuration of the BMS network shall be totally transparent to the user when accessing data or developing control programs.

F. The BMS design shall allow the co-existence of current and future primary control panels and personal computer operator workstations on the same primary network.

G. The BMS contractor shall provide new supervisory controllers/routers as required to connect to all new controllers being installed as part of this project, while still keeping with all requirements such as spare capacity requirements, etc.

2.8 OPERATOR SERVER/WORKSTATION HARDWARE – THE EXISTING SIEMENS INSIGHT OPERATOR SOFTWARE SHALL BE UPGRADED TO DESIGO AS PART OF THIS PROJECT. WORK INCLUDES A NEW SERVER AND OPERATOR WORKSTATION.

A. Provide one (1) new Server and (1) new operator workstation. Operator workstation shall be located as directed by the construction manager.

B. Workstation shall be provided for command entry, information management, network alarm management and database management functions. All real time control functions shall be resident in the DDC Controllers to facilitate greater fault tolerance and reliability.

C. Each server/workstation shall consist of the following, at a minimum:

1. Minimum sixteen (16) GB RAM

2. One (1) 500 GB SSD

3. Processor shall have a minimum speed of 3.0 GHz with no less than 4 cores

4. Mouse and 101-key enhanced keyboard.

D. Provide a monitor of flat panel type and shall support a minimum display resolution of no less than 1920 x 1080 pixels. The display shall have a minimum of 27-inch visible area in diagonal measurement. Separate controls shall be provided for color, contrasts and brightness. The screen shall be non-reflective.

E. Locate the Operator Workstations in a clean, secure, dry and temperature-controlled environment

F. Provide software licenses for interfacing to the BAS. Load software, configure and setup for viewing the BAS system.

G. Provide the PC with an operating system, such as Windows 10 Pro or other operating systems compatible with the BAS software.

H. Software: Provide the following application software licenses, preloaded on the workstation for the Owner: MS Office Professional, Internet Explorer or equal browser, MS Outlook, Acrobat Reader, CAD Viewer, Antivirus. Set up an icon on the desktop to take the Owner directly to the BAS system login page.

2.9 BUILDING MANAGEMENT SYSTEM SOFTWARE – DESIGO CC

A. General - The parameters of the DESIGO software implementation will mirror the configuration parameters of the existing INSIGHT software.

B. Provide software which includes the following capabilities. The parameters of the DESIGO software implementation will mirror the configuration parameters of the existing INSIGHT software.

1. Scheduling and override of building operations.

2. Collection and analysis of historical data.

3. Editing, programming, storage and downloading of controller databases, programs and parameters.

4. The latest version Microsoft Windows environment that allows the user to run several applications simultaneously. Other Windows applications shall run simultaneously with the BMS software including, but not limited to, Word, Excel, Access, etc.

5. Provide a user interface that shall minimize the use of a typewriter style keyboard through the use of a mouse or similar pointing device and "point and click" approach to menu selection.

6. The operator shall be able to drag and drop information between applications (e.g., click on a point in the alarm screen and drag it into the dynamic trend graph screen to initiate a dynamic trend).

7. Operator specific password access protection shall allow the user to limit workstation control, display and data base manipulation capabilities for each object in the system. An object shall be defined as any input or output point, setpoint, system program, etc. The operator privileges shall “follow” the operator to any workstation or primary control panel that the operator logs on to. Provide a minimum of 1000 passwords.

8. Operators will be able to perform only those commands on the objects available based on their respective passwords. Menu selections displayed shall be limited to only those items defined for the access level of the password used to log-on.

9. An audit trail report to track system object changes that shall record operator-initiated actions. These actions shall include, but not be limited to, changes made by a particular person, changes made to a specific piece of equipment and/or changes made during a designated time frame. The changes shall be printed and archived for future reference either on command or automatically, at the operator’s option. The operator activity tracking data shall be stored in a tamper proof buffer.

10. Software shall allow the operator to perform commands including, but not limited to:

    a. Start up and shutdown of equipment.

    b. Setpoint adjustment.

    c. Add/modify/delete time programming.

    d. Enable/disable process execution.

e. Lock/unlock alarm reporting.

f. Enable/disable totalization and/or trending.

g. Override PID loop setpoints.

h. Enter temporary override schedules.

i. Define holiday schedules.

j. Change time/date.

k. Automatic daylight savings time adjustments.

l. Enter/modify analog warning and alarm limits.

C. Reporting. Reports in DESIGO will mirror the existing INSIGHT reports.

1. Reports shall be generated and directed to displays, printers or disk. As a minimum, the system shall allow the user to easily obtain the following types of reports:

a. A general listing of all points in the network.

b. List of all points currently in alarm.

c. List of all points currently in override status.

d. List of all disabled points.

e. List of all points currently locked out.

f. DDC Controller trend overflow warning.

g. List all weekly schedules.

D. Scheduling. Scheduling in DESIGO will mirror the existing INSIGHT schedules.

1. Provide a graphical spreadsheet-type format for simplification of time-of-day scheduling and overrides of building operations. Provide schedules for 365 days in advance.

2. Weekly schedules shall be provided for each building zone or piece of equipment with a specific occupancy schedule. Temporary overrides and associated times may be inserted into blocks for modified operating schedules. After overrides have been executed, the original schedule will automatically be restored.

3. Zone schedules shall be provided for each building zone as previously described. Each schedule shall include all points that can be commanded residing within the zone. Each point may have a unique schedule of operation relative to the zone's occupancy schedule, allowing for sequential starting and control of equipment within the zone. Scheduling and rescheduling of points may be accomplished easily via the zone schedule graphic.

E. Password. New user passwords and access levels will need to be established.

1. Multiple-level password access protection shall be provided to allow the user/manager to limit workstation control, display, and database manipulation capabilities as he or she deems appropriate for each user, based on an assigned password.

2. Each user shall have the following: a user name (12 characters minimum); a password (12 characters minimum), and an access level (from 1 - 5).The system shall allow each user to change his or her password at will.

3. When entering or editing passwords, the system shall not echo the actual characters for display on the monitor.

4. A minimum of five levels of access shall be supported as follows.

   a. Level 1 = Data Access and Display

   b. Level 2 = Level 1 and Operator Overrides

   c. Level 3 = Level 2 and Database Modification

   d. Level 4 = Level 3 and Database Generation

   e. Level 5 = All privileges, including Password Add/Modify

5. A minimum of 100 unique passwords, including user initials, shall be supported.

6. Operators shall be able to perform only those commands available for their respective passwords. Display of menu selections shall be limited to only those items defined for the access level of the password used to log-on.

7. The system shall automatically generate a report of log-on/log-off and system activity for each user. Any action that results in a change in the operation or configuration of the control system shall be recorded, including: modification of point values, schedules or history collection parameters, and all changes to the alarm management system, including the acknowledgment and deletion of alarms.

8. User-definable, automatic log-off timers of from 1 to 60 minutes shall be provided to prevent operators from inadvertently leaving the operator workstation logged on.

F. Collection and Analysis of Historical Data. Trend collection in DESIGO will mirror the existing INSIGHT trend schedules.

1. Provide trending capabilities that allow the user to easily monitor and preserve records of system activity over an extended period of time. Any system point may be trended automatically at time-based intervals or changes of value, both of which shall be user-definable. Trend data shall be stored on hard disk for future diagnostics and reporting.

2. Trend data report graphics shall be provided to allow the user to view all trended point data. Reports may be customized to include individual points or pre-defined

groups of at least 6 points. Provide additional functionality to allow any trended data to be transferred directly to an off-the-shelf spreadsheet package such as Excel. This shall allow the user to perform custom calculations such as energy usage, equipment efficiency and energy costs and shall allow for generation of these reports on high-quality plots, graphs and charts.

3. Provide additional functionality that allows the user to view trended data on trend graph displays. Displays shall be actual plots of both historical and/or real-time dynamic point data. A minimum of 10 points shall be viewed simultaneously on a single graph. The user may pause the graph and take "snapshots" of screens to be stored on the hard disk for future recall and analysis. Displays shall include an 'X' axis indicating elapsed time and a 'Y' axis indicating a range scale in engineering units for each point. The 'Y' axis shall have the ability to be manually or automatically scaled at the user's option. Different ranges for each point may be used with minimum and maximum values listed at the bottom and top of the 'Y' axis. All 'Y' axis data shall be color-coded to match the line color for the corresponding point.

4. Static graphs shall represent actual point data that has been trended and stored on disk. Exact point values may be viewed on a data window by pointing or scrolling to the place of interest along the graph. Provide capability to print any graph on the system printer for use as a building management and diagnostics tool.

5. Dynamic graphs shall represent real-time point data. Any point or group of points may be graphed, regardless of whether they have been predefined for trending. The graphs shall continuously update point values. At any time the user may redefine sampling times or range scales for any point. In addition, the user may pause the graph and take "snapshots" of screens to be stored on the workstation disk for future recall and analysis. As with static graphs, exact point values may be viewed and the graphs may be printed.

G. Dynamic Color Graphic Displays. The Existing INSIGHT graphics will be used as a template when creating the new DESIGO graphics. Approximately (80) system graphics are included. In addition - each terminal unit with a networked Siemens controller (Unit vent, fan-coil unit, etc.) shall have a dedicated graphic.

1. All workstation(s) shall be provided with color graphics. All workstation(s) software shall include a graphical viewing and control environment and definition and construction of dynamic color graphic displays.

2. Provide system color graphics for each HVAC system and for each electrical, plumbing and/or piping system that is monitored and/or controlled by the BMS. Provide scaled floor plans indicating equipment location, service and system data as required.

3. Provide color graphic floor plan displays and system schematics for each piece of mechanical equipment, including but not limited to air handling units, and hot water systems to optimize system performance analysis and speed alarm recognition.

4. The operator interface shall allow users to access the various system schematics and floor plans via a graphical penetration scheme, menu selection or text-based commands.

5. Dynamic temperature values, humidity values, flow values and status indication shall be shown in their actual respective locations and shall automatically update to represent current conditions without operator intervention.

6. The windowing environment of the PC operator workstation(s) shall allow the user to simultaneously view several graphics at a time to analyze total building operation or to allow the display of a graphic associated with an alarm to be viewed without interrupting work in progress.

7. Graphic generation software shall be provided to allow the user to add, modify, or delete system graphic displays via an off the shelf graphics package.

8. Provide libraries of pre-engineered screens and symbols depicting standard air handling unit components (e.g., fans, cooling coils, filters, dampers, etc.), complete mechanical systems (e.g., constant volume-terminal reheat, VAV, etc.) and electrical symbols.

9. Graphical displays can be created to represent any logical grouping of system points or calculated data based upon building function, mechanical system, building layout, or any other logical grouping of points that aids the operator in the analysis of the facility.

10. Graphical displays shall contain animation to assist the operator in determining status of the equipment being displayed (e.g., a fan that is energized shall rotate).

11. Provide an automatically updated, dynamic display of the site-specific BMS architecture indicating the status of primary and secondary controllers, PC workstation(s) and networks.

12. Provide a separate dynamic display page of each HVAC (AHU, RTU, heat pump, unit ventilator, blower coil, etc.), electrical and/or plumbing system connected to the BMS.

13. Provide a separate dynamic display page of each piece of terminal equipment (VAV box, fan coil unit, etc.) connected to the BMS.

14. Provide a separate dynamic display page for each floor, roof and zone of each building within the school district. At a minimum, each page shall display the associated space temperature readings and links to equipment located on the floor or in the zone.

15. Graphics shall incorporate all system integration points communicated via hardware or software gateways and/or interfaces. Origin of information shall be transparent to the operator and shall be controlled, displayed, trended, etc. as if the points were hardwired to the BMS.

H. System Configuration and Definition

1. All temperature and equipment control strategies and energy management routines shall be definable by the operator. System definition and modification procedures shall not interfere with normal system operation and control.

2. The system shall be provided complete with all equipment and documentation necessary to allow an operator to independently add, delete or modify any system object including primary control panel(s), operator workstations(s), secondary control panels, reporting definitions, control loops, energy management applications, time and calendar-based programming, totalization, historical data trending, custom control processes, graphic displays, operator passwords, alarm messages, etc.

3. Definition of operator device characteristics for individual points, applications and control sequences shall be performed using instructive prompting software.

4. Programming shall be performed with the BMS system online and shall not interfere with BMS system operation.

5. Inputs and outputs for any process shall not be restricted to a single primary control panel, but shall be able to include data from any and all other network panels to allow the development of network-wide control strategies. Processes shall also allow the operator to use the results of 1 process as the input to any number of other processes (cascading).

6. Provide the capability to backup and store all system databases on the workstation hard disk. In addition, all database changes shall be performed while the workstation(s) are on-line without disrupting other system operations. Changes shall be automatically recorded and downloaded to the appropriate primary control panel. Similarly, changes made at the primary control panels shall be automatically uploaded to the workstation, ensuring system continuity. The user shall also have the option to selectively download changes as desired.

7. Provide context-sensitive help menus to provide instructions appropriate with operations and applications currently being performed.

I. External Data Access

1. The software shall provide the ability to expose configuration properties and real-time values through CSV files, OPC DA, OPC UA, or REST-based Web Services.

2. The software shall provide the ability for external applications to change configuration and real-time values through OPC DA, OPC UA, or REST-based Web Services.

3. The software shall provide the ability for external applications to access historical Trend data through CSV files or REST-based Web Services.

4. External data access must be secured using the level of permissions configured for users and operator workstations.

5. Web service interfaces must allow for exchanging data (object’s values, events and trend series) between workstation and external applications such as facility

management systems, enterprise applications, mobile applications or other value-added services.

6. Documentation describing web services interfaces must be included to allow external developers to write applications that leverage the data exchange.

J. Data Security

1. The BAS software must allow that all communication paths between clients and the server are encrypted and protected against replay attacks as well as data manipulation.

2. Any runtime data transfer between the system server and Web Server (IIS) must be allowed to be encrypted by Desigo CC.

3. Communication between any Web Server (IIS) and the Web Clients must be allowed to be encrypted.

4. Passwords must be handled with encrypted storage and transmission

5. The software must support the use of public domain algorithms for cryptographic functions, including AES, DiffieHellmann, RSA, and SHA-2. No self-coded algorithms shall be allowed.

6. All symmetrical encryption must use 256 bit AES or stronger.

7. All asymmetrical encryption must use 2048 bit or stronger.

8. The software must support the use of commercial certificates for securing client-server communications.

9. The software must support the use of self-signed certificates to allow local deployments without the overhead of obtaining commercial certificates.

10. When using self-signed certificates, the owner of the Desigo CC system is responsible for maintaining their validity status, and for manually adding them to and removing them from the list of trusted certificates.

11. The BAS software shall be compatible with the following Virus Scanners:

    a. Kaspersky

    b. Avira

    c. McAfee

    d. Bitdefender

    e. TrendMicro Office Scan

2.10 BUILDING CONTROLLER HARDWARE (B-BC)

A. If available, existing P2/P1 or BACnet building controllers may be utilized. For new controllers, utilize the below specification requirements.

B. Provide all necessary hardware for a complete operating system as required. The Building Controller shall be able to operate as a standalone panel and shall not be dependent upon any higher-level computer or another controller for operation.

C. Basis of Design: Siemens PXC Series.

D. This controller shall have the BTL listing and meet the BACnet device profile of a Building Controller (B-BC).

1. Controller shall support BACnet MS/TP and BACnet/IP.

E. This level of controller shall be used for the following types of systems:

1. Hot water systems.

2. Air handling units.

3. Rooftop Unit systems.

4. Heat Pump systems.

F. Computing power and memory minimum:

1. A stand-alone, multi-tasking, multi-user, real-time 1.2GHz digital control microprocessor module.

2. Inputs shall be 16-bit minimum analog-to-digital resolution

3. Outputs shall be 10-bit minimum digital-to-analog resolution

4. Memory module (2GB, minimum) to accommodate all Primary Control Panel software requirements, including but not limited to, its own operating system and databases (see Controllers Software section), including control processes, energy management applications, alarm management applications, historical/trend data for points specified, maintenance support applications, custom processes, operator I/O, dial-up communications.

5. Real time clock and battery

6. Data collection/ Data Trend module sized for 10,000 data samples.

7. Flash Memory Firmware: Each Building Level Control Panel shall support firmware upgrades without the need to replace hardware.

G. Communication

1. 2-Port Ethernet switch cabling compatible with star, bus or daisy chain topology.

2. WLAN connection for service, commissioning and firmware upgrade.

3. Web user interface is accessible over HTTP or securely over HTTPS.

4. Individual 3rd Ethernet port for local service/tools connection.

H. Input and Output Points Hardware

1. Input/output point expansion modules shall be installed as required to include 20% spare capacity of points.

2. Input/output point modules shall have removable terminal blocks.

3. Monitoring of the status of all hand-off-auto switches.

4. Monitoring of all industry standard types of analog and digital inputs and outputs, without the addition of equipment to the primary control panel.

5. Local status indication for each digital input and output for constant, up-to-date verification of all point conditions without the need for an operator I/O device. Each primary control panel shall perform diagnostics on all inputs and outputs and a failure of any input or output shall be indicated both locally and at the operator workstation.

6. Graduated intensity LEDs or analog indication of value for each analog output.

7. Optional HOA (hand-off-auto module) with software configurability and LED status indicators.

I. Code compliance

1. Approvals and standards: UL916; CE; FCC

2. Provide UL864-UUKL where called for in the sequences of operations.

J. Accessories:

1. Appropriate NEMA rated metal enclosure.

2. Power supplies as required for all associated modules, sensors, actuators, etc.

K. The operator shall have the ability to manually override automatic or centrally executed commands at the primary control panels via local, point discrete, on-board hand/off/auto operator override switches. If on board switches are not available, provide separate control panels with HOA switches. Mount panel adjacent to primary control panel. Provide hand/off/auto switch for each digital output, including spares.

L. Panel setup, point definitions and sequencing diagrams shall be backed up on EEPROM memory.

M. Power loss. In the event of the loss of power, there shall be an orderly shutdown of all Building Controllers to prevent the loss of database or operating system software. Non-volatile memory shall be incorporated for all critical controller configuration data and

battery backup shall be provided to support the real-time clock and all volatile memory for a minimum of 30 days.

N. Building Level Controllers shall have the capability to serve as a gateway between Modus subnetworks and BACnet objects. Provide software, drives and programming.

O. Spare Capacity: Provide enough inputs and outputs to handle the equipment shown to be “future” on drawings and 20% more of each point type. Provide all hardware modules, software modules, processors, power supplies, communication controllers, etc. required to ensure adding a point to the spare point location only requires the addition of the appropriate sensor/actuator and field wiring/tubing.

P. Environment:

1. Controller hardware shall be suitable for the anticipated ambient conditions.

2. Controllers used outdoors and/or in wet ambient conditions shall be mounted within waterproof enclosures and shall be rated for operation at 0°C to 49°C (32°F to 120°F).

3. Controllers used in conditioned space shall be mounted in dust-proof enclosures and shall be rated for operation at 0°C to 49°C (32°F to 120°F).

4. Controller hardware shall be optionally suitable for rooftop environments.

2.11 BACNET APPLICATION SPECIFIC CONTROLLERS (B-ASC)

A. Each Application Specific Controller shall operate as a stand alone controller capable of performing its user selectable control routines independently of any other controller in the system. Each Application Specific Controller shall provide standard applications and programmability to provide both reliability and flexibility. Each application specific controller shall be a microprocessor based, multi tasking, digital control processor.

B. Basis of Design: Siemens DXR.

C. Configurable control applications. Each Application Specific Controller model must have a set of pre-loaded, selectable and field-adjustable control applications appropriate for the secondary HVAC equipment that the controller model is intended to control. Specific applications must be configurable to meet the user's control strategy requirements, allowing for additional system flexibility.

D. Programmability: Application Specific Controllers shall be programmable. Program language shall be graphical.

E. The Application Specific Controller shall include all point inputs and outputs necessary to perform the specified HVAC control sequences. The controller shall accept input and provide output signals that comply with industry standards. Controllers utilizing proprietary control output signals shall not be acceptable. Controllers shall provide outputs utilized either for two-state, modulating floating, or proportional control, allowing for additional system flexibility.

1. Analog inputs shall be software configurable to accept sensors using 0-10v (such as RH or CO2 sensors), NTC3k, NTC10k, NTC100k, Ni1000, PT1K 385, and resistance sensors of 1000Ω, 2500 Ω, 10K Ω, and 100k Ω . 24vDC power to drive active sensors shall be an option available from the controller.

2. Digital input

3. Analog Outputs shall support 0-10v HVAC control signals.

4. Digital outputs shall be AC 24V high-side switching triacs, able to switch loads of 250 mA / 6 VA per output.

5. Every installed Application Specific Controller shall be prepared for the addition of occupancy, CO2 and humidity sensors

6. Additional sensors and output modules for occupancy, lighting and shade control within the same space as the HVAC control shall be connected as needed via a sub-network connection on each Application Specific Controller

7. The Application Specific Controller shall be compatible with a Siemens Room Unit which combines a display with CO2, temperature and humidity sensing in 1 wall device.

8. The Application Specific Controller shall be compatible with a Siemens Room Unit which combines a display with temperature sensing and configurable switches for lighting, shade and scene control in 1 wall device.

F. Application Specific Controller communication

1. Communication over floor level network shall be BACnet MS/TP or BACnet IP over Ethernet unless otherwise required by the application.

2. Each controller that uses BACnet IP shall provide at least two Ethernet ports allowing the controllers to be wired in a daisy-chain configuration of up to at least 20 controllers per chain, utilizing standard Ethernet cables of up to 300ft in length between each controller.

G. The Application Specific Controller shall have the BTL listing and meet the BACnet device profile of an Application Specific Controller (B-ASC) as specified in ANSI/ASHRAE 135.

1. Controller shall support BACnet MS/TP or BACnet/IP.

H. The Application Specific Controller shall provide for control of each piece of equipment, including, but not limited to the following:

1. Variable Air volume (VAV)

2. Hot water and electric reheat Coils (RH)

3. Fan Coil Units (FCU)

4. Unit Ventilators
5. Baseboard radiator
6. Chilled/heated ceiling panels
7. DX cooling coils

I. Each Application Specific Controller shall, at a minimum, be provided with:

1. Appropriate NEMA rated enclosure
2. Power supplies as required for all associated modules, sensors, actuators, etc.
3. Each controller measuring air volume shall include a differential pressure transducer
4. Approvals and standards: UL916 PAZX; CUL; FCC

J. Each Application Specific Controller shall continuously perform self-diagnostics on all hardware and secondary network communications. The Application Specific Controller shall provide both local and remote annunciation of any detected component failures or repeated failure to establish communication to the system.

K. Power Supply. The Application Specific controller shall be powered from a 24 VAC source and shall function normally under an operating range of -15% / +20%.

L. All controller configuration settings and programs shall be stored in non volatile memory. The controllers shall be able to return to full normal operation without user intervention after a power failure of unlimited duration.

M. Environment. The controllers shall function normally under ambient conditions of 23 to 122°F (-5 to 50°C) and 5% to 95% RH (non-condensing). Provide each controller with a suitable cover or enclosure to protect the circuit board assembly.

2.12 ALARM PROCESSING

A. Alarms shall be classified by their alarm type. The facility shall be provided for enabling and disabling each individual alarm on the system.

B. Once generated, the alarm shall be processed by its associated alarm type as defined in the I/O Point Schedules. The alarm types shall be as follows:

1. General Mismatch
2. Critical Mismatch
3. General Binary
4. Critical Binary
5. General Analog
6. Critical Analog

7. Alarm Inhibition

C. Consequential alarm suppression algorithms shall be provided to limit the alarms annunciated on the DDC System to those associated with the source of the initial alarm condition e.g. fire alarms shall not initiate mismatch alarms, restoration of power following a power failure shall not initiate mismatch alarms etc.

2.13 CONFIGURATION

A. Configuration data shall be stored in the DDC Controllers or the Terminal Unit Controllers. Configuration data shall include but not be limited to the following:

1. The unit applicable (deg F, GPM's, inches, etc.).

2. The point identifier (minimum of 12 characters).

3. The point alarm message if applicable (minimum of 80 characters).

4. The point descriptor (minimum of 32 characters).

2.14 DDC STANDARD PROGRAMS

A. The device schedules included in this Specification provide details of inputs monitored and outputs controlled by the DDC System. All point types are described under Controllers elsewhere in this Specification. The DDC System shall allow for the following point functionality and standard programs to be available:

1. Point Override

2. Manual Start/Stop

3. Fixed Time Program

4. Optimum Start/Stop

5. Control Loops

6. Rotational Point

7. Run Time Totalization

8. KWH calculations

9. Anti-Short Cycling

10. Staggered Start

11. User Definable Software

12. General Control Requirements

2.15 INTEGRATIONS

A. The BMS shall utilize and be compatible with industry-standard integration protocols (BACnet and Modbus) for subsystem integration. Coordinate integration protocols with subsystem manufacturer.

B. In addition to the above, the BMS shall be integrated with all pump and fan VFDs via BACnet MS/TP or IP. All up to (20) software points shall be made available at the BMS for monitoring.

2.16 CONTROL PANELS

A. Fully enclosed, steel-rack-type cabinet with locking doors or locking removable backs.

B. Field equipment panels located indoors shall be NEMA 1. Field equipment panels located outdoors or subject to outdoor air conditions shall be minimum of NEMA 3R, provided with internal electric heater and cooling fan.

C. Coordinate installation of the control panels with the engineer/architect.

D. Coordinate power for the panels with the electrical contractor.

E. All control panels shall be provided with DIN Rail mounted screw terminal blocks. Field wiring shall be connected to the screw terminal blocks. It is not acceptable to terminate any field wiring directly to the DDC controller or any panel devices such as relay and transducers. The screw terminal blocks located/attached to the DDC controller alone does not comply with this requirement.

F. All control devices such as relays, transformers, transducers, power supplies, associated I/O devices, etc. shall be installed inside the panel, not at the starter or electrical junction box.

2.17 SENSORS

A. Input/output sensors and devices shall be closely matched to the requirements of the DDC for accurate, responsive, noise-free signal input/output. Control input response shall be high sensitivity and matched to the loop gain requirements for precise and responsive control. Thermistors are acceptable for VAV terminal applications.

B. Temperature Sensors

1. Provide the following instrumentation as required by the monitoring, control, and optimization functions. All temperature sensors shall use platinum RTD elements only, nickel or silicon RTD’s and thermistors are not acceptable.

2. Temperature Transmitter Assembly – Airstream averaging type

a. The assembly shall consist of a capillary type 1000-ohm platinum RTD housed in a flexible sheath contained in housing suitable for duct mounting.

3. Temperature Transmitter Assembly – Airstream non-averaging type

a. The assembly shall consist of an insertion type 1000-ohm platinum RTD mounted on a 12-inch probe (or duct diameter) contained in a housing suitable for duct mounting.

4. For outside air application mount with weather protection and sun shield.

5. Low Temperature Limit Switch (Freezestat) – Airstream

a. The low temperature limit switch shall be of the automatic reset type with Double Pole/Single Throw snap acting contacts rated for 16 amps at 120VAC.

b. The sensing element shall be a minimum of 15 feet in length and shall react to the coldest 18-inch section. Element shall be mounted horizontally across duct in accordance with manufacturers recommended installation procedures.

c. Provide one freezestat per coil section or a maximum of 18 square feet whichever is more provides more coverage.

6. Temperature Transmitter – Space

a. The assembly shall consist of a 1000-ohm platinum RTD contained in a decorative ventilated enclosure similar in appearance to room thermostats.

b. Temperature transmitters for terminal unit applications (such as VAVs, FCUs, etc.) may utilize industry-standard KNX protocol.

c. Cover type (i.e. indicating, adjustable, blank), colors, and final installation locations shall be as reviewed approved by the architect, owner, and engineer. In general, occupied spaces (i.e. offices, conference rooms, etc.) shall be provided with indicating temperature display (LCD) and setpoint adjustment (±3°F); transient spaces (i.e. open office area, hallways, etc.) shall be provided with blank non-indicating and non-adjustable sensors. Note: All adjustable sensors are subject to ADA requirements.

7. Temperature Transmitter – Liquid Immersion

8. Sensing element RTD

a. Temperature range Suitable for application

b. Output signal 4-20 mA

c. Accuracy ±0.15°F

d. Provide Type 304 stainless steel thermowell for each liquid immersion temperature sensing element.

e. Siemens Q series Sensors

C. Humidity Sensors, Siemens Q Series Sensors

1. Relative Humidity – Space

a. Sensor Humidity range 0 to 100%

b. Accuracy ±4% RH (20-80% RH).

c. Sensing element Digital Sensor IC (capacitive)

d. Provide with readable LCD display where indicated in the sequences or drawings

e. For rooms with temperature sensing as well, provide a combined temperature/humidity sensor or provide units with matching cover.

2. Relative Humidity – Duct

a. Sensor humidity range 0 to 100%

b. Accuracy ±2%

c. Sensing element Digital Sensor IC (capacitive)

d. Output signal 4-20 mA/0-5V/0-10V selectable

e. Calibration adjustment adjustable to ±5% RH

3. Outside-Air Sensors: Provide duct-mounted sensor with element guard and mounting plate.

D. Carbon Dioxide Transmitters

1. Carbon Dioxide – Space

a. Sensor range 0-2000 ppm

b. Accuracy ±(30 ppm + 4% of measured value)

c. Provide with readable LCD display where indicated in the sequences or drawings

d. For rooms with temperature sensing as well, provide a combined temperature/humidity sensor or provide units with matching cover.

2. Carbon Dioxide – Duct

a. Sensor range 0-2000 ppm

b. Accuracy ±(50 ppm + 2% of measured value)

c. Output signal 4-20 mA/0-5V/0-10V selectable

E. Pressure Sensors/Switches

1. Airside Differential Pressure Transmitter

a. Non-directional sensor with suitable range for expected input, and temperature compensated.

b. Assembly to include integral mounting bracket

c. Accuracy ±1% of Full Scale

d. Output 4 to 20 mA or 0-10 VDC (selectable)

e. Static Pressure Ranges

1) Building 0 to 0.25 inches wg.

2) Duct 0 to 5 inches wg.

3) AHU Filter 0 to 1 inch wg. (Coordinate with manufacturer)

2. Airside Static Pressure Switches

a. Diaphragm type air differential pressure switches with die cast aluminum housing, adjustable setpoint, minimum 5 amp switch rating at 120VAC, SPDT switches. Switch pressure range and set point shall be suitable for the application. High and low ports shall be 1/8 inch NPT connected to angle type tips designed to sense pressure.

b. Reset-type based on applications:

1) Fan status Automatic Reset

2) Hi/Lo Static Safety Manual Reset

c. Provide AFS Series as manufactured by Siemens, Cleveland Controls or pre-approved equal.

F. Water Differential Pressure Transmitter

1. Wet-to-wet differential pressure transmitter shall be direct acting for gas or liquid service. Pressure range shall be suitable for system and applications.

2. Transmitter shall meet the following criteria:

a. Supply Voltage 15 - 30 VDC

b. Output 2-wire proportional output, 4 to 20 mA

c. Housing NEMA 4 with LCD Display

d. Operating Temp -4ºF - 185ºF

e. Accuracy ±1.0% FS

3. Transmitter shall be furnished with factory-assembled 5-valve manifold.

4. Provide Siemens QBE series or Setra Model 231, or approved equal.

G. Water Differential Pressure Switch

1. Differential pressure switch shall contain brass bellows which shall operate snap-acting SPDT contacts.

2. High- and low-sensing ports shall be 1/4 inch NPT.

3. Adjustable operating range shall be capable of sustaining 75 psig in either direction.

H. Current-Sensing Relays

1. Relay shall be field-adjustable for detecting AC current levels in equipment served. Relay shall be non-latching and shall have no time delay. Nominal input voltage and current-sensing range shall be selected based on electrical characteristics of equipment served. Relay shall be installed on one (1) lead of the load side of motor feed. Relay contacts shall be Form C-rated for 5A at 120 VAC.

I. Electromagnetic In-line Flow Meter

1. Flow meter shall be an inline electromagnetic flowmeter complete with NIST traceable, wet calibrated flow-measuring element, transmitter, visual display, ANSI Class 150 or 300 mounting flanges, and calibration certificate.

2. Flowmeter shall be constructed, calibrated and scaled for the intended application in terms of pipe size, pipe material, installation requirements, expected flow rate, ambient conditions and fluid characteristics which include but are not limited to pressure, temperature, conductivity and viscosity.

3. Flow meter shall meet the following criteria:

a. Sensing Technology Electromagnetic velocity-measuring element

b. Accuracy ±0.2% for 1.6 to 33.0 ft/s, ±0.0033 ft/s for <1.6 ft/s

c. Power Supply 20-28 VAC @ 50/60 Hz or 120-240 VAC @ 50-60Hz

d. Display

1) Three (3) Button programming keys

2) 16-character, 8-line graphic LCD display

e. Outputs

1) Two (2) digital outputs.

f. Two (2) analog outputs

4. Flow meter shall meet the following material construction specifications:

a. Enclosure Rating IP67

b. Outer Body Epoxy-painted carbon steel

c. Flow tube 304 stainless steel

d. Integral liner Based on operating temperature/fluid

e. Maximum Pressure 580 psig

f. Maximum Temperature 266°F

g. End connections ANSI Class 150 (or as per application)

5. Provide remote mounting of display at eye level for applications where flow sensor is located above 10 ft. For all other locations, transmitter shall be mounted to flow sensor assembly.

6. Flow meter shall be Onicon Model FT-3000 Series, or approved equal.

J. Electromagnetic Insertion Flow Meter

1. Flow meter shall be an insertion electromagnetic flowmeter complete with NIST traceable, wet calibrated flow-measuring element, integral transmitter, installation valves, installation depth gage and calibration certificate. Flowmeter shall be wet tappable, allowing insertion and removal from the flow stream without system shutdown.

2. Flowmeter shall be constructed, calibrated and scaled for the intended application in terms of pipe size, pipe material, installation requirements, expected flow rate, ambient conditions and fluid characteristics which include but are not limited to pressure, temperature, conductivity and viscosity.

3. Flow meter shall meet the following criteria:

a. Sensing Technology Electromagnetic velocity-measuring element

b. Accuracy ±1.0% for 2.0 to 20.0 ft/s, ±0.02 ft/s for <2.0 ft/s

c. Power Supply 20-28 VAC @ 50/60 Hz or 120-240 VAC @ 50-60Hz

d. Outputs

1) One (1) scalable pulsed output.

2) One (1) analog output, field selectable 4-20 mA or 0-10 V.

4. Flow meter shall meet the following material construction specifications:

a. Wetted components 316 stainless steel

b. Maximum Pressure 400 psig

c. Enclosure NEMA 4

d. End connections 1” Male NPT Hot Tap Adapter fitting

e. Installation shall be through 1” full port isolation valve.

5. Flow meter shall be Onicon Model F-3500 Series, or approved equal.

K. Turbine Insertion Flow Meter – Utilize only for closed piping systems

1. Flow meter shall be insertion turbine flowmeter complete with NIST traceable, wet calibrated flow-measuring element, integral transmitter, installation valves, depth gage and calibration certificate. Flowmeter shall be wet tappable, allowing insertion and removal from the flow stream without system shutdown.

2. Flowmeter shall be constructed, calibrated, and scaled for the intended application in terms of pipe size, pipe material, installation requirements, expected flow rate, ambient conditions and fluid characteristics which include but are not limited to pressure, temperature, conductivity, and viscosity. Flow meter shall meet the following criteria:

a. Sensing Technology Dual axial turbine flow-measuring element

b. Accuracy ±1% for 3 to 30 ft/s, ±2% for 0.4 to 20 ft/s

c. Power Supply 20-28 VAC @ 50/60 Hz

d. Outputs

1) One (1) scalable pulsed output.

2) One (1) analog output, field selectable 4-20 mA or 0-10 V.

3. Flow meter shall meet the following material construction specifications:

a. Wetted components 316 stainless steel

b. Maximum Pressure 400 psig

c. Enclosure NEMA 4

d. End connections 1” Male NPT Hot Tap Adapter fitting with 1” full port isolation valve.

4. Flow meter shall be Onicon Model F-1000 Series, or approved equal.

2.18 FIELD DEVICES

A. General

1. Specified in this section are the following hard-wired input/output devices connected to the Networked Primary DDC Controller or ASC.

a. Automatic Control Valves

b. Binary Temperature Devices

c. Temperature Sensors

d. Differential Pressure Switches

e. Relays

f. Current Switches

B. ELECTRIC DAMPER ACTUATORS

1. General

a. The actuator shall have mechanical or electronic stall protection to prevent damage to the actuator throughout the rotation of the actuator.

b. Where shown, for power-failure/safety applications, an internal mechanical, spring-return mechanism shall be built into the actuator housing. Alternatively, an uninterruptible power supply (UPS) may be provided.

c. Proportional actuators shall accept a 0 to 10 VDC or 4 to 20 mA control signal.

d. All 24 VAC/VDC actuators shall operate on Class 2 wiring

e. All actuators shall have an external manual gear release to allow manual positioning of the damper when the actuator is not powered. Spring-return actuators with more than 7 Nm (60 in.-lb) torque capacity shall have a manual crank for this purpose.

C. AUTOMATIC CONTROL VALVES.

1. General:

a. Control valves shall be two-way or three-way type single seated globe type for two-position or modulating service as shown. Valves shall meet ANSI Class IV leakage rating.

b. Body pressure rating and connection type construction shall conform to pipe, fitting and valve schedules. Where pressure and flow combinations exceed ratings for commercial valves and operators, industrial class valves and operators shall be provided.

c. Valve operators shall be of electric type.

d. The valves shall be quiet in operation and fail-safe in either normally open or normally closed position in the event of power failure.

e. Provide valves 2" and smaller with screwed end bronze bodies and stainless-steel trim. Provide valves 2-1/2" and larger with flanged ends, cast iron body and stainless-steel trim.

f. Valves shall have sufficient stuffing box protection to ensure against leakage at hydrostatic head involved. Control valve operators shall be sized to close against differential pressure equal to the design pump head plus 10 percent. Valve leakage shall meet or exceed ANSI Class IV leakage (0.01% of rated valve capacity).

g. Two-way Modulating Control Valves – 2-1/2” and larger

1) Two-way modulating control valves shall be globe-style with equal percentage flow characteristic for water service and linear flow characteristic for steam service.

(a) Performance:

(1)	Pressure Rating	ANSI 125 or 250
(2)	Close-off Pressure	Pump head plus 10%
(3)	Leakage	ANSI Class IV
(4)	Temperature Range	34 to 250°F
(5)	Rangeability	100:1

(b) Material construction:

(1)	Body	Cast Iron
(2)	End Connection	ANSI Flanged
(3)	Trim	Bronze
(4)	Stem	Stainless Steel

(c) Input power voltage shall be 24VAC.

(d) Control signal to valves shall be via hardwired analog output (0-10 VDC).

(e) Valves shall be Siemens Flanged Iron Two-Way Globe Valves, or approved equal.

h. Three-way Modulating Control Valves – 2-1/2” and larger

1) Three-way modulating control valves shall be globe-style with equal percentage flow characteristic.

(a) Performance:

(1)	Pressure Rating	ANSI 125 or 250
(2)	Close-off Pressure	Pump head plus 10%

(b) Leakage ANSI Class IV

(1)	Temperature Range	34 to 250°F
(2)	Rangeability	100:1

(c) Material construction:

(1) Body — Cast Iron

(2) End Connection — ANSI Flanged

(3) Trim — Bronze

(4) Stem — Stainless Steel

(d) Input power voltage shall be 24VAC.

(e) Control signal to valves shall be via hardwired analog output (0-10 VDC).

(f) Valves shall be Siemens Flanged Iron Three-Way Globe Valves, or approved equal.

i. Motorized Isolation Valves – Up to 2”

1) Valve shall be suitable for hot water service. Isolation valve shall be line-sized, full-port ball valve.

2) Performance:

3) Pressure Rating — 360 psig

(a) Close-off pressure — 200 psi

(b) Temperature Range — 35 to 250°F

(c) Valves shall meet the following material construction specifications:

4) Body — Forged brass

5) End Connection — NPT female

6) Ball — Stainless steel

7) Stem — Stainless steel

8) Ball Seats — Teflon PTFE

9) Stem Seal — EPDM O-rings

10) Input power voltage shall be 24VAC.

11) Valves shall be two-position (on/off) and provided with open and closed endswitches.

12) Valves shall be as manufactured by Belimo, Siemens, or approved equal.

j. High Performance Motorized Butterfly Valves for Isolation – 2-1/2” and larger

1) Valve shall be suitable for chilled and hot water service. Valve shall be line-sized.

2) Performance:

(a) Pressure Rating ANSI Class 200, 740 psig

(b) Close-off pressure Suitable for application

3) Temperature Range -62 to 500°F

4) Valves shall meet the following material construction specifications:

(a) Body Carbon steel

(b) End Connection Lugged

(c) Disc Stainless steel

5) Stem Stainless steel

(a) Seat PTFE

6) Valve Actuator

(a) Input Power 120 VAC or 24 VAC

(b) Signal Two position (on/off)

(c) Enclosure Rating NEMA 4 or greater

(d) Limit Switches Integral opened and closed

(e) Torque Suitable for application close-off

(f) Manual Override Handwheel

(g) Valve and actuator shall be as manufactured by Siemens, Bray, or approved equal.

D. RELAYS.

1. Control relays shall be UL listed plug-in type with dust cover and LED “energized” indicator. Contact rating, configuration, and coil voltage shall be suitable for application.

2. Time delay relays shall be UL listed solid-state plug-in type with adjustable time delay. Delay shall be adjustable ±200% (minimum) from set point shown on plans. Contact rating, configuration, and coil voltage shall be suitable for application. Provide NEMA 1 enclosure when not installed in local control panel.

E. CURRENT SWITCHES.

1. Current-operated switches shall be self-powered, solid-state with adjustable trip current. The switches shall be selected to match the current of the application and output requirements of the DDC system.

2.19 AIRFLOW MEASURING DEVICES

A. Small Duct Air Measuring Devices:

1. Airflow Measurement Device (AMD) with Temperature Output and Integral Airflow Alarming

a. General

1) Provide one AMD with an integral airflow alarm for each measurement location provided on the plans, schedules and/or control diagrams to determine the average airflow rate and temperature at each measurement location.

2) Each AMD shall be provided with a remotely mounted microprocessor-based transmitter and one or two sensor probes.

(a) Devices that have electronic signal processing components in the sensor probe are not acceptable.

3) Airflow measurement shall determine the average actual airflow rate.

4) Temperature measurement shall determine the velocity weighted average temperature by factory default or the arithmetic average by manual field selection.

b. Sensor Probe Design

1) Sensor probes shall be constructed of 6063 extruded aluminum alloy tube.

2) Sensor probe mounting brackets shall be constructed of 304 stainless steel.

3) Probe internal wiring between the connecting cable and sensor nodes shall be Kynar coated copper.

(a) PVC jacketed internal wiring is not acceptable.

4) Probe internal wiring connections shall consist of solder joints and spot welds.

(a) Connectors of any type within the probe are not acceptable.

(b) Printed circuit boards within the probe are not acceptable.

5) Each sensor node shall be provided with two bead-in-glass, hermetically sealed thermistors potted in a marine grade waterproof epoxy.

(a) Devices that use epoxy or glass encapsulated chip thermistors are not acceptable.

6) Each thermistor shall be individually calibrated at a minimum of 3 temperatures to NIST-traceable temperature standards.

7) Each sensor node shall be calibrated to volumetric standards at a minimum of 7 calibration points.

8) The number of independent sensor nodes provided shall be as follows:

(a) 4" diameter - 1 sensor node

(b) greater than 4" diameter up to 16" diameter - 2 sensor nodes

9) Probe to transmitter cables shall be FEP jacketed, plenum rated CMP/CL2P and UL/cUL Listed, -67° to 392° F (19.4° C to 200° C) and UV tolerant. Cables shall include a terminal plug for connection to the remotely mounted transmitter. PVC jacketed cables or PVC insulated conductors are not acceptable with ducted sensor probes.

c. Transmitter

1) An integral microprocessor-based transmitter shall be provided for each measurement location.

2) All printed circuit board interconnects and test points shall be gold plated.

3) All printed circuit boards shall be electroless nickel immersion gold (ENIG) plated.

4) All integrated circuitry shall be temperature rated as ‘industrial-grade’. Submissions containing ‘commercial-grade’ integrated circuitry are not acceptable.

5) The transmitter shall be capable of determining the average actual airflow rate and temperature of the sensor nodes in the array.

6) The transmitter shall be capable of identifying an AMD malfunction and ignore a sensor node that is in a fault condition, while simultaneously indicating a fault visually and over the network.

7) The transmitter shall be provided with one of the following:

(a) Two scalable, protected and field selectable analog output signals (0-5 / 1-5 VDC or 0-10 / 2-10 VDC, choose one), or

(b) One non-isolated RS-485 network connection (field selectable BACnet MS/TP or Modbus RTU protocol). Provide individual 24 VAC transformers at each network transmitter requiring isolated RS-485 connection.

8) One analog output shall be airflow (AO1), while the second output (AO2) shall be configurable as average temperature (default), adjustable airflow alarm or system alarm.

(a) When the alarm is active, the alarm condition shall be indicated on the LCD display.

(b) Alarm reset shall be manual or automatic.

(c) Alarm set points shall be adjustable by type, tolerance, delay, disable/enable, and analog signal indication for AO2.

9) RS-485 network communications shall provide the average airflow rate, average temperature, system status alarm, Hi-Lo airflow alarm, individual sensor node airflow rates and individual sensor node temperatures.

10) Each transmitter shall provide one dry contact relay with onboard jumper to drive a remote LED. The relay shall be rated for no less than 30 VDC or 24 VAC @ 3 amp max and user configurable as N.O. or N.C. during set up.

11) The transmitter shall have a built-in field adjustment wizard for one or two point output adjustments to the factory calibration, when required.

12) The transmitter shall be powered by 24 VAC (22.8 to 26.4 under load) @8 V-A.

13) The transmitter shall provide an integral LCD display for display of airflow, temperature and alarms; and a pushbutton user interface for configuration and diagnostics.

14) The transmitter shall be mounted in an environment protected from direct contact with water.

15) The transmitter shall independently process the airflow and temperature of each sensor node prior to averaging and output.

16) The transmitter shall use a “watchdog” timer circuit to ensure continuous operation in the event of brown-out and/or power failure.

d. Performance and calibration

1) Each sensing node shall have an airflow accuracy of ±3% of reading (typical) ±4% max. from 0 to 3,000 FPM (15.24 m/s) over a temperature range of 0° F to 160° F (-18° to 71° C). Airflow accuracy shall be maintained at lower operating temperatures of -20° F to 160° F (-29° C to 71° C) but the velocity range shall be limited to 0 - 2,000 FPM (10.2 m/s).

(a) Accuracy shall include the combined uncertainty of the sensor nodes and transmitter.

(b) Devices whose overall performance at the host controller input terminals is the combined accuracy of the transmitter and sensor probes shall demonstrate that the total accuracy meets the performance requirements of this specification throughout the measurement range.

2) Each sensor node shall be factory calibrated at a minimum of 7 airflow rates including zero (still air), to to NIST Traceable standards.

3) Each thermistor shall be individually calibrated at a minimum of 3 temperatures to standards that are traceable to the National Institute of Standards and Technology (NIST).

4) Each sensing node shall have a temperature accuracy of ± 0.15° F (± 0.08° C) over a calibrated range of -20° F to 160° F (-28.9° C to 71.1° C).

5) Minimum calibrated and operating temperature range for the sensor probes shall be -20° F to 160° F (-28.9° C to 71.1° C).

6) Operating temperature range for the transmitter shall be -20° F to 120° F (-28.9° C to 48.9° C).

e. Listings and Certifications

1) The AMD shall be UL 60730-1 and 60730-2-9 Listed as an assembly and subscribed to the UL Follow-up Services.

(a) Devices claiming compliance with the UL Listing based on individual UL component listings are not acceptable.

B. Large Ducts and Intakes Air Measuring Devices:

1. Airflow Measurement Devices (AMD) with Temperature Output and Airflow Alarming Capability

a. General

1) Provide one AMD for each measurement location provided on the plans, schedules and/or control diagrams to determine the average airflow rate and temperature at each measurement location.

2) Each AMD shall be provided with a microprocessor-based transmitter and one or more sensor probes.

(a) Devices that have electronic signal processing components on or in the sensor probe are not acceptable.

3) Airflow measurement shall be field configurable to determine the average Actual or Standard mass airflow rate.

(a) Actual airflow rate calculations shall have the capability of being corrected by the transmitter for altitudes other than sea level.

4) Temperature measurement shall be field configurable with velocity weighted average as the default, or manual selection of arithmetic average temperature.

b. Sensor Probes

1) Sensor probes shall be constructed of gold anodized, 6063 aluminum alloy tube.

2) Sensor probe mounting brackets shall be constructed of 304 stainless steel.

3) Probe internal wiring between the connecting cable and sensor nodes shall be Kynar coated copper.

   (a) PVC jacketed internal wiring is not acceptable.

4) Probe internal wiring connections shall consist of solder joints and spot welds.

   (a) Internal wiring connections shall be sealed and protected from the elements. They shall be capable of direct exposure to water without affecting instrument operation.

   (b) Connectors of any type within the probe are not acceptable.

   (c) Printed circuit boards within the probe are not acceptable.

5) Each sensor probe shall be provided with an integral, FEP jacket, plenum rated CMP/CL2P, UL/cUL Listed cable rated for exposures from -67° F to 392° F (-55° C to 200° C) and continuous and direct UV exposure.

   (a) Plenum rated PVC jacket cables are not acceptable.

6) Each sensor probe cable shall be provided with a connector plug with gold plated pins for connection to the transmitter.

7) Each sensor probe shall contain one or more independently wired sensing nodes.

8) Sensor node airflow and temperature calibration data shall be stored in a serial memory chip in the cable connecting plug and not require matching or adjustments to the transmitter in the field.

9) Each sensor node shall be provided with two bead-in-glass, hermetically sealed thermistors potted in a marine grade waterproof epoxy with sensor housings constructed of glass-filled polypropylene. Upon request, the manufacture shall provide a written independent laboratory test result of 100% survival rate in a 30 day saltwater and acid vapor test.

   (a) Devices that use epoxy or glass encapsulated chip thermistors are not acceptable.

   (b) Devices with exposed leads are not acceptable.

10) Each thermistor shall be individually calibrated at a minimum of 3 temperatures to NIST-traceable temperature standards.

11) Each sensor node shall be individually calibrated at 16 measurement points to airflow standards directly calibrated at NIST to the NIST Laser Doppler Anemometer (LDA) primary velocity standard and have an

accuracy of ±2% of reading over the entire calibrated airflow range of 0 to 5,000 FPM (25.4 m/s).

(a) Upon request the manufacture shall submit for AMD approval a copy of the NIST report of calibration used for the reference standard used.

(b) Devices claiming NIST traceability to third party laboratories and not directly to NIST are not acceptable

(c) Devices calibrated against standards other than the NIST LDA are not acceptable.

12) Accuracy shall include the combined uncertainty of the sensor nodes and transmitter.

13) The installed airflow accuracy shall be:

(a) Ducts - ±3% of reading when installed in accordance with the manufactures recommended placement guidelines.

(b) Non-ducted Outdoor Air intakes - better than or equal to ±5% of reading when installed in accordance with the manufactures recommended placement guidelines.

14) Devices whose overall accuracy is based on individual accuracy specifications of the sensor probes and transmitter shall demonstrate compliance with this requirement over the entire operating range.

15) Each sensing node shall have a temperature accuracy of ±0.15° F (0.08° C) over an operating range of -20° F to 160° F. (-28.9° C to 71.1° C) and humidity range of 0 to 100% RH.

16) Sensor nodes provided shall be as follows:

(a) The number of sensor housings provided for each location shall be as follows:

(b) Area (sq.ft.) Sensors

(c) 1 or less 2

(d) > 1 to < 4 4

(e) 4 to <8 6

(f) 8 to <12 8

(g) 12 to <16 12

(h) 16 or more 16

(i) A total of 4 probes shall be required for openings with an aspect ratio less than or equal to 1.5 and with an area greater than or equal to 25 ft2.

17) Fan Inlet Sensor Probe Assemblies

(a) Sensor housings shall be mounted on 304 stainless steel blocks.

(b) Mounting rods shall be field adjustable to fit the fan inlet and constructed of nickel plated steel.

(c) Mounting feet shall be constructed of 304 stainless steel.

(d) The operating airflow range shall be 0 to 10,000 FPM unless otherwise indicated on the plans.

c. Transmitter

1) A remotely located microprocessor-based transmitter shall be provided for each measurement location.

2) The transmitter shall be comprised of a main circuit board and interchangeable interface card.

3) All printed circuit board interconnects, edge fingers, receptacle plug pins and PCB test points shall be gold plated.

4) All printed circuit boards shall be electroless nickel immersion gold (ENIG) plated.

5) All integrated circuitry shall be temperature rated as ‘industrial-grade’. Submissions containing ‘commercial-grade’ integrated circuitry are not acceptable.

6) The transmitter shall be capable of determining the airflow rate and temperature average of all connected sensor nodes in an array for a single location.

(a) Separate integration buffers shall be provided for display airflow output, airflow signal output (analog and network) and individual sensor output (IR-interface).

7) The transmitter shall be capable of providing a high and/or low airflow alarm with user-defined set point and % of set point tolerance. Alarm shall be capable of being manually or automatically reset and low-limit cutoff value may be selected to disable the alarm. An alarm delay function shall also be field defined.

8) The transmitter shall be capable of identifying an AMD malfunction via the system status alarm and ignore any sensor node that is in a fault condition.

9) The transmitter shall be capable of field configuration, diagnostics and include Field Output Adjustment Wizard that allows for a one or two point field adjustment to factory calibration for installations that require adjustment.

10) The transmitter shall be provided with a 16-character, alpha-numeric, LCD display.

11) The transmitter shall be provided with two field selectable (0-5/0-10 VDC or 4-20mA), scalable, isolated and over-current protected analog output signals (AO1=airflow, AO2=temperature or alarm), in combination with:

    (a) one isolated RS-485 (field selectable BACnet MS/TP or Modbus RTU) network connection

12) The analog signal capability shall include two output terminals: the first (AO1), shall provide the total airflow rate and the second output (AO2) shall be field configurable to provide one of the following:

    (a) temperature

    (b) low and/or high airflow user-defined set point alarm, or

    (c) system status alarm

13) The transmitter shall also be available with a single isolated LonWorks Free Topology network interface. Transmitters shall be available alternatively with one USB connection for thumb-drive data logging of sensor data. Neither of these options shall include analog output signals.

14) The network communications RS-485 (BACnet MS/TP or Modbus RTU) or Ethernet (BACnet Ethernet or BACnet IP, Modbus TCP and TCP/IP) shall provide: the average airflow rate, temperature, hi and/or low airflow set point alarm, system status alarm, individual sensor node airflow rates and individual sensor node temperatures. Individual node airflow rates and temperatures shall NOT be available via the network with Lon.

15) The transmitter shall have an on-off power switch. Isolation transformers shall not be required.

16) The transmitter shall be powered by 24 VAC (22.8 to 26.4 under load) @20 V-A maximum and use a switching power supply that is over-current and over-voltage protected.

17) The transmitter shall use a “watchdog” timer circuit to ensure automatic reset after power disruption, transients and brown-outs.

18) Each transmitter shall have an operating temperature range of -20° F to 120° F (-28.9° C to 48.9° C) and humidity range of 5 to 95% RH.

d. Listings and Certifications

1) The AMD shall be UL/cUL 873 Listed as an assembly.

(a) Devices claiming compliance with the UL Listing based on individual UL component listing are not acceptable.

2) All network-capable AMD models supplied with RS-485 interface and BACnet protocol shall be BTL Listed.

3) The AMD shall be tested for compliance with the EMC Directive's requirements and be certified to carry the CE Mark for European Union Shipments.

C. Rooftop Energy Recovery Unit Outside Air Intake Measuring Devices:

1. Airflow Measurement Device (AMD) with Temperature Output and Integral Airflow Alarming

a. General

1) Provide one AMD with temperature output and an integral airflow alarm for each measurement location provided on the plans, schedules and/or control diagrams to determine the average airflow rate and temperature at each measurement location.

2) Each AMD shall be provided with a remotely mounted microprocessor-based transmitter and one or two sensor probes.

(a) Devices that have electronic signal processing components in the sensor probe are not acceptable.

3) Airflow measurement shall determine the average actual airflow rate.

4) Temperature measurement shall determine the velocity weighted average temperature (factory default) or the arithmetic average (field selection).

b. Sensor Probe Design

1) Sensor probes shall be constructed of 6063 extruded aluminum alloy tube.

2) Sensor probe mounting brackets shall be constructed of 304 stainless steel.

3) Probe internal wiring between the connecting cable and sensor nodes shall be Kynar coated copper.

(a) PVC jacketed internal wiring is not acceptable.

4) Probe internal wiring connections shall consist of solder joints and spot welds.

(a) Connectors of any type within the probe are not acceptable.

(b) Printed circuit boards within the probe are not acceptable.

5) Each sensor node shall contain one hermetically sealed 'bead-in-glass' thermistor sensor and one high performance parylene-coated chip thermistor, in a structural sensor housing. The airflow rate and temperature shall be independently determined at each measurement node prior to averaging.

6) Each preselected probe shall be adjustable insertion or stand-off bracket type, and choice of probes in lengths of 6, 8, or 16 in. [152.4, 203.2, or 406.4 mm]

7) The maximum number of independent sensor nodes/probe provided shall be 1 each x 2 probes total.

8) Probe to transmitter cables shall be FEP jacketed, plenum rated CMP/CL2P and UL/cUL Listed, -67° to 392° F (19.4° C to 200° C) and UV tolerant. Cables shall include a terminal plug for connection to the remotely mounted transmitter. PVC jacketed cables or PVC insulated conductors are not acceptable with ducted sensor probes.

c. Transmitter

1) An integral microprocessor-based transmitter shall be provided for each measurement location.

(a) All printed circuit board interconnects and test points shall be gold plated.

(b) All printed circuit boards shall be electroless nickel immersion gold (ENIG) plated.

2) All integrated circuitry shall be temperature rated as 'industrial-grade'. Submissions containing 'commercial-grade' integrated circuitry are not acceptable.

3) The transmitter shall be capable of determining the average airflow rate and temperature at each of the sensor nodes in the array.

4) The transmitter shall be capable of identifying an AMD malfunction and ignore any sensor node that is in a fault condition.

5) The transmitter shall be provided with one of the following:

(a) Two scalable, protected and field selectable analog output signals (0-5 / 1-5 VDC or 0-10 / 2-10 VDC, choose one), or

(b) One non-isolated RS-485 network connection (field selectable BACnet MS/TP or Modbus RTU).

6) One analog output shall be airflow (AO1), while the second output (AO2) shall be configurable as airflow (independent of AO1 for dual outputs), average temperature (default), adjustable airflow alarm or system alarm.

(a) When the alarm is active, the alarm condition shall be indicated on the LCD display.

(b) Alarm reset shall be manual or automatic.

(c) Alarm set points shall be adjustable by type, tolerance, delay, disable/enable, and analog signal indication for AO2.

7) RS-485 network communications shall provide the average airflow rate, average temperature, Hi-Lo airflow alarm, system status alarm, individual sensor node airflow rates and individual sensor node temperatures.

8) Each transmitter shall provide one dry contact relay with onboard jumper to drive a remote LED. The relay shall be rated for no less than 30 VDC or 24 VAC @ 3 amp max.

9) The transmitter shall have a built-in field adjustment wizard for one or two point output adjustments to the factory calibration, when required.

10) The transmitter shall be powered by 24 VAC (22.8 to 26.4 under load) @8 V-A.

11) The transmitter shall provide an integral LCD for the display of airflow, temperature and alarms; and a pushbutton user interface for configuration and diagnostics.

12) The transmitter shall be mounted in an environment protected from direct contact with water.

13) The transmitter shall independently process the airflow and temperature of each sensor node prior to averaging and output.

14) The transmitter shall use a “watchdog” timer circuit to ensure continuous operation in the event of brown-out and/or power failure.

d. Performance and Calibration

1) Each sensing node shall have an airflow accuracy of ±3% of reading (typical) ±4% max. from 0 to 3,000 FPM (15.24 m/s) over a temperature range of 0° F to 160° F (-18° to 71° C). Airflow accuracy shall be maintained at lower operating temperatures of -20° F to 160° F (-29° C to 71° C) but the velocity range shall be limited to 0 - 2,000 FPM (10.2 m/s)

(a) Accuracy shall include the combined uncertainty of the sensor nodes and transmitter.

(b) Devices whose overall performance at the host controller input terminals is the combined accuracy of the transmitter and sensor probes shall demonstrate that the total accuracy meets the performance requirements of this specification throughout the measurement range.

2) Each sensor node shall be individually calibrated at 7 measurement points to NIST traceable airflow standards.

(a) Submissions for AMD approval shall include a copy of the actual NIST report of calibration for the reference standard used.

(b) Devices claiming NIST traceability to third party laboratories and not directly to NIST are not acceptable

(c) Devices calibrated against standards other than the NIST LDA or against NIST temperature standards only are not acceptable.

3) Each sensing node shall have a temperature accuracy of ± 0.36° F (± 0.2° C) over a range of -20° F to 160° F (-28.9° C to 71.1° C).

4) Minimum calibrated and operating temperature range for the sensor probes shall be -20° F to 160° F (-29° C to 71° C).

5) Operating temperature range for the transmitter shall be -20° F to 120° F (-29° C to 49° C).

e. Listings and Certifications

1) The AMD shall be UL 60730-1 and 60730-2-9 Listed as an assembly and subscribe to the UL Follow-up Services.

(a) Devices claiming compliance with the UL Listing based on individual UL component listings are not acceptable.

2.20 AIR SUPPLY

A. Control and Instrumentation Tubing:

1. Copper Tube: ASTM B 819 Type K, or ASTM B 88 (ASTM B 88M) Type K, seamless, drawn or annealed.

a. Fittings: ASME B16.22, wrought copper.

b. Joints: Solder, lead free, ASTM B 32, HB alloy (95-5 tin-antimony), or tin and silver.

2. Polyethylene Tubing: Black, flame retardant, virgin polyethylene, resistant to environmental stress-cracking when tested in accordance with ASTM D 1693. All poly tubing shall be installed in conduit or NEMA 1 boxes. No poly tubing shall be run exposed.

a. Fittings: UL labeled, rod or forged brass rated to 200 psig at 100 degrees F.

b. Joints: Compression or barbed type.

PART 3 EXECUTION

3.1 EXAMINATION

A. Verify existing conditions before starting work.

B. Verify that conditioned power supply is available to the control units and to the operator work station. Verify that field end devices, wiring, and pneumatic tubing is installed prior to installation proceeding.

3.2 INSTALLATION

A. Install control units and other hardware in position on permanent walls where not subject to excessive vibration.

B. Install software in control units and in operator work station. Implement all features of programs to specified requirements and appropriate to sequence of operation.

C. For all thermostats and temperature sensors shown to be installed on outside walls, provide insulated backs.

D. Install all thermostats, sensors and other wall mounted end device input control equipment at elevations in conformance with ADA requirements.

E. PROJECT MANAGEMENT

1. Provide a designated project manager who will be responsible for the following:

a. Construct and maintain project schedule

b. On-site coordination with all applicable trades, subcontractors, and other integration vendors

c. Authorized to accept and execute orders or instructions from owner/architect

d. Attend project meetings as necessary to avoid conflicts and delays

e. Make necessary field decisions relating to this scope of work

f. Coordination/Single point of contact

3.3 ELECTRICAL WIRING AND MATERIALS

A. Install, connect and wire the items included under this Section. This work includes providing required conduit, wire, fittings, and related wiring accessories.

B. Provide wiring between thermostats, aqua-stats, and unit heater/cabinet unit heater motors.

C. 120 Volt power provided to BMS Panels and Local Transformer Panels shall be included by BAS contractor.

D. Provide status function conduit and wiring for equipment covered under this Section.

E. Low voltage wiring exposed to view shall be installed in conduit. Low voltage wiring exposed to view within Mechanical rooms shall be installed in conduit. Open plenum rated cable is acceptable in concealed for low voltage wiring only. All wiring to be compliant to local building code and the NEC.

F. Conceal cable, except in mechanical rooms and areas where other conduit and piping are exposed.

G. Install exposed cable in EMT raceways.

H. Install concealed cable in enclosed vertical chases and within furred walls as open plenum rated cable.

I. Install outdoor cabling in water-tight EMT or galvanized rigid conduit.

J. Bundle and harness multiconductor instrument cable in place of single cables where several cables follow a common path.

K. Install wire and cable with sufficient slack and flexible connections to allow for vibration of piping and equipment.

L. Plenum Rated Cable to be used in accessible locations above ceilings (i.e. open ceilings and drop-ceilings).

M. Install, connect and wire the items included under this Section. This work includes providing required conduit, wire, fittings, and related wiring accessories.

1. Provide wiring for thermostats, aquastats, and all control and alarm devices for all Sections of the Specifications and wiring for all break-glass stations furnished under this Section.

2. Power for each direct digital control unit, field equipment panel, workstation, server, controller, shall be taken from dedicated power circuits as indicated on the electrical drawings. Power type (normal, emergency, life-safety, etc.) shall be determined on Electrical Drawings. If no guidance is included on the electrical drawings all power wiring shall be ‘normal’ power or match that of the associated mechanical equipment. Wiring and conduit between the electrical junction boxes and all direct digital control units, field equipment cabinets, workstation, server and unitary controllers, etc., shall be furnished and installed by this Section of the Specifications.

3. Provide conduit and control wiring for devices specified in this Section.

4. Provide control and signal wiring between the DDC system and equipment provided by other Sections such as pumps, variable frequency drives, etc.

5. Provide all control wiring for variable air volume and constant air volume terminal units.

N. All wiring in Mechanical Equipment Rooms, communications or electrical closets shall be in approved raceways (cable tray, conduit, EMT, etc.). Open wiring strung above accessible ceilings shall be plenum-rated cable, bundled together and protected from mechanical damage. Wiring shall be independently supported from the building structure

with bridal rings and clips. The supporting of wiring from mechanical ductwork or piping shall not be acceptable. Provide individual supports for conduit. Where conduit is required, this Contractor shall be responsible for providing all conduit serving DDC system. DDC system wiring (i.e. power, control, communication, sensor or interlock) shall not be installed in conduits, provided under another section of the specification unless noted otherwise. DDC system wiring shall not “share” conduits with any other system unless noted otherwise.

O. 120 VAC circuits used for control and instrumentation shall be taken from panelboards provided under the Electrical Section. The electrical section shall provide junction boxes local to the BMS devices and equipment. Final connection between junction box and BMS devices shall be furnished by this Contractor.

P. RS-485 Cabling

1. RS-485 cabling shall be used for BACnet MS/TP networks.

2. RS-485 shall use low capacitance, 20-24 gauge, twisted shielded pair.

3. The shields shall be tied together at each device.

4. The shield shall be grounded at one end only and capped at the other end.

5. Provide end of line (EOL) termination devices at each end of the RS-485 network or subnetwork run, to match the impedance of the cable, 100 to 120 Ohm.

Q. Ethernet Cabling

1. Ethernet shall not be run with any Class 1 or low voltage Class 2 wiring.

2. CAT6, unshielded twisted pair (UTP) cable shall be used for BAS Ethernet.

3. Solid wire shall be used for long runs, between mechanical rooms and between floors. Stranded cable can be used for patch cables and between panels in the same mechanical room up to 50 feet away.

4. When the BAS Ethernet connects to an Owner’s network switch, document the port number on the BAS As-builts.

R. Fiber-Optic Cabling

1. All fiber optic cabling shall be 50/125-micrometer, laser-optimized (multi-mode OM3/OM4), duplex (2-strand) fiber, optical fiber cable with plenum-rated jackets. Minimum bend radius shall be 7.5mm. Industry standard LC style connectors shall be usedFiber optic cabling shall be manufactured by Corning.

2. Maximum pulling tensions as specified by the cable manufacturer shall not be exceeded during installation. Post-installation residual cable tension shall be within cable manufacturer’s specifications.

3. All cabling and associated components shall be installed in accordance with manufacturers' instructions. Minimum cable and unjacketed fiber bend radii, as specified by cable manufacturer, shall be maintained.

4. All terminations shall be made into a patch panel, designed for such use. Free air terminations with patch panels are prohibited.

3.4 INSTALLATION OF SENSORS

A. General:

1. Install sensors in accordance with the manufacturer's recommendations.

2. Mount sensors rigidly and adequately for the environment within which the sensor operates.

3. Room temperature sensors shall be installed on concealed junction boxes properly supported by the wall framing.

4. All wires attached to sensors shall be air sealed in their raceways or in the wall to stop air transmitted from other areas affecting sensor readings.

5. Sensors used in mixing plenums shall be of the averaging type.

6. All pipe-mounted temperature sensors shall be installed in wells. Install all liquid temperature sensors with heat-conducting fluid in thermal wells.

B. Room Instrument Mounting

1. Room instruments, including but not limited to wall mounted thermostats and sensors located in occupied spaces shall be mounted 48 inches above the finished floor unless otherwise shown.

C. Instrumentation Installed in Piping Systems

1. Thermometers and temperature sensing elements installed in liquid systems shall be installed in thermowells.

2. Gauges in piping systems subject to pulsation shall have snubbers.

D. Duct Smoke Detectors

1. Duct smoke detectors will be provided by the Fire Alarm System Contractor in supply and return air ducts in accordance with Division 26

2. Contractor shall connect the DDC System to the auxiliary contacts provided on the Smoke Detector as required for system safeties and to provide alarms to the DDC system.

E. Temperature Limit Switch

1. A temperature limit switch (Low Temperature Detector) shall be provided to sense the temperature.

2. A sufficient number of temperature limit switches shall be installed to provide complete coverage of the duct section.

3. Manual reset limit switches shall be installed in approved, accessible locations where they can be reset easily.

4. The temperature limit switch sensing element shall be installed in a serpentine pattern and in accordance with the manufacturer's installation instructions.

5. Each bend shall be supported with a capillary clip. Provide 3 m of sensing element for each 1 m2 (1 ft of sensing element for each 1 ft2) of coil area.

F. Averaging Temperature Sensing Elements

1. Sensing elements shall be installed in a serpentine pattern.

2. Averaging sensors shall be installed in a serpentine manner vertically across the duct. Each bend shall be supported with a capillary clip.

G. Differential air static pressure.

1. Supply Duct Static Pressure: Pipe the high-pressure tap to the duct using a pitot tube. Pipe the low-pressure port to a tee in the high-pressure tap tubing of the corresponding building static pressure sensor (if applicable) or to the location of the duct high-pressure tap and leave open to the plenum.

2. The piping to the pressure ports on all pressure transducers shall contain a capped test port located adjacent to the transducer.

3. All pressure transducers, other than those controlling VAV boxes, shall be located in field device panels, not on the equipment monitored or on ductwork.

4. Mount transducers in a location accessible for service without use of ladders or special equipment.

3.5 ACTUATORS

A. Mount and link control damper actuators according to manufacturer's instructions.

1. To compress seals when spring-return actuators are used on normally closed dampers, power actuator to approximately 5° open position, manually close the damper, and then tighten the linkage.

2. Check operation of damper/actuator combination to confirm that actuator modulates damper smoothly throughout stroke to both open and closed positions.

3. Provide all mounting hardware and linkages for actuator installation.

B. Electric/Electronic

1. Dampers: Actuators shall be direct-mounted on damper shaft or jackshaft unless shown as a linkage installation. For low-leakage dampers with seals, the actuator

shall be mounted with a minimum 5° available for tightening the damper seals. Actuators shall be mounted following manufacturer's recommendations.

2. Valves: Actuators shall be connected to valves with adapters approved by the actuator manufacturer. Actuators and adapters shall be mounted following the actuator manufacturer's recommendations.

3.6 WARNING LABELS AND IDENTIFICATION TAGS

A. Permanent warning labels shall be affixed to all equipment that can be automatically started by the DDC system.

1. Labels shall use white lettering (12-point type or larger) on a red background.

2. Warning labels shall read as follows: “C A U T I O N This equipment is operating under automatic control and may start or stop at any time without warning. Switch disconnect to “Off” position before servicing.”

B. Permanent warning labels shall be affixed to all motor starters and all control panels that are connected to multiple power sources utilizing separate disconnects.

1. Labels shall use white lettering (12-point type or larger) on a red background.

2. Warning labels shall read as follows: “C A U T I O N This equipment is fed from more than one power source with separate disconnects. Disconnect all power sources before servicing.”

C. Equipment and Device labeling:

1. Labels and tags shall be keyed to the unique identifiers shown on the As-Built drawings.

2. All Enclosures and DDC Hardware shall be labeled.

3. All sensors and actuators not in occupied areas shall be tagged.

4. Airflow measurement arrays shall be tagged to show flow rate range for signal output range, duct size, and pitot tube AFMS flow coefficient.

5. Duct static pressure taps shall be tagged at the location of the pressure tap.

6. Tags shall be plastic or metal and shall be mechanically attached directly to each device or attached by a metal chain or wire.

7. Labels exterior to protective enclosures shall be engraved plastic and mechanically attached to the enclosure or DDC Hardware.

8. Labels inside protective enclosures may be attached using adhesive, but shall not be hand written.

9. Identify all other control components with permanent labels. All plug-in components shall be labeled such that removal of the component does not remove the label.

10. Identify room sensors relating to unit ventilator or valves with nameplates.

11. Manufacturers' nameplates and UL or CSA labels are to be visible and legible after equipment is installed.

D. Identification of Tubing and Wiring

1. All wiring and cabling including that within factory-fabricated panels shall be labeled at each end within 5 cm (2 in.) of termination with the DDC address or termination number.

2. Permanently label or code each point of field terminal strips to show the instrument or item served.

3. All pneumatic tubing shall be labeled at each end within 5 cm (2 in.) of termination with a descriptive identifier.

3.7 IDENTIFICATION OF HARDWARE AND WIRING

A. All wiring and cabling, including that within factory-fabricated panels shall be labeled at each end within 5 cm (2 in.) of termination with the DDC address or termination number.

B. All pneumatic tubing shall be labeled at each end within 5 cm (2 in.) of termination with a descriptive identifier.

C. Permanently label or code each point of field terminal strips to show the instrument or item served.

D. Identify control panels with minimum 1 cm (½ in.) letters on laminated plastic nameplates.

E. Identify all other control components with permanent labels. All plug-in components shall be labeled such that removal of the component does not remove the label.

F. Identify room sensors relating to terminal box or valves with nameplates.

G. Manufacturers' nameplates and UL or CSA labels are to be visible and legible after equipment is installed.

H. Identifiers shall match record documents.

I. Control Equipment and Device labeling:

1. Labels and tags shall match the unique identifiers shown on the as-built drawings.

2. All Enclosures shall be labeled to match the as-built drawing by either control panel name or the names of the DDC controllers inside.

3. All sensors and actuators not in occupied areas shall be tagged.

4. Airflow measurement arrays shall be tagged to show flow rate range for signal output range, duct size, and pitot tube AFMS flow coefficient.

5. Duct static pressure taps shall be tagged at the location of the pressure tap.

6. Each device inside enclosures shall be tagged.

7. Terminal equipment need only have a tag for the unique terminal number, not for each device. Match the unique number on:

   a. First, the design drawings, or

   b. Second, the control as-builts, or

   c. Third, the DDC addressing scheme

8. Tags shall be mechanically printed on permanent adhesive backed labeling strips, 12 point height minimum.

9. Identification of Wires

   a. Tag each wire with a common identifier on each end of the wire

   b. Tag each network wire with a common identifier on each end.

   c. Tag each 120V power source with the panel and breaker number it is fed by.

3.8 FIELD QUALITY CONTROL

A. After completion of the installation of work in this section, test, regulate and adjust system equipment, controllers, alarms, sensors, transmitters, switches, relays, automatic control valves, automatic damper motors and related system accessories, and the entire automation system, including interconnections with the building life safety, plumbing, fire protection and electrical systems, and place these items in complete and satisfactory operating condition. Submit data showing set points and final adjustments of controls.

B. This Contractor shall provide assistance to the Air and Water Balancer for access to all set point adjustments and calibration requirements. At the completion of the balancing process all air and water set points shall be hardcoded into the default set points for each system.

3.9 COMMISSIONING

A. The BMS contractor shall submit point to point verification of all hard-wired control points and Terminal unit control functions verification documentation for terminal units controllers showing all control systems have been tested, startup complete, final PID adjustments complete, dynamic graphics installed on workstation as per owners requirements etc. prior to scheduled commissioning.

B. The BMS contractor shall notify the authorized representative that the BMS is 100% ready for demonstration and commissioning. The BMS contractor shall demonstrate to the authorized representative typical operating functional control loops for 50% of control points and functions. If any failure occurs the test would stop and the BMS contractor shall be responsible to demonstrate all control points.

3.10 CONTROL SYSTEM DEMONSTRATION AND ACCEPTANCE

A. Demonstration

1. Prior to acceptance, the control system shall undergo a series of performance tests to verify operation and compliance with this specification. These tests shall occur after the Contractor has completed the installation, started up the system, and performed his/her own tests.

2. The tests described in this section are to be performed in addition to the tests that the contractor performs as a necessary part of the installation, start-up, and debugging process and as specified in the “Control System Checkout and Testing” article in Part 3 of this specification. The engineer will be present to observe and review these tests. The engineer shall be notified at least 10 days in advance of the start of the testing procedures.

3. The demonstration process shall follow that approved in Part 1, “Submittals.” The approved checklists and forms shall be completed for all systems as part of the demonstration.

4. The contractor shall provide at least two persons equipped with two-way communication and shall demonstrate actual field operation of each control and sensing point for all modes of operation including day, night, occupied, unoccupied, fire/smoke alarm, seasonal changeover, and power failure modes. The purpose is to demonstrate the calibration, response, and action of every point and system. Any test equipment required to prove the proper operation shall be provided by and operated by the contractor.

5. As each control input and output is checked, a log shall be completed showing the date, technician's initials, and any corrective action taken or needed.

6. Demonstrate compliance with Part 1, “System Performance.”

7. Demonstrate compliance with sequences of operation through all modes of operation.

8. Demonstrate complete operation of operator interface.

9. Additionally, the following items shall be demonstrated:

    a. DDC control loop response. The contractor shall supply trend data output in a graphical form showing the step response of each DDC control loop. The test shall show the loop's response to a change in set point, which represents a change of actuator position of at least 25% of its full range. The sampling rate of the trend shall be from 10 seconds to 3 minutes, depending on the speed of the loop. The trend data shall show for each sample the set point, actuator position, and controlled variable values. Any loop that yields unreasonably under-damped or over-damped control shall require further tuning by the Contractor.

b. Demand limiting. The contractor shall supply a trend data output showing the action of the demand-limiting algorithm. The data shall document the action on a minute-by-minute basis over at least a 30-minute period. Included in the trend shall be building kW, demand limiting set point, and the status of sheddable equipment outputs.

c. Optimum start/stop. The contractor shall supply a trend data output showing the capability of the algorithm. The change-of value or change-of-state trends shall include the output status of all optimally started and stopped equipment, as well as temperature sensor inputs of affected areas.

d. Interface to the building fire alarm system.

e. Operational logs for each system that indicate all set points, operating points, valve positions, mode, and equipment status shall be submitted to the architect/engineer. These logs shall cover three 48-hour periods and have a sample frequency of not more than 10 minutes. The logs shall be provided in both printed and electronic formats.

10. Any tests that fail to demonstrate the operation of the system shall be repeated at a later date. The contractor shall be responsible for any necessary repairs or revisions to the hardware or software to successfully complete all tests.

B. Acceptance

1. All tests described in this specification shall have been performed to the satisfaction of both the engineer and owner prior to the acceptance of the control system as meeting the requirements of completion. Any tests that cannot be performed due to circumstances beyond the control of the contractor may be exempt from the completion requirements if stated as such in writing by the engineer. Such tests shall then be performed as part of the warranty.

2. The system shall not be accepted until all forms and checklists completed as part of the demonstration are submitted and approved as required in Part 1, “Submittals.”

3.11 CLEANING

A. The contractor shall clean up all debris resulting from their activities daily. The contractor shall remove all cartons, containers, crates, etc., under his/her control as soon as their contents have been removed. Waste shall be collected and placed in a designated location.

B. At the completion of work in any area, the contractor shall clean all work, equipment, etc., keeping it free from dust, dirt, and debris, etc.

C. At the completion of work, all equipment furnished under this section shall be checked for paint damage, and any factory-finished paint that has been damaged shall be repaired to match the adjacent areas. Any cabinet or enclosure that has been deformed shall be replaced with new material and repainted to match the adjacent areas.

3.12 MANUFACTURER'S FIELD SERVICES

A. Start and commission systems. Allow sufficient time for start-up and commissioning prior to placing control systems in permanent operation.

3.13 TEMPERATURE CONTROL SEQUENCES

A. MILLER ELEMENTARY SCHOOL

1. NON-DUCTED VRF FAN COIL UNITS:

a. Occupied Mode - For spaces with existing floor mounted unit ventilators providing ventilation and heating, the space temperature sensor serving the unit ventilator shall be set to 68 degrees F heating setpoint and 75 degrees F cooling setpoint. The VRF fan coil unit controller heating setpoint shall be set to 70 degrees F heating setpoint and 75 degrees F cooling setpoint. In heating mode, the heat pump and fan coil unit shall provide heating to satisfy the 70 F setpoint. The unit ventilator shall utilize the heating water control valve to maintain a constant leaving air temperature matching the unit ventilator sensor setpoint (68 degrees F). Should the fan coil unit be unable to maintain the setpoint and the space temperature falls below 68 degrees F on the unit ventilator sensor, the unit ventilator operation shall be overridden and the DDC system shall modulate the heating water control valve to provide leaving air temperature as required to maintain the 68 F lower level heating setpoint. In cooling mode, if economizer cooling is available the fan coil unit shall be locked out of mechanical cooling at the DDC system and the unit ventilator shall operate in economizer mode to maintain the space sensor setpoint. Should economizer cooling be unavailable, the fan coil unit and its associated heat pump shall operate as required to maintain the controller's cooling setpoint. During building occupied times (in NON-Economizer mode) the unit ventilator shall remain on in minimum ventilation mode with the fan on.

2. The DDC shall integrate into the VRF system's master controller through BACnet connectivity and allow the DDC system to globally switch each pump into HEATING MODE, COOLING MODE OR OFF MODE. The DDC system shall also connect to the BACnet integration on the master controllers to set the minimum cooling setpoint and maximum heating setpoint of the VRF fan coil remote controllers and lock the remote controllers from allowing manual changes from HEAT MODE/COOL MODE/OFF and lock the remote controllers from allowing manual changes to the room temperature setpoint.

3. Economizer Lock-out: The DDC shall integrate into the VRF system's master controller through BACnet connectivity and allow the DDC system to lock-out mechanical cooling through the fan coils from each space that is ventilated via unit ventilators when the outside air temperature is 62 degrees F or below (adjustable). At all outside air temperatures above 62 degrees F, the mechanical cooling through the VRF systems shall be allowed.

4. Fan coil unit supply fans shall only operate on a call for cooling or heating and be OFF when controller temperature setpoint is satisfied.

B. HIGHVIEW ELEMENTARY SCHOOL:

1. Cabinet Unit Heaters:

a. Cycle fan operation and valve position to maintain space temperature at setpoint conditions through space temperature sensor. Provide a two-position, normally-open, spring return control valve on the hot water return line.

2. Exhaust Fans EF-HE-1, EF-HE-2, EF-HE-3:

a. Fans shall be OFF during building unoccupied periods with associated motorized damper closed.

b. Fans shall be ON during building occupied periods with associated motorized damper opened.

3.14 TRAINING

A. Provide sixteen (8) hours of on-site training for up-to four (4) building operators from competent factory authorized personnel. Intent is to provide instruction to operation and maintenance personnel concerning the location, operation and troubleshooting of the installed systems. The instruction shall be scheduled in coordination with the Construction Manager and owner after submission and approval of formal training plans. Training on BAS systems other than Siemens shall be (40) Hours.

B. Additional training of (16) hours shall be provided for DESIGO software

C. (2) multi-day remote site classroom training sessions shall be included for up to (1) person for DESIGO software.

D. Training shall include but not limited to:

1. Explanation of drawings and operations and maintenance manuals.

2. Walk thru of the job to locate control components.

3. Operator workstation and peripherals.

4. Operator control functions including graphic generation and field panel programming.

5. Explanation of adjustment, calibration and replacement procedures.

END OF SECTION

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SECTION 232113 - HYDRONIC PIPING

PART 1 GENERAL

1.1 SECTION INCLUDES

A. Hydronic system requirements.

B. Heating water and glycol piping, above grade.

C. Cooling coil condensate piping.

D. Natural Gas piping, above grade.

E. Pipe hangers and supports.

F. Unions, flanges, mechanical couplings, and dielectric connections.

1.2 REFERENCE STANDARDS

A. ASME BPVC-IX - Boiler and Pressure Vessel Code, Section IX - Welding, Brazing, and Fusing Qualifications; 2015.

B. ASME B16.3 - Malleable Iron Threaded Fittings; The American Society of Mechanical Engineers; 1998 (R2006).

C. ASME B16.18 - Cast Copper Alloy Solder Joint Pressure Fittings; 2012.

D. ASME B16.22 - Wrought Copper and Copper Alloy Solder-Joint Pressure Fittings; 2013.

E. ASME B31.9 - Building Services Piping; The American Society of Mechanical Engineers; 2008.

F. ASTM A106/A106M - Standard Specification for Seamless Carbon Steel Pipe for High-Temperature Service; 2014.

G. ASTM A123/A123M - Standard Specification for Zinc (Hot-Dip Galvanized) Coatings on Iron and Steel Products; 2015.

H. ASTM A234/A234M - Standard Specification for Piping Fittings of Wrought Carbon Steel and Alloy Steel for Moderate and High Temperature Service; 2015.

I. ASTM B32 - Standard Specification for Solder Metal; 2008 (Reapproved 2014).

J. ASTM B88 - Standard Specification for Seamless Copper Water Tube; 2014.

K. ASTM B88M - Standard Specification for Seamless Copper Water Tube (Metric); 2013.

L. ASTM D2466 - Standard Specification for Poly(Vinyl Chloride) (PVC) Plastic Pipe Fittings, Schedule 40; 2013.

M. ASTM D2855 - Standard Practice for Making Solvent-Cemented Joints with Poly(Vinyl Chloride) (PVC) Pipe and Fittings; 1996 (Reapproved 2010).

N. ASTM F708 - Standard Practice for Design and Installation of Rigid Pipe Hangers; 1992 (Reapproved 2008).

O. ASTM F 708 - Standard Practice for Design and Installation of Rigid Pipe Hangers; 1992 (Reapproved 2008).

P. MSS SP-58 - Pipe Hangers and Supports - Materials, Design, Manufacture, Selection, Application, and Installation; 2009.

1.3 SUBMITTALS

A. Piping Schedule: Provide schedule of piping applications and materials, indicating piping and fittings.

B. Piping Shop Drawings: Provide drawings of piping installation, indicating dimensioned locations, equipment, critical dimensions, elevations, sizes, systems, and valve locations.

C. Product Data:

1. Include data on pipe materials, pipe fittings, valves, and accessories.

2. Provide manufacturers catalog information.

3. Indicate valve data and ratings.

D. Manufacturer's Installation Instructions: Indicate hanging and support methods, joining procedures.

E. Project Record Documents: Record actual locations of valves.

1.4 QUALITY ASSURANCE

A. Manufacturer Qualifications: Company specializing in manufacturing products of the type specified in this section, with minimum three years of documented experience.

B. Installer Qualifications: Company specializing in performing work of the type specified in this sectionwith minimum three years of experience.

C. Welder Qualifications: Certify in accordance with ASME BPVC-IX.

1. Provide certificate of compliance from authority having jurisdiction, indicating approval of welders.

1.5 DELIVERY, STORAGE, AND HANDLING

A. Accept valves on site in shipping containers with labeling in place. Inspect for damage.

B. Provide temporary protective coating on cast iron and steel valves.

C. Provide temporary end caps and closures on piping and fittings. Maintain in place until installation.

D. Protect piping systems from entry of foreign materials by temporary covers, completing sections of the work, and isolating parts of completed system.

PART 2 PRODUCTS

2.1 HYDRONIC SYSTEM REQUIREMENTS

A. Comply with ASME B31.9 and applicable federal, state, and local regulations.

B. Piping: Provide piping, fittings, hangers, and supports as required, as indicated, and as follows:

1. Where more than one piping system material is specified, provide joining fittings that are compatible with piping materials and ensure that the integrity of the system is not jeopardized.

2. Use non-conducting dielectric connections whenever jointing dissimilar metals.

3. Grooved mechanical joints are not permitted in any location.

4. Provide pipe hangers and supports in accordance with ASME B31.9 or MSS SP-58 unless indicated otherwise.

C. Pipe-to-Valve and Pipe-to-Equipment Connections: Use flanges or unions to allow disconnection of components for servicing; do not use direct welded, soldered, or threaded connections.

D. Valves: Provide valves where indicated:

1. Provide drain valves where indicated, and if not indicated provide at least at main and main branch shut-offs locations, low points of piping, bases of vertical risers, and at equipment. Use 3/4 inch ball valves with cap.

2. For throttling, bypass, or manual flow control services, use ball or butterfly valves.

3. For shut-off and to isolate parts of systems or vertical risers, use ball or butterfly valves.

2.2 HEATING WATER AND GLYCOL PIPING

A. Steel Pipe for sizes 2-1/2" and above: ASTM A53/A53M, Schedule 40, black, using one of the following joint types:

1. Welded Joints: ASTM A234/A234M, wrought steel welding type fittings; AWS D1.1/D1.1M welded.

2. Threaded Joints: ASME B16.3, malleable iron fittings.

3. Fittings: ASTM B 16.3, malleable iron or ASTM A 234/A 234M, forged steel welding type fittings.

B. Copper Tube for piping sizes 3" and below: ASTM B88 (ASTM B88M), Type L (B), drawn, using one of the following joint types:

1. Solder Joints: ASME B16.18 cast brass/bronze or ASME B16.22 solder wrought copper fittings.

a. Solder: ASTM B32 lead-free solder, HB alloy (95-5 tin-antimony) or tin and silver.

b. Braze: AWS A5.8M/A5.8 BCuP copper/silver alloy.

2. Hydraulic Press Fitting for Copper Tubing.

a. Acceptable Fittings:

1) ProPress by Viega, 301 N. Main, Wichita, KS 67202, (877) 843-4262, www.viega.com.

b. Operating Conditions:

1) Maximum Operating Pressure: 200 psi.

2) Operating Temperature Range: 0-250 degrees F.

3) Maximum Test Pressure: 600 psi.

4) Maximum Vacuum: 29.2 inches hg @ 68 degrees F.

c. Features:

1) Fittings: Copper and copper alloy conforming to material requirements of ASME B16.18 or ASME B16.22.

(a) Stainless Steel Grip Ring: Adds strength to the joint without collapsing the interior passageway.

2) No flame for soldering required for installation of fittings and valves.

3) Unpressed connections identified during pressure testing when water flows past sealing element.

4) Sealing Elements: Factory installed, EPDM.

5) Fittings that have been pressed can be rotated. If rotated more than 5 degrees, the fitting must be repressed to restore its resistance to rotational movement.

6) Extended fitting end lead allows for twice the retention grip surface, and assists with proper tube alignment.

7) Soldered adapter fittings are not allowed.

3. Tee Connections: Mechanically extracted collars with notched and dimpled branch tube.

2.3 COOLING COIL CONDENSATE PIPING SYSTEM

A. Copper Tube: ASTM B 88 (ASTM B 88M), Type L (B), hard drawn.

1. Fittings: ASME B16.18, cast brass, or ASME B16.22, solder wrought copper.

2. Tee Connections: Mechanically extracted collars with notched and dimpled branch tube.

3. Joints: Solder, lead free, ASTM B 32, HB alloy (95-5 tin-antimony), or tin and silver.

B. PVC Pipe: ASTM D 1785, Schedule 40, or ASTM D 2241, SDR 21 or 26.

1. Fittings: ASTM D 2466 or D2467, PVC.

2. Joints: Solvent welded.

2.4 NATURAL GAS PIPING, ABOVE GRADE

A. Steel Pipe: ASTM A53/A53M Schedule 40 black.

1. Fittings:

a. ASME B16.3, malleable iron, or ASTM A234/A234M, wrought steel welding type.

b. Cold Press Mechanical Joint Fittings shall conform to material requirements of ASTM A420 or ASME B16.3 and performance criteria of IAPMO PS117. Sealing elements for press fittings shall be FKM. Sealing elements shall be factory installed or an alternative supplied by fitting manufacturer. Press ends shall have Smart Connect technology design. MegaPress fittings with the Smart Connect technology assure leakage of liquids and/or gases from inside the system past the sealing element of an unpressed connection. The function of this technology is to provide the installer quick and easy identification of connections which have not been pressed prior to putting the system into operation.

2. Joints:

a. NFPA 54, threaded or welded to ASME B31.1 or cold press mechanical joint fittings.

2.5 PIPE HANGERS AND SUPPORTS

A. Provide hangers and supports that comply with MSS SP-58.

1. If type of hanger or support for a particular situation is not indicated, select appropriate type using MSS SP-58 recommendations.

B. Hangers for Pipe Sizes 1/2 to 1-1/2 Inches: Malleable iron, adjustable swivel, split ring.

C. Hangers for Cold Pipe Sizes 2 Inches and Greater: Carbon steel, adjustable, clevis.

D. Hangers for Hot Pipe Sizes 2 to 4 Inches: Carbon steel, adjustable, clevis.

E. Hangers for Hot Pipe Sizes 6 Inches and Greater: Adjustable steel yoke, cast iron roll, double hanger.

F. Multiple or Trapeze Hangers: Steel channels with welded spacers and hanger rods.

G. Multiple or Trapeze Hangers for Hot Pipe Sizes 6 Inches and Greater: Steel channels with welded spacers and hanger rods, cast iron roll.

H. Wall Support for Pipe Sizes to 3 Inches: Cast iron hook.

I. Wall Support for Pipe Sizes 4 Inches and Greater: Welded steel bracket and wrought steel clamp.

J. Wall Support for Hot Pipe Sizes 6 Inches and Greater: Welded steel bracket and wrought steel clamp with adjustable steel yoke and cast iron roll.

K. Vertical Support: Steel riser clamp.

L. Floor Support for Cold Pipe: Cast iron adjustable pipe saddle, lock nut, nipple, floor flange, and concrete pier or steel support.

M. Floor Support for Hot Pipe Sizes to 4 Inches: Cast iron adjustable pipe saddle, lock nut, nipple, floor flange, and concrete pier or steel support.

N. Floor Support for Hot Pipe Sizes 6 Inches and Greater: Adjustable cast iron roll and stand, steel screws, and concrete pier or steel support.

O. Copper Pipe Support: Carbon steel ring, adjustable, copper plated.

P. Hanger Rods: Mild steel threaded both ends, threaded one end, or continuous threaded.

Q. Inserts: Malleable iron case of galvanized steel shell and expander plug for threaded connection with lateral adjustment, top slot for reinforcing rods, lugs for attaching to forms; size inserts to suit threaded hanger rods.

R. Rooftop Supports for Low-Slope Roofs and Exterior Pipe supports at grade level: Steel pedestals with bases that rest on top of roofing membrane or on grade, not requiring any attachment to the roof structure or exterior grade and not penetrating the roofing assembly or exterior grading, with support fixtures as specified; and as follows:

1. Bases: High-density polypropylene.

2. Base Sizes: As required to distribute load sufficiently to prevent indentation of roofing assembly or exterior grading.

3. Steel Components: Stainless steel or carbon steel hot-dip galvanized after fabrication in accordance with ASTM A123/A123M.

4. Attachment/Support Fixtures: As recommended by manufacturer, same type as indicated for equivalent indoor hangers and supports; corrosion-resistant material.

5. Height: Provide minimum clearance of 6 inches under pipe to grade level or to top of roofing .

2.6 UNIONS, FLANGES, MECHANICAL COUPLINGS, AND DIELECTRIC CONNECTIONS

A. Unions for Pipe of 2 Inches and Less:

1. Ferrous Piping: 150 psi brass or malleable iron, threaded.

2. Copper Pipe: Bronze, soldered joints.

B. Flanges for Pipe 2 Inches and Greater:

1. Ferrous Piping: 150 psig forged steel, slip-on.

2. Copper Piping: Bronze.

3. Gaskets: 1/16 inch thick, preformed neoprene.

C. Dielectric Connections:

1. Waterways:

a. Water impervious insulation barrier capable of limiting galvanic current to 1 percent of short circuit current in a corresponding bimetallic joint.

b. Dry insulation barrier able to withstand 600-volt breakdown test.

c. Construct of galvanized steel with threaded end connections to match connecting piping.

d. Suitable for the required operating pressures and temperatures.

2. Flanges:

a. Dielectric flanges with same pressure ratings as standard flanges.

b. Water impervious insulation barrier capable of limiting galvanic current to 1 percent of short circuit current in a corresponding bimetallic joint.

c. Dry insulation barrier able to withstand 600-volt breakdown test.

d. Construct of galvanized steel with threaded end connections to match connecting piping.

e. Suitable for the required operating pressures and temperatures.

2.7 GAS COCKS

A. Full port, brass ball valves with bottom-loaded blowout proof stem, virgin PTFE seats, thrust washer and adjustable stem packing gland, stem packing nut, chrome plated breass ball, brass adapter and steel handle.

B. 1/4" to 3/8": 1/2 psig, ASME B16.33.

C. 1/2" to 2": 1/2 psig, ASME B16.33.

2.8 BALL VALVES

A. 3-inch and smaller: 2-piece, full port:

1. Class: 150 psi saturated steam, 600 psi wog.

2. Body: ASTM B-584 Alloy 844 bronze.

3. Body End Piece: ASTM B-584 Alloy 844 bronze.

4. Ball: ASTM B-584 Alloy 844 bronze with hard chrome plate.

5. Seat Ring: Reinforced TFE.

6. Threaded Packing Gland: ASTM B-16 Alloy 360 brass.

7. Stem: 316 stainless steel.

8. Ends: Soldered or Press Fittings.

B. Acceptable Manufacturers:

1. Nibco.

2. Apollo.

3. Stockham.

2.9 ZERO LEAKAGE TRIPLE OFFSET HIGH-PERFORMANCE BUTTERFLY VALVES

A. 2-1/2 inch and larger: Triple offset rotary valve, carbon steel, bi-directional, double flange body (wafer or lug-style not acceptable), zero leakage.

1. Class: ANSI 300.

2. Body: Carbon steel.

3. Disc: Nickel plated carbon steel.

4. Shaft: ASTM A-564 Type 630 (17-4PH) stainless steel.

5. Seat: Welded Stellite GR.21, integral with valve body.

6. Seat Ring: Dublex, stainless steel, laminated, field replaceable.

7. Locator Bearing: ASTM A-743 Grade CG8M Type 317 stainless steel.
8. Thrust Bearing: Type 317 stainless steel with PTFE woven fabric.
9. Packing: Graphite.
10. Packing Gland: ASTM A-743 Grade CF8M Type 316 stainless steel.
11. Disc Pins: ASTM A-276 Type stainless steel.
12. Operator: Self-locking, manual gear operator.
13. Leakage class. Zero leakage as defined by API 598, 7th edition.

B. Acceptable Manufacturers:

1. Tyco Vanessa Series 30,000.
2. Crane Flowseal MS.
3. Adams Valve MAK.

2.10 CHECK VALVES

A. Wafer Check: 2-1/2 inch and larger:

1. Class: 125
2. Body: ASTM A-126 Class B cast iron.
3. Disc: ASTM B-148 aluminum-bronze.
4. Hinge Pin: ASTM A-276 Type 316 stainless steel.
5. Spring: ASTM A-276 Type 316 stainless steel.
6. Seat: Buna-N.
7. Ends: Lug type for installation between pipe flanges.
8. Acceptable Manufacturers:
    a. Stockham
    b. Nibco
    c. Milwaukee

B. Swing Check: 2-Inch and smaller:

1. Class: 125
2. Body: ASTM B-62 bronze.
3. Disc: ASTM B-62 bronze.

4. Hinge : ASTM B-62 bronze.

5. Hinge Pin: ASTM B-16 brass.

6. Cap: ASTM B-62 bronze.

7. Ends: Threaded or soldered.

8. Acceptable Manufacturers:

   a. Stockham

   b. Nibco

   c. Milwaukee

2.11 CALIBRATED BALANCE VALVES

A. Size 1/2 inch to 3 inch:

1. Bronze body with brass ball construction with glass and carbon filled TFE seat rings. Valves shall have differential pressure read-out ports across valve seat area. Read-out ports shall be fitted with internal EPT insert and check valve. Valve bodies shall have 1/4 inch NPT tapped drain/purge port. Valves shall have memory stop feature to allow valve to be closed for service and then reopened to set point without disturbing balance position. All valves shall have calibrated nameplate to assure specific valve setting. Valves shall be leak-tight at full rated working pressure.

2. Design Pressure/Temperature:

   a. 1/2" to 3" NPT connections: 300 psi at 250 degrees F.

   b. 1/2" to 2" sweat connections: 200 psi at 250 degrees F.

B. Size 2-1/2" to 8"

1. Valves shall be of heavy-duty cast iron construction with ANSI flanged connections suitable up to 175 psi working pressure. Valves 2-1/2" to 3" pipe shall have a brass ball with glass and carbon filled TFE seat rings. Valves 4" to 8" shall be fitted with a bronze seat, replaceable bronze disc with EPDM seal insert, and stainless steel stem. Valves shall have memory stop feature to allow valve to be closed for service and then reopened to set point without disturbing balance position. All valves shall have calibrated nameplate to assure specific valve setting. Valves shall be leak-tight at full rated working pressure.

C. Design Pressure/Temperature: 175 psi at 250 degrees F.

D. Acceptable Manufacturers:

1. Red-White Valve Corp.

2. Bell and Gossett

3. Flow Design, Inc.

PART 3 EXECUTION

3.1 PREPARATION

A. Ream pipe and tube ends. Remove burrs. Bevel plain end ferrous pipe.

B. Remove scale and dirt on inside and outside before assembly.

C. Prepare piping connections to equipment using jointing system specified.

D. Keep open ends of pipe free from scale and dirt. Protect open ends with temporary plugs or caps.

E. After completion, fill, clean, and treat systems. See Section 232500 for additional requirements.

3.2 CALIBRATED BALANCE VALVE SELECTION

A. The contractor shall be responsible for selection of the appropriate size of all calibrated balance valves. Select valve size such that optimal accurace is achieved when balanced to the flow rate as indicated on contract documents. Provide all required increasers and reducers to mate the installed calibrated balance valves to the adjacent piping and equpment.

B. Balance Valve Sizing:

GPM	Balance Valve Size
Up to 2.5	1/2"
2.6 to 4.5	3/4"
4.6 to 9.0	1"
9.1 to 22.0	1-1/4"
22.1 to 35.0	1-1/2"
35.1 to 78.0	2"
78.1 to 120.0	2-1/2"
120.1 to 200.0	3"
200.1 to 400.0	4"
400.1 to 500.0	5"

3.3 INSTALLATION

A. Install in accordance with manufacturer's instructions.

B. Install heating water piping to ASME B31.9 requirements.

C. PVC Pipe: Make solvent-welded joints in accordance with ASTM D2855.

D. Install cooling coil condensate drains from all cooling coils to locations shown on drawings. Provide trap sized for required depth as determined by maximum static pressure of the cooling coil supply fan.

E. Route piping in orderly manner, parallel to building structure, and maintain gradient.

F. Install piping to conserve building space and to avoid interference with use of space.

G. Group piping whenever practical at common elevations.

H. Sleeve pipe passing through partitions, walls, and floors.

I. Install firestopping to preserve fire resistance rating of partitions and other elements, using materials and methods specified.

J. Slope piping and arrange to drain at low points.

K. Install piping to allow for expansion and contraction without stressing pipe, joints, or connected equipment. See Section 230516.

L. Inserts:

1. Provide inserts for placement in concrete formwork.

2. Provide inserts for suspending hangers from reinforced concrete slabs and sides of reinforced concrete beams.

3. Provide hooked rod to concrete reinforcement section for inserts carrying pipe over 4 inches.

4. Where concrete slabs form finished ceiling, locate inserts flush with slab surface.

5. Where inserts are omitted, drill through concrete slab from below and provide through-bolt with recessed square steel plate and nut above slab.

M. Pipe Hangers and Supports:

1. Install in accordance with ASME B31.9, ASTM F708, or MSS SP-58.

2. Support horizontal piping as scheduled.

3. Install hangers to provide minimum 1/2-inch space between finished covering and adjacent work.

4. Place hangers within 12 inches of each horizontal elbow.

5. Use hangers with 1-1/2 inches minimum vertical adjustment. Design hangers for pipe movement without disengagement of supported pipe.

6. Support vertical piping at every floor. Support riser piping independently of connected horizontal piping.

7. Where several pipes can be installed in parallel and at same elevation, provide multiple or trapeze hangers.

8. Provide copper plated hangers and supports for copper piping.

N. Provide clearance in hangers and from structure and other equipment for installation of insulation and access to valves and fittings. See Section 230719.

3.4 FIELD QUALITY CONTROL

A. Preparation for Testing: Prepare hydronic piping in accordance with ASME B 31.9 and as follows:

1. Leave joints, including welds, uninsulated and exposed for examination during the test.

2. Flush system with clean water. Clean strainers.

3. Isolate equipment that is not to be subjected to the test pressure from the piping. If a valve is used to isolate the equipment, its closure shall be capable of sealing against the test pressure without damage to the valve. Flanged joints at which blinds are inserted to isolate equipment need not be tested.

4. Install relief valve set at a pressure no more than 1/3 higher than the test pressure, to protect against damage by expansion of liquid or other source of overpressure during the test.

B. Testing: Test hydronic piping as follows:

1. Use ambient temperature water as the testing medium, except where there is a risk of damage due to freezing. Another liquid may be used if it is safe for the workmen and compatible with the piping system components.

2. Use vents installed at high points in the system to release trapped air while filling the system. Use drains installed at low points in the system for complete removal of the test liquid.

3. Examine system to ensure that equipment and components that cannot withstand test pressures are properly isolated. Examine test equipment to ensure tight connection and that low pressure filling lines have been disconnected.

4. Subject piping system to a hydrostatic test pressure which at every point in the system is not less than 1.5 times the system design pressure, but not less than 100 psi. The test pressure shall not exceed the maximum pressure for any vessel, pump, valve, or other component in the system under testing. Make a check to verify that the stress due to pressure at the bottom of vertical runs does not exceed either 90% of specified yield strength, or 1.7 times the "SE" value in Appendix A of ASME B31.9, Code for Pressure Piping, Building Service Piping.

5. After the 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 as appropriate, and repeat hydrostatic test until there are no leaks.

3.5 VALVE ENDS SELECTION

A. Select valves with the following ends or types of pipe/tube connections:

1. Copper Tube Size, 3-inch and Smaller: Press or threaded ends for heating hot water.

2. Steel Pipe Sizes, 2-inch and Smaller: threaded end.

3. Steel Pipe Sizes 2-1/2 inch and Larger: flanged end.

3.6 VALVE INSTALLATIONS

A. General Application: Use ball, and butterfly valves for shut-off duty; ball globe, and butterfly for throttling duty. Refer to piping system specification sections for specific valve applications and arrangements.

B. Locate valves for easy access and provide separate support where necessary.

C. Install valves and unions for each item of equipment arranged to allow equipment removal without system shutdown. Unions are not required on flanged devices.

D. Install valves in horizontal piping with stem at or above the center of the pipe.

E. Install valves in a position to allow full stem movement.

F. Installation of Check Valves: Install for proper direction of flow as follows:

1. Wafer Check Valves: Horizontal or vertical position.

3.7 SOLDER CONNECTIONS

A. Cut tube square and to exact lengths.

B. Clean end of tube to depth of valve socket with steel wool, sand cloth, or a steel wire brush to a bright finish. Clean valve socket in the same manner.

C. Apply a proper soldering flux in an even coat to inside of valve socket and outside of tube.

D. Insert tube into valve socket, making sure the end rests against the shoulder inside valve. Rotate valve or tube slightly to ensure even distribution of the flux.

E. Apply heat evenly to outside of valve around joint until solder will melt upon contact. Feed solder until it completely fills the joint around the tube. Avoid hot spots or overheating valve. Once the solder starts cooling, remove excess amounts around the joint with a cloth or brush.

3.8 THREADED CONNECTIONS

A. Note the internal length of threads in valve ends, and proximity of valve internal seat or wall, to determine how far pipe should be threaded into valve.

B. Align threads at point of assembly.

C. Apply appropriate tape or thread compound to the external pipe threads (except where dry seal threading is specified).

D. Assemble joint, wrench tight. Wrench on valve shall be on the valve end into which the pipe is being threaded.

3.9 FLANGED CONNECTIONS

A. Align flange surfaces parallel.

B. Assemble joints by sequencing bolt tightening to make initial contact of flanges and gaskets as flat and parallel as possible. Use suitable lubricants on bolt threads. Tighten bolts gradually and uniformly with a torque wrench.

3.10 PRESS FITTING CONNECTIONS (NON-NATURAL GAS PIPING)

A. Press connections: Copper and copper alloy press connections shall be made in accordance with the manufacturer's installation instructions. The tubing shall be fully inserted into the fitting and the tubing marked at the shoulder of the fitting. The fitting alignment shall be checked against the mark on the tubing to assure the tubing is fully engaged (inserted) in the fitting. The joints shall be pressed using the tool(s) approved by the manufacturer.

3.11 PRESS FITTING CONNECTIONS FOR NATURAL GAS PIPING

A. Cold press mechanical joint fittings shall be installed in accordance with the manufacturer's installation instructions. The protective corrosion coating shall be removed from the outside of the pipe end. The pipe shall be fully inserted into the fitting and the pipe marked at the shoulder of the fitting. The fitting alignment shall be checked against the mark on the pipe to assure the pipe is fully engaged (inserted) in the fitting. The joints shall be pressed using the tool(s) approved by the manufacturer.

B. Air Testing: The piping system shall be air tested for joint tightness. The piping system shall be pressurized with air to the maximum pressure of the system or to the code or standard required minimum for the required length of time. The system shall have no leaks at the rated pressure.

3.12 INSPECTION, TESTING AND PURGING OF NATURAL GAS PIPING

A. General: Prior to acceptance and initial operation, all piping installations shall be inspected and pressure tested to determine that the materials, design, fabrication, and installation practices comply with the requirements of authority having jurisdiction.

1. Inspections: Inspection shall consist of visual examination, during or after manufacture, fabrication, assembly, or pressure tests as appropriate. Supplementary types of nondestructive inspection techniques, such as magnetic-particle, radiographic, ultrasonic, etc., shall not be required unless specifically listed herein or in the engineering design.

2. Repairs and additions: In the event repairs or additions are made following the pressure test, the affected piping shall be tested.

a. EXCEPTION: Minor repairs or additions, provided the work is inspected and connections are tested with a noncorrosive leak-detecting fluid.

B. Section testing: A piping system shall be permitted to be tested as a complete unit or in sections. Under no circumstances shall a valve in a line be used as a bulkhead between gas in one section of the piping system and test medium in an adjacent section, unless two valves are installed in series with a valved "telltale" located between these valves. A valve shall not be subjected to the test pressure unless it can be determined that the valve, including the valve closing mechanism, is designed to safely withstand the test pressure.

C. Regulators and valve assemblies. Regulator and valve assemblies fabricated independently of the piping system in which they are to be installed shall be permitted to be tested with inert gas or air at the time of fabrication.

D. Test medium: The test medium shall be air or an inert gas. Oxygen shall not be used.

E. Test preparation: Pipe joints, including welds, shall be left exposed for examination during the test. If the pipe end joints have been previously tested in accordance with this section, they shall be permitted to be covered or concealed.

1. Expansion joints: Expansion joints shall be provided with temporary restraints, if required, for the additional thrust load under test.

2. Equipment isolation: Equipment that is not to be included in the test shall be either disconnected from the piping or isolated by blanks, blind flanges, or caps. Flanged joints at which blinds are inserted to blank off other equipment during the test shall not be required to be tested.

3. Equipment disconnection: Where the piping system is connected to equipment or components designed for operating pressures of less than the test pressure, such equipment or equipment components shall be isolated from the piping system by disconnecting them and capping the outlet(s).

4. Valve isolation: Where the piping system is connected to equipment or components designed for operating pressures equal to or greater than the test pressure, such equipment shall be isolated from the piping system by closing the individual equipment shutoff valve(s).

5. Testing precautions: All testing of piping systems shall be done with due regard for the safety of employees and the public during the test. Bulkheads, anchorage, and bracing suitably designed to resist test pressures shall be installed if necessary. Prior to testing, the interior of the pipe shall be cleared of all foreign material.

F. Test Pressure measurement: Test pressure shall be measured with a manometer or with a pressure measuring device designed and calibrated to read, record, or indicate a pressure loss due to leakage during the pressure test period. The source of pressure shall be isolated before the pressure tests are made.

1. Test pressure: The test pressure to be used shall be no less than 1-1/2 times the proposed maximum working pressure, but not less than 3 psig (20 kPa gauge), irrespective of design pressure. Where the test pressure exceeds 125 psig (862 kPa gauge), the test pressure shall not exceed a value that produces a hoop stress in the piping greater than 50 percent of the specified minimum yield strength of the pipe.

2. Test duration: Test duration shall be not less than 1/2 hour for each 500 cubic feet (14 m3) of pipe volume or fraction thereof. When testing a system having a volume less than 10 cubic feet (0.28 m3) or a system in a single-family dwelling, the test duration shall be permitted to be reduced to 10 minutes. For piping systems having a volume of more than 24,000 cubic feet (680 m3), the duration of the test shall not be required to exceed 24 hours.

G. Detection of leaks and defects: The piping system shall withstand the test pressure specified without showing any evidence of leakage or other defects. Any reduction of test pressures as indicated by pressure gages shall be deemed to indicate the presence of a leak unless such reduction can be readily attributed to some other cause.

1. Detection methods: The leakage shall be located by means of an approved combustible gas detector, a noncorrosive leak detection fluid, or an equivalent nonflammable solution. Matches, candles, open flames, or other methods that could provide a source of ignition shall not be used.

2. Corrections: Where leakage or other defects are located, the affected portion of the piping system shall be repaired or replaced and retested.

H. System and equipment leakage test: Leakage testing of systems and equipment shall be in accordance with the following:

1. Test gases: Fuel gas shall be permitted to be used for leak checks in piping systems that have been tested in accordance with requirements of this section.

2. Before turning gas on: Before gas is introduced into a system of new gas piping, the entire system shall be inspected to determine that there are no open fittings or ends and that all manual valves at outlets on equipment are closed and all unused valves at outlets are closed and plugged or capped.

3. Test for leakage: Immediately after the gas is turned on into a new system or into a system that has been initially restored after an interruption of service, the piping system shall be tested for leakage. If leakage is indicated, the gas supply shall be shut off until the necessary repairs have been made.

4. Placing equipment in operation: Gas utilization equipment shall be permitted to be placed in operation after the piping system has been tested and determined to be free of leakage and purged in accordance with the following table:

Nominal Pipe Size(inches)	Length of Piping Requiring Purging
3	> 30 feet
4	> 15 feet
6	> 10 feet
8 or larger	Any length

I. Purging: Purging of piping shall comply with the following:

1. Removal from service: Where gas piping is to be opened for servicing, addition, or modification, the section to be worked on shall be turned off from the gas supply at

the nearest convenient point, and the line pressure vented to the outdoors, or to ventilated areas of sufficient size to prevent accumulation of flammable mixtures.

2. The remaining gas in this section of pipe shall be displaced with an inert gas as required by the following table:

Nominal Pipe Size (inches)	Length of Piping Requiring Purging
2-1/2	> 50 feet
3	> 30 feet
4	> 15 feet
6	> 10 feet
8 or larger	Any length

3. Placing in operation: Where piping full of air is placed in operation, the air in the piping shall be displaced with fuel gas, provided the piping does not exceed the length shown in the table below. The air can be safely displaced with fuel gas provided that a moderately rapid and continuous flow of fuel gas is introduced at one end of the line and air is vented out at the other end. The fuel gas flow shall be continued without interruption until the vented gas is free of air. The point of discharge shall not be left unattended during purging. After purging, the vent shall then be closed. Where required by the table below, the air in the piping shall first be displaced with an inert gas, and the inert gas shall then be displaced with fuel gas:

Nominal Pipe Size(inches)	Length of Piping Requiring Purging
3	> 30 feet
4	>15 feet
6	>10 feet
8 or larger	Any length

4. Discharge of purged gases: The open end of piping systems being purged shall not discharge into confined spaces or areas where there are sources of ignition unless precautions are taken to perform this operation in a safe manner by ventilation of the space, control of purging rate, and elimination of all hazardous conditions.

5. Placing equipment in operation: After the piping has been placed in operation, all equipment shall be purged and then placed in operation, as necessary.

3.13 SCHEDULES

A. Pipe Hanger Spacing:

1. Copper Piping:

a. 1-1/4 inch diameter and smaller: 6 feet maximum horizontal spacing, 10 feet maximum vertical spacing.

b. 1-1/2 inch diameter and larger: 10 feet maximum horizontal spacing, 10 feet maximum vertical spacing.

2. PVC Pipe or Tubing: 4 feet maximum horizontal spacing, 10 feet maximum vertical spacing.

3. Steel Pipe: 12 feet maximum horizontal spacing, 15 feet maximum vertical spacing.

END OF SECTION

SECTION 232114 - HYDRONIC SPECIALTIES

PART 1 GENERAL

1.1 SECTION INCLUDES

A. Air vents.

B. Strainers.

C. Suction diffusers.

D. Combination pump discharge valves (Multi-Purpose valves).

1.2 REFERENCE STANDARDS

A. ASME BPVC-VIII-1 - Boiler and Pressure Vessel Code, Section VIII, Division 1 - Rules for Construction of Pressure Vessels; 2015.

1.3 SUBMITTALS

A. Product Data: Provide product data for manufactured products and assemblies required for this project. Include component sizes, rough-in requirements, service sizes, and finishes. Include product description and model.

B. Certificates: Inspection certificates for pressure vessels from authority having jurisdiction.

C. Manufacturer's Installation Instructions: Indicate hanging and support methods, joining procedures.

1.4 QUALITY ASSURANCE

A. Manufacturer Qualifications: Company specializing in manufacturing the type of products specified in this section, with minimum three years of documented experience.

PART 2 PRODUCTS

2.1 AIR VENTS

A. Manual Air Vent: Short vertical sections of 2-inch diameter pipe to form air chamber, with 1/8 inch brass needle valve at top of chamber.

B. Float Air Vent:

1. Brass or semi-steel body, copper, polypropylene, or solid non-metallic float, stainless steel valve and valve seat; suitable for system operating temperature and pressure; with isolating valve.

2. Cast iron body and cover, float, bronze pilot valve mechanism suitable for system operating temperature and pressure; with isolating valve.

C. Maximum Fluid Pressure: 150 psi.

D. Maximum Fluid Temperature: 250 degrees F.

2.2 STRAINERS

A. Size 2 inch and Under:

1. Provide threaded, grooved, or sweat brass or iron body for up to 175 psi working pressure, Y-pattern strainer with 1/32 inch stainless steel perforated screen.

B. Size 2-1/2 inch to 4 inch:

1. Provide flanged or flanged iron body for up to 175 psi 175 psi working pressure, up to 250 degrees F 250 degrees F working temperature, Y-pattern strainer with with 1/16 inch or 1/16 inch stainless steel perforated screen.

2.3 SUCTION DIFFUSERS

A. Fitting: Angle pattern, cast-iron body, threaded for 2 inch and smaller, flanged for 2-1/2 inch and larger, rated for 175 psi working pressure, with inlet vanes, cylinder strainer with 3/16 inch diameter openings, disposable 5/32 inch mesh strainer to fit over cylinder strainer, 20 mesh startup screen, and permanent magnet located in flow stream and removable for cleaning.

2.4 **COMBINATION PUMP DISCHARGE VALVES (MULTI-PURPOSE VALVES)**

A. Quarter-Turn Plug Type: Flanged cast-iron body with bolt-on bonnet, position indicator, stainless steel stem, backflow preventer, memory stop, metering connectors, bubble-tight shutoff, and wrench-adjustable plug flow regulator.

PART 3 EXECUTION

3.1 INSTALLATION

A. Install specialties in accordance with manufacturer's instructions.

B. Provide manual air vents at system high points and as indicated.

C. Provide valved drain and hose connection on strainer blowdown connection.

D. Support pump fittings with floor-mounted pipe and flange supports.

END OF SECTION

SECTION 232123 - HYDRONIC PUMPS

PART 1 GENERAL

1.1 SECTION INCLUDES

A. Close-Coupled pumps.

B. Coil Condensate Pumps

1.2 REFERENCE STANDARDS

A. NEMA MG 1 - Motors and Generators; 2014.

B. NFPA 70 - National Electrical Code; Most Recent Edition Adopted by Authority Having Jurisdiction, Including All Applicable Amendments and Supplements.

C. UL 778 - Standard for Motor-Operated Water Pumps; Current Edition, Including All Revisions.

1.3 SUBMITTALS

A. Product Data: Provide certified pump curves showing performance characteristics with pump and system operating point plotted. Include NPSH curve when applicable. Include electrical characteristics and connection requirements.

B. Manufacturer's Installation Instructions: Indicate hanging and support requirements and recommendations.

C. Operation and Maintenance Data: Include installation instructions, assembly views, lubrication instructions, and replacement parts list.

1.4 QUALITY ASSURANCE

A. Manufacturer Qualifications: Company specializing in manufacture, assembly, and field performance of pumps, with minimum three years of documented experience.

B. Provide motors in compliance with the requirements of the New York State Energy Conservation Construction Code, tested in accordance with IEEE Standard 112, test method B.

PART 2 PRODUCTS

2.1 ACCEPTABLE MANUFACTURERS

A. Taco: www.taco-hvac.com.

B. Armstrong Pumps Inc: www.armstrongpumps.com.

C. Bell & Gossett, a Xylem Inc. brand: www.bellgossett.com.

2.2 GENERAL

A. Provide pumps that operate at specified system fluid temperatures without vapor binding and cavitation, are non-overloading in parallel or individual operation, and operate within 25 percent of midpoint of published maximum efficiency curve.

B. Minimum Quality Standard: UL 778.

C. Electrical Requirements:

1. Listed and classified by UL or testing agency acceptable to authority having jurisdiction as suitable for the purpose specified and indicated.

2. Enclosures: Provide unspecified product(s) required to fit motor:

2.3 CLOSE COUPLED PUMPS

A. The pumps shall be close-coupled, foot mounted, single stage, end suction, vertical split case design, in cast iron stainless steel fitted construction specifically designed for quiet operation. Suitable standard operations at 225° F and 175 PSIG working pressure or optional temperatures to 250° F. Working pressures shall not be de-rated at temperatures up to 250F. The pump internals shall be capable of being serviced without disturbing piping connections.

B. The pumps shall have a solid alloy steel shaft that is integral to the motor. A stainless steel shaft sleeve shall be employed to completely cover the wetted area under the seal.

C. The motor bearings shall support the shaft via heavy-duty grease lubricated ball bearings.

D. Pump shall be equipped with an internally flushed mechanical seal assembly installed in an enlarged tapered seal chamber. Seal assembly shall have Buna bellows and seat gasket, stainless steel spring, and be of a carbon / ceramic design with the carbon face rotating against a stationary ceramic face.

E. Motor shaft shall connect to a stainless steel impeller. Impeller shall be hydraulically and dynamically balanced to ANSI/HI 9.6.4-2009, ISO 1940 balance grade G6.3, keyed to the shaft and secured by a stainless steel locking caps crew.

F. Pump should be designed to allow for true back pull-out access to the pump’s working components for ease of maintenance.

G. Pump volute shall be of a cast iron design for HVAC systems rated for 175 PSIG with integral cast iron flanges drilled for 125# ANSI companion flanges NPT pipe. Volute shall include gauge ports at nozzles, and vent and drain ports.

H. Motors shall meet scheduled horsepower, speed, voltage, and enclosure design. Motors shall have heavy-duty grease lubricated ball bearings to offset the additional bearing loads associated with the closed-coupled pump design. Motors shall be non-overloading at any point on the pump curve and shall meet NEMA specifications.

I. Pumps shall conform to ANSI/HI 9.6.3.1-2012 standard for Preferred Operating Region (POR) unless otherwise approved by the engineer. The pump NPSH shall conform to the ANSI/HI 9.6.1-2012 standards for *Centrifugal and Vertical Pumps for NPSH Margin*.

J. Pump shall be of a maintainable design and for ease of maintenance shall use machine fit parts and not press fit components.

K. Pump manufacturer shall be ISO-9001 certified.

L. Each pump shall be factory tested and name-plated before shipment.

2.4 COIL CONDENSATE PUMPS

A. Refer to condensate pump schedule for pump requirements.

PART 3 EXECUTION

3.1 PREPARATION

A. Verify that electric power is available and of the correct characteristics.

3.2 INSTALLATION

A. Install in accordance with manufacturer's instructions.

B. Provide access space around pumps for service. Provide no less than minimum space recommended by manufacturer.

C. Decrease from line size with long radius reducing elbows or reducers.

D. Check, align, and certify alignment of base-mounted pumps prior to start-up.

END OF SECTION

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SECTION 232300 - REFRIGERANT PIPING

PART 1 GENERAL

1.1 SECTION INCLUDES

A. Piping.

B. Refrigerant.

C. Moisture and liquid indicators.

D. Valves.

E. Filter-driers.

F. Expansion valves.

G. Flexible connections.

1.2 REFERENCE STANDARDS

A. AHRI 710 - Performance Rating of Liquid-Line Driers; 2009.

B. AHRI 730 (I-P) - Flow Capacity Rating of Suction-Line Filters and Suction-Line Filter-Driers; 2013.

C. AHRI 750 - Standard for Thermostatic Refrigerant Expansion Valves; 2007.

D. ASHRAE Std 15 - Safety Standard for Refrigeration Systems; 2013.

E. ASHRAE Std 34 - Designation and Safety Classification of Refrigerants; 2013.

F. ASME B16.22 - Wrought Copper and Copper Alloy Solder-Joint Pressure Fittings; 2013.

G. ASME B16.26 - Cast Copper Alloy Fittings for Flared Copper Tubes; 2013.

H. ASME B31.5 - Refrigeration Piping and Heat Transfer Components; 2013.

I. ASME B31.9 - Building Services Piping; 2014.

J. ASTM A123/A123M - Standard Specification for Zinc (Hot-Dip Galvanized) Coatings on Iron and Steel Products; 2015.

K. ASTM B88 - Standard Specification for Seamless Copper Water Tube; 2014.

L. ASTM B88M - Standard Specification for Seamless Copper Water Tube (Metric); 2013.

M. ASTM B280 - Standard Specification for Seamless Copper Tube for Air Conditioning and Refrigeration Field Service; 2013.

N. AWS A5.8M/A5.8 - Specification for Filler Metals for Brazing and Braze Welding; 2011-AMD 1.

O. ICC (IMC)-2018 - International Mechanical Code; 2018.

P. MSS SP-58 - Pipe Hangers and Supports - Materials, Design, Manufacture, Selection, Application, and Installation; 2009.

Q. UL 207 - Standard for Refrigerant-Containing Components and Accessories, Nonelectrical; Current Edition, Including All Revisions.

1.3 SYSTEM DESCRIPTION

A. Where more than one piping system material is specified ensure system components are compatible and joined to ensure the integrity of the system is not jeopardized. Provide necessary joining fittings. Ensure flanges, union, and couplings for servicing are consistently provided.

B. Provide pipe hangers and supports in accordance with ASME B31.5 unless indicated otherwise.

C. Valves:

1. Use service valves on suction and discharge of compressors.

D. Filter-Driers:

1. Use a filter-drier on suction line just ahead of compressor.

1.4 SUBMITTALS

A. Product Data: Provide general assembly of specialties, including manufacturers catalogue information. Provide manufacturers catalog data including load capacity.

B. Piping Schedule: Provide schedule of piping applications and materials, indicating piping and fittings.

C. Piping Shop Drawings: Provide drawings of piping installation, indicating dimensioned locations, equipment, critical dimensions, elevations, sizes, systems, and valve locations.

D. Manufacturer Piping Sizing: Provide documentation from the manufacturer of the refrigeration equipment connected to the refrigerant piping and accessories establishing the required sizing of piping.

E. Shop Drawings: Indicate schematic layout of system, including equipment, critical dimensions, and sizes.

F. Design Data: Submit design data indicating pipe sizing. Indicate load carrying capacity of trapeze, multiple pipe, and riser support hangers.

G. Test Reports: Indicate results of leak test, acid test.

H. Manufacturer's Installation Instructions: Indicate support, connection requirements, and isolation for servicing.

I. Installer's qualification statement.

1.5 QUALITY ASSURANCE

A. Installer Qualifications: Company specializing in performing the type of work specified in this section, with minimum 3 years of documented experience.

B. The manufacturer of the refrigeration equipment connected to the refrigerant piping and accessories shall review and provide final sizing of piping and accessories.

PART 2 PRODUCTS

2.1 PIPING

A. Copper Tube: ASTM B280, H58 hard drawn.

1. Fittings: ASME B16.22 wrought copper.

2. Joints: Braze, AWS A5.8M/A5.8 BCuP silver/phosphorus/copper alloy.

3. Mechanical Press Sealed Fittings: Double pressed type complying with UL 207 and ICC (IMC)-2018.

B. Pipe Supports and Anchors:

1. Provide hangers and supports that comply with MSS SP-58.

a. If type of hanger or support for a particular situation is not indicated, select appropriate type using MSS SP-58 recommendations.

2. Hangers for Pipe Sizes 1/2 to 1-1/2 Inch: Malleable iron adjustable swivel, split ring.

3. Hangers for Pipe Sizes 2 Inches and Over: Carbon steel, adjustable, clevis.

4. Multiple or Trapeze Hangers: Steel channels with welded spacers and hanger rods.

5. Vertical Support: Steel riser clamp.

6. Floor Support: Cast iron adjustable pipe saddle, lock nut, nipple, floor flange, and concrete pier or steel support.

7. Copper Pipe Support: Carbon steel ring, adjustable, copper plated.

8. Hanger Rods: Mild steel threaded both ends, threaded one end, or continuous threaded.

9. Inserts: Malleable iron case of galvanized steel shell and expander plug for threaded connection with lateral adjustment, top slot for reinforcing rods, lugs for attaching to forms; size inserts to suit threaded hanger rods.

10. Rooftop Supports for Low-Slope Roofs: Steel pedestals with bases that rest on top of roofing membrane, not requiring any attachment to the roof structure and not penetrating the roofing assembly, with support fixtures as specified; and as follows:

    a. Bases: High density, UV tolerant, polypropylene or reinforced PVC.

    b. Base Sizes: As required to distribute load sufficiently to prevent indentation of roofing assembly.

    c. Steel Components: Stainless steel, or carbon steel hot-dip galvanized after fabrication in accordance with ASTM A123/A123M.

    d. Attachment/Support Fixtures: As recommended by manufacturer, same type as indicated for equivalent indoor hangers and supports; corrosion resistant material.

    e. Height: Provide minimum clearance of 6 inches under pipe to top of roofing.

2.2 REFRIGERANT

A. Refrigerant: Use only refrigerants that have ozone depletion potential (ODP) of zero and global warming potential (GWP) of less than 50.

B. Refrigerant: R-410A as defined in ASHRAE Std 34.

2.3 MOISTURE AND LIQUID INDICATORS

A. Indicators: Single port type, UL listed, with copper or brass body, flared or solder ends, sight glass, color coded paper moisture indicator with removable element cartridge and plastic cap; for maximum temperature of 200 degrees F and maximum working pressure of 500 psi.

2.4 VALVES

A. Diaphragm Packless Valves:

1. UL listed, globe or angle pattern, forged brass body and bonnet, phosphor bronze and stainless steel diaphragms, rising stem and handwheel, stainless steel spring, nylon seat disc, solder or flared ends, with positive backseating; for maximum working pressure of 500 psi and maximum temperature of 275 degrees F.

B. Service Valves:

1. Forged brass body with copper stubs, brass caps, removable valve core, integral ball check valve, flared or solder ends, for maximum pressure of 500 psi.

2.5 FILTER-DRIERS

A. Performance:

1. Pressure Drop: 2 psi, maximum, when operating at full connected evaporator capacity.

2. Design Working Pressure: 350 psi, minimum.

B. Cores: Molded or loose-fill molecular sieve desiccant compatible with refrigerant, activated alumina, and filtration to 40 microns, with secondary filtration to 20 microns; of construction that will not pass into refrigerant lines.

C. Construction: UL listed.

1. Connections: As specified for applicable pipe type.

2.6 EXPANSION VALVES

A. Angle or Straight Through Type: AHRI 750; design suitable for refrigerant, brass body, internal or external equalizer, bleed hole, adjustable superheat setting, replaceable inlet strainer, with non-replaceable capillary tube and remote sensing bulb and remote bulb well.

B. Selection: Evaluate refrigerant pressure drop through system to determine available pressure drop across valve. Select valve for maximum load at design operating pressure and minimum 10 degrees F superheat. Select to avoid being undersized at full load and excessively oversized at part load.

2.7 FLEXIBLE CONNECTORS

A. Corrugated stainless steel hose with single layer of stainless steel exterior braiding, minimum 9 inches long with copper tube ends; for maximum working pressure of 500 psi.

PART 3 EXECUTION

3.1 PREPARATION

A. Ream pipe and tube ends. Remove burrs. Bevel plain end ferrous pipe.

B. Remove scale and dirt on inside and outside before assembly.

C. Prepare piping connections to equipment with flanges or unions.

3.2 INSTALLATION

A. Install refrigeration specialties in accordance with manufacturer's instructions.

B. Route piping in orderly manner, with plumbing parallel to building structure, and maintain gradient.

C. Install piping to conserve building space and avoid interference with use of space.

D. Group piping whenever practical at common elevations and locations. Slope piping one percent in direction of oil return.

E. Install piping to allow for expansion and contraction without stressing pipe, joints, or connected equipment.

F. Inserts:

1. Provide inserts for placement in concrete formwork.

2. Provide inserts for suspending hangers from reinforced concrete slabs and sides of reinforced concrete beams.

3. Where concrete slabs form finished ceiling, locate inserts flush with slab surface.

4. Where inserts are omitted, drill through concrete slab from below and provide through-bolt with recessed square steel plate and nut above slab.

G. Pipe Hangers and Supports:

1. Install in accordance with ASME B31.5.

2. Support horizontal piping as indicated.

3. Install hangers to provide minimum 1/2 inch space between finished covering and adjacent work.

4. Place hangers within 12 inches of each horizontal elbow.

5. Support vertical piping at every floor. Support riser piping independently of connected horizontal piping.

6. Where several pipes can be installed in parallel and at same elevation, provide multiple or trapeze hangers.

7. Provide copper plated hangers and supports for copper piping.

H. Arrange piping to return oil to compressor. Provide traps and loops in piping, and provide double risers as required. Slope horizontal piping 0.40 percent in direction of flow.

I. Provide clearance for installation of insulation and access to valves and fittings.

J. Provide access to concealed valves and fittings.

K. Flood piping system with nitrogen when brazing.

L. Insulate piping; refer to Section and Section 230716.

M. Follow ASHRAE Std 15 procedures for charging and purging of systems and for disposal of refrigerant.

N. Locate expansion valve sensing bulb immediately downstream of evaporator on suction line.

O. Provide external equalizer piping on expansion valves with refrigerant distributor connected to evaporator.

P. Install flexible connectors at right angles to axial movement of compressor, parallel to crankshaft.

Q. Fully charge completed system with refrigerant after testing.

3.3 FIELD QUALITY CONTROL

A. Test refrigeration system in accordance with ASME B31.5.

B. Pressure test system with dry nitrogen to 200 psi. Perform final tests at 27 inches vacuum and 200 psi using halide torch. Test to no leakage.

3.4 SCHEDULES

A. Pipe Hanger Spacing:

1. Copper Piping:

a. 1-1/4 inch diameter and smaller: 6 feet maximum horizontal spacing, 10 feet maximum vertical spacing.

b. 1-1/2 inch diameter and larger: 10 feet maximum horizontal spacing, 10 feet maximum vertical spacing.

END OF SECTION

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SECTION 232500 - HVAC WATER TREATMENT

PART 1 GENERAL

1.1 SECTION INCLUDES

A. Materials.

1. System cleaner.

2. Closed system treatment (water).

1.2 SUBMITTALS

A. Product Data: Provide chemical treatment materials, chemicals, and equipment including electrical characteristics and connection requirements.

B. Shop Drawings: Indicate system schematic, equipment locations, and controls schematics, electrical characteristics and connection requirements.

C. Manufacturer's Installation Instructions: Indicate placement of equipment in systems, piping configuration, and connection requirements.

D. Manufacturer's Field Reports: Indicate start-up of treatment systems when completed and operating properly. Indicate analysis of system water after cleaning and after treatment.

1.3 QUALITY ASSURANCE

A. Manufacturer Qualifications: Company specializing in manufacturing the type of products specified in this section, with minimum three years of documented experience. Company shall have local representatives with water analysis laboratories and full time service personnel.

B. Installer Qualifications: Company specializing in performing the type of work specified in this section, with minimum 3 years of experience and approved by manufacturer.

1.4 REGULATORY REQUIREMENTS

A. Conform to applicable code for addition of non-potable chemicals to building mechanical systems and to public sewage systems.

B. Products Requiring Electrical Connection: Listed and classified by UL as suitable for the purpose specified and indicated.

PART 2 PRODUCTS

2.1 SYSTEM CLEANER FOR NEWLY INSTALLED PIPING SYSTEMS

A. Closed Loop Water System Cleaner/Conditioner: Provide industrial degreaser which is chemically engineered to include non-ionic as well as ionic surface-active compounds dispersed in dionized water.

B. Chemical Composition:

1. Boiling Point: 212 Degrees F.
2. Freezing Point: 30 Degrees F.
3. Weight per Gallon at 68 Degrees F: 8.67 pounds.
4. Coefficient of Expansion at 68 Degrees F: 0.00019.
5. Coefficient of Expansion at 131 Degrees F: 0.00023.
6. Flash Point PMCC/COC: None/None.
7. Vapor Pressure, Reid Bomb at 100 Degrees F: 1.4 psia.
8. Vapor Density (Air = 1): <1.
9. Specific Gravity (water = 1): 1.04031.
10. Evaporation Rate (Butyl Acetate = 1): <1.
11. Volitile % by Volume: 100%.
12. Solubility in Water: Complete.
13. Color: Amber.
14. pH: 7.2/8.2.

C. Manufacturer: Interclean DG-3, or approved equal.

2.2 SYSTEM CLEANER FOR RE-USED AND RETROFITTED SYSTEMS

A. Closed Loop Water System Cleaner/Conditioner: Provide industrial cleaner consisting of ammonia-neutralized chelating and sequetering agents to convert water insoluble compounds containing the elements of calcium, magnesium, iron, aluminum, copper, lead and zinc into water soluble compounds, allowing for removal of corrosion such as rust, line and other mineral scales.

B. Chemical Composition:

1. Boiling Point: 216 Degrees F.
2. Freezing Point: 18 Degrees F.

3. Weight per Gallon at 68 Degrees F: 9.37 pounds.
4. Coefficient of Expansion at 68 Degrees F: 0.00018.
5. Coefficient of Expansion at 131 Degrees F: 0.00018.
6. Flash Point PMCC/COC: None/None.
7. Vapor Pressure, Reid Bomb at 100 Degrees F: 1.2 psia.
8. Vapor Density (Air = 1): <1.
9. Specific Gravity (water = 1): 1.12425.
10. Evaporation Rate (Butyl Acetate = 1): <1.
11. Volitile % by Volume: 100%.
12. Solubility in Water: Complete.
13. Color: Blue Green.
14. pH: 7.2/8.2.

C. Manufacturer: Interclean MC-1, or approved equal.

PART 3 EXECUTION

3.1 PREPARATION

A. Systems shall be operational, filled, started, and vented prior to cleaning. Use water meter to record capacity in each system.

B. Place terminal control valves in open position during cleaning.

C. Verify that electric power is available and of the correct characteristics.

3.2 NEW PIPING CLEANING SEQUENCE

A. Concentration:

1. 1% by volume, verify with cleaner manufacturer.

B. Water Systems:

1. Fill the system with clear water with air bleeds open to completely vent air. Close air bleeds and circulate for 30 minutes.
2. Stop circulation and drain the entire system as quickly as possible through low point drains.
3. Fill the system with the required concentration clear water and system cleaner with air bleeds open to completely vent air. Close air bleeds.

4. Operate the system at as high a temperature as possible but do not exceed 190 degrees F. Continue to operate until pH is greater than 8.3. At 180 degrees F, this may take 8-12 hours. At ambient temperature, this may take 24-36 hours.

5. Stop circulation and drain the entire system as quickly as possible through low point drains.

6. Fill the system with clear water with air bleeds open to completely vent air. Close air bleeds and circulate for 30 minutes.

7. Stop circulation and drain the entire system as quickly as possible through low point drains.

8. Inspect piping condition at representative locations. If the system is not satisfactory, repeat steps 3-7.

3.3 EXISTING PIPING CLEANING SEQUENCE

A. Concentration:

1. 10% by volume, verify with cleaner manufacturer.

B. Water Systems:

1. Fill the system with clear water with air bleeds open to completely vent air. Close air bleeds and circulate for 30 minutes.

2. Stop circulation and drain the entire system as quickly as possible through low point drains.

3. Fill the system with the required concentration clear water and system cleaner with air bleeds open to completely vent air. Close air bleeds.

4. Operate the system at as high a temperature as possible but do not exceed 190 degrees F. Continue to operate until pH is greater than 8.3. At 180 degrees F, this may take 8-12 hours. At ambient temperature, this may take 24-36 hours.

5. Stop circulation and drain the entire system as quickly as possible through low point drains.

6. Fill the system with clear water with air bleeds open to completely vent air. Close air bleeds and circulate for 30 minutes.

7. Stop circulation and drain the entire system as quickly as possible through low point drains.

8. Inspect piping condition at representative locations. If the system is not satisfactory, repeat steps 3-7.

3.4 INSTALLATION

A. Install in accordance with manufacturer's instructions.

END OF SECTION

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SECTION 233100 - HVAC DUCTS AND CASINGS

PART 1 GENERAL

1.1 SECTION INCLUDES

A. Metal ductwork.

B. Flexible ductwork.

C. Plenums.

1.2 RELATED WORK SPECIFIED IN OTHER SECTIONS

A. This contract includes sheet metal ductwork which is to be fabricated with duct liner specified in Section 230713- DUCT INSULATION. Work of this section includes requirements for fabricating and insulating the ductwork. Net clear interior dimensions of lined ductwork shall be the duct sizes indicated on the drawings. Provide ductwork with sufficient dimensions such that final net clear interior sizes with the ductwork liner meets the drawings for sizing.

1.3 REFERENCES

A. ASTM A 36/A 36M - Standard Specification for Carbon Structural Steel; 1994.

B. ASTM A 569/A 569M - Standard Specification for Steel, Carbon (0.15 Maximum, Percent), Hot-Rolled Sheet and Strip, Commercial Quality; 1991a (Reapproved 1993).

C. ASTM A 653/A 653M - Standard Specification for Steel Sheets, Zinc-Coated (Galvanized) or Zinc-Iron Alloy-Coated (Galvannealed) by the Hot Dip Process; 1995.

D. ASTM B 209 - Standard Specification for Aluminum and Aluminum-Alloy Sheet and Plate; 1995.

E. ASTM B 209M - Standard Specification for Aluminum and Aluminum-Alloy Sheet and Plate (Metric); 1995.

F. NFPA 90A - Installation of Air Conditioning and Ventilating Systems; 1993.

G. NFPA 90B - Installation of Warm Air Heating and Air Conditioning Systems; 1993.

H. SMACNA (LEAK) - HVAC Air Duct Leakage Test Manual; 2012.

I. SMACNA (DCS) - HVAC Duct Construction Standards - Metal and Flexible;2005.

J. UL 181 - Factory-Made Air Ducts and Connectors; 1994.

1.4 PERFORMANCE REQUIREMENTS

A. No variation of duct configuration or sizes permitted except by written permission. Size round ducts installed in place of rectangular ducts in accordance with ASHRAE table of equivalent rectangular and round ducts.

1.5 SUBMITTALS

A. Product Data: Provide data for duct materials.

B. Shop Drawings: Indicate duct fittings, particulars such as gages, sizes, welds, and configuration prior to start of work for all ductwork systems.

C. Ductwork Shop Drawings: Provide drawings of ductwork installation, indicating dimensioned locations, equipment, critical dimensions, elevations, sizes, systems, and damper locations. Indicate duct fittings, particulars such as gages, sizes, welds, and configuration.

D. Coordination Shop Drawings:

1. Prior to starting construction work submit coordination drawings.

2. Submit coordination drawings that show the layout and coordination within each building and all building systems including, but not limited to the following:

a. Building structure

b. Structural penetrations

c. Reflected ceiling plan

d. HVAC ductwork

e. Diffusers, grilles and registers

f. HVAC piping

g. All HVAC equipment including kitchen exhaust hoods, air handling units, rooftop energy recovery units, boilers, fans, heating coils, fin tube radiation enclosure units, blower coils, unit ventilators, condensing units, pumps, expansion tanks, air separators, cabinet heaters, variable refrigerant volume heta pumps, floor radiator units, radiant ceiling panels, duct silencers, and VAV Boxes.

h. sanitary drain

i. sanitary vent

j. storm drain

k. domestic cold water, domestic hot water and domestic hot water recirculation

l. electrical light fixtures

m. electric panels

n. electric conduit 2" and larger

o. fire alarm devices

3. The contractor shall prepare as part of its costs, shop drawings in compatible format which will be used for incorporation into the coordination drawings.

4. The initial coordination drawings shall be produced by the contractor starting with the “Base” CAD background drawing. These backgrounds shall be updated and modified with integration and revision of CAD drawings for new construction to indicate conditions for approved final layouts for foundations, steel framing, concrete reinforcing, and access flooring approved rough-in layout plans. All building structural elements, walls, doors, windows, louvers, openings, ceiling layouts, access floor layouts and major equipment provided by the contractor and other significant elements shall be shown on designated layers. Scheduled heights for finished ceilings above finished floor, and height above finished floor of underside of concrete and metal decks and all beams and joists including provision for fireproofing and finished enclosures shall be indicated at all areas.

5. The contractor shall provide full size “CAD” files for each level, to be plotted at 3/8” or approved coordination scale.

6. All larger coordination drawings, broken up with match lines to correlate with phases and distinct plan areas with drawing designations.

7. All coordination drawings will have the location of plan view information the same.

8. Coordination drawings shall be prepared for the following areas:

   a. All areas (above ceiling).

   b. Separate coordination plans shall be prepared for the following areas:

      1) All Mechanical rooms.

      2) All Boiler Rooms.

      3) High School Roof.

      4) Miller Elementary School Roof.

      5) Barr Middle School Roof.

9. The Contractor shall meet at a minimum weekly meetings to be held to review the status of the coordination process, and drawings which the foremen and/or Superintendent of each Contractor will be required to attend. The Contractor will be required to bring at least one color plot of all areas to be coordinate. Each affected Contractor shall review, sign and date each updated coordinated drawing which will indicate their agreement that the coordination drawing(s) has (have) been fully coordinated and are void of all conflicts at each stage. Final completed coordination

drawings shall be signed off by the Contractor. Any work in place not in conformance with final approved coordination drawings will be required to be removed and relocated unless specific written approval with each contractor.

10. Any conflicts, etc., discovered in the coordination stages prior to contractor sign-off which cannot be resolved by the Contractors shall be brought to the attention of the Architect for resolution.

11. Any conflicts, etc., discovered after coordination sign-off and during the installation of the Work will be the responsibility of the Contractor to resolve with the review of the Architect.

12. A coordination drawing schedule will be developed by the contractor for tracking and reporting the status of coordination drawings with the overall project schedule to which the Contractor shall be responsible.

13. Work fabricated/installed prior to the completion of this process is performed at the Contractor's own risk, and compensation of time/costs for corrections will not be allowed.

14. The Contractor shall be responsible for timely updates to the coordination drawings to indicate as-built conditions for their own work. Updates are required to include all changes regardless of the source or reason for the change.

E. Test Reports: Indicate pressure tests performed. Include date, section tested, test pressure, and leakage rate, following SMACNA (LEAK) - HVAC Air Duct Leakage Test Manual.

1.6 QUALITY ASSURANCE

A. Manufacturer Qualifications: Company specializing in manufacturing the type of products specified in this section, with minimum three years of documented experience.

B. Installer Qualifications: Company specializing in performing the type of work specified in this section, with minimum 3 years of documented experience.

1.7 REGULATORY REQUIREMENTS

A. Construct ductwork to NFPA 90A standards.

1.8 ENVIRONMENTAL REQUIREMENTS

A. Do not install duct sealants when temperatures are less than those recommended by sealant manufacturers.

B. Maintain temperatures within acceptable range during and after installation of duct sealants.

2.1 MATERIALS

A. Galvanized Steel Ducts: ASTM A 653/A 653M galvanized steel sheet, lock-forming quality, with G90/Z275 zinc coating.

B. Reinforcement Shapes and Plates: Unless otherwise indicated, provide galvanized steel reinforcing where installed on galvanized sheet metal ducts.

C. Non-Fibrous, Closed Cell, Outdoor Rectangular Ductwork and Fittings:

1. Basis of Design: Thermaduct by Thermaduct, LLC. 855-809-6903 or equal

2. The panel shall be manufactured of CFC-free Kingspan Kooltherm closed cell rigid thermoset resin thermally bonded on both sides to a factory applied .001" (25 micron) aluminum foil facing reinforced with a fiberglass scrim. An added UV stable, IR reflective 1000-micron high impact resistant titanium infused vinyl is factory bonded using a full lamination process. The lamination process shall permanently bond the vinyl clad to the outer surfaces of the phenolic foam panel to provide a zero-permeability water tight barrier and to form a structurally insulated panel (SIP) in which to form duct segments. Processes that do not employ a full lamination process are not acceptable. Self-applied adhesives such as tapes, caulks or cladding that incorporate pressure sensitive or spray adhesives are not acceptable.

3. The thermal conductivity shall be no greater than 0.146BTU • in/Hr •ft2•°F, the thermal conductivity shall be no greater than 0.146BTU • in/Hr •ft2•°F.

4. The density of the foam shall not be less than 3.5 pcf with a minimum compressive strength of 28 psi.

5. The standard panel shall be 1-3/4" thick with R-12 and shall be utilized unless indicated otherwise on the print, and utilized for outdoor supply, exhaust and return ductwork applications.

6. Maximum Temperature: Continuous rating of 185 degrees F (70 deg C) inside ducts or ambient temperature surrounding ducts.

7. Maximum Thermal Conductivity: 0.146 Btu x in./h x sq. ft. x deg F at 75 deg F mean temperature.

8. Permeability: 0.00 perms maximum when tested according to ASTM E 96/E 96M, Procedure A.

9. Antimicrobial Agent: Additive for antimicrobial shall not be used but instead, raw product must pass UL bacteria growth testing.

10. Noise-Reduction Coefficient: 0.05 minimum when tested according to ASTM C 423, Mounting A.

11. Required Markings: All interior duct liner shall bear UL label and other markings required by UL 181 on each full sheet of duct panel; UL ratings for internal closure materials.

12. All insulation materials shall be closed cell with a closed cell content of >90%.

13. Pressure Class: 4" wg

14. Closure Materials:

    a. UV stable 1000 micron high impact resistant titanium infused vinyl (exterior).

        1) Factory manufactured seamless corners for zero perms.

        2) Cohesive bonded over-lap at corner seam covers for zero perms.

        3) Water resistant titanium infused welded vinyl seams.

        4) Mold and mildew resistant.

    b. Polymeric Sealing System:

        1) Structural Membrane: Aluminum scrim with woven glass fiber with UV stable vinyl clad applied

        2) Minimum Seam Cover Width: 2 7/8” inches (75 mm)

        3) Sealant: Low VOC.

        4) Color: White (colors, matched by architect optional).

        5) Water resistant.

        6) Mold and mildew resistant.

    c. Duct Connectors: Factory manufactured galvanized 4-bolt flange.

15. Outdoor Cladding:

    a. Outdoor Installations: Duct segments shall incorporate UV stable 1000 micron high impact resistant titanium infused vinyl which is introduced during the manufacturing process.

16. Flange Coverings:

    a. Flanges are field sealed airtight before flange covers are installed. Flange covering consists of the following:

        1) Foam tape insulation with molded 39 mil covers.

17. Reinforcement:

    a. Outdoor ducts shall provide designed and built with adequate reinforcement to both; withstand air pressure forces from within the duct from blower pressure

and shall be built to handle expected snow load for the location where the duct is being installed. The ductwork reinforcement system when both specified static pressure and duct sizes dictate the need. This is a factory installed system and no field installation of the reinforcement system is required.

18. Weight:

    a. The outdoor ductwork shall provide low weight stresses on the building framing and support members. Assembled duct shall have a weight of 0.86 lbs. per square foot to maximum weight of 2.7 lbs. per square foot (depending on R-value and reinforcement requirement). Hangers and tiedowns are to be detailed in the Installation Manual for review prior to installation but not exceeding 13’ for duct girth <84” and 8’ for duct girth >85” between hangers and designed to carry the weight and wind load of the ductwork.

D. Stainless Steel Ducts:

1. Use minimum No. 16 gage for exhaust ducts connected to cooking equipment hoods.

    a. Use stainless steel reinforcing members for ducts in finished spaces and galvanized steel in unfinished spaces.

E. Aluminum Ducts: ASTM B 209; aluminum sheet, alloy 3003-H14. Aluminum Connectors and Bar Stock: Alloy 6061- T6 or of equivalent strength.

F. Insulated Flexible Ducts:

1. UL 181, Class 1, aluminum laminate and polyester film with latex adhesive supported by helically wound spring steel wire; fiberglass insulation; polyethylene vapor barrier film.

    a. Pressure Rating: 10 inches WG positive and 1.0 inches WG negative.

    b. Maximum Velocity: 4000 fpm.

    c. Temperature Range: -20 degrees F to 210 degrees F.

G. Hanger Rod: ASTM A 36/A 36M; steel, galvanized; threaded both ends, threaded one end, or continuously threaded.

2.2 DUCTWORK FABRICATION

A. Fabricate and support in accordance with SMACNA (DCS) - HVAC Duct Construction Standards - Metal and Flexible, and as indicated. Provide duct material, gages, reinforcing, and sealing for operating pressures indicated.

B. Construct T's, bends, and elbows with radius of not less than 1-1/2 times width of duct on centerline. Where not possible and where rectangular elbows are outlined on the drawings, provide air foil turning vanes. Where acoustical lining is indicated, provide turning vanes of perforated metal with glass fiber insulation.

C. Increase duct sizes gradually, not exceeding 15 degrees divergence wherever possible; maximum 30 degrees divergence upstream of equipment and 45 degrees convergence downstream.

D. Fabricate continuously welded round and oval duct fittings two gages heavier than duct gages indicated in SMACNA Standard. Joints shall be minimum 4 inch cemented slip joint, brazed or electric welded. Prime coat welded joints.

E. Provide standard 45 degree lateral wye takeoffs unless otherwise indicated where 90 degree conical tee connections may be used.

F. Where ducts are connected to exterior wall louvers and duct outlet is smaller than louver frame, provide blank-out panels sealing louver area around duct. Use same material as duct, painted black on exterior side; seal to louver frame and duct.

2.3 SEALING MATERIALS

A. Joint and Seam Sealants, General: The term sealant used here is not limited to materials of adhesive or mastic nature, but also includes combinations of open weave fabric strips and mastics

B. Joint and Seam Tape: 2 inches wide, glass-fiber-fabric reinforced.

C. Tape Sealing System: Woven-fiber tape impregnated with a gypsum mineral compound and a modified acrylic/silicone activator to react exothermically with the tape to form a hard, durable, airtight seal.

D. Joint and Seam Sealant:

1. Color: Grey
2. Base: Water
3. Chemical Family: Synthetic Latex
4. Solids Content: 75 ± 2%
5. Viscosity: Approx. 300,000 - 400,000 CPS
6. Application Temperature: 40°F - 110°F
7. Service Temperature: -25°F - 200°F
8. Freeze/Thaw Stability: Through 5 cycles no deterioration (DPTM-20)
9. Flammability: Non-flammable
10. Wet or Dry Flash Point: No flash to boiling
11. Shelf Life: 2 Years (unopened containers)
12. Cure Time: 24 - 72 hours depending on humidity, temperature and application

13. Coverage: Dependent on application thickness, 80-100 sq. ft. at 20-30 wet mils.

14. Packaging: 1/12 gallon tubes, 1 gallon pails, 2 gallon pails, 5 gallon pails, 54 gallon drums

15. Pressure Classes: Meets all SMACNA pressure classes

16. Seal Classes: Meets all SMACNA seal classes

E. Flanged Joint Mastics: One-part, acid-curing, silicone elastomeric joint sealants, complying ASTM C920, Type S, Grade NS Class 25, Use O.

2.4 FIRE STOPPING

A. Provide fire-stopping of penetrations as work of this contract.

2.5 HANGERS AND SUPPORTS

A. Building Attachments: Concrete inserts, powder actuated fasteners, or structural steel fasteners appropriate for building materials. Do not use powder actuated concrete fasteners for lightweight aggregate concretes or for slabs less than 4 inches thick.

B. Hangers: Galvanized sheet steel, or round, uncoated steel, threaded rod.

1. Straps and Rod sizes: Conform with Table 4-1 in SMACNA HVAC Duct Construction Standards, 1985 Edition, for sheet steel width and gage and steel rod diameters

C. Duct Attachments: Sheet metal screws, blind rivets, or self-tapping metal screws; compatible with duct materials.

D. Trapeze and Riser Supports: Steel shapes conforming to ASTM-A36.

1. Where galvanized steel ducts are installed, provide hot-dipped galvanized steel shapes and plates.

E. Rooftop Duct Supports: Dual bases supporting "H" frame strut assembly to support duct.

1. Strut Material: Hot-dip galvanized steel.

2. Stainless steel bases and hot-dip galvanized steel struts.

3. Base Material: Polycarbonate resin, stainless steel or hot-dip galvanized

2.6 RECTANGULAR DUCT FABRICATION

A. General: Except as otherwise indicated, fabricate rectangular ducts with galvanized sheet steel, in accordance with SMACNA "HVAC Duct Construction Standards", Tables 1-3 through 1-19, including their associated details. Conform to the requirements in the referenced standard for metal thickness, reinforcing types and intervals, tie rod applications, and joint types and intervals.

1. Fabricate rectangular ducts in lengths appropriate to reinforcement and rigidity class required for pressure classification

2. Provide materials that are free from visual imperfections such as pitting, seam marks, roller marks, stains and discolorations.

B. Static Pressure Classifications: Unless otherwise noted, construct all ductwork in this contract to 4 inch water gage static pressure class, for both supply, exhaust and return ductwork.

C. Longitudinal joints shall be Pittsburgh Lock L-1.

D. Transverse joints shall be T-12 Standing S as a minimum, or shall be made using Ductmate, WDCI and Ductlock slide-on connector systems. For ductwork rated at 3" w.g. and above, the transverse joints shall be made with the Ductmate, Ward, or Nexus ductwork connection system. Formed-on connector systems and slip and drive joints (SMACNA Type T-1 through T-14, excluding T-12) shall not be permitted.

E. Fabricate duct fittings to match adjoining ducts and to comply with duct requirements as applicable to fittings. Except as otherwise indicated, fabricate elbows with centerline radius equal to 1.5 times associated duct width. Limit angular tapers to 30 degrees for contracting tapers, and 20 degrees for expanding tapers.

F. Fabricate ductwork with accessories installed during fabrication to the greatest extend possible. Refer to Division 23 section "Ductwork Accessories" for accessory requirements.

G. Fabricate plenums of galvanized sheet steel complying with ASTM A527, with G90 zinc coating in accordance with ASTM A525. Gages, construction, reinforcing and bracing shall comply with Section VI of SMACNA "HVAC Duct Construction Standards, Metal and Flexible".

H. Provide structural steel channels for support of plenums; provide structural angles and hanger rods.

2.7 RECTANGULAR DUCT FITTINGS

A. Fabricate elbows, transitions, offsets, branch connections and other duct construction in accordance with SMACNA "HVAC Metal Duct Construction Standard," 1985 Edition, Figures 2-1 through 2-10.

B. All branch takesoffs shall be made with 45 degree entry fittings; splitter dampers and extractors shall not be permitted.

2.8 ROUND DUCT FABRICATION

A. Round Ducts: Fabricate round supply ducts with spiral lockseam construction. Comply with SMACNA "HVAC Duct Construction Standards," Table 3 2 for galvanized steel gages.

1. Duct thickness shall be a minimum of 26 gauge.

B. Round Ducts: Fabricate round supply ducts using seam types identified in SMACNA "HVAC Duct Construction Standards," 1985 Edition, Figure 3-1, RL-Standards, " Table 3-2 for galvanized steel gages.

1. Drawband and crimp type transverse joints (RT-3 and RT-5 respectively) shall not be permitted.

2. Pleated, adjustable, and mitered elbows shall not be permitted, and segmented elbows shall be constructed with five segments, minimum.

2.9 ROUND SUPPLY AND RETURN FITTINGS FABRICATION

A. Conical Tees: Fabricate to conform to SMACNA "HVAC Duct Construction Standards", 1985 Edition, Figures 3-4 and 3-5 and with metal thicknesses specified for longitudinal seam straight duct.

B. Elbows: Fabricate in die-formed, gored or pleated construction. Fabricate the bend radius of die-formed, gored and pleated elbows 1.5 times the elbow diameter. Unless elbow construction type is indicated, provide elbows meeting the following requirements:

1. Round Elbows - 8 inches and Smaller: Die-formed elbows for 45- and 90- degree elbows and pleated elbows for 30, 45, 60, and 90 degrees only.

2. Round Elbows - 9 inches through 14 inches: Gored or pleated elbows for 30, 45, 60, and 90 degrees.

3. Round Elbows - Larger Than 14 Inches: Gored elbows

4. Die-Formed Elbows for Sizes Through 8 inches: 20 gage with 2-piece welded construction.

5. Round Gored Elbows Gages: Same as for non-elbow fittings specified above

6. Pleated Elbows Sizes Through 14 inches: 26 gage

C. High Efficiency Round Taps to Rectangular Duct Mains:

1. High-Efficiency Takeoff shall be utilized with a rectangular opening and an approximate 45° slope on the body. A flange shall be turned out on all four sides with each corner being filled. The flange shall also have pre-punched holes for easy installation. There shall be a closed cell neoprene gasket (3/4” X 1/4”) applied to the flange to assure a tight seal. High-Efficiency Takeoffs shall be fabricated from 24 gauge galvanized steel.

PART 3 EXECUTION

3.1 INSTALLATION

A. Install in accordance with manufacturer's instructions.

B. Duct sizes indicated are inside clear dimensions.

C. Install and seal metal and flexible ducts in accordance with SMACNA (DCS) - HVAC Duct Construction Standards - Metal and Flexible.

D. Locate ducts with sufficient space around equipment to allow normal operating and maintenance activities.

E. Use crimp joints with or without bead for joining round duct sizes 8 inch and smaller with crimp in direction of air flow.

F. Use double nuts and lock washers on threaded rod supports.

G. Connect flexible ducts to metal ducts with adhesive.

H. During construction provide temporary closures of metal or taped polyethylene on open ductwork to prevent construction dust from entering ductwork system.

I. At exterior wall louvers, seal duct to louver frame and install blank-out panels.

3.2 CLEANING

A. Clean newly installed duct systems with high power vacuum machines. Protect equipment which may be harmed by excessive dirt with filters, or bypass during cleaning. Provide adequate access into ductwork for cleaning purposes.

3.3 SCHEDULES

A. Ductwork Material:

1. Supply/Return/Relief (interior): Galvanized Steel.

2. Exhaust/Return (Exterior): 1-3/4" thick with R-12 Non-Fibrous, Closed Cell, Outdoor Rectangular Ductwork and Fittings.

3. Outdoor (Exterior): 1-3/4" thick with R-12 Non-Fibrous, Closed Cell, Outdoor Rectangular Ductwork and Fittings.

4. General Exhaust: Galvanized Steel.

5. Air Transfer Ductwork: Galvanized Steel.

6. Kitchen Hood Exhaust: Welded stainless Steel (concealed or exposed ductwork).

7. Outside Air Intake: Welded aluminum.

B. Ductwork Pressure Class:

1. Supply Ductwork: 4 inches

2. Return/Relief Ductwork: 4 inches

3. Transfer Air Ductwork: 1 inch

4. Outside air Ductwork: 4 inches

5. Exhaust air Ductwork: 2 inches

C. Ductwork Leakage Class:

1. Rectangular ductwork: Class 6

2. Round/Oval ductwork: Class 3

3. Air Leakage Testing: All ductwork systems shall be leak tested to the ductwork leakage classes specified. For supply air systems, measured leakage shall not exceed 3% of the total supply fan air volume. For exhaust and return air systems, measured leakage shall not exceed 5% of the total exhaust/return air volume per exhaust/return air fan system. Results of leakage testing shall be submitted to engineer for review.

D. Ducts Connected to Commercial Kitchen Hoods: Comply with NFPA 96.

1. Exposed to View: Type 304, stainless-steel sheet, No. 3 finish, 16 gauge minimum.

2. Concealed: Type 304, stainless-steel sheet, No. 3 finish, 16 gauge minimum, or carbon-steel sheet, 16 gauge minimum.

3. Welded seams and joints.

4. Pressure Class: Positive or negative 10-inch wg, 16 gauge minimum.

5. Minimum SMACNA Seal Class: Welded seams, joints, and penetrations.

6. SMACNA Leakage Class: 6.

3.4 ADDITIONAL INSTALLATION REQUIREMENTS FOR COMMERCIAL KITCHEN HOOD EXHAUST DUCTS

A. Install commercial kitchen hood exhaust ducts without dips and traps that may hold grease, and sloped a minimum of 2 percent to drain grease back to the hood.

B. Install fire-rated access panel assemblies at each change in direction and at maximum intervals of 20 feet in horizontal ducts, and at every floor for vertical ducts, or as indicated on Drawings. Locate access panel on top or sides of duct a minimum of 1-1/2 inches from bottom of duct.

C. Do not penetrate fire-rated assemblies except as allowed by applicable building codes and authorities having jurisdiction.

D. Prior to the use or concealment of any portion of a grease duct system, a leakage test shall be performed in the presence of the code enforcement official. Ducts shall be considered to be concealed where installed in shafts or covered by coatings or wraps that prevent the ductwork from being visually inspected on all sides. The permit holder shall be responsible to provide the necessary equipment and perform the grease duct leakage test. A light test or an approved equivalent test method shall be performed to determine that all welded and brazed joints are liquid tight. A light test shall be performed by passing a lamp having a power rating of not less than 100 watts through the entire section of duct work to be tested. The lamp shall be open so as to emit light equally in all directions perpendicular to the duct walls.

1. A test shall be performed for the entire duct system, including the hood-to-duct connection. The ductwork shall be permitted to be tested in sections, provided that every joint is tested.

END OF SECTION

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SECTION 233300 - AIR DUCT ACCESSORIES

PART 1 GENERAL

1.1 SECTION INCLUDES

A. Air turning devices.

B. Backdraft dampers - metal.

C. Combination fire and smoke dampers.

D. Duct access doors.

E. Duct test holes.

F. Fire dampers.

G. Flexible duct connectors.

H. Thermally broken low leakage motorized dampers.

I. Volume control dampers.

J. Low leakage (Class 1A) control dampers.

1.2 REFERENCE STANDARDS

A. NFPA 90A - Standard for the Installation of Air-Conditioning and Ventilating Systems; 2015.

B. NFPA 92 - Standard for Smoke Control Systems; 2015.

C. NFPA 96 - Standard for Ventilation Control and Fire Protection of Commercial Cooking Operations; 2014.

D. SMACNA (DCS) - HVAC Duct Construction Standards Metal and Flexible; 2005.

E. UL 555 - Standard for Fire Dampers; Current Edition, Including All Revisions.

F. UL 555S - Standard for Smoke Dampers; Current Edition, Including All Revisions.

G. UL 1978 - Grease Ducts; Current Edition, Including All Revisions.

1.3 SUBMITTALS

A. Product Data: Provide for shop fabricated assemblies including volume control dampers, duct access doors, duct test holes, and hardware used. Include electrical characteristics and connection requirements.

B. Shop Drawings: Indicate for shop fabricated assemblies including volume control dampers.

1.4 QUALITY ASSURANCE

A. Manufacturer Qualifications: Company specializing in manufacturing the type of products specified in this section, with minimum three years of documented experience.

B. Products Requiring Electrical Connection: Listed and classified by Underwriters Laboratories Inc. as suitable for the purpose specified and indicated.

PART 2 PRODUCTS

2.1 AIR TURNING DEVICES

A. Turning Vanes

1. Provide single width airfoil type fabricated turning vanes and vane runners constructed in accordance with SMACNA "HVAC Duct Construction Standards".

B. Multi-blade device with blades aligned in short dimension; steel construction; with individually adjustable blades, mounting straps.

2.2 BACKDRAFT DAMPERS - METAL

A. Multi-Blade, Parallel Action Gravity Balanced Backdraft Dampers: Extruded aluminum, with center pivoted blades of maximum 6 inch width, with felt or flexible vinyl sealed edges, linked together in rattle-free manner with 90 degree stop, steel ball bearings, and plated steel pivot pin; adjustment device to permit setting for varying differential static pressure.

2.3 COMBINATION FIRE AND SMOKE DAMPERS

A. Fabricate in accordance with NFPA 90A, UL 555, UL 555S, and as indicated.

B. Provide factory sleeve and collar for each damper.

C. Multiple Blade Dampers: Fabricate with 16 gauge, 0.0598 inch galvanized steel frame and blades, oil-impregnated bronze or stainless steel sleeve bearings and plated steel axles, stainless steel jamb seals, 1/8 by 1/2 inch plated steel concealed linkage, stainless steel closure spring, blade stops, and lock, and 1/2 inch actuator shaft.

D. Operators: UL listed and labelled spring return electric type suitable for 120 volts, single phase, 60 Hz. Provide end switches to indicate damper position. Locate damper operator on interior of duct and link to damper operating shaft.

E. Combination fire and smoke dampers shall be provided with Belimo Aircontrols FSAF (133 in-#) actuators or equal. Actuator timing shall meet local codes - 15 seconds.

1. Actuator shall carry a manufacturer's 5-year warranty and be manufactured under ISO 9001 quality control.

2. Actuator shall have microcontroller based motor controller providing:

    a. Electronic cut off at full open so that no noise can be generated while holding open. Holding noise level shall be inaudible.

    b. Overload protection. Shall be incapable of burning out if stalled before reaching full rotation.

3. Housing shall be steel and gears shall be permanently lubricated.

4. The actuators shall be direct coupled and employ a steel-toothed cold-weld clamp for connecting to damper shafts. Aluminum clamps or set-screw attachment shall not be acceptable.

5. Actuator shall have UL555S Listing by the damper manufacturer for 250°F.

6. Dampers shall be installed straight and true, level in all planes, and square in all dimensions. Dampers shall move freely without undue stress due to twisting, racking, bowing, or other installation error. Do not install in area where moisture can penetrate damper or actuator nor where actuator temperature continuously exceeds 120°F.

F. Provide each combination fire/smoke damper with a position indicator package, which operates as a function of the damper blade position. The position indicator shall allow remote indication of damper blade position with two single pole, double throw switches and provides a positive open or closed signal.

G. Normally Open Smoke Responsive Fire Dampers: Curtain type, closing upon actuation of electro thermal link, flexible stainless steel blade edge seals to provide constant sealing pressure, stainless steel springs with locking devices to ensure positive closure for units mounted horizontally.

H. Electro Thermal Link: Fusible link melting at 165 degrees F; 120 volts, single phase, 60 Hz; UL listed and labeled.

2.4 DUCT ACCESS DOORS

A. Fabrication: Rigid and close-fitting of galvanized steel with sealing gaskets and quick fastening locking devices. For insulated ducts, install minimum 1 inch thick insulation with sheet metal cover.

1. Less Than 12 inches Square: Secure with sash locks.

2. Up to 18 inches Square: Provide two hinges and two sash locks.

3. Up to 24 by 48 inches: Three hinges and two compression latches with outside and inside handles.

4. Larger Sizes: Provide an additional hinge.

B. Access doors with sheet metal screw fasteners are not acceptable.

2.5 DUCT TEST HOLES

A. Temporary Test Holes: Cut or drill in ducts as required. Cap with neat patches, neoprene plugs, threaded plugs, or threaded or twist-on metal caps.

B. Permanent Test Holes: Factory fabricated, air tight flanged fittings with screw cap. Provide extended neck fittings to clear insulation.

2.6 DYNAMIC FIRE DAMPERS

A. Dynamic Fire Dampers - Fabrication:

1. Fire Rating: UL 555 classified and labeled as a 1-1/2 hour fire damper.

2. Air Flow Rating: UL approved for dual directional air flow.

3. Frame: 5 inches x minimum 16 gage (127 x minimum 1.6 mm) roll formed, galvanized steel hat-shaped channel, reinforced at corners. Structurally equivalent to 13 gage (2.3 mm) U-channel.

4. Blades:

a. Style: Airfoil-shaped, single-piece.

b. Action: Opposed, spring closure upon fusible link release.

1) Orientation: Horizontal.

c. Material: Minimum 14 gage (2.0 mm) equivalent thickness, galvanized steel.

d. Width: Maximum 6 inches (152 mm).

5. Bearings: Self-lubricating stainless steel sleeve, turning in extruded hole in frame.

6. Blade Seals: Galvanized steel for flame seal to 1,900 degrees F (1,038 degrees C). Mechanically attached to blade edge.

7. Linkage: Concealed in frame.

8. Axles: Minimum 1/2 inch (13 mm) diameter plated steel, hex-shaped, mechanically attached to blade.

9. Mounting: Vertical or Horizontal.

10. Temperature Release Device:

a. Fusible link, 165 degrees F (74 degrees C).

b. ETL, 24 VAC/VDC, 165 degrees F (74 degrees C).

11. Finish: Mill galvanized.

12. Assembly: Factory assemble damper and accessories and furnish as a single unit conforming to UL 555.

B. Performance Data:

1. Temperature Qualified: Damper qualified in accordance with UL 555 as a 1-1/2 hour fire damper.

2. Capacity: Demonstrate capacity of damper to close in HVAC system operating conditions.

a. Maximum Pressure: 4 inches w.g. (1 kPa).

b. Maximum Air Velocity: 4,000 feet per minute (1,219 m/min).

3. Pressure Drop: Maximum 0.07 inches w.g. (0.02 kPa) at 2,000 feet per minute (610 m/min) through 24 x 24 inch (610 x 610 mm) damper.

C. Accessories:

1. Jamb Seals: Stainless steel, flexible metal compression type.

2. Picture Frame Mounting Angles:

a. One-piece, roll formed retaining angles 1-1/2 x 1-1/2 inches (38 x 38 mm)

b. Factory matched and shipped on individual damper.

c. Factory prepunched screw holes.

d. Requires factory sleeve.

e. Factory Sleeve: Minimum 20 gage (1.0 mm) thickness, minimum 12 inches (305 mm) length.

f. Steel Mullions: For dampers in oversized masonry wall openings.

g. Breakaway Connection: Ductmate.

2.7 STATIC FIRE DAMPERS

A. Fabrication:

1. Fire Rating: UL 555 classified and labeled as a 1-1/2 hour static fire damper.

2. Air Flow Rating: UL approved for dual directional air flow.

3. Frame: Maximum 2-1/8 inches (54 mm) with no flanges x minimum 20 gage (0.9 mm) roll formed, galvanized steel.

4. Blades:

a. Style: Curtain type, in airstream.

b. Action: Spring or gravity closure upon fusible link release.

c. Orientation: Horizontal.

d. Material: Minimum 24 gage (0.6 mm) roll formed, galvanized steel.

5. Closure Springs: Type 301 stainless steel, constant force type, if required.

6. Temperature Release Device:

a. Fusible link, 165 degrees F (74 degrees C).

b. ETL, 24 VAC/VDC, 165 degrees F (74 degrees C).

B. Mounting: Vertical.

C. Finish: Mill galvanized.

D. Assembly: Factory assemble damper and accessories and furnish as a single unit conforming to UL 555.

E. Performance Data:

1. Temperature Qualified: Damper qualified in accordance with UL 555 as a 1-1/2 hour fire damper.

2. Pressure Drop: Maximum 0.08 inch w.g. (0.02 kPa) at 1,000 feet per minute (305 m/min) through 40 x 48 inch (1,016 x 1,219 mm) damper.

F. ACCESSORIES

1. Picture Frame Mounting Angles:

a. One-piece, roll formed retaining angles 1-1/2 x 1-1/2 inches (38 x 38 mm).

b. Factory matched and shipped on individual damper.

c. Factory prepunched screw holes.

d. Requires factory sleeve.

2. Factory Sleeve: Minimum 20 gage (1.0 mm) thickness.

3. Steel Mullions: For dampers in oversized masonry wall openings.

2.8 FLEXIBLE DUCT CONNECTORS

A. Fabricate in accordance with SMACNA (DCS) and as indicated.

B. Flexible Duct Connections: Fabric crimped into metal edging strip.

1. Fabric: UL listed fire-retardant neoprene coated woven glass fiber fabric to NFPA 90A, minimum density 30 oz/sq yd.

a. Net Fabric Width: Approximately 2 inches wide.

2. Metal: 3 inches wide, 24 gauge, 0.0239 inch thick galvanized steel.

2.9 LOW LEAK THERMALLY-BROKEN MOTORIZED DAMPERS

A. General: Provide thermally-broken motorized dampers with insulated blades for all outside air intake dampers as well as exhaust dampers and return air dampers,. Basis of design: Tamco Series 9000.

B. Construction:

1. Frame: Extruded aluminum (6063T5), with thickness of 0.80 inches, 4 inches deep, insulated with styrofoam on four sides. Entire frame shall be thermally broken by means of polyurethane resin pockets complete with thermal cuts

2. Blades: Blades shall be extruded aluminum (6063T5, internally insulated with expanded polyurethane foam and thermally broken. Complete blade shall have an insulating factor of R-2.29 and a temperature index of 55.

3. Seals: Blade and frame seals shall be extruded silicone and secured in an integral slot within the aluminum extrusions.

4. Bearings: Bearings shall be composed of a celcon inner bearing fixed to a 7 /16 inch aluminum hexagon blade pin rotating within a polycarbonate outer bearing inserted in the frame, resulting in no metal-to-metal or metal-to-plastic contact.

5. Normal Position: Closed.

6. Blade Operation: Parallel.

7. Performance: Tested in accordance with AMCA Test Standard 500 D: Leakage: 4.12 CFM/square foot with 4 inches differential pressure, as tested through 48x48 louver.

2.10 VOLUME CONTROL DAMPERS

A. Fabricate in accordance with SMACNA (DCS) and as indicated.

B. Single Blade Dampers:

1. Fabricate for duct sizes up to 6 by 30 inch.

2. Blade: 24 gauge, 0.0239 inch, minimum.

C. Multi-Blade Damper: Fabricate of opposed blade pattern with maximum blade sizes 8 by 72 inch. Assemble center and edge crimped blades in prime coated or galvanized channel frame with suitable hardware.

1. Blade: 18 gauge, 0.0478 inch, minimum.

D. End Bearings: Except in round ducts 12 inches and smaller, provide end bearings. On multiple blade dampers, provide oil-impregnated nylon or sintered bronze bearings.

E. Quadrants:

1. Provide locking, indicating quadrant regulators on single and multi-blade dampers.

2. On insulated ducts mount quadrant regulators on stand-off mounting brackets, bases, or adapters.

3. Where rod lengths exceed 30 inches provide regulator at both ends.

PART 3 EXECUTION

3.1 PREPARATION

A. Verify that electric power is available and of the correct characteristics.

3.2 INSTALLATION

A. Install accessories in accordance with manufacturer's instructions, NFPA 90A, and follow SMACNA (DCS). See Section 233100 for duct construction and pressure class.

B. Provide backdraft dampers on exhaust fans or exhaust ducts nearest to outside and where indicated.

C. Provide duct access doors for inspection and cleaning before and after filters, coils, fans, automatic dampers, at fire dampers, smoke dampers, combination fire and smoke dampers, and elsewhere as indicated. Provide for cleaning kitchen exhaust ducts in accordance with NFPA 96. Provide minimum 8 x 8 inch size for hand access, 16" x 16" size for shoulder access, and as indicated. Provide 4 x 4 inch for balancing dampers only. Review locations prior to fabrication.

D. Provide duct test holes where indicated and required for testing and balancing purposes.

E. Provide fire dampers, combination fire and smoke dampers, and smoke dampers at locations indicated, where ducts and outlets pass through fire rated components, and where required by Authorities Having Jurisdiction. Install with required perimeter mounting angles, sleeves, breakaway duct connections, corrosion resistant springs, bearings, bushings and hinges.

F. Install combination smoke and fire dampers in accordance with NFPA 92.

G. Demonstrate re-setting of fire dampers to Nanuet Union Free School District's representative.

H. At rooftop air handling units, blower coils, air handling units, fans and motorized equipment associated with ducts that DON'T include internal fan vibration isolation devices, provide flexible duct connections immediately adjacent to the equipment.

I. Fire Dampers:

1. Provide dynamic fire dampers at locations where dampers are installed in duct systems connected to fans systems. Provide static fire dampers at locations where fire dampers are installed in air transfer duct systems not connected to fans.

2. Install dampers at locations indicated on the drawings and in accordance with manufacturer's UL approved installation instructions.

3. Install dampers square and free from racking with blades running horizontally.

4. Do not compress or stretch damper frame into duct or opening.

5. Handle damper using sleeve or frame. Do not lift damper using blades or jackshaft.

6. Install bracing for multiple section assemblies to support assembly weight and to hold against system pressure. Install bracing as needed.

J. Combination Fire/Smoke Dampers:

1. Install dampers at locations indicated on the drawings and in accordance with manufacturer's UL approved installation instructions.

2. Install dampers square and free from racking with blades running horizontally.

3. Do not compress or stretch damper frame into duct or opening.

4. Handle damper using sleeve or frame. Do not lift damper using blades, actuator, or jackshaft.

5. Install bracing for multiple section assemblies to support assembly weight and to hold against system pressure. Install bracing as needed.

K. At equipment supported by vibration isolators, provide flexible duct connections immediately adjacent to the equipment.

L. Provide balancing dampers at points on supply, return, and exhaust systems where branches are taken from larger ducts as required for air balancing. Install minimum 2 duct widths from duct take-off.

M. Volume Control Balancing Dampers: Provide multi-blade opposed blade dampers for ductwork 12" high and larger and single blade dampers for ductwork sizes 10" and smaller.

N. Provide balancing dampers on duct take-off to active terminal units, diffusers, grilles, and registers, regardless of whether dampers are specified as part of the diffuser, grille, or register assembly.

END OF SECTION

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SECTION 233423 - HVAC POWER VENTILATORS

PART 1 GENERAL

1.1 SECTION INCLUDES

A. Roof mounted downblast exhausters.

B. Kitchen hood upblast roof exhausters.

1.2 REFERENCE STANDARDS

A. AMCA 99 - Standards Handbook; 2010.

B. AMCA 204 - Balance Quality and Vibration Levels for Fans; 2005.

C. AMCA 210 - Laboratory Methods of Testing Fans for Certified Aerodynamic Performance Rating; 2007.

D. AMCA 300 - Reverberant Room Method for Sound Testing of Fans; 2014.

E. AMCA 301 - Methods for Calculating Fan Sound Ratings from Laboratory Test Data; 2014.

F. NEMA 250 - Enclosures for Electrical Equipment (1000 Volts Maximum); 2014.

G. NFPA 96 - Standard for Ventilation Control and Fire Protection of Commercial Cooking Operations; 2014.

H. UL 705 - Power Ventilators; Current Edition, Including All Revisions.

I. UL 762 - Outline of Investigation for Power Roof Ventilators for Restaurant Exhaust Appliances; Current Edition, Including All Revisions.

1.3 SUBMITTALS

A. Product Data: Provide data on fans and accessories, including fan curves with specified operating point plotted, power, rpm, sound power levels at rated capacity, and electrical characteristics and connection requirements.

B. Manufacturer's Instructions: Indicate installation instructions.

C. Maintenance Data: Include instructions for lubrication, motor and drive replacement, spare parts list, and wiring diagrams.

D. Coordination Drawings: 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: Roof framing and support members relative to duct penetrations.

E. Maintenance Materials: Furnish the following for Nanuet Union Free School District's use in maintenance of project.

1. Extra Fan Belts: One set for each individual belt driven fan.

1.4 QUALITY ASSURANCE

A. Manufacturer Qualifications: Company specializing in manufacturing the type of products specified in this section, with minimum three years of documented experience.

1.5 FIELD CONDITIONS

A. Permanent ventilators may be used for ventilation during construction only after ductwork is clean, filters are in place, bearings have been lubricated, and fan has been test run under observation.

B. Provide one set of variable and adjustable pitch sheaves for each belt-driven centrifugal fan selected for midpoint operation at specified performance. Furnish one set of fixed sheaves and matched belts for each belt-driven centrifugal fan, selected following completion of balancing to deliver specified unit airflow. Turn fixed sheaves and matched belts over to balancer upon completion of balancing of variable and adjustable pitched sheaves.

PART 2 PRODUCTS

2.1 POWER VENTILATORS - GENERAL

A. Static and Dynamically Balanced: Comply with AMCA 204.

B. Performance Ratings: Comply with AMCA 210, bearing certified rating seal.

C. Sound Ratings: Comply with AMCA 301, tested to AMCA 300, bearing certified sound ratings seal.

D. Fabrication: Comply with AMCA 99.

E. UL Compliance: UL 705, listed, labeled, designed, manufactured, and tested.

F. Electrical Components: Listed and classified by Underwriters Laboratories Inc. as suitable for the purpose specified and indicated.

G. Enclosed Safety Switches: Comply with NEMA 250.

2.2 KITCHEN HOOD UPBLAST ROOF EXHAUSTERS

A. Acceptable Manufacturers:

1. Loren Cook.

2. Twin City.

3. Greenheck.

B. Description: Fan shall be a spun aluminum, roof mounted, direct driven, upblast extended pressure centrifugal exhaust ventilator.

C. Certifications: Fan shall be manufactured at an ISO 9001 certified facility. Fan shall be listed by Underwriters Laboratories (UL 762) and UL listed for Canada (Power Ventilator for Restaurant Exhaust Appliances). Fan shall bear the AMCA certified ratings seal for sound and air performance.

D. Construction: The fan shall be of bolted and welded construction utilizing corrosion resistant fasteners. The spun aluminum structural components shall be constructed of minimum 16 gauge marine alloy aluminum, bolted to a rigid aluminum support structure. The aluminum base shall have a one piece inlet spinning and continuously welded curb cap corners for maximum leak protection. The windband shall have a rolled bead for added strength. A two piece top cap shall have stainless steel quick release latches to provide access into the motor compartment without the use of tools. An external wiring compartment with integral conduit chase shall be provided into the motor compartment to facilitate wiring connections. The motor shall be enclosed in a weather-tight compartment, separated from the exhaust airstream. Unit shall bear an engraved aluminum nameplate. Nameplate shall indicate design CFM and static pressure. Unit shall be shipped in ISTA certified transit tested packaging.

E. Wheel: Wheel shall be centrifugal backward inclined, constructed of 100 percent aluminum, including a precision machined cast aluminum hub. Wheel inlet shall overlap an aerodynamic aluminum inlet cone to provide maximum performance and efficiency. Wheel shall be balanced in accordance withA MCA Standard 204-05, Balance Quality and Vibration Levels for Fans.

F. Motor: Motor shall be NEMA design B with a minimum of class B insulation rated for continuous duty and furnished at the specified voltage, phase and enclosure.

G. Options/Accessories:

1. Birdscreen:

    a. Provide aluminum construction.

    b. Protects fan discharge.

2. Clean Out Port: Removable grease repellent compression rubber plug allows access for cleaning wheel through windband.

3. Roof Curb Extension: Vented curb extension where required for compliance with minimum clearances required by NFPA 96.

4. Drain Connection:

    a. Aluminum construction.

    b. Allows single-point drainage of grease, water, or other residues.

5. Finishes: Factory primed.

6. Grease Trap:
    a. Aluminum.
    b. Includes drain connection.
    c. Collects grease residue.
7. Hinge Kit:
    a. Aluminum hinges.
    b. Hinges and restraint cables mounted to base (sleeve).
    c. Allows fan to tilt away for access to wheel and ductwork for inspection and cleaning.
8. Heat Baffle: Prevents heat from radiating into motor compartment.
9. Tie-down Points: Four brackets located on windband secures fan in heavy wind applications.

2.3 ROOF MOUNTED DOWNBLAST EXHAUSTERS

A. Acceptable Manufacturers:
    1. Loren Cook.
    2. Twin City.
    3. Greenheck.

B. Fan Unit: Direct drive, with spun aluminum housing and aluminum rub ring; resilient mounted motor; 1/2 inch mesh, 0.62 inch thick aluminum wire birdscreen; square base to suit roof curb with continuous curb gaskets.

C. Roof Curb: 16 inch high self-flashing of galvanized steel with continuously welded seams, built-in cant strips, insulation and curb bottom, and factory installed nailer strip.

D. Disconnect Switch: Factory wired, non-fusible, in housing for thermal overload protected motor.

E. Backdraft Damper: Motor actuated, aluminum multiple blade construction, felt edged with offset hinge pin, nylon bearings, blades linked.

F. Sheaves (for belt drive fans only): Cast iron or steel, dynamically balanced, bored to fit shafts and keyed; variable and adjustable pitch motor sheave selected so required rpm is obtained with sheaves set at mid-position; fan shaft with self-aligning pre-lubricated ball bearings.

G. Motor (for three phase fans only): Heavy duty type with permanently lubricated sealed ball bearings and furnished at the scheduled voltage and phase.

1. Provide premium efficiency motor, suitable for inverter duty.

H. Motor (FOR single phase DIRECT DRIVE FANS): Motor shall be an electronically commutated motor rated for continuous duty and furnished either with leads for connection to 0-10 VDC external controller.

1. Provide with Air Balance Kit:

a. Provides a point to set the speed range over which the motor will operate

b. Shall contains an integral 24V control transformer

c. Shall incorporate a speed control to facilitate field air balancing as well as a Hand-Stop-Auto control that allows selection of operating modes from 'stopped,' to manual, to fully automatic control

d. Shall provide convenient terminals for landing motors and controls as well as auxiliary control of motor operated dampers

e. Shall Provide a means for remote on/off control

f. Status indicated by a tricolor LED light

I. Standard Roof curbs: 16 or 18 inch high self-flashing of galvanized steel with continuously welded seams, built-in cant strips, insulation and curb bottom, and factory installed nailer strip.

J. Acoustical roof curbs: Acoustical Curbs shall be provided to reduce fan generated sound from traveling down ductwork without adversely affecting fan performance. Air shall pass between the streamlined baffles allowing fan sound to be absorbed and dissipated within the curb area preventing it from entering the building. Each perforated aluminum baffle section shall be filled with fiberglass wool. Spring steel wire holding clips shall secure the aluminum baffle. Assembly shall be a rigid, durable section which shall not warp or twist out of shape. Permanently constructed baffles shall be removable for access to dampers or for cleaning. No tools shall be required. Standard construction features for sound curbs shall be 18 gauge steel and one inch (25 mm) insulation. Sound curbs shall mount directly to the roof deck structure. Roofing material shall be sealed to the top of the lap-jointed wooden nailer for weather tightness.

K. Curb Adapters (where called out on drawings and/or schedules):

1. Roof Curb Adapter and Extension:

a. Used to connect a new roof fan to an existing roof curb

b. Roof Products and Systems (RPS) model CA-2 or equal

c. Construction:

1) 18 gauge galvanized steel

2) 1-1/2", 3 LB. density fiberglass insulation

3) Unitized construction

4) Continuous welded corner seams

5) 16 inch height

d. Field measure existing roof curb dimensions as required to provide curb adapter size to match replacement fan inlet dimensions.

PART 3 EXECUTION

3.1 INSTALLATION

A. Install in accordance with manufacturer's instructions.

B. Secure roof exhausters with cadmium plated steel lag screws to roof curb.

C. Extend ducts to roof exhausters into roof curb. Counterflash duct to roof opening.

END OF SECTION

SECTION 233700 - AIR OUTLETS AND INLETS

PART 1 GENERAL

1.1 SECTION INCLUDES

A. Diffusers.

B. Registers/grilles.

1.2 REFERENCE STANDARDS

A. ASHRAE Std 70 - Method of Testing the Performance of Air Outlets and Inlets; 2006 (R2011).

B. SMACNA (ASMM) - Architectural Sheet Metal Manual; 2012.

C. SMACNA (DCS) - HVAC Duct Construction Standards Metal and Flexible; 2005.

1.3 SUBMITTALS

A. Product Data: Provide data for equipment required for this project. Review outlets and inlets as to size, finish, and type of mounting prior to submission. Submit schedule of outlets and inlets showing type, size, location, application, and noise level.

B. Project Record Documents: Record actual locations of air outlets and inlets.

1.4 QUALITY ASSURANCE

A. Test and rate air outlet and inlet performance in accordance with ASHRAE Std 70.

B. Manufacturer Qualifications: Company specializing in manufacturing the type of products specified in this section, with minimum three years of documented experience.

PART 2 PRODUCTS

2.1 RETURN REGISTERS

A. Approved Manufacturers:

1. Price 530 (basis of design)

2. Titus

3. Nailor

B. Furnish and install steel return registers of the sizes and mounting types indicated on the plans and outlet schedule. Registers shall be 45 degree deflection fixed louver type with blades spaced 3/4 in. on center. The blades shall run parallel to the long dimension of the register. The register shall be finished in B12 White Powder Coat. Paint finish shall pass

500 hours of salt spray exposure with no measurable creep in accordance with ASTM D1654 and 1000 hours with no rusting or blistering as per ASTM D610 and ASTM D714.

2.2 SPIRAL DUCT RETURN GRILLE, EXTRUDED ALUMINUM

A. Approved Manufacturers:

1. Price SDGER (basis of design)

2. Titus

3. Nailor

B. Furnish and install return grilles of sizes and mounting types indicated on the plans and outlet schedule. Perforated face shall be securely attached to aluminum grille frame. The grille shall be finished in clear anodized for field painting.

2.3 TRANSFER REGISTERS

A. Approved Manufacturers:

1. Price 630 (basis of design)

2. Titus

3. Nailor

B. Furnish and install aluminum transfer registers of the sizes and mounting types indicated on the plans and outlet schedule. Registers shall be 45 degree deflection fixed louver type with blades spaced 3/4 in. on center. The blades shall run parallel to the long dimension of the register. The register shall be finished in B12 White Powder Coat. Paint finish shall pass 500 hours of salt spray exposure with no measurable creep in accordance with ASTM D1654 and 1000 hours with no rusting or blistering as per ASTM D610 and ASTM D714.

2.4 EXHAUST REGISTERS

A. Approved Manufacturers:

1. Price 630 (basis of design)

2. Titus

3. Nailor

B. Furnish and install aluminum exhaust registers of the sizes and mounting types indicated on the plans and outlet schedule. Registers shall be 45 degree deflection fixed louver type with blades spaced 3/4 in. on center. The blades shall run parallel to the long dimension of the register. The register shall be finished in B12 White Powder Coat. Paint finish shall pass 500 hours of salt spray exposure with no measurable creep in accordance with ASTM D1654 and 1000 hours with no rusting or blistering as per ASTM D610 and ASTM D714.

2.5 SQUARE PLAQUE DIFFUSERS

A. Construction:

1. Diffusers shall be steel construction, and shall consist of a seamless, one-piece, precision formed backpan that incorporates a round inlet collar of sufficient length for connecting rigid or flexible duct.

2. An inner plaque assembly shall be incorporated and shall drop no more than ¼ inch below the ceiling plane to assure proper air distribution performance.

3. The inner plaque assembly shall be completely removable from the room side to allow for full access to any dampers or other ductwork components located near the diffuser neck.

4. The diffuser shall integrate with all duct sizes shown on the plans without affecting the face size and appearance of the unit.

5. The face panel shall have smooth edges and rounded corners to blend with the back cone.

6. The diffuser ceiling module size shall be:

   a. 24 x 24 inches (600 x 600 millimeters)

   b. 12 x 12 inches (300 x 300 millimeters)

B. Paint Specification:

1. Paint finish shall be:

   a. All components shall have a baked-on powder coat finish.

      1) The paint finish must demonstrate no degradation when tested in accordance with ASTM D1308 (covered and spot immersion) and ASTM D4752 (MEK double rub) paint durability tests.

      2) The paint film thickness shall be a minimum of 2.0 mils.

      3) The finish shall have a hardness of 2H.

      4) The finish shall withstand a minimum salt spray exposure of 500 hours with no measurable creep in accordance with ASTM D1654, and 1000 hours of exposure with no rusting or blistering as per ASTM D610 and ASTM D714.

      5) The finish shall have an impact resistance of 80 inch-pounds.

   b. All components shall have a custom finish in a color to match a customer supplied sample.

2.6 MODULAR CORE ADJUSTABLE DIRECTIONAL DIFFUSERS

A. Approved Manufacturers:

1. Price AMCD (basis of design)

2. Titus

3. Nailor

B. Furnish and install directional modular core louvered face diffusers of the sizes and mounting types shown on the plans and air distribution schedule. Diffusers shall consist of an outer frame assembly, which facilitates mounting in the application shown. A collar that allows connection to the square duct size indicated shall be an integral part of the frame assembly. The diffuser core shall consist of fixed louver directional modules that may be easily field adjusted from the diffuser face (without any type of tools or mechanical device) for 1, 2, 3, or 4 way discharge. Each module shall be easily removable to allow for access to any damper or other ductwork component in or near the diffuser neck. Finish shall be B12 white powder coat. Paint finish shall pass 500 hours of salt spray exposure with no measurable creep in accordance with ASTM D1654 and 1000 hours with no rusting or blistering as per ASTM D610 and ASTM D714.

2.7 SPIRAL DUCT GRILLE, EXTRUDED ALUMINUM

A. Approved Manufacturers:

1. Price SDGE (basis of design)

2. Titus

3. Nailor

B. Furnish and install supply registers of sizes and mounting types indicated on the plans and outlet schedule. Register shall be double deflection type with two sets of fully adjustable deflection blades spaced 3/4 in. on center. The front blades shall run parallel to the short dimension of the register, as indicated in the outlet schedule. The air-scoop shall be adjusted via the operator on the side frame. The register shall be finished in clear anodized for field painting.

2.8 LOUVERED FACE SUPPLY REGISTERS

A. Approved Manufacturers:

1. Price 510 (basis of design)

2. Titus

3. Nailor

B. Furnish and install steel supply registers of the sizes and mounting types indicated on the plans and outlet schedule. Registers shall be 45 degree deflection fixed louver type with blades spaced 3/4 in. on center. The blades shall run parallel to the (long / short)

dimension of the register. The register shall be finished in B12 White Powder Coat. Paint finish shall pass 500 hours of salt spray exposure with no measurable creep in accordance with ASTM D1654 and 1000 hours with no rusting or blistering as per ASTM D610 and ASTM D714.

PART 3 EXECUTION

3.1 INSTALLATION

A. Install in accordance with manufacturer's instructions.

B. Comply with SMACNA (ASMM) for flashing/counter-flashing of roof penetrations and supports for roof curbs and roof mounted equipment.

C. Check location of outlets and inlets and make necessary adjustments in position to comply with architectural features, symmetry, and lighting arrangement.

D. Install diffusers to ductwork with air tight connection.

E. Provide balancing dampers on duct take-off to diffusers, and grilles and registers, despite whether dampers are specified as part of the diffuser, or grille and register assembly.

END OF SECTION

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SECTION 235100 - BREECHINGS, CHIMNEYS, AND STACKS

PART 1 GENERAL

1.1 SECTION INCLUDES

A. Manufactured breechings.

B. Combustion air inlet for direct vent gas-fired appliances

C. Flue pipe for direct vent gas-fired appliances

1.2 REFERENCE STANDARDS

A. NFPA 54 - National Fuel Gas Code; 2015.

B. NFPA 70 - National Electrical Code; Most Recent Edition Adopted by Authority Having Jurisdiction, Including All Applicable Amendments and Supplements.

C. SMACNA (DCS) - HVAC Duct Construction Standards Metal and Flexible; 2005.

1.3 DEFINITIONS

A. Breeching: Vent connector.

B. Chimney: Primarily vertical shaft enclosing at least one vent for conducting flue gases outdoors.

C. Smoke Pipe: Round, single wall vent connector.

D. Vent: That portion of a venting system designed to convey flue gases directly outdoors from a vent connector or from an appliance when a vent connector is not used.

E. Vent Connector: That part of a venting system that conducts the flue gases from the flue collar of an appliance to a chimney or vent, and may include a draft control device.

1.4 SUBMITTALS

A. Product Data: Provide data indicating factory built chimneys, including dimensional details of components and flue caps, dimensions and weights, electrical characteristics and connection requirements.

B. Shop Drawings: Indicate general construction, dimensions, weights, support and layout of breechings. Submit layout drawings indicating plan view and elevations where factory built units are used.

C. Manufacturer's Instructions: Include installation instructions, and indicate assembly, support details, and connection requirements.

1.5 QUALITY ASSURANCE

A. Manufacturer Qualifications: Company specializing in manufacturing the type of products specified in this section, with minimum three years of documented experience.

B. Installer Qualifications: Company specializing in performing the type of work specified in this section with minimum 3 years documented experience, and approved by manufacturer.

PART 2 PRODUCTS

2.1 BREECHINGS, CHIMNEYS, AND STACKS - GENERAL

A. Regulatory Requirements:

1. Comply with applicable codes for installation of propane burning appliances and equipment.

2.2 COMBUSTION AIR INLET FOR DIRECT VENT GAS-FIRED APPLIANCES

A. PVC Pipe: ASTM D 2665 or ASTM D 3034.

1. Fittings: PVC.

2. Joints: Solvent welded, with ASTM D 2564 solvent cement.

B. Accessories:

1. Adjustable flashing.

2. Storm collar.

3. Screened inlet.

2.3 FLUE PIPE FOR DIRECT VENT GAS-FIRED APPLIANCES

A. Acceptable Manufacturers:

1. Selkirk Corporation: www.selkirkcommercial.com.

2. Metal-Fab, Inc: www.mtlfab.com.

3. AMPCO: www.ampcostacks.com.

B. Vent shall be factory-built special gas type, single wall, engineered and designed for use on Category IV appliances, or as specified by the equipment manufacturer.

C. Maximum continuous flue gas temperature shall not exceed 1400 degrees Fahrenheit.

D. Vent shall be constructed of AL29-4C® or 29-4 (S44735) superferritic stainless steel with a minimum thickness of .015” for diameters 3”-8” and .020” for diameters 10”-16”.

E. All conduit components shall be manufactured from AL29-4C®, or 29-4 (S44735). The joint closure system shall be a Ring-and-Tab mechanism that is integral to each joint. Joints shall not use screws or fasteners that penetrate the pipe.

F. Vent shall be constructed with a factory installed gasket used to seal the joint. Use of gasket lube, available from the factory, should be used for maximizing gasket life and ease of installation.

G. Joints shall be designed with a male and female overlapping metal-metal connection to maintain condensate on the AL29-4C stainless steel. Proper ¼" per foot pitch shall be maintained at all times and condensate shall flow back toward the appliance to the required number of drains

H. Vent shall be rated for an internal static pressure of 9" w.g.

I. All parts shall be compatible with other single wall and double wall products of the same manufacturer.

J. System shall be sized in accordance with the appliance manufacturer's specifications, NFPA 54-National Fuel Gas Code (ANSI Z223.1), ASHRAE recommendations and other applicable codes.

PART 3 EXECUTION

3.1 INSTALLATION

A. Install in accordance with manufacturer's instructions.

B. Install in accordance with NFPA 54

C. Install breechings with minimum of joints. Align accurately at connections, with internal surfaces smooth.

D. Support breechings from building structure, rigidly with suitable ties, braces, hangers and anchors to hold to shape and prevent buckling. Support vertical breechings, chimneys, and stacks at 12 foot spacing, to adjacent structural surfaces, and at floor and roof penetrations. Refer to SMACNA (DCS) for equivalent duct support configuration and size.

E. Clean breechings, chimneys, and stacks during installation, removing dust and debris.

END OF SECTION

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SECTION 235216 - CONDENSING BOILERS

PART 1 GENERAL

1.1 SECTION INCLUDES

A. Manufactured units.

B. Boiler construction.

C. Boiler trim.

D. Fuel burning system.

E. Factory installed controls.

1.2 REFERENCE STANDARDS

A. AHRI Directory of Certified Product Performance - Air-Conditioning, Heating, and Refrigeration Institute (AHRI); current edition at www.ahrinet.org.

B. ANSI Z21.13 - American National Standard for Gas-Fired Low-Pressure Steam and Hot Water Boilers; 2012.

C. HI BTS-2000 - Testing Standard, Method to Determine Heating Efficiency of Commercial Space Heating Boilers; 2007.

D. NFPA 54 - National Fuel Gas Code; 2015.

1.3 SUBMITTALS

A. Product Data: Provide data indicating general assembly, components, controls, safety controls, and wiring diagrams with electrical characteristics and connection requirements, and service connections.

B. Shop Drawings: Submit manufacturer’s end assembly drawings indicating dimensions, connection locations, and clearance requirements.

C. Wiring Diagrams: Submit manufacturer’s electrical requirements for the boiler including ladder type wiring diagrams for interlock and control wiring. Clearly differentiate between portions of wiring that are factory installed and portions to be field installed.

D. Manufacturer's Installation Instructions: Indicate assembly, support details, connection requirements, and include start up instructions.

E. Manufacturer's Factory Inspection Report: Submit boiler inspection prior to shipment.

F. Manufacturer's Field Reports: Burner manifold gas pressure, percent carbon monoxide (CO), percent oxygen (O), percent excess air, flue gas temperature at outlet, ambient temperature, net stack temperature, percent stack loss, percent combustion efficiency, and heat output.

1. Indicate compliance with specified performance and efficiency.

2. Provide results of the following combustion tests:

a. Boiler firing rate.

b. Over fire draft.

c. Gas flow rate.

d. Heat input.

e. Burner manifold gas pressure.

f. Percent carbon monoxide.

g. Percent oxides of nitrogen.

h. Percent oxygen.

i. Percent excess air.

j. Flue gas temperature at outlet.

k. Ambient temperature.

l. Net stack temperature.

m. Percent stack loss.

n. Percent combustion efficiency.

o. Heat output.

G. Operation and Maintenance Data: Include manufacturer's descriptive literature, operating instructions, cleaning procedures, replacement parts list, and maintenance and repair data.

H. Warranty: Submit manufacturer warranty and ensure forms have been completed in Nanuet Union Free School District's name and registered with manufacturer.

1.4 WARRANTY

A. Provide a 10 year warranty to include coverage for heat exchanger.

PART 2 PRODUCTS

2.1 BOILER CONSTRUCTION

A. The unit(s) shall be design-certified to comply with the current edition of the Harmonized ANSI Z21.13/CSA 4.9 Standard for Gas-Fired Low Pressure Steam and Hot Water Boilers. The unit(s) shall be designed and constructed in accordance with the ASME Boiler & Pressure Vessel Code, Section IV requirements for 30 psi (207 kPa) maximum working pressure, and shall bear the ASME "H" Stamp and be listed by the National Board. The boiler shall modulate from 10-100% of full fire for 10:1 turndown ratio.

B. The boiler shall be listed with AHRI (Air Conditioning, Heating and Refrigeration Institute), with a minimum AFUE of 95%. The unit(s) shall be constructed to comply with the efficiency requirements of the latest edition of ASHRAE Standard 90.1. The boiler shall meet the most stringent NOx emissions requirements.

C. The fire tube heat exchanger shall be stainless steel with aluminum core fire tubes. The heat exchanger shall be a low head loss design, and shall be accessible for visual inspection and cleaning of internal surfaces. The boiler shall be fully condensing design with built-in condensate drain and trap. The heat exchanger shall have a limited 10-year warranty.

D. The boiler shall be sealed combustion, and use a premix ceramic fiber burner and a zero governor gas valve to burn cleanly. The boiler shall operate with 3.5-10.5" w.c. natural gas pressure. The combustion chamber shall include a sight glass for viewing flame. The boiler jacket shall be a unitized shell finished with acrylic thermoset paint. The boiler shall have three service panels for easy service access, and shall have adjustable leveling feet.

E. The boiler shall be designed and certified for vertical or horizontal Category IV venting, two-pipe or concentric. Air may be taken from the room, or ducted directly to the boiler. Air pipe materials may be ABS, PVC, CPVC, Polypropylene or galvanized. The boiler shall be equipped with a removable and cleanable inlet air filter.

F. The boiler(s) shall be built with an integral stainless steel mini boiler tank that serves as a low loss header and boiler buffer tank.

G. The boiler shall be packaged with mounted and wired pump inside the boiler jacket. The boiler shall be equipped with an ASME certified pressure relief valve set at 30psi (207kPa). The boiler shall have a condensate trap that does not need to be primed and will not allow flue gases to pass back through unit.

H. Boiler shall meet the requirements of 12NYCRR 4 (low pressure boilers) of the New York State Department of Labor.

I. Unit shall be 120VAC, single phase, less than 4 Amps (including mounted pump) for connection to a 15A breaker. Maximum power consumption shall be 160W. The control circuit shall be 24VAC. A three-foot length 14 AWG plug-in line cord shall be included for

connection to a 120VAC/15A receptacle. A 120V receptacle for condensate pump, along with a space for placement of the pump, shall be included as standard equipment. Field connections for main power, external circulator, call for heat (thermostat or end switch), low water cutoff, and outdoor sensor shall be easily accessible via line voltage and low voltage terminal strips.

1. The control shall have the ability to accept a 0-10VDC input connection from an external control or building automation system, for remote temperature setpoint control. A bonus TT connection, for a high temperature zone shall be included.

J. Controls:

1. The ignition system shall be direct spark, and the boiler control shall be an integrated electronic PID temperature and ignition control with LCD, push buttons and dial. It shall control the boiler operation and firing rate. The boiler display shall be visible without the removal of any jacket panels, and shall be waterproof. The display shall include a numeric display to indicate temperature values, and shall have icons that indicate call for space heating, storage heating mode, anti-freeze mode, warm weather shutdown (summer mode), outside temperature mode, 0-10V setpoint mode, controller lock, status or installer mode, flame signal, and pump operation.

2. The control shall have built-in outdoor reset feature with warm weather shutdown, and customizable reset curves, based on the outdoor temperature and desired system water temperature. The boiler shall be shipped with the outdoor reset sensor, as standard equipment. The control shall have customizable freeze protection, and anti-short-cycle logic. The control shall easily allow the user to force the boiler into minimum or maximum firing rate, for boiler setup and diagnostic purposes. The control shall monitor flue gas temperature and shall stop the boiler from firing if temperature is excessive. The boiler shall have built-in gas leakage detection capabilities, such that when gas is detected for greater than 5 seconds, or three times within 10 minutes, the boiler will lock out for safety purposes.

3. The control shall have menu structures for user mode and installer mode. Allowable control adjustments shall include: Boiler temperature setpoint; °F or °C display; Outdoor reset selection; Low boiler setpoint temperature (for outdoor reset operation); Boiler temperature at high outdoor temperature (for outdoor reset operation); Boiler setpoint at low outdoor temperature (for outdoor reset operation).

4. The control shall be able to display the following parameters: Outdoor temperature; Return boiler water temperature; Blower rpm; Exhaust temperature; Output condition for pump; Burner operation times, Ignition cycles.

5. Control diagnostics shall include, at a minimum, the following: Ignition failure; Grounded flame rod; Boiler high limit exceeded; Sensor errors (open or shorted); and Fan speed proving rate failure.

a. The burner and boiler shall be installed with adequate controls to provide the following functions and interlocks:

1) Automatic flame safeguard controls.

2) Trial for ignition periods on the pilot and main burner.

3) Combustion airflow supervision to the combustion chamber.

4) Pre-ignition purging of the combustion chamber (four air changes of combustion chamber.)

5) Prove start and supervision of induced draft and forced draft fan operation.

6) Non-recycling safety shut-down on upper limit gas pressure or low limit gas pressure.

7) High temperature limit control for warm air and hot water.

8) Low water cut-off (LWCO) control.

9) An alarm system to signal burner failure and shut-down.

10) Observation ports shall be provided for visually observing the pilot and main flame.

11) All flame supervisory and programming control units shall include a self-checking circuit. This self- checking must be performed at least once on each ignition cycle.

12) High limit manual reset operating control of heating medium. This additional limit control shall not be installed on a common sampling tube with the operative limit control.

6. Boiler sequence of operations:

a. The boilers' firing rate shall be modulated based on outside air temperature through the boiler's integral outside reset sensor as follows:

1) When the outside air temperature is below 30 degrees F, building supply water temperature shall be 180 degrees F.

2) When the outside air temperature is between 30 degrees F and 60 degrees F, the leaving water temperature setpoint shall be linearly

3) The boiler shall be off when the outside air temperature is above 60 degrees F.

4) When the boiler is activated the boiler's circulator pump shall be started in conjunction with the boiler to provide primary water flow through the boiler, and operate at constant speed.

PART 3 EXECUTION

3.1 INSTALLATION

A. Install in accordance with manufacturer's instructions.

B. Install boiler and provide connection of natural gas service in accordance with requirements of NFPA 54 and applicable codes.

C. Provide operational tests for fuel and distribution piping and start-up tests for boiler.

END OF SECTION

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SECTION 238126 - MULTI-SPLIT HEAT PUMP SYSTEMS

PART 1 GENERAL

1.1 SECTION INCLUDES

A. Air-source heat pumps.

B. Indoor air handling (fan and coil) units for ducted systems.

C. Controls.

1.2 REFERENCE STANDARDS

A. AHRI 270 - Sound Performance Rating of Outdoor Unitary Equipment; 2008.

B. AHRI 520 - Performance Rating of Positive Displacement Condensing Units; 2004.

C. ASHRAE Std 15 - Safety Standard for Refrigeration Systems; 2013.

D. ASHRAE Std 52.2 - Method of Testing General Ventilation Air-Cleaning Devices for Removal Efficiency by Particle Size; 2012, with 2015 amendments.

E. ASHRAE Std 90.1 I-P - Energy Standard for Buildings Except Low-Rise Residential Buildings; 2013, Including All Ammendments and Errata.

F. NFPA 90A - Standard for the Installation of Air-Conditioning and Ventilating Systems; 2015.

G. NFPA 90B - Standard for the Installation of Warm Air Heating and Air-Conditioning Systems; 2015.

1.3 SUBMITTALS

A. Product Data: Provide rated capacities, weights, accessories, electrical nameplate data, and wiring diagrams.

B. Sustainable Design Documentation: Submit manufacturer's product data on refrigerant used, showing compliance with specified requirements.

C. Shop Drawings: Indicate assembly, required clearances, and location and size of field connections.

D. Design Data: Indicate refrigerant pipe sizing.

E. Manufacturer's Instructions: Indicate rigging, assembly, and installation instructions.

F. Project Record Documents: Record actual locations of components and connections.

G. Operation and Maintenance Data: Include manufacturer's descriptive literature, operating instructions, installation instructions, maintenance and repair data, and parts listing.

H. Warranty: Submit manufacturers warranty and ensure forms have been filled out in Nanuet Union Free School District's name and registered with manufacturer.

1.4 QUALITY ASSURANCE

A. Manufacturer Qualifications: Company specializing in manufacturing the type of products specified in this section, with minimum three years of documented experience.

B. Installer Qualifications: Company specializing in performing the work of this section with minimum 3 years of experience and approved by manufacturer.

1.5 WARRANTY

A. Provide five year manufacturers warranty for compressors.

PART 2 PRODUCTS

2.1 SYSTEM DESIGN

A. Split-System Heating and Cooling Units: Self-contained, packaged, matched factory-engineered and assembled, pre-wired indoor and outdoor units; UL listed.

1. Heating and Cooling: Air-source electric heat pump located in outdoor unit with evaporator.

2. Provide refrigerant lines internal to units and between indoor and outdoor units, factory cleaned, dried, pressurized and sealed, with insulated suction line.

B. Performance Requirements: See Drawings for additional requirements.

2.2 INDOOR UNITS

A. General: indoor unit shall be a wall mounted fan coil unit, operable with refrigerant R-410A, equipped with an electronic expansion valve, for installation onto a wall within a conditioned space. This compact design shall be furnised with finished white casing. Computerized PID control shall be used to control superheat to deliver a comfortable room temperature condition. The unit shall be equipped with a programmed drying mechanism that dehumidifies while limiting changes in room temperature when used with Daikin remote control BRC1E72, BRC1E73 and BRC2A71. A mildew-proof, polystyrene condensate drain pan and resin net mold resistant filter shall be included as standard equipment. The indoor units sound pressure shall range from 31 dB(A) to 41 dB(A) at low speed measured at 3.3 feet below and from the unit.

B. The ndoor unit hall be completely factory assembled and tested. Included in the unit is factory wiring, piping, electronic proportional expansion valve, control circuit board, fan motor thermal protector, flare connections, condensate drain pan, self-diagnostics, auto-restart function, 3-minute fused time delay, and test run switch. The unit shall have an

auto-swing louver which ensures efficient air distribution, which closes automatically when the unit stops. The remote controller shall be able to set five (5) steps of discharge angle. The front grille shall be easily removed for washing. The discharge angle shall automatically set at the same angle as the previous operation upon restart. The drain pipe can be fitted to from either left or right sides.

C. Indoor unit and refrigerant pipes will be charged with dehydrated air prior to shipment from the factory.

D. Both refrigerant lines shall be insulated from the outdoor unit.

E. Return air shall be through a resin net mold resistant filter.

F. The indoor units shall be equipped with a condensate pan.

G. The indoor units shall be equipped with a return air thermistor.

H. Unit Cabinet:

1. The cabinet shall be affixed to a factory supplied wall mounting template and located in the conditioned space.

2. The cabinet shall be constructed with sound absorbing foamed polystyrene and polyethylene insulation.

I. Fan:

1. The fan shall be a direct-drive cross-flow fan, statically and dynamically balanced impeller with high and low fan speeds available.

2. The fan motor shall be thermally protected.

J. Coil:

1. Coils shall be of the direct expansion type constructed from copper tubes expanded into aluminum fins to form a mechanical bond.

2. The coil shall be of a waffle louver fin and high heat exchange, rifled bore tube design to ensure highly efficient performance.

3. The coil shall be a 2-row cross fin copper evaporator coil with 14 fpi design completely factory tested.

4. The refrigerant connections shall be flare connections and the condensate will be 11/16 inch outside diameter PVC.

K. A thermistor will be located on the liquid and gas line.

L. A condensate pan shall be located in the unit.

M. Control:

1. The unit shall have controls provided by Daikin to perform input functions necessary to operate the system.

2. The unit shall be compatible with interfacing with a BMS system via optional LonWorks or BACnet gateways.

3. The unit shall be compatible with a Daikin Intelligent Touch Manager advanced multi-zone controller.

2.3 OUTDOOR UNITS

A. The outdoor units shall be specifically designed to work with the ducted, 4-way cassette, one-way cassette and multi-position air handler indoor units. The outdoor units must have a thermally fused powder coated finish. The outdoor unit shall be completely factory assembled, piped and wired. Each unit shall be run tested at the factory.

B. Outdoor unit shall have a sound rating no higher than 55 dB(A). If an alternate manufacturer is selected, any additional material, cost, and labor to meet published sound levels shall be incurred by the contractor.

C. Refrigerant lines from the outdoor unit to the indoor units shall be insulated in accordance with the installation manual.

D. The outdoor unit shall meet performance requirements per schedule and be within piping limitations & acceptable ambient temperature ranges as described in respective manufacturers' published product catalogs. Non-published product capabilities or performance data are not acceptable.

E. The outdoor unit shall be capable of guaranteed operation in heating mode down to -13°F ambient temperatures and cooling mode up to 115°F without additional restrictions on line length & vertical separation beyond those published in respective product catalogs. Models with capacity data for required temperature range published as "for reference only" are not considered capable of guaranteed operation and are not acceptable. If an alternate manufacturer is selected, any additional material, cost, and labor to meet ambient operating range and performance shall be incurred by the contractor.

F. The outdoor unit shall be provided with a manufacturer supplied 20 gauge hot dipped galvanized snow /hail guard. The snow/hail guard protects the outdoor coil surfaces from hail damage and snow build-up in severe climates.

G. Four-legged outdoor unit mounting systems shall be provided by manufacturer. Stand shall be made from 7 gauge plate steel with thermally fused polyester powder coat finish that meets ASTM D3451-06 standards. Stands shall be provided with galvanized mounting hardware and meets all ASCE 7 overturning safety requirement.

H. Unit Cabinet:

1. The casing shall be fabricated of galvanized steel, bonderized, finished with an electrostatically applied, thermally fused acrylic or polyester powder coating for

corrosion protection. Assembly hardware shall be cadmium plated for weather resistance.

2. Cabinet color shall be Munsell 3Y 7.8/1.1.

3. Two (2) mild steel mounting feet, traverse mounted across the cabinet base pan, welded mount, providing four (4) slotted mounting holes shall be furnished. Assembly shall withstand lateral wind gust up to 155 MPH to meet applicable weather codes.The casing(s) shall be fabricated of galvanized steel, bonderized and finished.

I. Fan:

1. The unit shall be furnished with a direct drive propeller type fan.

2. The outdoor unit fan motor shall be a direct current (DC) motor and have permanently lubricated bearings.

3. The fan motor shall be mounted for quiet operation.

4. The fan shall be provided with a raised guard to prevent contact with moving parts.

5. The outdoor unit shall have horizontal discharge airflow.

J. Refrigerant and Refrigerant Piping

1. R410A refrigerant shall be required for systems.

2. Polyolester (POE) oil—widely available and used in conventional domestic systems—shall be required. Prior to bidding, manufacturers using alternate oil types shall submit material safety data sheets (MSDS) and comparison of hygroscopic properties for alternate oil with list of local suppliers stocking alternate oil for approval at least two weeks prior to bidding.

3. Refrigerant piping shall be phosphorus deoxidized copper (copper and copper alloy seamless pipes) of sufficient radial thickness as defined by the equipment manufacturer and installed in accordance with manufacturer recommendations.

4. Refrigerant line sizing shall be in accordance with manufacturer specifications.

K. Coil:

1. The outdoor unit coil shall be of nonferrous construction with lanced or corrugated plate fins on copper tubing.

2. The coil fins shall have a factory applied corrosion resistant Blue Fin finish. Uncoated aluminum coils/fins are not allowed.

3. The coil shall be protected with an integral metal guard.

4. Refrigerant flow from the outdoor unit shall be regulated by means of an electronically controlled, precision, linear expansion valve.

5. Outdoor unit shall be pre-charged with sufficient R-410a refrigerant for up to twenty five (25) feet of refrigerant piping for capacities up to 24,000 BTU/h.

6. All refrigerant lines between outdoor and indoor units shall be of annealed, refrigeration grade copper tubing, ARC Type, meeting ASTM B280 requirements.

7. All refrigerant connections between outdoor and indoor units shall be flare type.

L. Compressor:

1. The compressor shall be a high performance, hermetic, inverter driven, variable speed, dual rotary type manufactured by Mitsubishi Electric Corporation.

2. The compressor motor shall be direct current (DC) type equipped with a factory supplied and installed inverter drive package.

3. The compressor will be equipped with internal thermal overload protection.

4. The outdoor unit must have the ability to operate over the full capacity range with a maximum height difference of 40 feet (12 meters) for 9,000, 12,000, and 15,000 BTU/h models, 50 feet (15 meters) for 18,000 BTU/h models, and 100 feet (30 meters) for 24,000 BTU/h, 30,000 BTU/h and 36,000 BTU/h models; and have refrigerant tubing length of up to 65 feet (20 meters) for 9,000, 12,000, and 15,000 BTU/h models, and 100 feet (30 meters) for 18,000 BTU/h, 24,000 BTU/h, 30,000 BTU/h and 36,000 BTU/h models between the indoor and outdoor units.

5. Filters, sight glasses, and traps shall not be used, and no additional refrigerant oil shall be required.

6. The compressor shall be mounted so as to avoid the transmission of vibration.

M. Basepan Heater:

2.4 ACCESSORY EQUIPMENT

A. Controls

1. The control system shall consist of a minimum of one microprocessor on each indoor unit and one in the outdoor unit, communicating via A-Control data over power transmission. The microprocessor located in the indoor unit shall have the capability of monitoring return air temperature and indoor coil temperature, receiving and processing commands from the wired or wireless controller, providing emergency operation and controlling the outdoor unit. The control signal between the indoor and outdoor unit shall be pulse signal 24 volts DC.

2. A three (3) conductor 14 gauge AWG wire with ground shall provide power feed and bi-directional control transmission between the outdoor and indoor units.

3. The system shall be capable of automatic restart when power is restored after power interruption. The system shall have self-diagnostics ability, including total hours of compressor run time. Diagnostics codes for indoor and outdoor units shall be displayed on the wired controller panel.

4. The indoor and outdoor unit control system shall be capable of supporting integration with Building Management Systems (BMS) through BACnet Protocol (ANSI/ASHRAE 135-2010) and be Certified by the (BTL) BACnet® Testing Laboratories. The BACnet® interface shall support BACnet Broadcast Management (BBMD).

PART 3 EXECUTION

3.1 EXAMINATION

A. Verify that substrates are ready for installation of units and openings are as indicated on shop drawings.

B. Verify that proper power supply is available and in correct location.

3.2 INSTALLATION

A. Install in accordance with NFPA 90A and NFPA 90B.

B. Install refrigeration systems in accordance with ASHRAE Std 15.

END OF SECTION 23 81 26

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SECTION 238129 - VARIABLE REFRIGERANT FLOW HVAC SYSTEMS

PART 1 GENERAL

1.1 SECTION INCLUDES

A. Air-source outdoor units.

B. Refrigerant piping.

C. Refrigerant branch units.

D. Indoor units.

E. Outdoor unit support systems.

F. Control panels.

G. Control wiring.

1.2 REFERENCE STANDARDS

A. ASHRAE Std 15 - Safety Standard for Refrigeration Systems; 2013.

B. ASHRAE Std 34 - Designation and Safety Classification of Refrigerants; 2013.

C. NFPA 70 - National Electrical Code; Most Recent Edition Adopted by Authority Having Jurisdiction, Including All Applicable Amendments and Supplements.

1.3 SUBMITTALS

A. Product Data: Submit manufacturer's standard data sheets showing the following for each item of equipment, marked to correlate to equipment item markings indicated in Contract Documents:

1. Outdoor Units:

a. Refrigerant Type and Size of Charge.

b. Output and Input Cooling Capacity: Btu/h.

c. Output and Input Heating Capacity: Btu/h.

d. Operating Temperature Range, Cooling and Heating.

e. Fan Capacity: Flow in cfm with respective fan curves.

f. External Static Pressure (ESP): In-wc.

g. Sound Pressure Level: dB(A).

SECTION 238126.13 - SMALL-CAPACITY SPLIT-SYSTEM AIR CONDITIONERS

PART 1 GENERAL

1.1 SECTION INCLUDES

A. Air cooled condensing units.

1.2 REFERENCE STANDARDS

A. AHRI 270 - Sound Performance Rating of Outdoor Unitary Equipment; 2008.

B. AHRI 520 - Performance Rating of Positive Displacement Condensing Units; 2004.

C. ASHRAE Std 15 - Safety Standard for Refrigeration Systems; 2013.

D. ASHRAE Std 52.2 - Method of Testing General Ventilation Air-Cleaning Devices for Removal Efficiency by Particle Size; 2012, with 2015 amendments.

E. ASHRAE Std 90.1 I-P - Energy Standard for Buildings Except Low-Rise Residential Buildings; 2013, Including All Ammendments and Errata.

F. NFPA 90A - Standard for the Installation of Air-Conditioning and Ventilating Systems; 2015.

G. NFPA 90B - Standard for the Installation of Warm Air Heating and Air-Conditioning Systems; 2015.

1.3 SUBMITTALS

A. Product Data: Provide rated capacities, weights, accessories, electrical nameplate data, and wiring diagrams.

B. Sustainable Design Documentation: Submit manufacturer's product data on refrigerant used, showing compliance with specified requirements.

C. Shop Drawings: Indicate assembly, required clearances, and location and size of field connections.

D. Design Data: Indicate refrigerant pipe sizing.

E. Manufacturer's Instructions: Indicate rigging, assembly, and installation instructions.

F. Project Record Documents: Record actual locations of components and connections.

G. Operation and Maintenance Data: Include manufacturer's descriptive literature, operating instructions, installation instructions, maintenance and repair data, and parts listing.

H. Warranty: Submit manufacturers warranty and ensure forms have been filled out in Nanuet Union Free School District's name and registered with manufacturer.

1.4 QUALITY ASSURANCE

A. Manufacturer Qualifications: Company specializing in manufacturing the type of products specified in this section, with minimum three years of documented experience.

B. Installer Qualifications: Company specializing in performing the work of this section with minimum 3 years of experience and approved by manufacturer.

1.5 WARRANTY

A. Provide five year manufacturers warranty for condensing units and compressors.

PART 2 PRODUCTS

2.1 SYSTEM DESIGN

A. Split-System Heating and Cooling Units: Self-contained, packaged, matched factory-engineered and assembled, pre-wired indoor and outdoor units; UL listed.

1. Cooling: Outdoor electric condensing unit with evaporator located in a unit ventilator .

2. Provide refrigerant lines internal to units and between indoor and outdoor units, factory cleaned, dried, pressurized and sealed, with insulated suction line.

B. Performance Requirements: See Drawings for additional requirements.

2.2 OUTDOOR UNITS

A. Outdoor Units: Self-contained, packaged, pre-wired unit consisting of cabinet, with compressor and condenser.

1. Comply with AHRI 210/240.

2. Refrigerant: R-410A.

3. Cabinet: Galvanized steel with baked enamel finish, easily removed and secured access doors with safety interlock switches, glass fiber insulation with reflective liner.

B. Compressor: AHRI 520; scroll, 3600 rpm, resiliently mounted integral with condenser, with positive lubrication, crankcase heater, high pressure control, motor overload protection, service valves and drier. Provide time delay control to prevent short cycling and rapid speed changes.

C. Air Cooled Condenser: Aluminum fin and copper tube coil, AHRI 520 with direct drive axial propeller fan resiliently mounted, galvanized fan guard.

1. Condenser Fans: Direct-drive propeller type.

2. Condenser Fan Motor: Enclosed, 1-phase type, permanently lubricated.

D. Coil: Air-cooled, aluminum fins bonded to copper tubes.

PART 3 EXECUTION

3.1 EXAMINATION

A. Verify that substrates are ready for installation of units and openings are as indicated on shop drawings.

B. Verify that proper power supply is available and in correct location.

3.2 INSTALLATION

A. Install in accordance with NFPA 90A and NFPA 90B.

B. Install refrigeration systems in accordance with ASHRAE Std 15.

END OF SECTION

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h. Electrical Data: Complete including motor size.

i. Maximum number of indoor units that can be served.

j. Maximum refrigerant piping run from outdoor unit to indoor unit(s).

k. Maximum height difference between outdoor unit to Indoor unit(s), both above and below.

2. Control Panels: Complete data of controllers, input-output points, and zones.

B. Shop Drawings: Installation drawings custom-made for this project; include as-designed HVAC layouts, locations of equipment items, refrigerant piping sizes and locations, condensate piping sizes and locations, remote sensing devices, control components, electrical connections, control wiring connections. Include:

1. Detailed piping diagrams, with branch balancing devices.

2. Condensate piping routing, size, and pump connections.

3. Detailed power wiring diagrams.

4. Detailed control wiring diagrams.

5. Locations of required access through fixed construction.

6. Drawings required by manufacturer.

C. Operating and Maintenance Data:

1. Manufacturer's complete standard instructions for each unit of equipment and control panel.

2. Custom-prepared system operation, troubleshooting, and maintenance instructions and recommendations.

3. Identification of replaceable parts and local source of supply.

D. Warranty: Executed warranty, made out in Nanuet Union Free School District's name.

1.4 QUALITY ASSURANCE

A. Manufacturer Qualifications:

1. Company that has been manufacturing variable refrigerant volume heat pump equipment for at least 5 years.

2. Company that provides system design software to installers.

B. Installer Qualifications: Trained and approved by manufacturer of equipment.

C. The units shall be tested by a National Recognized Testing Laboratory (NRTL), in accordance with ANSI/UL 1995 – Heating and Cooling Equipment and bear the Listed Mark.

D. All wiring shall be in accordance with the National Electric Code (NEC).

E. The system will be produced in an ISO 9001 and ISO 14001 facility, which are standards set by the International Standard Organization (ISO). The system shall be factory tested for safety and function.

F. The condensing units shll be factory charged with R410A.

1.5 WARRANTY

A. Compressors: Provide manufacturer's warranty for ten (10) years from date of installation. During the stated period, should any part fail due to defects in material and workmanship, it shall be repaired or replaced at the discretion of manufacturer according to the manufacturer's terms and conditions. All warranty service work shall be preformed by the manufacturer's factory trained service professional.

B. The equipment manufacturer shall warrant the indoor and outdoor products in this specification section installed that under normal use and maintenance for comfort cooling and conditioning applications such products (the “Products”) will be free from defects in material and workmanship. This warranty applies to compressor and all parts and is limited in duration to ten (10) years starting from the ‘’installation date’’ which is one of the two dates below:

PART 2 PRODUCTS

2.1 MANUFACTURERS

A. Basis of Design: The system design indicated in Contract Documents is based on equipment and system designed by Daikin AC; www.daikinac.com.

B. The variable capacity heat pump air conditioning system shall be a Daikin Variable Refrigerant Volume Series (heat or cool model) system as specified.

C. The systems shall consist of multiple evaporators using PID control, REFNET joints and headers, a two-pipe refrigeration distribution system and Daikin VRV condenser unit.

D. The condensers shall be a direct expansion (DX), air-cooled heat pump, multi-zone air-conditioning system with variable speed inverter driven compressors using R-410A refrigerant.

E. The condensing units may connect an indoor evaporator capacity up to 200% of the condensing unit capacity. All zones are each capable of operating separately with individual temperature control.

F. The Daikin condensing unit shall be interconnected to unit ventilator DX cooling coils in accordance with Daikin’s engineering data book detailing each unit.

G. The fan coil unit, unit ventilator and blower coil DX cooling coils shall be connected to the condensing units utilizing Daikin’s REFNET specified piping joints and headers to ensure correct refrigerant flow and balancing. T style joints are not acceptable for a variable refrigerant system.

H. Operation of the system shall permit either cooling or heating of all of the indoor units simultaneously. Each indoor unit or group of indoor units shall be able to provide set temperature independently via a local remote controller, the existing Intelligent Manager, or the specified Direct Digital Control (DDC) system interface.

I. Each fan coil unit, blower coil, unit ventilator or group of unit ventilators shall be independently controlled.

J. The condensing unit shall feature a sealed E-box with a minimum of IP55 rating to provide high dust and moisture protection for reliability.

K. Each system shall be able to enlarge from single to dual module or dual to triple module without the need for installed main pipe size changes. The manufacturer shall provide predefined pipe sizes and design rules ensuring reliable system operation and offering design flexibility in phased installation applications.

L. Stable Operation – System shall provide stable inverter operation at varied ambient conditions.

M. No Drain Pan Heater – System shall be capable of heating operation without the need for a drain pan heater. If alternate manufacturer is chosen, an additional drain pan heater shall be provided by the manufacturer.

N. Independent Control - Each indoor unit shall use a dedicated electronic expansion valve with 2000 positions for independent control.

O. VFD Inverter Control and Variable Refrigerant Temperature - Each condensing unit shall use high efficiency, variable speed all “inverter” compressor(s) coupled with inverter fan motors to optimize part load performance. The system capacity and refrigerant temperatures shall be modulated automatically to set suction and condensing pressures while varying the refrigerant volume for the needs of the cooling or heating loads. The control will be automatic and customizable depending on load and weather conditions.

P. Unit Ventilator and blower coil DX coils shall use PID to control superheat to deliver a comfortable room temperature condition and optimize efficiency.

Q. Configurator software - Each system shall be available with configurator software package to allow for remote configuration of operational settings and also for assessment of operational data and error codes.

R. Independent Control - Each fan coil unit, blower coil and unit ventilator DX coil shall use a dedicated electronic expansion valve for independent control.

S. Flexible Design –

1. Systems shall be capable of up to 540ft [623 ft. equivalent] of linear piping between the condensing unit and furthest located indoor unit.

T. Systems shall be capable of up to 3,280ft (1,000m) total “one-way” piping in the piping network.

1. Systems shall have a vertical (height) separation of up to 295ft between the condensing unit and the indoor units.

2. Systems shall be capable of up to 295ft (90m) from the first REFNET / branch point.

3. The condensing unit shall have the ability to connect an indoor unit evaporator capacity of up to 200% of the condensing unit nominal capacity.

4. Systems shall be capable of 361ft vertical separation between indoor units.

5. Oil Return – Each system shall be furnished with a centrifugal oil separator and active oil recovery cycle.

6. Simple wiring – Systems shall use 16/18 AWG, 2 wire, stranded, non-shielded and non-polarized daisy chain control wiring between fan coil units, blower coils and unit ventilators and heat pumps and between fan coil units, blower coils and unit ventilators and remote controllers.

7. Each condensing unit shall include a multi-functional digital display that can provide system operation status such as operating refrigerant temperatures, pressures, outdoor electronic expansion valve opening and compressor operation time.

8. Each condensing unit shall include a service window that can provide easy access to system field settings and operation status without completely removing the condensing unit panel.

9. Systems shall include a self-diagnostic, auto-check function to detect a malfunction and display the type and location.

10. Each condensing unit shall incorporate contacts for electrical demand shedding with optional 3 stage demand control with 12 customizable demand settings.

11. Each system shall be capable of integrating with open protocol BACnet and LonWorks building management systems.

12. Each system shall use indoor and condensing units with quiet operation as low as 27 dB(A).

13. Each system shall include a built-in data recorder that can store up to 40 minutes of operational data which can help identify the issue in case of a product failure

14. Heating during Defrost and Oil Return. Reverse cycle (cooling mode) in these modes shall not be permitted due to the potential reduction in space temperature.

15. Low Ambient Cooling - Each system shall be capable of low ambient cooling operation to -4°FDB (-20°CDB).

16. The condensing unit shall have configurable settings for intermittent fan operation to help minimize snow accumulation on fan blades when the system is off.

17. The condensing unit shall be factory equipped with a Schrader valve for connection to a pressure relief kit.

18. Substitutions: Systems manufactured by other manufacturers will not be considered.

2.2 VARIABLE REFRIGERANT FLOW SYSTEM

A. Cooling Operation:

1. The operating range in cooling shall be 23°F DB ~ 122°F DB (-5°CDB ~ 50°CDB).

2. Cooling mode indoor room temperature range shall be 57-77°FWB (13.8 - 25°CWB).

B. Heating Operation:

1. The operating range in heating shall be -13°F WB – 61°F WB.

2. Heating mode indoor room temperature range shall be 59°FDB - 80°F DB (15°CDB – 26.7°CDB).

C. WIRING:

1. The control voltage between the indoor and condensing unit, and between the indoor unit and associated remote controller, shall be 16VDC non-shielded, stranded 2 conductor cable.

2. The control wiring shall be a two-wire multiplex transmission system, making it possible to connect multiple indoor units to one condensing unit with one 2-cable wire, thus simplifying the wiring installation.

D. REFRIGERANT PIPING:

1. REFNET piping joints and headers shall be used to ensure proper refrigerant balance and flow for optimum system capacity and performance.

a. T style joints shall not be acceptable as this will negatively impact proper refrigerant balance and flow for optimum system capacity and performance.

2.3 AIR-SOURCE OUTDOOR UNITS

A. GENERAL:

1. The condensing unit shall be designed specifically for use with VRV series components.

2. The refrigeration circuit of the condensing unit shall consist of Daikin inverter scroll compressors, motors, fans, condenser coil, electronic expansion valves, solenoid valves, 4-way valve, distribution headers, capillaries, filters, shut off valves, oil separators, service ports and refrigerant accumulator.

3. Liquid and suction lines shall be individually insulated between the condensing and indoor units.

4. The condensing unit can be wired and piped with access from the left, right, rear or bottom.

5. The connection ratio of indoor units to condensing unit shall be permitted up to 200% of nominal capacity.

6. Each condensing system shall be able to support the connection of up to 64 indoor units dependent on the model of the condensing unit.

7. The sound pressure level standard shall be that value as listed in the Daikin engineering manual for the specified models at 3 feet from the front of the unit. The condensing unit shall be capable of operating automatically at further reduced noise during night time or via an external input.

8. The system will automatically restart operation after a power failure and will not cause any settings to be lost, thus eliminating the need for reprogramming.

9. The condensing unit shall be modular in design and should allow for side-by-side installation with minimum spacing.

10. The following safety devices shall be included on the condensing unit; high pressure sensor and switch, low pressure switch, control circuit fuses, crankcase heaters, fusible plug, overload relay, inverter overload protector, thermal protectors for compressor and fan motors, over current protection for the inverter and anti-recycling timers.

11. To ensure the liquid refrigerant does not flash when supplying to the various indoor units, the circuit shall be provided with a sub-cooling feature.

12. Oil recovery cycle shall be automatic occurring 2 hours after start of operation and then every 8 hours of operation.

13. The condensing unit shall be capable of heating operation at -13°F (-25°C) wet bulb ambient temperature without additional low ambient controls or an auxiliary heat source.

B. UNIT CABINET:

1. The condensing unit shall be completely weatherproof and corrosion resistant. The unit shall be constructed from rust-proofed galvanized steel panels coated with a baked enamel finish.

2. Each condensing unit shall have a three-segment panel design which allows for direct access to outdoor fans, critical mechanical and electrical components separately for ease of installation and service.

3. Each outdoor unit shall have separate knock-outs for both refrigerant piping and wiring on the bottom panel.

C. FAN:

1. The condensing unit shall consist of one or more propeller type, direct-drive fan motors that have multiple speed operation via a DC (digitally commutating) inverter.

2. The condensing unit fan motor shall have multiple speed operation of the DC (digitally commutating) inverter type, and be of high external static pressure and shall be factory set as standard at 0.12 in. WG. A field setting switch to a maximum 0.32 in. WG pressure is available to accommodate field applied duct for indoor mounting of condensing units.

3. The condensing unit shall have configurable settings for intermittent fan operation to help minimize snow accumulation on fan blades when the system is off.

4. The fan shall be a vertical discharge configuration with a nominal airflow maximum range of 6,200 CFM to 14,505 CFM dependent on model specified.

5. The fan motor shall have inherent protection and permanently lubricated bearings and be mounted.

6. The fan motor shall be provided with a fan guard to prevent contact with moving parts.

D. CONDENSER COIL:

1. The condenser coil shall be manufactured from copper tubes expanded into aluminum fins to form a mechanical bond.

2. The heat exchanger coil shall be of a waffle louver fin and rifled bore tube design to ensure high efficiency performance.

3. The heat exchanger on the condensing units shall be manufactured from Hi-X seamless copper tube with N-shape internal grooves mechanically bonded on to aluminum fins to an e-Pass Design.

4. The fins shall be coated with an anti-corrosion hydrophilic blue coating as standard from factory with a salt spray test rating of 1000hr per ASTM test standards.

5. The condensing unit shall be factory equipped with condenser coil guards on all sides.

E. COMPRESSOR:

1. The Daikin inverter scroll compressors shall be variable speed (PVM inverter) controlled which is capable of changing the speed to follow the variations in total cooling and heating load as determined by the suction gas pressure as measured in the condensing unit.

    a. In addition, samplings of evaporator and condenser temperatures shall be made so that the high/low pressures detected are read every 20 seconds and calculated. With each reading, the compressor capacity (INV frequency) shall be controlled to eliminate deviation from target value.

        1) Non –inverter-driven compressors, which may cause starting motor current to exceed the nominal motor current (RLA) and require larger wire sizing, shall not be allowed.

2. The inverter driven compressors in the condensing unit shall be of highly efficient reluctance DC (digitally commutating), hermetically sealed scroll “G-type” or “J-type”.

3. Neodymium magnets shall be adopted in the rotor construction to yield a higher torque and efficiency in the compressor instead of the normal ferrite magnet type.

    a. At complete stop of the compressor, the neodymium magnets will position the rotor into the optimum position for a low torque start.

4. The capacity control range shall be as low as 1% to 100%.

5. The compressor’s motor shall have a cooling system using discharge gas, to avoid sudden changes in temperature resulting in significant stresses on winding and bearings.

6. Each compressor shall be equipped with a crankcase heater, high pressure safety switch, and internal thermal overload protector.

7. Oil separators shall be standard with the equipment together with an intelligent oil management system.

8. The compressor shall be mounted on vibration dampening rubber grommets to minimize the transmission of vibration, eliminating the standard need for external spring isolation.

9. In the event of compressor failure, the remaining compressors shall continue to operate and provide heating or cooling as required at a proportionally reduced capacity. The microprocessor and associated controls shall be manually activated to specifically address this condition for single module and manifolded systems.

10. In the case of multiple condenser modules, conjoined operation hours of the compressors shall be balanced by means of the Duty Cycling Function, ensuring sequential starting of each module at each start/stop cycle, completion of oil return, completion of defrost or every 8 hours. When connected to a central control system sequential start is activated for all system on each DIII network.

F. Roof Curbs:

1. Roof Curbs: 18 ga. galvanized steel, unitized construction with attn integral base plate, continuous welded corner seams, pressure treated wood nailer, counterflashing with location screws. Internally re-inforced to conform with load bearing factors.

    a. 24" overall height, length based on heat pump unit length.

2.4 INDOOR UNITS

A. 4 WAY CEILING SUSPENDED CASSETTE UNIT

1. General: Daikin indoor unit model FXUQ shall be a ceiling suspended cassette fan coil unit, operable with R-410A refrigerant, equipped with an electronic expansion valve, for installation onto a ceiling within a conditioned space. It shall be available

in capacities from 18,000 Btu/h to 36,000 Btu/h. It shall be a four-way air distribution type, fresh white, impact resistant with a washable panel. The supply air is distributed via motorized louvers which can be horizontally and vertically adjusted from 0° to 60°. Computerized PID control shall be used to control superheat to deliver a comfortable room temperature condition. The indoor units sound pressure shall range from 36 dB(A) to 40 dB(A) at low speed measured at 5 feet below the unit.

2. Indoor Unit:

    a. The Daikin unit shall be completely factory assembled and tested. Included in the unit is factory wiring, piping, electronic proportional expansion valve, control circuit board, fan motor thermal protector, flare connections, condensate drain pan, condensate safety shutoff and alarm, self-diagnostics, auto-restart function, 3-minute fused time delay, and test run switch.

3. Indoor unit and refrigerant pipes will be charged with dehydrated air prior to shipment from the factory.

    a. Both refrigerant lines shall be insulated from the outdoor unit.

    b. The 4-way supply air flow can be field modified to 3-way and 2-way airflow to accommodate various installation configurations including corner installations.

    c. Return air shall be through the concentric panel, which includes a resin net mold resistant filter.

    d. The indoor units shall be equipped with a condensate pan and condensate pump. The condensate pump provides up to 23-5/8” of lift and has a built in safety shutoff and alarm.

    e. The indoor units shall be equipped with a return air thermistor.

    f. All electrical components are reached through the decoration panel, which reduces the required side service access.

    g. The indoor unit will be separately powered with 208~230V/1-phase/60Hz.

    h. The voltage range will be 253 volts maximum and 187 volts minimum.

4. Unit Cabinet:

    a. The cabinet shall be space saving and shall be located into the ceiling.

    b. Three auto-swing positions shall be available to choose, which include standard, draft prevention and ceiling stain prevention.

    c. The airflow of the unit shall have the ability to shut down outlets with multiple patterns allowing for simpler installation in irregular spaces.

    d. The cabinet shall be constructed with sound absorbing foamed polystyrene and polyethylene insulation.

5. Fan:
    a. The fan shall be direct-drive turbo fan type with statically and dynamically balanced impeller with three fan speeds available.
    b. The fan motor shall operate on 208/230 volts, 1 phase, 60 hertz with a motor output range from 0.06 to 0.14 HP.
    c. The airflow rate shall be available in three settings.
    d. The fan motor shall be thermally protected.
6. Filter:
    a. The return air shall be filtered by means of a washable long-life filter with mildew proof resin.
7. Coil:
    a. Coils shall be of the direct expansion type constructed from copper tubes expanded into aluminum fins to form a mechanical bond.
    b. The coil shall be of a waffle louver fin and high heat exchange, rifled bore tube design to ensure highly efficient performance.
    c. The coil shall be a 3-row cross fin copper evaporator coil with 21 FPI design completely factory tested.
    d. The refrigerant connections shall be flare connections and the condensate will be 1 inch outside diameter PVC.
    e. A condensate pan with antibacterial treatment shall be located under the coil.
    f. A condensate pump with a 23-5/8 inch lift shall be located below the coil in the condensate pan with a built-in safety alarm.
    g. A thermistor will be located on the liquid and gas line.
8. Electrical:
    a. A separate power supply will be required of 208/230 volts, 1 phase, 60 hertz. The acceptable voltage range shall be 187 to 253 volts.
    b. Transmission (control) wiring between the indoor and outdoor unit shall be a maximum of 3,280 feet (total 6,560 feet).
    c. Transmission (control) wiring between the indoor unit and remote controller shall be a maximum distance of 1,640 feet.
9. Control:
    a. The unit shall have controls provided by Daikin to perform input functions necessary to operate the system.

b. The unit shall be compatible with interfacing with a BMS system via BACnet gateways.

c. The unit shall be compatible with the existing Daikin Intelligent Touch Manager advanced multi-zone controller.

B. 1-Way Ceiling-Recessed Cassette, Indoor Units:

1. General: Daikin indoor unit model FXEQ shall be a ceiling suspended cassette fan coil unit, operable with R-410A refrigerant, equipped with an electronic expansion valve, for installation onto a ceiling within a conditioned space. It shall be a one-way air distribution type, fresh white, impact resistant with a washable panel. The supply air is distributed via motorized vertical and horizontal louvers which can be adjusted from 0° to 45° and 20° to 70° respectively. Computerized PID control shall be used to control superheat to deliver a comfortable room temperature condition. The unit shall be equipped with a programmed drying mechanism that dehumidifies while limiting changes in room temperature when used with Daikin remote control BRC1E73. The indoor units sound pressure shall range from 26 dB(A) to 38 dB(A) at low speed measured at 3.3 feet below the unit.

2. The Daikin indoor unit FXEQ shall be completely factory assembled and tested. Included in the unit is factory wiring, piping, electronic proportional expansion valve, control circuit board, fan motor thermal protector, flare connections, condensate drain pan, condensate lift pump, condensate safety shutoff and alarm, self-diagnostics, auto-restart function, 3-minute fused time delay, and test run switch.

3. The indoor unit shall be able to process up to 15% fresh air

4. Indoor unit and refrigerant pipes will be charged with dehydrated air prior to shipment from the factory.

5. Both refrigerant lines shall be insulated from the outdoor unit.

6. Return air shall be through the flat back panel, which includes a white resin net mold resistant filter.

7. The indoor units shall be equipped with a condensate pan and condensate pump. The condensate pump provides up to 33-716” of lift and has a built in safety shutoff and alarm.

8. The indoor units shall be equipped with a return air thermistor.

9. Motor and some of the electrical components shall be reachable through the decoration panel.

10. The indoor unit will be separately powered with 208~230V/1-phase/60Hz.

11. The voltage range will be 253 volts maximum and 187 volts minimum.

12. Unit Cabinet:

a. The cabinet shall be space saving and shall be located into the ceiling.

b. The cabinet shall have a built in 4” knock-out to connect fresh air intake

c. The cabinet shall be constructed with sound absorbing foamed polyurethane noise insulation.

d. The cabinet shall be equipped with foamed polystyrene and foamed polyethylene heat insulation.

13. Fan:

a. The fan shall be direct-drive Sirocco fan type with statically and dynamically balanced impeller with five selectable fan speeds available.

b. The fan motor shall operate on 208/230 volts, 1 phase, 60 hertz with a motor output range from 0.11 to 0.15 HP.

c. The airflow rate shall be available in five settings.

d. The fan motor shall be thermally protected.

14. Filter:

a. The return air shall be filtered by means of a mold resistant Resin net filter.

b. The filter shall be accessible from the decoration panel

15. Coil:

a. Coils shall be of the direct expansion type constructed from copper tubes expanded into aluminum fins to form a mechanical bond.

b. The coil shall be of a waffle louver fin and high heat exchange, rifled bore tube design to ensure highly efficient performance.

c. The coils for units up to 1 ton shall be a 2-row cross fin copper evaporator coil with 20.5 FPI design completely factory tested for the

d. The coils for units from 1.25 ton to 2.0 ton shall be 2-row cross fin copper evaporator coil with 20.5 FPI and an additional row with 15.9 FPI.

e. The refrigerant connections shall be flare connections and the condensate will be 1-1/32 inch outside diameter PVC.

f. A condensate pan with antibacterial treatment shall be located under the coil.

g. A condensate pump with a 25 inch lift shall be located below the coil in the condensate pan with a built-in safety alarm.

h. A thermistor will be located on the liquid and gas line.

16. Electrical:

a. A separate power supply will be required of 208/230 volts, 1 phase, 60 hertz. The acceptable voltage range shall be 187 to 253 volts.

b. Transmission (control) wiring between the indoor and outdoor unit shall be a maximum of 3,280 feet (total 6,560 feet).

c. Transmission (control) wiring between the indoor unit and remote controller shall be a maximum distance of 1,640 feet.

17. Control:

a. The unit shall have controls provided by Daikin to perform input functions necessary to operate the system.

b. The unit shall be compatible with interfacing with a BMS system via optional LonWorks or BACnet gateways.

c. The unit shall be compatible with a Daikin Intelligent Touch Manager advanced multi-zone controller.

C. One Way Blow Ceiling Suspended Indoor Unit

1. The indoor unit shall be factory assembled, wired and run tested. Contained within the unit shall be all factory wiring, piping, electronic modulating linear expansion device, control circuit board and fan motor. The unit shall have a self-diagnostic function, 3-minute time delay mechanism, an auto restart function, and a test run switch. The unit shall have an auto-swing function for the horizontal vane. Indoor unit and refrigerant pipes shall be charged with dehydrated air before shipment from the factory.

2. The casing shall have a white finish.

3. Fan:

a. The indoor unit fan shall be an assembly with two, three, or four Sirocco fan(s) direct driven by a single motor.

b. The indoor fan shall be statically and dynamically balanced to run on a motor with permanently lubricated bearings.

c. The indoor fan shall consist of four (4) speeds, Low, Mid1, Mid2, and High, and Auto fan function.

4. Return air shall be filtered by means of an easily removable, washable filter.

5. Coil:

a. The indoor coil shall be of nonferrous construction with smooth plate fins on copper tubing. The tubing shall have inner grooves for high efficiency heat exchange. All tube joints shall be brazed with phos- copper or silver alloy.

b. The coils shall be pressure tested at the factory.

6. Controls:

   a. Units shall have the ability to control supplemental heat via connector CN24 and a 12 VDC output.

   b. Control board shall include contacts for control of external heat source. External heat may be energized as second stage with 1.8°F – 9.0°F adjustable deadband from set point.

   c. Indoor unit shall include no less than four (4) digital inputs capable of being used for customizable control strategies.

   d. Indoor unit shall include no less than three (3) digital outputs capable of being used for customizable control strategies.

   e. Manufacturer to provide drain pan level sensor powered by a 20-year life lithium battery. Sensor shall require no external power for operation and shall have an audible indication of low battery condition.

   f. The drain pan sensor shall provide protection against drain pan overflow by sensing a high condensate level in the drain pan. Should this occur the control shuts down the indoor unit before an overflow can occur. A thermistor error code will be produced should the sensor activate indicating a fault which must be resolved before the unit re-starts.

PART 3 EXECUTION

3.1 INSTALLATION

A. Install in accordance with manufacturer's instructions.

B. Install refrigerant piping in accordance with equipment manufacturer's instructions.

C. Perform wiring in accordance with NFPA 70, National Electric Code (NEC).

D. Coordinate with installers of systems and equipment connecting to this system.

3.2 SYSTEM STARTUP

A. Prepare and start equipment and system in accordance with manufacturer's instructions and recommendations.

B. Adjust equipment for proper operation within manufacturer's published tolerances.

END OF SECTION

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SECTION 238200 - CONVECTION HEATING AND COOLING UNITS

PART 1 GENERAL

1.1 SECTION INDLUDES

A. Baseboard radiation.

B. Cabinet Unit Heaters.

1.2 REFERENCE STANDARDS

A. AHRI Directory of Certified Product Performance - Air-Conditioning, Heating, and Refrigeration Institute (AHRI) Current Edition.

B. AHRI 410 - Forced-Circulation Air-Cooling and Air-Heating Coils 2001, with Addenda (2011).

C. ASHRAE (HVACA) - ASHRAE Handbook - HVAC Applications Most Recent Edition Cited by Referring Code or Reference Standard.

D. ASHRAE Std 62.1 - Ventilation for Acceptable Indoor Air Quality Most Recent Edition Adopted by Authority Having Jurisdiction, Including All Applicable Amendments and Supplements.

E. NFPA 70 - National Electrical Code Most Recent Edition Adopted by Authority Having Jurisdiction, Including All Applicable Amendments and Supplements.

F. NFPA 90A - Standard for the Installation of Air-Conditioning and Ventilating Systems 2021.

G. SMACNA (DCS) - HVAC Duct Construction Standards Metal and Flexible 2021.

1.3 SUBMITTALS

A. Product Data: Provide typical catalog of information including arrangements.

B. Shop Drawings:

1. Indicate cross sections of cabinets, grilles, bracing and reinforcing, and typical elevations.

2. Indicate air coil and frame configurations, dimensions, materials, rows, connections, and rough-in dimensions.

3. Submit schedules of equipment and enclosures typically indicating length and number of pieces of element and enclosure, corner pieces, end caps, cap strips, access doors, pilaster covers, and comparison of specified heat required to actual heat output provided.

4. Indicate mechanical and electrical service locations and requirements.

C. Selection Samples: For each finish product specified, color chart representing manufacturer's full range of available colors.

D. Verification Samples: For each finish product specified, color chip representing actual product in color and texture.

E. Certificates: Certify that coils are tested and rated in accordance with AHRI 410.

F. Manufacturer's Instructions: Indicate installation instructions and recommendations.

G. Operation and Maintenance Data: Include manufacturer's descriptive literature, operating instructions, installation instructions, maintenance and repair data, and parts listings.

1.4 QUALITY ASSURANCE

A. Manufacturer Qualifications: Company specializing in manufacturing the Products specified in this section with minimum three years documented experience.

B. Products Requiring Electrical Connection: Listed and classified by Underwriters Laboratories Inc. as suitable for the purpose specified and indicated.

1.5 WARRANTY

A. Provide 5 year manufacturer's warranty for unit ventilators.

PART 2 PRODUCTS

2.1 HDYRONIC WALL RADIATORS

A. Provide steel panel radiator elements of lengths and in locations as indicated, and of capacities, style and having accessories as scheduled. The wall hung vertical heating panel radiation shall be of one-piece all-welded steel construction, consisting of flattened water tubes welded to headers at the top and bottom. The radiator shall include an integral heavy gauge (0.09” minimum) all-welded perforated side grilles for both sides.

B. The radiator’s headers shall include all necessary inlet, outlet and vent connections as required. Standard connection sizes are ½” NPT tapered thread for supply and return piping, and 1/8” for the vent connection. Internal baffling is provided where required for proper water flow.

C. The radiant heating panels shall be available in heights from 2’-0” to 29’-6” in two inch even increments without the need for splicing. Appropriate wall mounting brackets shall be provided with the radiators, but additional wall bracing (if required) is to be provided by the installing contractor. Panel radiation expansion shall not exceed 1/64” per foot of radiation at 215ºF. The installer shall provide adequate expansion compensation for each radiator.

D. Pressure ratings: Working pressure of 128 PSI, test pressure of 184 PSI.

E. Finish: Panel radiation shall be cleaned and phosphatized in preparation for a powder coat finish. The radiation shall be finish painted with a gloss powder coat finish, for a total paint thickness of 2-3 mils (.002" - .003"). The color shall be selected by the architect from the optional color selection list.

F. Accessories:Flex connectors:

1. Ribbed pipe cover trims, finished to match the radiators shall be provided with the radiation. Vertical pipe trim covers shall be utilized for piping connections through the floor to the radiator. Full pipe trim covers shall be utilized to conceal side piping, including center trims, left and right end caps, and inside and outside corners.

2. Air Vent: Chrome plated manual air vent.

3. Flex connectors: Provide flexible pipe connectors where shown on the drawings to provide expansion compensation for the radiators.

4. Thermostatic control valves: Mechanical, thermostatic controls valve piped inline upstream of radiator with manual heat setting dial.

2.2 HYDRONIC CABINET HEATERS

A. Provide products listed, classified, and labeled by Underwriters Laboratories Inc. (UL), Intertek (ETL), or testing firm acceptable to Authority Having Jurisdiction as suitable for the purpose indicated.

B. Coils:

1. Evenly spaced aluminum fins mechanically bonded to copper tubes.

2. Heating Hot Water: Suitable for working temperatures up to a maximum not less than 200 degrees F.

C. Cabinet: Minimum 16 gage, 0.0598 inch thick sheet steel front panel with exposed corners and edges rounded, easily removed panels, glass fiber insulation, integral air outlet, and inlet grilles.

D. Finish: Factory applied baked primer coat on visible surfaces of enclosure or cabinet.

E. Fans: Centrifugal forward-curved double-width wheels, statically and dynamically balanced, direct driven.

F. Motor: Electrically Commutated Motor.

G. Filter: Easily removed, 1 inch thick glass fiber throw-away type, located to filter air before coil.

PART 3 EXECUTION

3.1 EXAMINATION

A. Verify that surfaces are suitable for installation.

B. Verify that field measurements are as indicated on drawings.

3.2 INSTALLATION

A. Install in accordance with manufacturer's recommendations.

B. Install equipment exposed to finished areas after walls and ceilings are finished and painted.

C. Do not damage equipment or finishes.

3.3 CLEANING

A. After construction and painting is completed, clean exposed surfaces of units.

B. Vacuum clean coils and inside of units.

C. Touch-up marred or scratched surfaces of factory-finished cabinets using finish materials furnished by the manufacturer.

D. Install new filters.

E. Protect units before, during and after installation. Damaged material due to improper site protection shall be cause for rejection.

3.4 PROTECTION

A. Provide finished cabinet units with protective covers during the balance of construction.

END OF SECTION

SECTION 260505 - SELECTIVE DEMOLITION FOR ELECTRICAL

PART 1 GENERAL

1.1 SECTION INCLUDES

A. Electrical demolition.

1.2 RELATED REQUIREMENTS

PART 2 PRODUCTS

2.1 MATERIALS AND EQUIPMENT

A. Materials and equipment for patching and extending work: As specified in individual sections.

PART 3 EXECUTION

3.1 EXAMINATION

A. Verify field measurements and circuiting arrangements are as indicated.

B. Verify that abandoned wiring and equipment serve only abandoned facilities.

C. Demolition drawings are based on casual field observation and existing record documents.

D. Report discrepancies to Engineer before disturbing existing installation.

E. Beginning of demolition means installer accepts existing conditions.

3.2 PREPARATION

A. Disconnect electrical systems in walls, floors, and ceilings to be removed.

B. Coordinate utility service outages with utility company.

C. Provide temporary wiring and connections to maintain existing systems in service during construction. When work must be performed on energized equipment or circuits, use personnel experienced in such operations.

D. Existing Electrical Service: Maintain existing system in service until new system is complete and ready for service. Disable system only to make switchovers and connections. Minimize outage duration.

1. Obtain permission from Nanuet Union Free School District at least 24 hours before partially or completely disabling system.

2. Make temporary connections to maintain service in areas adjacent to work area.

E. Existing Telephone System: Maintain existing system in service until new system is complete and ready for service. Disable system only to make switchovers and connections. Minimize outage duration.

1. Notify Nanuet Union Free School District at least 24 hours before partially or completely disabling system.

2. Notify telephone utility company at least 24 hours before partially or completely disabling system.

3. Make temporary connections to maintain service in areas adjacent to work area.

3.3 DEMOLITION AND EXTENSION OF EXISTING ELECTRICAL WORK

A. Perform work for removal and disposal of equipment and materials containing toxic substances regulated under the Federal Toxic Substances Control Act (TSCA) in accordance with applicable federal, state, and local regulations. Applicable equipment and materials include, but are not limited to:

1. PCB-containing electrical equipment, including transformers, capacitors, and switches.

2. PCB- and DEHP-containing lighting ballasts.

3. Mercury-containing lamps and tubes, including fluorescent lamps, high intensity discharge (HID), arc lamps, ultra-violet, high pressure sodium, mercury vapor, ignitron tubes, neon, and incandescent.

B. Remove, relocate, and extend existing installations to accommodate new construction.

C. Remove abandoned wiring to source of supply.

D. Remove exposed abandoned conduit, including abandoned conduit above accessible ceiling finishes. Cut conduit flush with walls and floors, and patch surfaces.

E. Maintain access to existing electrical installations that remain active. Modify installation or provide access panel as appropriate.

F. Extend existing installations using materials and methods compatible with existing electrical installations, or as specified.

3.4 CLEANING AND REPAIR

A. Clean and repair existing materials and equipment that remain or that are to be reused.

END OF SECTION

SECTION 260519 - LOW-VOLTAGE ELECTRICAL POWER CONDUCTORS AND CABLES

PART 1 GENERAL

1.1 SECTION INCLUDES

A. Single conductor building wire.

B. Armored cable.

C. Metal-clad cable.

D. Wiring connectors.

E. Electrical tape.

F. Heat shrink tubing.

G. Wire pulling lubricant.

1.2 REFERENCE STANDARDS

A. ASTM B3 - Standard Specification for Soft or Annealed Copper Wire; 2013.

B. ASTM B8 - Standard Specification for Concentric-Lay-Stranded Copper Conductors, Hard, Medium-Hard, or Soft; 2011.

C. ASTM B787/B787M - Standard Specification for 19 Wire Combination Unilay-Stranded Copper Conductors for Subsequent Insulation; 2004 (Reapproved 2014).

D. ASTM D3005 - Standard Specification for Low-Temperature Resistant Vinyl Chloride Plastic Pressure-Sensitive Electrical Insulating Tape; 2010.

E. ASTM D4388 - Standard Specification for Nonmetallic Semi-Conducting and Electrically Insulating Rubber Tapes; 2013.

F. NECA 1 - Standard for Good Workmanship in Electrical Construction; 2010.

G. NEMA WC 70 - Nonshielded Power Cable 2000 V or Less for the Distribution of Electrical Energy; 2009.

H. NFPA 70 - National Electrical Code; Most Recent Edition Adopted by Authority Having Jurisdiction, Including All Applicable Amendments and Supplements.

I. UL 44 - Thermoset-Insulated Wires and Cables; Current Edition, Including All Revisions.

J. UL 83 - Thermoplastic-Insulated Wires and Cables; Current Edition, Including All Revisions.

K. UL 486A-486B - Wire Connectors; Current Edition, Including All Revisions.

L. UL 486C - Splicing Wire Connectors; Current Edition, Including All Revisions.

M. UL 486D - Sealed Wire Connector Systems; Current Edition, Including All Revisions.

N. UL 510 - Polyvinyl Chloride, Polyethylene, and Rubber Insulating Tape; Current Edition, Including All Revisions.

1.3 ADMINISTRATIVE REQUIREMENTS

A. Coordination:

1. Coordinate sizes of raceways, boxes, and equipment enclosures installed under other sections with the actual conductors to be installed, including adjustments for conductor sizes increased for voltage drop.

2. Coordinate with electrical equipment installed under other sections to provide terminations suitable for use with the conductors to be installed.

3. Notify Engineer of any conflicts with or deviations from Contract Documents. Obtain direction before proceeding with work.

1.4 SUBMITTALS

A. Product Data: Provide manufacturer's standard catalog pages and data sheets for conductors and cables, including detailed information on materials, construction, ratings, listings, and available sizes, configurations, and stranding.

B. Project Record Documents: Record actual installed circuiting arrangements. Record actual routing for underground circuits.

1.5 QUALITY ASSURANCE

A. Comply with requirements of NFPA 70.

B. Maintain at the project site a copy of each referenced document that prescribes execution requirements.

C. Manufacturer Qualifications: Company specializing in manufacturing the products specified in this section with minimum three years documented experience.

D. Product Listing Organization Qualifications: An organization recognized by OSHA as a Nationally Recognized Testing Laboratory (NRTL) and acceptable to authorities having jurisdiction.

1.6 DELIVERY, STORAGE, AND HANDLING

A. Receive, inspect, handle, and store conductors and cables in accordance with manufacturer's instructions.

1.7 FIELD CONDITIONS

A. Do not install or otherwise handle thermoplastic-insulated conductors at temperatures lower than 14 degrees F, unless otherwise permitted by manufacturer's instructions.

When installation below this temperature is unavoidable, notify Engineer and obtain direction before proceeding with work.

PART 2 PRODUCTS

2.1 CONDUCTOR AND CABLE APPLICATIONS

A. Do not use conductors and cables for applications other than as permitted by NFPA 70 and product listing.

B. Provide single conductor building wire installed in suitable raceway unless otherwise indicated, permitted, or required.

C. Nonmetallic-sheathed cable is not permitted.

D. Underground feeder and branch-circuit cable is not permitted.

E. Service entrance cable is not permitted.

F. MC cable is not permitted, except as indicated below:.

1. Where not otherwise restricted, may be used:

a. Where concealed above accessible ceilings for final connections from junction boxes to luminaires.

b. Where concealed in hollow stud walls, above accessible ceilings, and under raised floors for branch circuits up to 20 A.

1) Exception: Provide single conductor building wire in raceway for circuit homerun from first outlet to panelboard.

2. In addition to other applicable restrictions, may not be used:

a. Where exposed to view.

b. Where exposed to damage.

c. For damp, wet, or corrosive locations, unless provided with a PVC jacket listed as suitable for those locations.

2.2 CONDUCTOR AND CABLE GENERAL REQUIREMENTS

A. Provide products that comply with requirements of NFPA 70.

B. Provide products listed, classified, and labeled as suitable for the purpose intended.

C. Provide new conductors and cables manufactured not more than one year prior to installation.

D. Unless specifically indicated to be excluded, provide all required conduit, boxes, wiring, connectors, etc. as required for a complete operating system.

E. Comply with NEMA WC 70.

F. Thermoplastic-Insulated Conductors and Cables: Listed and labeled as complying with UL 83.

G. Thermoset-Insulated Conductors and Cables: Listed and labeled as complying with UL 44.

H. Conductors for Grounding and Bonding: Also comply with Section 260526.

I. Conductors and Cables Installed Exposed in Spaces Used for Environmental Air (only where specifically permitted): Plenum rated, listed and labeled as suitable for use in return air plenums.

J. Conductor Material:

1. Provide copper conductors only. Aluminum conductors are not acceptable for this project. Conductor sizes indicated are based on copper.

2. Copper Conductors: Soft drawn annealed, 98 percent conductivity, uncoated copper conductors complying with ASTM B3, ASTM B8, or ASTM B787/B787M unless otherwise indicated.

K. Minimum Conductor Size:

1. Branch Circuits: 12 AWG.

a. Exceptions:

1) 20 A, 120 V circuits longer than 75 feet: 10 AWG, for voltage drop.

2) 20 A, 120 V circuits longer than 150 feet: 8 AWG, for voltage drop.

L. Where conductor size is not indicated, size to comply with NFPA 70 but not less than applicable minimum size requirements specified.

M. Conductor Color Coding:

1. Color code conductors as indicated unless otherwise required by the authority having jurisdiction. Maintain consistent color coding throughout project.

2. Color Coding Method: Integrally colored insulation.

a. Conductors size 4 AWG and larger may have black insulation color coded using vinyl color coding electrical tape.

3. Color Code:

a. 480Y/277 V, 3 Phase, 4 Wire System:

1) Phase A: Brown.

2) Phase B: Orange.

3) Phase C: Yellow.

4) Neutral/Grounded: Gray.

b. 208Y/120 V, 3 Phase, 4 Wire System:

1) Phase A: Black.

2) Phase B: Red.

3) Phase C: Blue.

4) Neutral/Grounded: White.

c. Equipment Ground, All Systems: Green.

d. Travelers for 3-Way and 4-Way Switching: Pink.

e. For control circuits, comply with manufacturer's recommended color code.

2.3 SINGLE CONDUCTOR BUILDING WIRE

A. Manufacturers:

1. Copper Building Wire:

a. Cerro Wire LLC: www.cerrowire.com/#sle.

b. Encore Wire Corporation: www.encorewire.com/#sle.

c. Southwire Company: www.southwire.com/#sle.

B. Description: Single conductor insulated wire.

C. Conductor Stranding:

1. Feeders and Branch Circuits:

a. Size 10 AWG and Smaller: Solid.

b. Size 8 AWG and Larger: Stranded.

2. Control Circuits: Stranded.

D. Insulation Voltage Rating: 600 V.

E. Insulation:

1. Copper Building Wire: Type THHN/THWN or THHN/THWN-2, except as indicated below.

a. Installed Underground: Type XHHW-2.

b. Fixture Wiring Within Luminaires: Type TFFN/TFN for luminaires with labeled maximum temperature of 90 degrees C; Approved suitable type for luminaires with labeled maximum temperature greater than 90 degrees C.

2.4 WIRING CONNECTORS

A. Description: Wiring connectors appropriate for the application, suitable for use with the conductors to be connected, and listed as complying with UL 486A-486B or UL 486C as applicable.

B. Connectors for Grounding and Bonding: Comply with Section 260526.

C. Wiring Connectors for Splices and Taps:

1. Copper Conductors Size 8 AWG and Smaller: Use twist-on insulated spring connectors.

2. Copper Conductors Size 6 AWG and Larger: Use mechanical connectors or compression connectors.

D. Wiring Connectors for Terminations:

1. Provide terminal lugs for connecting conductors to equipment furnished with terminations designed for terminal lugs.

2. Provide compression adapters for connecting conductors to equipment furnished with mechanical lugs when only compression connectors are specified.

3. Where over-sized conductors are larger than the equipment terminations can accommodate, provide connectors suitable for reducing to appropriate size, but not less than required for the rating of the overcurrent protective device.

4. Provide motor pigtail connectors for connecting motor leads in order to facilitate disconnection.

5. Copper Conductors Size 8 AWG and Larger: Use mechanical connectors or compression connectors where connectors are required.

E. Do not use insulation-piercing or insulation-displacement connectors designed for use with conductors without stripping insulation.

F. Do not use push-in wire connectors as a substitute for twist-on insulated spring connectors.

G. Twist-on Insulated Spring Connectors: Rated 600 V, 221 degrees F for standard applications and 302 degrees F for high temperature applications; pre-filled with sealant and listed as complying with UL 486D for damp and wet locations.

1. Manufacturers:

a. 3M: www.3m.com/#sle.

b. Ideal Industries, Inc: www.idealindustries.com/#sle.

c. NSI Industries LLC: www.nsiindustries.com/#sle.

H. Mechanical Connectors: Provide bolted type or set-screw type.

1. Manufacturers:

a. Burndy: www.burndy.com.

b. Ilsco: www.ilsco.com/#sle.

c. Thomas & Betts Corporation: www.tnb.com/#sle.

I. Compression Connectors: Provide circumferential type or hex type crimp configuration.

1. Manufacturers:

a. Burndy: www.burndy.com.

b. Ilsco: www.ilsco.com/#sle.

c. Thomas & Betts Corporation: www.tnb.com/#sle.

J. Crimped Terminals: Nylon-insulated, with insulation grip and terminal configuration suitable for connection to be made.

1. Manufacturers:

a. Burndy: www.burndy.com.

b. Ilsco: www.ilsco.com/#sle.

c. Thomas & Betts Corporation: www.tnb.com/#sle.

2.5 ACCESSORIES

A. Electrical Tape:

1. Manufacturers:

a. 3M: www.3m.com/#sle.

b. Plymouth Rubber Europa: www.plymouthrubber.com/#sle.

2. Vinyl Color Coding Electrical Tape: Integrally colored to match color code indicated; listed as complying with UL 510; minimum thickness of 7 mil; resistant to abrasion, corrosion, and sunlight; suitable for continuous temperature environment up to 221 degrees F.

3. Vinyl Insulating Electrical Tape: Complying with ASTM D3005 and listed as complying with UL 510; minimum thickness of 7 mil; resistant to abrasion, corrosion, and sunlight; conformable for application down to 0 degrees F and suitable for continuous temperature environment up to 221 degrees F.

4. Rubber Splicing Electrical Tape: Ethylene Propylene Rubber (EPR) tape, complying with ASTM D4388; minimum thickness of 30 mil; suitable for continuous temperature environment up to 194 degrees F and short-term 266 degrees F overload service.

5. Electrical Filler Tape: Rubber-based insulating moldable putty, minimum thickness of 125 mil; suitable for continuous temperature environment up to 176 degrees F.

6. Moisture Sealing Electrical Tape: Insulating mastic compound laminated to flexible, all-weather vinyl backing; minimum thickness of 90 mil.

B. Heat Shrink Tubing: Heavy-wall, split-resistant, with factory-applied adhesive; rated 600 V; suitable for direct burial applications; listed as complying with UL 486D.

1. Manufacturers:

a. 3M: www.3m.com/#sle.

b. Burndy: www.burndy.com.

c. Thomas & Betts Corporation: www.tnb.com/#sle.

C. Wire Pulling Lubricant: Listed; suitable for use with the conductors or cables to be installed and suitable for use at the installation temperature.

1. Manufacturers:

a. 3M: www.3m.com/#sle.

b. American Polywater Corporation: www.polywater.com/#sle.

c. Ideal Industries, Inc: www.idealindustries.com/#sle.

PART 3 EXECUTION

3.1 EXAMINATION

A. Verify that interior of building has been protected from weather.

B. Verify that work likely to damage wire and cable has been completed.

C. Verify that raceways, boxes, and equipment enclosures are installed and are properly sized to accommodate conductors and cables in accordance with NFPA 70.

D. Verify that field measurements are as indicated.

E. Verify that conditions are satisfactory for installation prior to starting work.

3.2 PREPARATION

A. Clean raceways thoroughly to remove foreign materials before installing conductors and cables.

3.3 INSTALLATION

A. Circuiting Requirements:

1. Unless dimensioned, circuit routing indicated is diagrammatic.

2. When circuit destination is indicated without specific routing, determine exact routing required.

3. Arrange circuiting to minimize splices.

4. Include circuit lengths required to install connected devices within 10 ft of location indicated.

5. Maintain separation of Class 1, Class 2, and Class 3 remote-control, signaling, and power-limited circuits in accordance with NFPA 70.

6. Maintain separation of wiring for emergency systems in accordance with NFPA 70.

7. Circuiting Adjustments: Unless otherwise indicated, when branch circuits are indicated as separate, combining them together in a single raceway is not permitted.

   a. Provide no more than six current-carrying conductors in a single raceway. Dedicated neutral conductors are considered current-carrying conductors.

   b. Increase size of conductors as required to account for ampacity derating.

   c. Size raceways, boxes, etc. to accommodate conductors.

8. Common Neutrals: Unless otherwise indicated, sharing of neutral/grounded conductors among up to three single phase branch circuits of different phases installed in the same raceway is not permitted. Provide dedicated neutral/grounded conductor for each individual branch circuit.

B. Install products in accordance with manufacturer's instructions.

C. Perform work in accordance with NECA 1 (general workmanship).

D. Installation in Raceway:

1. Tape ends of conductors and cables to prevent infiltration of moisture and other contaminants.

2. Pull all conductors and cables together into raceway at same time.

3. Do not damage conductors and cables or exceed manufacturer's recommended maximum pulling tension and sidewall pressure.

4. Use suitable wire pulling lubricant where necessary, except when lubricant is not recommended by the manufacturer.

E. Paralleled Conductors: Install conductors of the same length and terminate in the same manner.

F. Secure and support conductors and cables in accordance with NFPA 70 using suitable supports and methods approved by the authority having jurisdiction. Provide independent support from building structure. Do not provide support from raceways, piping, ductwork, or other systems.

1. Installation Above Suspended Ceilings: Do not provide support from ceiling support system. Do not provide support from ceiling grid or allow conductors and cables to lay on ceiling tiles.

2. Installation in Vertical Raceways: Provide supports where vertical rise exceeds permissible limits.

G. Install conductors with a minimum of 12 inches of slack at each outlet.

H. Neatly train and bundle conductors inside boxes, wireways, panelboards and other equipment enclosures.

I. Group or otherwise identify neutral/grounded conductors with associated ungrounded conductors inside enclosures in accordance with NFPA 70.

J. Make wiring connections using specified wiring connectors.

1. Make splices and taps only in accessible boxes. Do not pull splices into raceways or make splices in conduit bodies or wiring gutters.

2. Remove appropriate amount of conductor insulation for making connections without cutting, nicking or damaging conductors.

3. Do not remove conductor strands to facilitate insertion into connector.

4. Clean contact surfaces on conductors and connectors to suitable remove corrosion, oxides, and other contaminates. Do not use wire brush on plated connector surfaces.

5. Mechanical Connectors: Secure connections according to manufacturer's recommended torque settings.

6. Compression Connectors: Secure connections using manufacturer's recommended tools and dies.

K. Insulate splices and taps that are made with uninsulated connectors using methods suitable for the application, with insulation and mechanical strength at least equivalent to unspliced conductors.

1. Dry Locations: Use insulating covers specifically designed for the connectors, electrical tape, or heat shrink tubing.

a. For taped connections, first apply adequate amount of rubber splicing electrical tape or electrical filler tape, followed by outer covering of vinyl insulating electrical tape.

2. Damp Locations: Use insulating covers specifically designed for the connectors, electrical tape, or heat shrink tubing.

a. For connections with insulating covers, apply outer covering of moisture sealing electrical tape.

b. For taped connections, follow same procedure as for dry locations but apply outer covering of moisture sealing electrical tape.

3. Wet Locations: Use heat shrink tubing.

L. Insulate ends of spare conductors using vinyl insulating electrical tape.

M. Field-Applied Color Coding: Where vinyl color coding electrical tape is used in lieu of integrally colored insulation as permitted in Part 2 under "Color Coding", apply half overlapping turns of tape at each termination and at each location conductors are accessible.

N. Identify conductors and cables in accordance with Section 260553.

O. Install firestopping to preserve fire resistance rating of partitions and other elements, using materials and methods specified in Section 078400.

P. Unless specifically indicated to be excluded, provide final connections to all equipment and devices, including those furnished by others, as required for a complete operating system.

END OF SECTION

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SECTION 260526 - GROUNDING AND BONDING FOR ELECTRICAL SYSTEMS

PART 1 GENERAL

1.1 SECTION INCLUDES

A. Grounding and bonding requirements.

B. Conductors for grounding and bonding.

C. Connectors for grounding and bonding.

D. Ground bars.

E. Ground rod electrodes.

1.2 REFERENCE STANDARDS

A. NECA 1 - Standard for Good Workmanship in Electrical Construction; 2010.

B. NETA ATS - Acceptance Testing Specifications for Electrical Power Equipment and Systems; 2013.

C. NFPA 70 - National Electrical Code; Most Recent Edition Adopted by Authority Having Jurisdiction, Including All Applicable Amendments and Supplements.

D. UL 467 - Grounding and Bonding Equipment; Current Edition, Including All Revisions.

1.3 ADMINISTRATIVE REQUIREMENTS

A. Coordination:

1. Verify exact locations of underground metal water service pipe entrances to building.

2. Coordinate the work with other trades to provide steel reinforcement complying with specified requirements for concrete-encased electrode.

3. Notify Engineer of any conflicts with or deviations from Contract Documents. Obtain direction before proceeding with work.

1.4 SUBMITTALS

A. Product Data: Provide manufacturer's standard catalog pages and data sheets for grounding and bonding system components.

1.5 QUALITY ASSURANCE

A. Comply with requirements of NFPA 70.

B. Maintain at the project site a copy of each referenced document that prescribes execution requirements.

C. Manufacturer Qualifications: Company specializing in manufacturing the products specified in this section with minimum three years documented experience.

1.6 DELIVERY, STORAGE, AND HANDLING

A. Receive, inspect, handle, and store products in accordance with manufacturer's instructions.

PART 2 PRODUCTS

2.1 GROUNDING AND BONDING REQUIREMENTS

A. Do not use products for applications other than as permitted by NFPA 70 and product listing.

B. Unless specifically indicated to be excluded, provide all required components, conductors, connectors, conduit, boxes, fittings, supports, accessories, etc. as necessary for a complete grounding and bonding system.

C. Where conductor size is not indicated, size to comply with NFPA 70 but not less than applicable minimum size requirements specified.

D. Bonding and Equipment Grounding:

1. Provide bonding for equipment grounding conductors, equipment ground busses, metallic equipment enclosures, metallic raceways and boxes, device grounding terminals, and other normally non-current-carrying conductive materials enclosing electrical conductors/equipment or likely to become energized as indicated and in accordance with NFPA 70.

2. Provide insulated equipment grounding conductor in each feeder and branch circuit raceway. Do not use raceways as sole equipment grounding conductor.

3. Where circuit conductor sizes are increased for voltage drop, increase size of equipment grounding conductor proportionally in accordance with NFPA 70.

4. Unless otherwise indicated, connect wiring device grounding terminal to branch circuit equipment grounding conductor and to outlet box with bonding jumper.

5. Terminate branch circuit equipment grounding conductors on solidly bonded equipment ground bus only. Do not terminate on neutral (grounded) bus.

6. Provide bonding jumper across expansion or expansion/deflection fittings provided to accommodate conduit movement.

2.2 GROUNDING AND BONDING COMPONENTS

A. General Requirements:

1. Provide products listed, classified, and labeled as suitable for the purpose intended.

2. Provide products listed and labeled as complying with UL 467 where applicable.

B. Conductors for Grounding and Bonding, in Addition to Requirements of Section 260526:

1. Use insulated copper conductors unless otherwise indicated.

a. Exceptions:

1) Use bare copper conductors where installed underground in direct contact with earth.

2) Use bare copper conductors where directly encased in concrete (not in raceway).

C. Connectors for Grounding and Bonding:

1. Description: Connectors appropriate for the application and suitable for the conductors and items to be connected; listed and labeled as complying with UL 467.

2. Unless otherwise indicated, use exothermic welded connections for underground, concealed and other inaccessible connections.

3. Unless otherwise indicated, use mechanical connectors, compression connectors, or exothermic welded connections for accessible connections.

4. Manufacturers - Mechanical and Compression Connectors:

a. Advanced Lightning Technology (ALT): www.altfab.com/#sle.

b. Burndy: www.burndy.com.

c. Harger Lightning & Grounding: www.harger.com/#sle.

d. Thomas & Betts Corporation: www.tnb.com/#sle.

5. Manufacturers - Exothermic Welded Connections:

a. Burndy: www.burndy.com.

b. Cadweld, a brand of Erico International Corporation: www.erico.com/#sle.

c. thermOweld, subsidiary of Continental Industries; division of Burndy LLC : www.thermoweld.com/#sle.

PART 3 EXECUTION

3.1 EXAMINATION

A. Verify that work likely to damage grounding and bonding system components has been completed.

B. Verify that field measurements are as indicated.

C. Verify that conditions are satisfactory for installation prior to starting work.

3.2 INSTALLATION

A. Install products in accordance with manufacturer's instructions.

B. Perform work in accordance with NECA 1 (general workmanship).

C. Make grounding and bonding connections using specified connectors.

1. Remove appropriate amount of conductor insulation for making connections without cutting, nicking or damaging conductors. Do not remove conductor strands to facilitate insertion into connector.

2. Remove nonconductive paint, enamel, or similar coating at threads, contact points, and contact surfaces.

3. Exothermic Welds: Make connections using molds and weld material suitable for the items to be connected in accordance with manufacturer's recommendations.

4. Mechanical Connectors: Secure connections according to manufacturer's recommended torque settings.

5. Compression Connectors: Secure connections using manufacturer's recommended tools and dies.

D. Identify grounding and bonding system components in accordance with Section 260553.

3.3 FIELD QUALITY CONTROL

A. Inspect and test in accordance with NETA ATS except Section 4.

B. Perform inspections and tests listed in NETA ATS, Section 7.13.

C. Perform ground electrode resistance tests under normally dry conditions. Precipitation within the previous 48 hours does not constitute normally dry conditions.

D. Investigate and correct deficiencies where measured ground resistances do not comply with specified requirements.

END OF SECTION

SECTION 260529 - HANGERS AND SUPPORTS FOR ELECTRICAL SYSTEMS

PART 1 GENERAL

1.1 SECTION INCLUDES

A. Support and attachment requirements and components for equipment, conduit, cable, boxes, and other electrical work.

1.2 REFERENCE STANDARDS

A. ASTM A123/A123M - Standard Specification for Zinc (Hot-Dip Galvanized) Coatings on Iron and Steel Products; 2015.

B. ASTM A153/A153M - Standard Specification for Zinc Coating (Hot-Dip) on Iron and Steel Hardware; 2009.

C. ASTM B633 - Standard Specification for Electrodeposited Coatings of Zinc on Iron and Steel; 2013.

D. MFMA-4 - Metal Framing Standards Publication; 2004.

E. NECA 1 - Standard for Good Workmanship in Electrical Construction; 2010.

F. NFPA 70 - National Electrical Code; Most Recent Edition Adopted by Authority Having Jurisdiction, Including All Applicable Amendments and Supplements.

G. UL 5B - Strut-Type Channel Raceways and Fittings; Current Edition, Including All Revisions.

1.3 ADMINISTRATIVE REQUIREMENTS

A. Coordination:

1. Coordinate sizes and arrangement of supports and bases with the actual equipment and components to be installed.

2. Coordinate the work with other trades to provide additional framing and materials required for installation.

3. Coordinate compatibility of support and attachment components with mounting surfaces at the installed locations.

4. Coordinate the arrangement of supports with ductwork, piping, equipment and other potential conflicts installed under other sections or by others.

5. Notify Engineer of any conflicts with or deviations from Contract Documents. Obtain direction before proceeding with work.

B. Sequencing:

1. Do not install products on or provide attachment to concrete surfaces until concrete has fully cured in accordance with Section 033000.

1.4 QUALITY ASSURANCE

A. Comply with NFPA 70.

B. Comply with applicable building code.

1.5 DELIVERY, STORAGE, AND HANDLING

A. Receive, inspect, handle, and store products in accordance with manufacturer's instructions.

PART 2 PRODUCTS

2.1 SUPPORT AND ATTACHMENT COMPONENTS

A. General Requirements:

1. Provide all required hangers, supports, anchors, fasteners, fittings, accessories, and hardware as necessary for the complete installation of electrical work.

2. Provide products listed, classified, and labeled as suitable for the purpose intended, where applicable.

3. Where support and attachment component types and sizes are not indicated, select in accordance with manufacturer's application criteria as required for the load to be supported with a minimum safety factor of 1.5. Include consideration for vibration, equipment operation, and shock loads where applicable.

4. Do not use products for applications other than as permitted by NFPA 70 and product listing.

5. Do not use wire, chain, perforated pipe strap, or wood for permanent supports unless specifically indicated or permitted.

6. Steel Components: Use corrosion resistant materials suitable for the environment where installed.

a. Indoor Dry Locations: Use zinc-plated steel or approved equivalent unless otherwise indicated.

b. Outdoor and Damp or Wet Indoor Locations: Use galvanized steel, stainless steel, or approved equivalent unless otherwise indicated.

c. Zinc-Plated Steel: Electroplated in accordance with ASTM B633.

d. Galvanized Steel: Hot-dip galvanized after fabrication in accordance with ASTM A123/A123M or ASTM A153/A153M.

e. Provide field galvanizing or equivalent to all ends of field-cut materials (struts, hangers, and rods).

f. Use approved zinc-rich paint or conduit joint compound on field-cut threads of galvanized steel conduits prior to making connections

B. Conduit and Cable Supports: Straps, clamps, etc. suitable for the conduit or cable to be supported.

1. Conduit Straps: One-hole or two-hole type; steel or malleable iron.

2. Conduit Clamps: Bolted type unless otherwise indicated.

3. Manufacturers:

a. Cooper Crouse-Hinds, a division of Eaton Corporation: www.cooperindustries.com/#sle.

b. Erico International Corporation: www.erico.com/#sle.

c. O-Z/Gedney, a brand of Emerson Electric Co: www.emerson.com/#sle.

d. Thomas & Betts Corporation: www.tnb.com/#sle.

C. Outlet Box Supports: Hangers, brackets, etc. suitable for the boxes to be supported.

1. Manufacturers:

a. Cooper Crouse-Hinds, a division of Eaton Corporation: www.cooperindustries.com/#sle.

b. Erico International Corporation: www.erico.com/#sle.

c. O-Z/Gedney, a brand of Emerson Electric Co: www.emerson.com/#sle.

d. Thomas & Betts Corporation: www.tnb.com/#sle.

D. Metal Channel (Strut) Framing Systems: Factory-fabricated continuous-slot metal channel (strut) and associated fittings, accessories, and hardware required for field-assembly of supports.

1. Comply with MFMA-4.

2. Channel (Strut) Used as Raceway (only where specifically indicated): Listed and labeled as complying with UL 5B.

3. Channel Material:

a. Indoor Dry Locations: Use painted steel, zinc-plated steel, or galvanized steel.

b. Outdoor and Damp or Wet Indoor Locations: Use galvanized steel.

4. Minimum Channel Thickness: Steel sheet, 12 gauge, 0.1046 inch.

5. Minimum Channel Dimensions: 1-5/8 inch width by 13/16 inch height.

6. Manufacturers:

   a. Cooper B-Line, a division of Eaton Corporation: www.cooperindustries.com/#sle.

   b. Thomas & Betts Corporation: www.tnb.com/#sle.

   c. Unistrut, a brand of Atkore International Inc: www.unistrut.com/#sle.

   d. Source Limitations: Furnish channels (struts) and associated fittings, accessories, and hardware produced by a single manufacturer.

E. Hanger Rods: Threaded zinc-plated steel unless otherwise indicated.

1. Minimum Size, Unless Otherwise Indicated or Required:

   a. Equipment Supports: 1/2 inch diameter.

   b. Busway Supports: 1/2 inch diameter.

   c. Single Conduit up to 1 inch (27 mm) trade size: 1/4 inch diameter.

   d. Single Conduit larger than 1 inch (27 mm) trade size: 3/8 inch diameter.

   e. Trapeze Support for Multiple Conduits: 3/8 inch diameter.

   f. Outlet Boxes: 1/4 inch diameter.

   g. Luminaires: 1/4 inch diameter.

F. Anchors and Fasteners:

1. Unless otherwise indicated and where not otherwise restricted, use the anchor and fastener types indicated for the specified applications.

2. Concrete: Use preset concrete inserts, expansion anchors, or screw anchors.

3. Solid or Grout-Filled Masonry: Use expansion anchors or screw anchors.

4. Hollow Masonry: Use toggle bolts.

5. Hollow Stud Walls: Use toggle bolts.

6. Steel: Use beam clamps, machine bolts, or welded threaded studs.

7. Sheet Metal: Use sheet metal screws.

8. Wood: Use wood screws.

9. Plastic and lead anchors are not permitted.

10. Powder-actuated fasteners are not permitted.

a. Where approved by Engineer.

b. Use only threaded studs; do not use pins.

11. Hammer-driven anchors and fasteners are not permitted.

12. Preset Concrete Inserts: Continuous metal channel (strut) and spot inserts specifically designed to be cast in concrete ceilings, walls, and floors.

    a. Comply with MFMA-4.

    b. Channel Material: Use galvanized steel.

    c. Minimum Channel Thickness: Steel sheet, 12 gauge, 0.1046 inch minimum base metal thickness.

    d. Manufacturer: Same as manufacturer of metal channel (strut) framing system.

13. Post-Installed Concrete and Masonry Anchors: Evaluated and recognized by ICC Evaluation Service, LLC (ICC-ES) for compliance with applicable building code.

14. Manufacturers - Mechanical Anchors:

    a. Hilti, Inc: www.us.hilti.com/#sle.

    b. ITW Red Head, a division of Illinois Tool Works, Inc: www.itwredhead.com/#sle.

    c. Powers Fasteners, Inc: www.powers.com/#sle.

    d. Simpson Strong-Tie Company Inc: www.strongtie.com/#sle.

15. Manufacturers - Powder-Actuated Fastening Systems:

    a. Hilti, Inc: www.us.hilti.com/#sle.

    b. ITW Ramset, a division of Illinois Tool Works, Inc: www.ramset.com/#sle.

    c. Powers Fasteners, Inc: www.powers.com/#sle.

    d. Simpson Strong-Tie Company Inc: www.strongtie.com/#sle.

PART 3 EXECUTION

3.1 EXAMINATION

A. Verify that field measurements are as indicated.

B. Verify that mounting surfaces are ready to receive support and attachment components.

C. Verify that conditions are satisfactory for installation prior to starting work.

3.2 INSTALLATION

A. Install products in accordance with manufacturer's instructions.

B. Perform work in accordance with NECA 1 (general workmanship).

C. Install anchors and fasteners in accordance with ICC Evaluation Services, LLC (ICC-ES) evaluation report conditions of use where applicable.

D. Provide independent support from building structure. Do not provide support from piping, ductwork, or other systems.

E. Unless specifically indicated or approved by Engineer, do not provide support from suspended ceiling support system or ceiling grid.

F. Unless specifically indicated or approved by Engineer, do not provide support from roof deck.

G. Do not penetrate or otherwise notch or cut structural members without approval of Structural Engineer.

H. Equipment Support and Attachment:

1. Use metal fabricated supports or supports assembled from metal channel (strut) to support equipment as required.

2. Use metal channel (strut) secured to studs to support equipment surface-mounted on hollow stud walls when wall strength is not sufficient to resist pull-out.

3. Use metal channel (strut) to support surface-mounted equipment in wet or damp locations to provide space between equipment and mounting surface.

4. Securely fasten floor-mounted equipment. Do not install equipment such that it relies on its own weight for support.

I. Conduit Support and Attachment: Also comply with Section 260533.13.

J. Interior Luminaire Support and Attachment: Also comply with Section 265100.

K. Exterior Luminaire Support and Attachment: Also comply with Section 265600.

L. Preset Concrete Inserts: Use manufacturer provided closure strips to inhibit concrete seepage during concrete pour.

M. Secure fasteners according to manufacturer's recommended torque settings.

N. Remove temporary supports.

O. Identify independent electrical component support wires above accessible ceilings (only where specifically indicated or permitted) with color distinguishable from ceiling support wires in accordance with NFPA 70.

3.3 FIELD QUALITY CONTROL

A. Inspect support and attachment components for damage and defects.

B. Repair cuts and abrasions in galvanized finishes using zinc-rich paint recommended by manufacturer. Replace components that exhibit signs of corrosion.

C. Correct deficiencies and replace damaged or defective support and attachment components.

END OF SECTION

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SECTION 260533.13 - CONDUIT FOR ELECTRICAL SYSTEMS

PART 1 GENERAL

1.1 SECTION INCLUDES

A. Galvanized steel rigid metal conduit (RMC).

B. Flexible metal conduit (FMC).

C. Liquidtight flexible metal conduit (LFMC).

D. Electrical metallic tubing (EMT).

E. Conduit fittings.

F. Accessories.

1.2 REFERENCE STANDARDS

A. ANSI C80.1 - American National Standard for Electrical Rigid Steel Conduit (ERSC); 2005.

B. NECA 1 - Standard for Good Workmanship in Electrical Construction; 2010.

C. NECA 101 - Standard for Installing Steel Conduits (Rigid, IMC, EMT); 2013.

D. NEMA FB 1 - Fittings, Cast Metal Boxes, and Conduit Bodies for Conduit, Electrical Metallic Tubing, and Cable; 2012.

E. NEMA TC 2 - Electrical Polyvinyl Chloride (PVC) Conduit; 2013.

F. NFPA 70 - National Electrical Code; Most Recent Edition Adopted by Authority Having Jurisdiction, Including All Applicable Amendments and Supplements.

G. UL 1 - Flexible Metal Conduit; Current Edition, Including All Revisions.

H. UL 6 - Electrical Rigid Metal Conduit-Steel; Current Edition, Including All Revisions.

I. UL 360 - Liquid-Tight Flexible Steel Conduit; Current Edition, Including All Revisions.

J. UL 514B - Conduit, Tubing, and Cable Fittings; Current Edition, Including All Revisions.

K. UL 797 - Electrical Metallic Tubing-Steel; Current Edition, Including All Revisions.

L. UL 1203 - Explosion-Proof and Dust-Ignition-Proof Electrical Equipment for Use in Hazardous (Classified) Locations; Current Edition, Including All Revisions.

1.3 ADMINISTRATIVE REQUIREMENTS

A. Coordination:

1. Coordinate minimum sizes of conduits with the actual conductors to be installed, including adjustments for conductor sizes increased for voltage drop.

2. Coordinate the arrangement of conduits with structural members, ductwork, piping, equipment and other potential conflicts installed under other sections or by others.

3. Verify exact conduit termination locations required for boxes, enclosures, and equipment installed under other sections or by others.

4. Coordinate the work with other trades to provide roof penetrations that preserve the integrity of the roofing system and do not void the roof warranty.

5. Notify Engineer of any conflicts with or deviations from Contract Documents. Obtain direction before proceeding with work.

B. Sequencing:

1. Do not begin installation of conductors and cables until installation of conduit is complete between outlet, junction and splicing points.

1.4 SUBMITTALS

A. Product Data: Provide manufacturer's standard catalog pages and data sheets for conduits and fittings.

B. Project Record Documents: Record actual routing for conduits installed underground, conduits embedded within concrete slabs, and conduits 2-inch (53 mm) trade size and larger.

1.5 QUALITY ASSURANCE

A. Comply with requirements of NFPA 70.

B. Maintain at the project site a copy of each referenced document that prescribes execution requirements.

C. Product Listing Organization Qualifications: An organization recognized by OSHA as a Nationally Recognized Testing Laboratory (NRTL) and acceptable to authorities having jurisdiction.

1.6 DELIVERY, STORAGE, AND HANDLING

A. Receive, inspect, handle, and store conduit and fittings in accordance with manufacturer's instructions.

PART 2 PRODUCTS

2.1 CONDUIT APPLICATIONS

A. Do not use conduit and associated fittings for applications other than as permitted by NFPA 70 and product listing.

B. Unless otherwise indicated and where not otherwise restricted, use the conduit types indicated for the specified applications. Where more than one listed application applies, comply with the most restrictive requirements. Where conduit type for a particular application is not specified, use galvanized steel rigid metal conduit.

C. Underground:

1. Under Slab on Grade: Use galvanized steel rigid metal conduit, intermediate metal conduit (IMC), PVC-coated galvanized steel rigid metal conduit, or rigid PVC conduit .

2. Exterior, Direct-Buried: Use galvanized steel rigid metal conduit or rigid PVC conduit .

3. Exterior, Embedded Within Concrete: Use galvanized steel rigid metal conduit or rigid PVC conduit.

4. Where rigid polyvinyl (PVC) conduit is provided, transition to galvanized steel rigid metal conduit where emerging from underground.

5. Where rigid polyvinyl (PVC) conduit larger than 2 inch (53 mm) trade size is provided, use galvanized steel rigid metal conduit elbows for bends.

6. Where steel conduit is installed in direct contact with earth where soil has a resistivity of less than 2000 ohm-centimeters or is characterized as severely corrosive based on soils report or local experience, use corrosion protection tape to provide supplementary corrosion protection or use PVC-coated galvanized steel rigid metal conduit.

D. Embedded Within Concrete:

1. Within Slab on Grade: Not permitted.

E. Concealed Within Masonry Walls: Use galvanized steel rigid metal conduit, intermediate metal conduit (IMC), or electrical metallic tubing (EMT).

F. Concealed Within Hollow Stud Walls: Use galvanized steel rigid metal conduit, intermediate metal conduit (IMC), or electrical metallic tubing (EMT).

G. Concealed Above Accessible Ceilings: Use galvanized steel rigid metal conduit, intermediate metal conduit (IMC), or electrical metallic tubing (EMT).

H. Interior, Damp or Wet Locations: Use galvanized steel rigid metal conduit.

I. Exposed, Interior, Not Subject to Physical Damage: Use galvanized steel rigid metal conduit, intermediate metal conduit (IMC), or electrical metallic tubing (EMT).

J. Exposed, Interior, Subject to Physical Damage: Use galvanized steel rigid metal conduit.

1. Locations subject to physical damage include, but are not limited to:

a. Where exposed below 8 feet, except within electrical and communication rooms or closets.

K. Exposed, Interior, Subject to Severe Physical Damage: Use galvanized steel rigid metal conduit (RMC).

L. Exposed, Exterior: Use galvanized steel rigid metal conduit or PVC-coated galvanized steel rigid metal conduit.

M. Concealed, Exterior, Not Embedded in Concrete or in Contact With Earth: Use galvanized steel rigid metal conduit.

N. Hazardous (Classified) Locations: Use galvanized steel rigid metal conduit.

O. Connections to Luminaires Above Accessible Ceilings: Use flexible metal conduit.

1. Maximum Length: 6 feet.

P. Connections to Vibrating Equipment:

1. Dry Locations: Use flexible metal conduit.

2. Damp, Wet, or Corrosive Locations: Use liquidtight flexible metal conduit.

3. Maximum Length: 6 feet unless otherwise indicated.

4. Vibrating equipment includes, but is not limited to:

a. Transformers.

b. Motors.

Q. Fished in Existing Walls, Where Necessary: Use flexible metal conduit (FMC) or galvanized steel electrical metallic tubing (EMT).

2.2 CONDUIT REQUIREMENTS

A. Existing Work: Where existing conduits are indicated to be reused, they may be reused only where they comply with specified requirements, are free from corrosion, and integrity is verified by pulling mandrel through them.

B. Communications Systems Conduits: Also comply with Section 271000.

C. Fittings for Grounding and Bonding: Also comply with Section 260526.

D. Provide all conduit, fittings, supports, and accessories required for a complete raceway system.

E. Provide products listed, classified, and labeled as suitable for the purpose intended.

F. Minimum Conduit Size, Unless Otherwise Indicated:

1. Branch Circuits: 3/4 inch (21 mm) trade size.

2. Branch Circuit Homeruns: 3/4 inch (21 mm) trade size.

3. Control Circuits: 3/4 inch (21 mm) trade size.

4. Flexible Connections to Luminaires: 3/8 inch (12 mm) trade size.

5. Underground, Interior: 1 inch (27 mm) trade size.

6. Underground, Exterior: 1 inch (27 mm) trade size.

G. Where conduit size is not indicated, size to comply with NFPA 70 but not less than applicable minimum size requirements specified.

2.3 GALVANIZED STEEL RIGID METAL CONDUIT (RMC)

A. Manufacturers:

1. Allied Tube & Conduit, a division of Atkore International: www.alliedeg.com/#sle.

2. Nucor Tubular Products: www.nucortubular.com/#sle.

3. Wheatland Tube, a division of Zekelman Industries: www.wheatland.com/#sle.

B. Description: NFPA 70, Type RMC galvanized steel rigid metal conduit complying with ANSI C80.1 and listed and labeled as complying with UL 6.

C. Fittings:

1. Manufacturers:

a. Bridgeport Fittings Inc: www.bptfittings.com/#sle.

b. O-Z/Gedney, a brand of Emerson Electric Co: www.emerson.com/#sle.

c. Thomas & Betts Corporation: www.tnb.com/#sle.

2. Non-Hazardous Locations: Use fittings complying with NEMA FB 1 and listed and labeled as complying with UL 514B.

3. Hazardous (Classified) Locations: Use fittings listed and labeled as complying with UL 1203 for the classification of the installed location.

4. Material: Use steel or malleable iron.

a. Do not use die cast zinc fittings.

5. Connectors and Couplings: Use threaded type fittings only. Threadless set screw and compression (gland) type fittings are not permitted.

2.4 FLEXIBLE METAL CONDUIT (FMC)

A. Manufacturers:

1. AFC Cable Systems, Inc: www.afcweb.com.

2. Electri-Flex Company: www.electriflex.com.

3. International Metal Hose: www.metalhose.com.

B. Description: NFPA 70, Type FMC standard wall steel flexible metal conduit listed and labeled as complying with UL 1, and listed for use in classified firestop systems to be used.

C. Fittings:

1. Manufacturers:

a. Bridgeport Fittings Inc: www.bptfittings.com/#sle.

b. O-Z/Gedney, a brand of Emerson Electric Co: www.emerson.com/#sle.

c. Thomas & Betts Corporation: www.tnb.com/#sle.

2. Description: Fittings complying with NEMA FB 1 and listed and labeled as complying with UL 514B.

3. Material: Use steel or malleable iron.

a. Do not use die cast zinc fittings.

2.5 LIQUIDTIGHT FLEXIBLE METAL CONDUIT (LFMC)

A. Manufacturers:

1. AFC Cable Systems, Inc: www.afcweb.com.

2. Electri-Flex Company: www.electriflex.com.

3. International Metal Hose: www.metalhose.com.

B. Description: NFPA 70, Type LFMC polyvinyl chloride (PVC) jacketed steel flexible metal conduit listed and labeled as complying with UL 360.

C. Fittings:

1. Manufacturers:

a. Bridgeport Fittings Inc: www.bptfittings.com/#sle.

b. O-Z/Gedney, a brand of Emerson Electric Co: www.emerson.com/#sle.

c. Thomas & Betts Corporation: www.tnb.com/#sle.

2. Description: Fittings complying with NEMA FB 1 and listed and labeled as complying with UL 514B.

3. Material: Use steel or malleable iron.

2.6 ELECTRICAL METALLIC TUBING (EMT)

A. Manufacturers:

1. Allied Tube & Conduit: www.alliedeg.com.

2. Nucor Tubular Products: www.nucortubular/#sle.

3. Wheatland Tube Company: www.wheatland.com.

B. Description: NFPA 70, Type EMT steel electrical metallic tubing complying with ANSI C80.3 and listed and labeled as complying with UL 797.

C. Fittings:

1. Manufacturers:

a. Bridgeport Fittings Inc: www.bptfittings.com/#sle.

b. O-Z/Gedney, a brand of Emerson Electric Co: www.emerson.com/#sle.

c. Thomas & Betts Corporation: www.tnb.com/#sle.

2. Description: Fittings complying with NEMA FB 1 and listed and labeled as complying with UL 514B.

3. Material: Use steel or malleable iron.

4. Connectors and Couplings: Use compression (gland) or set-screw type.

a. Do not use indenter type connectors and couplings.

5. Damp or Wet Locations (where permitted): Use fittings listed for use in wet locations.

PART 3 EXECUTION

3.1 EXAMINATION

A. Verify that field measurements are as indicated.

B. Verify that mounting surfaces are ready to receive conduits.

C. Verify that conditions are satisfactory for installation prior to starting work.

3.2 INSTALLATION

A. Install products in accordance with manufacturer's instructions.

B. Perform work in accordance with NECA 1 (general workmanship).

C. Install galvanized steel rigid metal conduit (RMC) in accordance with NECA 101.

D. Conduit Routing:

1. Unless dimensioned, conduit routing indicated is diagrammatic.
2. When conduit destination is indicated without specific routing, determine exact routing required.
3. Conceal all conduits unless specifically indicated to be exposed.
4. Conduits in the following areas may be exposed, unless otherwise indicated:
    a. Electrical rooms.
    b. Mechanical equipment rooms.
    c. Within joists in areas with no ceiling.
5. Unless otherwise approved, do not route conduits exposed:
    a. Across floors.
    b. Across roofs.
    c. Across top of parapet walls.
    d. Across building exterior surfaces.
6. Conduits installed underground or embedded in concrete may be routed in the shortest possible manner unless otherwise indicated. Route all other conduits parallel or perpendicular to building structure and surfaces, following surface contours where practical.
7. Arrange conduit to maintain adequate headroom, clearances, and access.
8. Arrange conduit to provide no more than the equivalent of four 90 degree bends between pull points.
9. Arrange conduit to provide no more than 150 feet between pull points.
10. Route conduits above water and drain piping where possible.
11. Arrange conduit to prevent moisture traps. Provide drain fittings at low points and at sealing fittings where moisture may collect.
12. Maintain minimum clearance of 6 inches between conduits and piping for other systems.
13. Maintain minimum clearance of 12 inches between conduits and hot surfaces. This includes, but is not limited to:
    a. Heaters.
    b. Hot water piping.
    c. Flues.

14. Group parallel conduits in the same area together on a common rack.

E. Conduit Support:

1. Secure and support conduits in accordance with NFPA 70 and Section 260529 using suitable supports and methods approved by the authority having jurisdiction.

2. Provide independent support from building structure. Do not provide support from piping, ductwork, or other systems.

3. Installation Above Suspended Ceilings: Do not provide support from ceiling support system. Do not provide support from ceiling grid or allow conduits to lay on ceiling tiles.

4. Use conduit strap to support single surface-mounted conduit.

   a. Use clamp back spacer with conduit strap for damp and wet locations to provide space between conduit and mounting surface.

5. Use metal channel (strut) with accessory conduit clamps to support multiple parallel surface-mounted conduits.

6. Use conduit clamp to support single conduit from beam clamp or threaded rod.

7. Use trapeze hangers assembled from threaded rods and metal channel (strut) with accessory conduit clamps to support multiple parallel suspended conduits.

8. Use non-penetrating rooftop supports to support conduits routed across rooftops (only where approved).

9. Use of spring steel conduit clips for support of conduits is not permitted.

   a. Support of electrical metallic tubing (EMT) up to 1 inch (27 mm) trade size concealed above accessible ceilings and within hollow stud walls.

10. Use of wire for support of conduits is not permitted.

11. Where conduit support intervals specified in NFPA 70 and NECA standards differ, comply with the most stringent requirements.

F. Connections and Terminations:

1. Use approved zinc-rich paint or conduit joint compound on field-cut threads of galvanized steel conduits prior to making connections.

2. Where two threaded conduits must be joined and neither can be rotated, use three-piece couplings or split couplings. Do not use running threads.

3. Use suitable adapters where required to transition from one type of conduit to another.

4. Provide drip loops for liquidtight flexible conduit connections to prevent drainage of liquid into connectors.

5. Terminate threaded conduits in boxes and enclosures using threaded hubs or double lock nuts for dry locations and raintight hubs for wet locations.

6. Where spare conduits stub up through concrete floors and are not terminated in a box or enclosure, provide threaded couplings equipped with threaded plugs set flush with finished floor.

7. Provide insulating bushings or insulated throats at all conduit terminations to protect conductors.

8. Secure joints and connections to provide maximum mechanical strength and electrical continuity.

G. Penetrations:

1. Do not penetrate or otherwise notch or cut structural members, including footings and grade beams, without approval of Structural Engineer.

2. Make penetrations perpendicular to surfaces unless otherwise indicated.

3. Provide sleeves for penetrations as indicated or as required to facilitate installation. Set sleeves flush with exposed surfaces unless otherwise indicated or required.

4. Conceal bends for conduit risers emerging above ground.

5. Seal interior of conduits entering the building from underground at first accessible point to prevent entry of moisture and gases.

6. Provide suitable modular seal where conduits penetrate exterior wall below grade.

7. Where conduits penetrate waterproof membrane, seal as required to maintain integrity of membrane.

8. Make penetrations for roof-mounted equipment within associated equipment openings and curbs where possible to minimize roofing system penetrations. Where penetrations are necessary, seal as indicated or as required to preserve integrity of roofing system and maintain roof warranty. Include proposed locations of penetrations and methods for sealing with submittals.

9. Install firestopping to preserve fire resistance rating of partitions and other elements, using materials and methods specified in Section 078400.

H. Underground Installation:

1. Provide trenching and backfilling.

2. Minimum Cover, Unless Otherwise Indicated or Required:

a. Underground, Exterior: 24 inches.

b. Under Slab on Grade: 12 inches to bottom of slab.

3. Provide underground warning tape in accordance with Section 260553 along entire conduit length for service entrance where not concrete-encased.

I. Hazardous (Classified) Locations: Where conduits cross boundaries of hazardous (classified) locations, provide sealing fittings located as indicated or in accordance with NFPA 70.

J. Conduit Movement Provisions: Where conduits are subject to movement, provide expansion and expansion/deflection fittings to prevent damage to enclosed conductors or connected equipment. This includes, but is not limited to:

1. Where conduits cross structural joints intended for expansion, contraction, or deflection.

2. Where calculated in accordance with NFPA 70 for rigid polyvinyl chloride (PVC) conduit installed above ground to compensate for thermal expansion and contraction.

3. Where conduits are subject to earth movement by settlement or frost.

K. Condensation Prevention: Where conduits cross barriers between areas of potential substantial temperature differential, provide sealing fitting or approved sealing compound at an accessible point near the penetration to prevent condensation. This includes, but is not limited to:

1. Where conduits pass from outdoors into conditioned interior spaces.

2. Where conduits pass from unconditioned interior spaces into conditioned interior spaces.

L. Provide pull string in all empty conduits and in conduits where conductors and cables are to be installed by others. Leave minimum slack of 12 inches at each end.

M. Provide grounding and bonding in accordance with Section 260526.

N. Identify conduits in accordance with Section 260553.

3.3 FIELD QUALITY CONTROL

A. Repair cuts and abrasions in galvanized finishes using zinc-rich paint recommended by manufacturer. Replace components that exhibit signs of corrosion.

B. Correct deficiencies and replace damaged or defective conduits.

3.4 CLEANING

A. Clean interior of conduits to remove moisture and foreign matter.

3.5 PROTECTION

A. Immediately after installation of conduit, use suitable manufactured plugs to provide protection from entry of moisture and foreign material and do not remove until ready for installation of conductors.

B. Run raceways concealed in finished areas. Raceways may be run exposed in unfinished areas such as mechanical and electrical rooms.

C. Flexible metal conduit may be used where conduit and wire installation requires "fishing" through confined chases.

D. Liquidtight flexible metal conduit may be used for final connections to equipment in wet or damp areas, maximum length six feet.

END OF SECTION

SECTION 260533.16 - BOXES FOR ELECTRICAL SYSTEMS

PART 1 GENERAL

1.1 SECTION INCLUDES

A. Outlet and device boxes up to 100 cubic inches, including those used as junction and pull boxes.

B. Cabinets and enclosures, including junction and pull boxes larger than 100 cubic inches.

C. Underground boxes/enclosures.

1.2 REFERENCE STANDARDS

A. NECA 1 - Standard for Good Workmanship in Electrical Construction; 2010.

B. NECA 130 - Standard for Installing and Maintaining Wiring Devices; 2010.

C. NEMA FB 1 - Fittings, Cast Metal Boxes, and Conduit Bodies for Conduit, Electrical Metallic Tubing, and Cable; 2012.

D. NEMA OS 1 - Sheet-Steel Outlet Boxes, Device Boxes, Covers, and Box Supports; 2013.

E. NEMA 250 - Enclosures for Electrical Equipment (1000 Volts Maximum); 2014.

F. NFPA 70 - National Electrical Code; Most Recent Edition Adopted by Authority Having Jurisdiction, Including All Applicable Amendments and Supplements.

G. SCTE 77 - Specification for Underground Enclosure Integrity; 2013.

H. UL 50 - Enclosures for Electrical Equipment, Non-Environmental Considerations; Current Edition, Including All Revisions.

I. UL 50E - Enclosures for Electrical Equipment, Environmental Considerations; Current Edition, Including All Revisions.

J. UL 508A - Industrial Control Panels; Current Edition, Including All Revisions.

K. UL 514A - Metallic Outlet Boxes; Current Edition, Including All Revisions.

1.3 ADMINISTRATIVE REQUIREMENTS

A. Coordination:

1. Coordinate the work with other trades to avoid placement of ductwork, piping, equipment, or other potential obstructions within the dedicated equipment spaces and working clearances for electrical equipment required by NFPA 70.

2. Coordinate arrangement of electrical equipment with the dimensions and clearance requirements of the actual equipment to be installed.

3. Coordinate minimum sizes of boxes with the actual installed arrangement of conductors, clamps, support fittings, and devices, calculated according to NFPA 70.

4. Coordinate minimum sizes of pull boxes with the actual installed arrangement of connected conduits, calculated according to NFPA 70.

5. Coordinate the placement of boxes with millwork, furniture, devices, equipment, etc. installed under other sections or by others.

6. Coordinate the work with other trades to preserve insulation integrity.

7. Coordinate the work with other trades to provide walls suitable for installation of flush-mounted boxes where indicated.

8. Notify Engineer of any conflicts with or deviations from Contract Documents. Obtain direction before proceeding with work.

1.4 SUBMITTALS

A. Product Data: Provide manufacturer's standard catalog pages and data sheets for underground handhole enclosures, underground handhole enclosures, underground handhole enclosures, and underground handhole enclosures.

1. Underground Boxes/Enclosures: Include reports for load testing in accordance with SCTE 77 certified by a professional engineer or an independent testing agency upon request.

B. Manufacturer's Installation Instructions: Indicate application conditions and limitations of use stipulated by product testing agency. Include instructions for storage, handling, protection, examination, preparation, and installation of product.

C. Project Record Documents: Record actual locations for underground handhole enclosures, underground handhole enclosures, underground handhole enclosures, underground handhole enclosures, and underground handhole enclosures.

D. Maintenance Materials: Furnish the following for Nanuet Union Free School District's use in maintenance of project.

1. Keys for Lockable Enclosures: Two of each different key.

1.5 QUALITY ASSURANCE

A. Comply with requirements of NFPA 70.

B. Maintain at the project site a copy of each referenced document that prescribes execution requirements.

C. Product Listing Organization Qualifications: An organization recognized by OSHA as a Nationally Recognized Testing Laboratory (NRTL) and acceptable to authorities having jurisdiction.

1.6 DELIVERY, STORAGE, AND HANDLING

A. Receive, inspect, handle, and store products in accordance with manufacturer's instructions.

PART 2 PRODUCTS

2.1 BOXES

A. General Requirements:

1. Do not use boxes and associated accessories for applications other than as permitted by NFPA 70 and product listing.

2. Provide all boxes, fittings, supports, and accessories required for a complete raceway system and to accommodate devices and equipment to be installed.

3. Provide products listed, classified, and labeled as suitable for the purpose intended.

4. Where box size is not indicated, size to comply with NFPA 70 but not less than applicable minimum size requirements specified.

5. Provide grounding terminals within boxes where equipment grounding conductors terminate.

B. Outlet and Device Boxes Up to 100 cubic inches, Including Those Used as Junction and Pull Boxes:

1. Use sheet-steel boxes for dry locations unless otherwise indicated or required.

2. Use cast iron boxes or cast aluminum boxes for damp or wet locations unless otherwise indicated or required; furnish with compatible weatherproof gasketed covers.

3. Use cast iron boxes or cast aluminum boxes where exposed galvanized steel rigid metal conduit is used.

4. Use suitable concrete type boxes where flush-mounted in concrete.

5. Use suitable masonry type boxes where flush-mounted in masonry walls.

6. Use raised covers suitable for the type of wall construction and device configuration where required.

7. Use shallow boxes where required by the type of wall construction.

8. Do not use "through-wall" boxes designed for access from both sides of wall.

9. Sheet-Steel Boxes: Comply with NEMA OS 1, and list and label as complying with UL 514A.

10. Cast Metal Boxes: Comply with NEMA FB 1, and list and label as complying with UL 514A; furnish with threaded hubs.

11. Boxes for Supporting Luminaires and Ceiling Fans: Listed as suitable for the type and weight of load to be supported; furnished with fixture stud to accommodate mounting of luminaire where required.

12. Boxes for Ganged Devices: Use multigang boxes of single-piece construction. Do not use field-connected gangable boxes unless specifically indicated or permitted.

13. Minimum Box Size, Unless Otherwise Indicated:

    a. Wiring Devices (Other Than Communications Systems Outlets): 4 inch square by 1-1/2 inch deep (100 by 38 mm) trade size.

    b. Ceiling Outlets: 4 inch octagonal or square by 1-1/2 inch deep (100 by 38 mm) trade size.

14. Wall Plates: Comply with Section 262726.

15. Manufacturers:

    a. Cooper Crouse-Hinds, a division of Eaton Corporation: www.cooperindustries.com/#sle.

    b. Hubbell Incorporated; Bell Products: www.hubbell-rtb.com.

    c. Hubbell Incorporated; RACO Products: www.hubbell-rtb.com.

    d. O-Z/Gedney, a brand of Emerson Electric Co: www.emerson.com/#sle.

    e. Thomas & Betts Corporation: www.tnb.com/#sle.

C. Cabinets and Enclosures, Including Junction and Pull Boxes Larger Than 100 cubic inches:

1. Comply with NEMA 250, and list and label as complying with UL 50 and UL 50E, or UL 508A.

2. NEMA 250 Environment Type, Unless Otherwise Indicated:

    a. Indoor Clean, Dry Locations: Type 1, painted steel.

    b. Outdoor Locations: Type 3R, painted steel.

3. Junction and Pull Boxes Larger Than 100 cubic inches:

    a. Provide screw-cover or hinged-cover enclosures unless otherwise indicated.

b. Boxes 6 square feet and Larger: Provide sectionalized screw-cover or hinged-cover enclosures.

4. Cabinets and Hinged-Cover Enclosures, Other Than Junction and Pull Boxes:

a. Provide lockable hinged covers, all locks keyed alike unless otherwise indicated.

b. Back Panels: Painted steel, removable.

c. Terminal Blocks: Provide voltage/current ratings and terminal quantity suitable for purpose indicated, with 25 percent spare terminal capacity.

5. Finish for Painted Steel Enclosures: Manufacturer's standard grey unless otherwise indicated.

6. Manufacturers:

a. Cooper B-Line, a division of Eaton Corporation: www.cooperindustries.com/#sle.

b. Hoffman, a brand of Pentair Technical Products: www.hoffmanonline.com/#sle.

c. Hubbell Incorporated; Wiegmann Products: www.hubbell-wiegmann.com/#sle.

D. Underground Boxes/Enclosures:

1. Description: In-ground, open bottom boxes furnished with flush, non-skid covers with legend indicating type of service and stainless steel tamper resistant cover bolts.

2. Size: As indicated on drawings.

3. Depth: As required to extend below frost line to prevent frost upheaval, but not less than 12 inches.

4. Applications:

a. Do not use polymer concrete enclosures in areas subject to deliberate vehicular traffic.

5. Polymer Concrete Underground Boxes/Enclosures: Comply with SCTE 77.

a. Manufacturers:

1) Highline Products, a subsidiary of MacLean Power Systems: www.highlineproducts.com.

2) Hubbell Incorporated; Quazite Products: www.hubbellpowersystems.com/#sle.

3) Oldcastle Precast, Inc: www.oldcastleprecast.com/#sle.

b. Combination fiberglass/polymer concrete boxes/enclosures are acceptable.

c. Product(s):

1) MacLean Highline PHA Series: Straight wall, all-polymer concrete splice box/pull box; available Tier 8, Tier 15, and Tier 22 load ratings.

2) MacLean Highline CHA Series: Fiberglass/polymer concrete splice box/pull box; available Tier 8 and Tier 15 load ratings.

3) MacLean Highline CVA Series: Fiberglass/polymer concrete splice vault; available Tier 8, Tier 15, and Tier 22 load ratings.

PART 3 EXECUTION

3.1 EXAMINATION

A. Verify that field measurements are as indicated.

B. Verify that mounting surfaces are ready to receive boxes.

C. Verify that conditions are satisfactory for installation prior to starting work.

3.2 INSTALLATION

A. Install products in accordance with manufacturer's instructions.

B. Install boxes in accordance with NECA 1 (general workmanship) and, where applicable, NECA 130, including mounting heights specified in those standards where mounting heights are not indicated.

C. Arrange equipment to provide minimum clearances in accordance with manufacturer's instructions and NFPA 70.

D. Provide separate boxes for emergency power and normal power systems.

E. Unless otherwise indicated, provide separate boxes for line voltage and low voltage systems.

F. Flush-mount boxes in finished areas unless specifically indicated to be surface-mounted.

G. Unless otherwise indicated, boxes may be surface-mounted where exposed conduits are indicated or permitted.

H. Box Locations:

1. Locate boxes to be accessible. Provide access panels in accordance with Section 083100 as required where approved by the Architect.

2. Locate boxes to be accessible. Provide access panels in accordance with Section 08 31 13 as required where approved by the Architect.

3. Unless dimensioned, box locations indicated are approximate.

4. Locate boxes as required for devices installed under other sections or by others.

    a. Switches, Receptacles, and Other Wiring Devices: Comply with Section 262726.

    b. Communications Systems Outlets: Comply with Section 271000.

5. Locate boxes so that wall plates do not span different building finishes.

6. Locate boxes so that wall plates do not cross masonry joints.

7. Unless otherwise indicated, where multiple outlet boxes are installed at the same location at different mounting heights, install along a common vertical center line.

8. Do not install flush-mounted boxes on opposite sides of walls back-to-back. Provide minimum 6 inches horizontal separation unless otherwise indicated.

9. Acoustic-Rated Walls: Do not install flush-mounted boxes on opposite sides of walls back-to-back; provide minimum 24 inches horizontal separation.

10. Fire Resistance Rated Walls: Install flush-mounted boxes such that the required fire resistance will not be reduced.

    a. Do not install flush-mounted boxes on opposite sides of walls back-to-back; provide minimum 24 inches separation where wall is constructed with individual noncommunicating stud cavities or protect both boxes with listed putty pads.

    b. Do not install flush-mounted boxes with area larger than 16 square inches or such that the total aggregate area of openings exceeds 100 square inches for any 100 square feet of wall area.

11. Locate junction and pull boxes as indicated, as required to facilitate installation of conductors, and to limit conduit length and/or number of bends between pulling points in accordance with Section 260533.13.

12. Locate junction and pull boxes in the following areas, unless otherwise indicated or approved by the Architect:

    a. Concealed above accessible suspended ceilings.

    b. Within joists in areas with no ceiling.

    c. Electrical rooms.

    d. Mechanical equipment rooms.

I. Box Supports:

1. Secure and support boxes in accordance with NFPA 70 and Section 260529 using suitable supports and methods approved by the authority having jurisdiction.

2. Provide independent support from building structure except for cast metal boxes (other than boxes used for fixture support) supported by threaded conduit

connections in accordance with NFPA 70. Do not provide support from piping, ductwork, or other systems.

3. Installation Above Suspended Ceilings: Do not provide support from ceiling grid or ceiling support system.

4. Use far-side support to secure flush-mounted boxes supported from single stud in hollow stud walls. Repair or replace supports for boxes that permit excessive movement.

J. Install boxes plumb and level.

K. Flush-Mounted Boxes:

1. Install boxes in noncombustible materials such as concrete, tile, gypsum, plaster, etc. so that front edge of box or associated raised cover is not set back from finished surface more than 1/4 inch or does not project beyond finished surface.

2. Install boxes in combustible materials such as wood so that front edge of box or associated raised cover is flush with finished surface.

3. Repair rough openings around boxes in noncombustible materials such as concrete, tile, gypsum, plaster, etc. so that there are no gaps or open spaces greater than 1/8 inch at the edge of the box.

L. Install boxes as required to preserve insulation integrity.

M. Metallic Floor Boxes: Install box level at the proper elevation to be flush with finished floor.

N. Underground Boxes/Enclosures:

1. Install enclosure on gravel base, minimum 6 inches deep.

2. Flush-mount enclosures located in concrete or paved areas.

3. Mount enclosures located in landscaped areas with top at 1 inch above finished grade.

4. Install additional bracing inside enclosures in accordance with manufacturer's instructions to minimize box sidewall deflections during backfilling. Backfill with cover bolted in place.

O. Install permanent barrier between ganged wiring devices when voltage between adjacent devices exceeds 300 V.

P. Install firestopping to preserve fire resistance rating of partitions and other elements, using materials and methods specified in Section 07 84 13.

Q. Close unused box openings.

R. Install blank wall plates on junction boxes and on outlet boxes with no devices or equipment installed or designated for future use.

S. Provide grounding and bonding in accordance with Section 260526.

T. Identify boxes in accordance with Section 260553.

3.3 CLEANING

A. Clean interior of boxes to remove dirt, debris, plaster and other foreign material.

3.4 PROTECTION

A. Immediately after installation, protect boxes from entry of moisture and foreign material until ready for installation of conductors.

END OF SECTION

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SECTION 260533.23 - SURFACE RACEWAYS FOR ELECTRICAL SYSTEMS

PART 1 GENERAL

1.1 SECTION INCLUDES

A. Surface raceway systems.

B. Wireways.

1.2 REFERENCE STANDARDS

A. NECA 1 - Standard for Good Workmanship in Electrical Construction; 2010.

B. NFPA 70 - National Electrical Code; Most Recent Edition Adopted by Authority Having Jurisdiction, Including All Applicable Amendments and Supplements.

C. NEMA 250 - Enclosures for Electrical Equipment (1000 Volts Maximum); 2014.

D. UL 5 - Surface Metal Raceways and Fittings; Current Edition, Including All Revisions.

E. UL 111 - Outline of Investigation for Multioutlet Assemblies; Current Edition, Including All Revisions.

F. UL 870 - Wireways, Auxiliary Gutters, and Associated Fittings; Current Edition, Including All Revisions.

1.3 ADMINISTRATIVE REQUIREMENTS

A. Coordination:

1. Coordinate the placement of raceways with millwork, furniture, equipment, etc. installed under other sections or by others.

2. Coordinate rough-in locations of outlet boxes provided under Section 260533.16 and conduit provided under Section 260533.13 as required for installation of raceways provided under this section.

3. Verify minimum sizes of raceways with the actual conductors and components to be installed.

4. Notify Engineer of any conflicts with or deviations from Contract Documents. Obtain direction before proceeding with work.

B. Sequencing:

1. Do not install raceways until final surface finishes and painting are complete.

2. Do not begin installation of conductors and cables until installation of raceways is complete between outlet, junction and splicing points.

1.4 SUBMITTALS

A. Product Data: Provide manufacturer's standard catalog pages and data sheets including dimensions, knockout sizes and locations, materials, fabrication details, finishes, service condition requirements, and accessories.

1. Surface Raceway Systems: Include information on fill capacities for conductors and cables.

1.5 QUALITY ASSURANCE

A. Comply with requirements of NFPA 70.

B. Maintain at the project site a copy of each referenced document that prescribes execution requirements.

C. Manufacturer Qualifications: Company specializing in manufacturing the products specified in this section with minimum three years documented experience.

D. Product Listing Organization Qualifications: An organization recognized by OSHA as a Nationally Recognized Testing Laboratory (NRTL) and acceptable to authorities having jurisdiction.

1.6 DELIVERY, STORAGE, AND HANDLING

A. Receive, inspect, handle, and store products in accordance with manufacturer's instructions.

PART 2 PRODUCTS

2.1 RACEWAY REQUIREMENTS

A. Provide all components, fittings, supports, and accessories required for a complete raceway system.

B. Provide products listed, classified, and labeled as suitable for the purpose intended.

C. Do not use raceways for applications other than as permitted by NFPA 70 and product listing.

2.2 SURFACE RACEWAY SYSTEMS

A. Manufacturers:

1. Hubbell Incorporated: www.hubbell-wiring.com.

2. MonoSystems, Inc: www.monosystems.com/#sle.

3. Wiremold, a brand of Legrand North America, Inc: www.legrand.us/#sle.

B. Surface Metal Raceways: Listed and labeled as complying with UL 5.

C. Metal Channel (Strut) Used as Raceway: Comply with Section 260529.

D. Surface Raceway System:

1. Raceway Type: Single channel, painted steel.

2. Length: As indicated on the drawings.

3. Color: White.

4. Accessory Device Boxes: Suitable for the devices to be installed; color to match raceway.

2.3 WIREWAYS

A. Manufacturers:

1. Cooper B-Line, a division of Cooper Industries: www.cooperindustries.com/#sle.

2. Hoffman, a brand of Pentair Technical Products: www.hoffmanonline.com/#sle.

3. Schneider Electric; Square D Products: www.schneider-electric.us/#sle.

B. Description: Lay-in wireways and wiring troughs with removable covers; listed and labeled as complying with UL 870.

C. Wireway Type, Unless Otherwise Indicated:

1. Indoor Clean, Dry Locations: NEMA 250, Type 1, painted steel with screw-cover.

2. Outdoor Locations: NEMA 250, Type 3R, painted steel with screw-cover; include provision for padlocking.

D. Finish for Painted Steel Wireways: Manufacturer's standard grey unless otherwise indicated.

E. Minimum Wireway Size: 4 by 4 inches unless otherwise indicated.

F. Where wireway size is not indicated, size to comply with NFPA 70 but not less than applicable minimum size requirements specified.

PART 3 EXECUTION

3.1 EXAMINATION

A. Verify that field measurements are as indicated.

B. Verify that outlet boxes and conduit terminations are installed in proper locations and are properly sized in accordance with NFPA 70 to accommodate raceways.

C. Verify that mounting surfaces are ready to receive raceways and that final surface finishes are complete, including painting.

D. Verify that conditions are satisfactory for installation prior to starting work.

3.2 INSTALLATION

A. Install products in accordance with manufacturer's instructions.

B. Perform work in accordance with NECA 1 (general workmanship).

C. Install raceways plumb and level.

D. Arrange wireways and associated raceway connections to comply with NFPA 70, including but not limited to requirements for deflected conductors and wireways used as pullboxes. Increase size of wireway where necessary.

E. Secure and support raceways in accordance with Section 260529 at intervals complying with NFPA 70 and manufacturer's requirements.

F. Close unused raceway openings.

G. Provide grounding and bonding in accordance with Section 260526.

3.3 FIELD QUALITY CONTROL

A. Inspect raceways for damage and defects.

B. Correct wiring deficiencies and replace damaged or defective raceways.

3.4 CLEANING

A. Clean exposed surfaces to remove dirt, paint, or other foreign material and restore to match original factory finish.

3.5 PROTECTION

A. Protect installed raceways from subsequent construction operations.

END OF SECTION

SECTION 260553 - IDENTIFICATION FOR ELECTRICAL SYSTEMS

PART 1 GENERAL

1.1 SECTION INCLUDES

A. Electrical identification requirements.

B. Identification nameplates and labels.

C. Wire and cable markers.

D. Underground warning tape.

E. Warning signs and labels.

1.2 REFERENCE STANDARDS

A. ANSI Z535.2 - American National Standard for Environmental and Facility Safety Signs; 2011.

B. ANSI Z535.4 - American National Standard for Product Safety Signs and Labels; 2011.

C. NFPA 70 - National Electrical Code; Most Recent Edition Adopted by Authority Having Jurisdiction, Including All Applicable Amendments and Supplements.

D. NFPA 70E - Standard for Electrical Safety in the Workplace; 2015.

E. UL 969 - Marking and Labeling Systems; Current Edition, Including All Revisions.

1.3 ADMINISTRATIVE REQUIREMENTS

A. Coordination:

1. Verify final designations for equipment, systems, and components to be identified prior to fabrication of identification products.

B. Sequencing:

1. Do not conceal items to be identified, in locations such as above suspended ceilings, until identification products have been installed.

2. Do not install identification products until final surface finishes and painting are complete.

1.4 SUBMITTALS

A. Product Data: Provide manufacturer's standard catalog pages and data sheets for each product.

1.5 QUALITY ASSURANCE

A. Comply with requirements of NFPA 70.

1.6 FIELD CONDITIONS

A. Do not install adhesive products when ambient temperature is lower than recommended by manufacturer.

PART 2 PRODUCTS

2.1 IDENTIFICATION REQUIREMENTS

A. Identification for Equipment:

1. Use identification nameplate to identify each piece of electrical distribution and control equipment and associated sections, compartments, and components.

a. Switchboards:

1) Identify ampere rating.

2) Identify power source and circuit number. Include location when not within sight of equipment.

3) Use identification nameplate to identify load(s) served for each branch device. Do not identify spares and spaces.

b. Panelboards:

1) Identify ampere rating.

2) Identify voltage and phase.

3) Identify power source and circuit number. Include location when not within sight of equipment.

4) Identify main overcurrent protective device. Use identification label for panelboards with a door. For power distribution panelboards without a door, use identification nameplate.

5) Use typewritten circuit directory to identify load(s) served for panelboards with a door. Identify spares and spaces using pencil.

6) For power panelboards, use identification nameplate to identify load(s) served for each branch device.

c. Enclosed switches, circuit breakers, and motor controllers:

1) Identify voltage and phase.

2) Identify power source and circuit number. Include location when not within sight of equipment.

3) Identify load(s) served. Include location when not within sight of equipment.

d. Time Switches:

1) Identify load(s) served and associated circuits controlled. Include location.

2) Identify source and circuit number.

e. Enclosed Contactors:

1) Identify ampere rating.

2) Identify voltage and phase.

3) Identify configuration, e.g., E.O.E.H. (electrically operated, electrically held) or E.O.M.H. (electrically operated, mechanically held).

4) Identify coil voltage.

5) Identify load(s) and associated circuits controlled. Include location.

6) Identify source and circuit number.

f. Transfer Switches:

1) Identify voltage and phase.

2) Identify power source and circuit number for both normal power source and standby power source. Include location when not within sight of equipment.

3) Identify load(s) served. Include location when not within sight of equipment.

4) Identify short circuit current rating based on the specific overcurrent protective device type and settings protecting the transfer switch.

2. Service Equipment:

a. Use identification nameplate to identify each service disconnecting means.

b. For buildings or structures supplied by more than one service, or any combination of branch circuits, feeders, and services, use identification nameplate or means of identification acceptable to authority having jurisdiction at each service disconnecting means to identify all other services, feeders, and branch circuits supplying that building or structure. Verify format and descriptions with authority having jurisdiction.

c. Use identification nameplate at each piece of service equipment to identify the available fault current and the date calculations were performed.

3. Emergency System Equipment:

a. Use identification nameplate or voltage marker to identify emergency system equipment in accordance with NFPA 70.

b. Use identification nameplate at each piece of service equipment to identify type and location of on-site emergency power sources.

c. Use identification nameplate to identify emergency operating instructions for emergency system equipment.

4. Use identification nameplate to identify disconnect location for equipment with remote disconnecting means.

5. Use identification label or handwritten text using indelible marker on inside of door at each fused switch to identify required NEMA fuse class and size.

6. Use identification label or handwritten text using indelible marker on inside of door at each motor controller to identify nameplate horsepower, full load amperes, code letter, service factor, voltage, and phase of motor(s) controlled.

7. Use identification label to identify overcurrent protective devices for branch circuits serving fire alarm circuits. Identify with text "FIRE ALARM CIRCUIT".

8. Available Fault Current Documentation: Use identification label to identify the available fault current and date calculations were performed at locations requiring documentation by NFPA 70 including but not limited to the following.

   a. Service equipment.

   b. Industrial control panels.

   c. Motor control centers.

   d. Elevator control panels.

   e. Industrial machinery.

9. Arc Flash Hazard Warning Labels: Use warning labels to identify arc flash hazards for electrical equipment, such as switchboards, panelboards, industrial control panels, meter socket enclosures, and motor control centers that are likely to require examination, adjustment, servicing, or maintenance while energized.

   a. Minimum Size: 3.5 by 5 inches.

   b. Legend: Include orange header that reads "WARNING", followed by the word message "Arc Flash and Shock Hazard; Appropriate PPE Required; Do not operate controls or open covers without appropriate personal protection equipment; Failure to comply may result in injury or death; Refer to NFPA 70E for minimum PPE requirements" or approved equivalent.

   c. Service Equipment: Include the following information in accordance with NFPA 70.

1) Nominal system voltage.

2) Available fault current.

3) Clearing time of service overcurrent protective device(s).

10. Use warning signs to identify electrical hazards for entrances to all rooms and other guarded locations that contain exposed live parts operating at 600 V nominal or less with the word message "DANGER; Electrical hazard; Authorized personnel only" or approved equivalent.

11. Use warning labels, identification nameplates, or identification labels to identify electrical hazards for equipment where multiple power sources are present with the word message "DANGER; Hazardous voltage; Multiple power sources may be present; Disconnect all electric power including remote disconnects before servicing" or approved equivalent.

B. Identification for Conductors and Cables:

1. Color Coding for Power Conductors 600 V and Less: Comply with Section 260519.

2. Use identification nameplate or identification label to identify color code for ungrounded and grounded power conductors inside door or enclosure at each piece of feeder or branch-circuit distribution equipment when premises has feeders or branch circuits served by more than one nominal voltage system.

3. Use wire and cable markers to identify circuit number or other designation indicated for power, control, and instrumentation conductors and cables at the following locations:

a. At each source and load connection.

b. Within boxes when more than one circuit is present.

c. Within equipment enclosures when conductors and cables enter or leave the enclosure.

4. Use wire and cable markers to identify connected grounding electrode system components for grounding electrode conductors.

5. Use underground warning tape to identify direct buried cables.

C. Identification for Raceways:

1. Use color-coded bands to identify systems other than normal power system for accessible conduits at maximum intervals of 20 feet.

a. Color-Coded Bands: Use field-painting or vinyl color coding electrical tape to mark bands 3 inches wide.

1) Color Code:

(a) Emergency Power System: Red.

2) Field-Painting: Comply with Section 09 91 00.

3) Vinyl Color Coding Electrical Tape: Comply with Section 260519.

2. Use identification labels, handwritten text using indelible marker, or plastic marker tags to identify circuits enclosed for accessible conduits at wall penetrations, at floor penetrations, at roof penetrations, and at equipment terminations when source is not within sight.

3. Use identification labels, handwritten text using indelible marker, or plastic marker tags to identify spare conduits at each end. Identify purpose and termination location.

4. Use underground warning tape to identify underground raceways.

D. Identification for Cable Tray: Comply with Section 260536.

E. Identification for Boxes:

1. Use voltage markers to identify highest voltage present.

2. Use color coded boxes to identify systems other than normal power system.

a. Color-Coded Boxes: Field-painted in accordance with Section 09 91 00.

3. Use identification labels or handwritten text using indelible marker to identify circuits enclosed.

F. Identification for Devices:

1. Identification for Communications Devices: Comply with Section 271000.

2. Wiring Device and Wallplate Finishes: Comply with Section 262726.

3. Factory Pre-Marked Wallplates: Comply with Section 262726.

4. Use identification label to identify fire alarm system devices.

a. For devices concealed above suspended ceilings, provide additional identification on ceiling tile below device location.

5. Use identification label or engraved wallplate to identify serving branch circuit for all receptacles.

a. For receptacles in public areas or in areas as directed by Architect, provide identification on inside surface of wallplate.

6. Use identification label or engraved wallplate to identify load controlled for wall-mounted control devices controlling loads that are not visible from the control location and for multiple wall-mounted control devices installed at one location.

7. Use identification label to identify receptacles protected by upstream GFI protection, where permitted.

G. Identification for Luminaires:

1. Use permanent red dot on luminaire frame to identify luminaires containing emergency (battery) ballasts.

2.2 IDENTIFICATION NAMEPLATES AND LABELS

A. Identification Nameplates:

1. Manufacturers:

a. Brimar Industries, Inc: www.brimar.com/#sle.

b. Kolbi Pipe Marker Co: www.kolbipipemarkers.com.

c. Seton Identification Products: www.seton.com.

2. Materials:

a. Indoor Clean, Dry Locations: Use plastic nameplates.

b. Outdoor Locations: Use plastic, stainless steel, or aluminum nameplates suitable for exterior use.

3. Plastic Nameplates: Two-layer or three-layer laminated acrylic or electrically non-conductive phenolic with beveled edges; minimum thickness of 1/16 inch; engraved text.

a. Exception: Provide minimum thickness of 1/8 inch when any dimension is greater than 4 inches.

4. Stainless Steel Nameplates: Minimum thickness of 1/32 inch; engraved or laser-etched text.

5. Aluminum Nameplates: Anodized; minimum thickness of 1/32 inch; engraved or laser-etched text.

6. Mounting Holes for Mechanical Fasteners: Two, centered on sides for sizes up to 1 inch high; Four, located at corners for larger sizes.

B. Identification Labels:

1. Manufacturers:

a. Brady Corporation: www.bradyid.com.

b. Brother International Corporation: www.brother-usa.com/#sle.

c. Panduit Corp: www.panduit.com/#sle.

2. Materials: Use self-adhesive laminated plastic labels; UV, chemical, water, heat, and abrasion resistant.

a. Use only for indoor locations.

3. Text: Use factory pre-printed or machine-printed text. Do not use handwritten text unless otherwise indicated.

C. Format for Equipment Identification:

1. Minimum Size: 1 inch by 2.5 inches.

2. Legend:

a. System designation where applicable:

1) Fire Alarm System: Identify with text "FIRE ALARM".

b. Equipment designation or other approved description.

c. Other information as indicated.

3. Text: All capitalized unless otherwise indicated.

4. Minimum Text Height:

a. System Designation: 1 inch.

b. Equipment Designation: 1/2 inch.

c. Other Information: 1/4 inch.

d. Exception: Provide minimum text height of 1 inch for equipment located more than 10 feet above floor or working platform.

5. Color:

a. Normal Power System: White text on black background.

D. Format for General Information and Operating Instructions:

1. Minimum Size: 1 inch by 2.5 inches.

2. Legend: Include information or instructions indicated or as required for proper and safe operation and maintenance.

3. Text: All capitalized unless otherwise indicated.

4. Minimum Text Height: 1/4 inch.

5. Color: Black text on white background unless otherwise indicated.

E. Format for Caution and Warning Messages:

1. Minimum Size: 2 inches by 4 inches.

2. Legend: Include information or instructions indicated or as required for proper and safe operation and maintenance.

3. Text: All capitalized unless otherwise indicated.

4. Minimum Text Height: 1/2 inch.

5. Color: Black text on yellow background unless otherwise indicated.

F. Format for Receptacle Identification:

1. Minimum Size: 3/8 inch by 1.5 inches.

2. Legend: Power source and circuit number or other designation indicated.

3. Text: All capitalized unless otherwise indicated.

4. Minimum Text Height: 3/16 inch.

5. Color: Black text on clear background.

G. Format for Control Device Identification:

1. Minimum Size: 3/8 inch by 1.5 inches.

2. Legend: Load controlled or other designation indicated.

3. Text: All capitalized unless otherwise indicated.

4. Minimum Text Height: 3/16 inch.

5. Color: Black text on clear background.

H. Format for Fire Alarm Device Identification:

1. Minimum Size: 3/8 inch by 1.5 inches.

2. Legend: Designation indicated and device zone or address.

3. Text: All capitalized unless otherwise indicated.

4. Minimum Text Height: 3/16 inch.

5. Color: Red text on white background.

2.3 WIRE AND CABLE MARKERS

A. Manufacturers:

1. Brady Corporation: www.bradyid.com.

2. HellermannTyton: www.hellermanntyton.com.

3. Panduit Corp: www.panduit.com/#sle.

B. Markers for Conductors and Cables: Use wrap-around self-adhesive vinyl cloth, wrap-around self-adhesive vinyl self-laminating, heat-shrink sleeve, plastic sleeve, plastic clip-on, or vinyl split sleeve type markers suitable for the conductor or cable to be identified.

C. Markers for Conductor and Cable Bundles: Use plastic marker tags secured by nylon cable ties.

D. Legend: Power source and circuit number or other designation indicated.

E. Text: Use factory pre-printed or machine-printed text, all capitalized unless otherwise indicated.

F. Minimum Text Height: 1/8 inch.

G. Color: Black text on white background unless otherwise indicated.

2.4 UNDERGROUND WARNING TAPE

A. Manufacturers:

1. Brady Corporation: www.bradyid.com.

2. Brimar Industries, Inc: www.brimar.com/#sle.

3. Seton Identification Products: www.seton.com.

B. Materials: Use foil-backed detectable type polyethylene tape suitable for direct burial, unless otherwise indicated.

C. Foil-backed Detectable Type Tape: 6 inches wide, with minimum thickness of 5 mil, unless otherwise required for proper detection.

D. Legend: Type of service, continuously repeated over full length of tape.

E. Color:

1. Tape for Buried Power Lines: Black text on red background.

2. Tape for Buried Communication, Alarm, and Signal Lines: Black text on orange background.

2.5 WARNING SIGNS AND LABELS

A. Manufacturers:

1. Brimar Industries, Inc: www.brimar.com/#sle.

2. Clarion Safety Systems, LLC: www.clarionsafety.com.

3. Seton Identification Products: www.seton.com.

B. Comply with ANSI Z535.2 or ANSI Z535.4 as applicable.

C. Warning Signs:

1. Materials:

a. Indoor Dry, Clean Locations: Use factory pre-printed rigid plastic or self-adhesive vinyl signs.

b. Outdoor Locations: Use factory pre-printed rigid aluminum signs.

2. Rigid Signs: Provide four mounting holes at corners for mechanical fasteners.

3. Minimum Size: 7 by 10 inches unless otherwise indicated.

D. Warning Labels:

1. Materials: Use factory pre-printed or machine-printed self-adhesive polyester or self-adhesive vinyl labels; UV, chemical, water, heat, and abrasion resistant; produced using materials recognized to UL 969.

a. Do not use labels designed to be completed using handwritten text.

b. Provide polyester overlaminate to protect handwritten text.

2. Machine-Printed Labels: Use thermal transfer process printing machines and accessories recommended by label manufacturer.

3. Minimum Size: 2 by 4 inches unless otherwise indicated.

PART 3 EXECUTION

3.1 PREPARATION

A. Clean surfaces to receive adhesive products according to manufacturer's instructions.

3.2 INSTALLATION

A. Install products in accordance with manufacturer's instructions.

B. Install identification products to be plainly visible for examination, adjustment, servicing, and maintenance. Unless otherwise indicated, locate products as follows:

1. Surface-Mounted Equipment: Enclosure front.

2. Flush-Mounted Equipment: Inside of equipment door.

3. Free-Standing Equipment: Enclosure front; also enclosure rear for equipment with rear access.

4. Elevated Equipment: Legible from the floor or working platform.

5. Branch Devices: Adjacent to device.

6. Interior Components: Legible from the point of access.

7. Conduits: Legible from the floor.

8. Boxes: Outside face of cover.

9. Conductors and Cables: Legible from the point of access.

10. Devices: Outside face of cover.

C. Install identification products centered, level, and parallel with lines of item being identified.

D. Secure nameplates to exterior surfaces of enclosures using stainless steel screws and to interior surfaces using self-adhesive backing or epoxy cement.

1. Do not use adhesives on exterior surfaces except where substrate cannot be penetrated.

E. Install self-adhesive labels and markers to achieve maximum adhesion, with no bubbles or wrinkles and edges properly sealed.

F. Install underground warning tape above buried lines with one tape per trench at 3 inches below finished grade.

G. Secure rigid signs using stainless steel screws.

H. Mark all handwritten text, where permitted, to be neat and legible.

3.3 FIELD QUALITY CONTROL

A. Replace self-adhesive labels and markers that exhibit bubbles, wrinkles, curling or other signs of improper adhesion.

END OF SECTION

SECTION 260923 - LIGHTING CONTROL DEVICES

PART 1 GENERAL

1.1 SECTION INCLUDES

A. Occupancy sensors.

B. Room Controllers

1.2 REFERENCE STANDARDS

A. NECA 1 - Standard for Good Workmanship in Electrical Construction; 2010.

B. NECA 130 - Standard for Installing and Maintaining Wiring Devices; 2010.

C. NEMA 410 - Performance Testing for Lighting Controls and Switching Devices with Electronic Drivers and Discharge Ballasts; 2011.

D. NFPA 70 - National Electrical Code; Most Recent Edition Adopted by Authority Having Jurisdiction, Including All Applicable Amendments and Supplements.

1.3 ADMINISTRATIVE REQUIREMENTS

A. Coordination:

1. Coordinate the placement of lighting control devices with millwork, furniture, equipment, etc. installed under other sections or by others.

2. Coordinate the placement of wall switch occupancy sensors with actual installed door swings.

3. Coordinate the placement of photo sensors for daylighting controls with windows, skylights, and luminaires to achieve optimum operation. Coordinate placement with ductwork, piping, equipment, or other potential obstructions to light level measurement installed under other sections or by others.

4. Notify Engineer of any conflicts or deviations from Contract Documents to obtain direction prior to proceeding with work.

B. Sequencing:

1. Do not install lighting control devices until final surface finishes and painting are complete.

1.4 SUBMITTALS

A. Product Data: Include ratings, configurations, standard wiring diagrams, dimensions, colors, service condition requirements, and installed features.

1. Occupancy Sensors: Include detailed motion detection coverage range diagrams.

B. Shop Drawings:

1. Occupancy Sensors: Provide lighting plan indicating location, model number, and orientation of each occupancy sensor and associated system component.

2. Daylighting Controls: Provide lighting plan indicating location, model number, and orientation of each photo sensor and associated system component.

C. Field Quality Control Reports.

D. Manufacturer's Installation Instructions: Include application conditions and limitations of use stipulated by product testing agency. Include instructions for storage, handling, protection, examination, preparation, and installation of product.

E. Operation and Maintenance Data: Include detailed information on device programming and setup.

F. Maintenance Materials: Furnish the following for Nanuet Union Free School District's use in maintenance of project.

G. Project Record Documents: Record actual installed locations and settings for lighting control devices.

1.5 QUALITY ASSURANCE

A. Comply with requirements of NFPA 70.

B. Maintain at the project site a copy of each referenced document that prescribes execution requirements.

C. Manufacturer Qualifications: Company specializing in manufacturing the products specified in this section with minimum three years documented experience.

D. Product Listing Organization Qualifications: An organization recognized by OSHA as a Nationally Recognized Testing Laboratory (NRTL) and acceptable to authorities having jurisdiction.

1.6 DELIVERY, STORAGE, AND PROTECTION

A. Store products in a clean, dry space in original manufacturer's packaging in accordance with manufacturer's written instructions until ready for installation.

1.7 FIELD CONDITIONS

A. Maintain field conditions within manufacturer's required service conditions during and after installation.

1.8 WARRANTY

A. Provide five year manufacturer warranty for all lighting control components.

PART 2 PRODUCTS

2.1 LIGHTING CONTROL DEVICES - GENERAL REQUIREMENTS

A. Provide products listed, classified, and labeled as suitable for the purpose intended.

B. Unless specifically indicated to be excluded, provide all required conduit, wiring, connectors, hardware, components, accessories, etc. as required for a complete operating system.

C. Products for Switching of Electronic Ballasts/Drivers: Tested and rated to be suitable for peak inrush currents specified in NEMA 410.

2.2 ROOM CONTROLLERS AND ACCESSORIES

A. Manufacturer: Eaton/Cooper Greengate RC3D

B. The Room Controllers are connected to a 120 VAC or 277 VAC 20 Amp circuit to provide unit power and input power to the individual relays. The wall stations, occupancy/vacancy sensors, and daylight sensors and receptacle control devices connect via QuickConnect cables providing a Class 2 connection. Upon power up the pre-engraved wall station automatically controls the On/Off relays adjust the dimming outputs. The daylight sensor will immediately adjust the lighting levels based on natural light.

C. Refer to drawing details for part numbers and components.

D. Provide manufacturer's pre-terminated cables.

E. Utilize daylight sensor where daylighting is required as indicated on the plans.

PART 3 EXECUTION

3.1 EXAMINATION

A. Verify that field measurements are as indicated.

B. Verify that outlet boxes are installed in proper locations and at proper mounting heights and are properly sized to accommodate devices and conductors in accordance with NFPA 70.

C. Verify that openings for outlet boxes are neatly cut and will be completely covered by devices or wall plates.

D. Verify that final surface finishes are complete, including painting.

E. Verify that branch circuit wiring installation is completed, tested, and ready for connection to lighting control devices.

F. Verify that the service voltage and ratings of lighting control devices are appropriate for the service voltage and load requirements at the location to be installed.

G. Verify that conditions are satisfactory for installation prior to starting work.

3.2 PREPARATION

A. Provide extension rings to bring outlet boxes flush with finished surface.

B. Clean dirt, debris, plaster, and other foreign materials from outlet boxes.

3.3 INSTALLATION

A. Install lighting control devices in accordance with NECA 1 (general workmanship) and, where applicable, NECA 130, including mounting heights specified in those standards unless otherwise indicated.

B. Coordinate locations of outlet boxes provided under Section 260533.16 as required for installation of lighting control devices provided under this section.

1. Mounting Heights: As indicated on the drawings.

2. Orient outlet boxes for vertical installation of lighting control devices unless otherwise indicated.

3. Locate wall switch occupancy sensors on strike side of door with edge of wall plate 3 inches from edge of door frame. Where locations are indicated otherwise, notify Engineer to obtain direction prior to proceeding with work.

C. Install lighting control devices in accordance with manufacturer's instructions.

D. Unless otherwise indicated, connect lighting control device grounding terminal or conductor to branch circuit equipment grounding conductor and to outlet box with bonding jumper.

E. Install lighting control devices plumb and level, and held securely in place.

F. Where required and not furnished with lighting control device, provide wall plate in accordance with Section 262726.

G. Provide required supports in accordance with Section 260529.

H. Where applicable, install lighting control devices and associated wall plates to fit completely flush to mounting surface with no gaps and rough opening completely covered without strain on wall plate. Repair or reinstall improperly installed outlet boxes or improperly sized rough openings. Do not use oversized wall plates in lieu of meeting this requirement.

I. Outdoor Photo Control Locations:

1. Where possible, locate outdoor photo controls with photo sensor facing north. If north facing photo sensor is not possible, install with photo sensor facing east, west, or down.

2. Locate outdoor photo controls so that photo sensors do not face artificial light sources, including light sources controlled by the photo control itself.

J. Install outdoor photo controls so that connections are weatherproof. Do not install photo controls with conduit stem facing up in order to prevent infiltration of water into the photo control.

K. Lamp Burn-In: Operate lamps at full output for minimum of 100 hours or prescribed period per manufacturer's recommendations prior to use with any dimming controls. Replace lamps that fail prematurely due to improper lamp burn-in.

L. Unless otherwise indicated, install power packs for lighting control devices above accessible ceiling or above access panel in inaccessible ceiling near the sensor location.

M. Where indicated, install separate compatible wall switches for manual control interface with lighting control devices or associated power packs.

N. Unless otherwise indicated, install switches on load side of power packs so that switch does not turn off power pack.

3.4 FIELD QUALITY CONTROL

A. Inspect each lighting control device for damage and defects.

B. Test time switches to verify proper operation.

C. Test outdoor photo controls to verify proper operation, including time delays where applicable.

D. Test daylighting controls to verify proper operation, including light level measurements and time delays where applicable. Record test results in written report to be included with submittals.

E. Correct wiring deficiencies and replace damaged or defective lighting control devices.

F. Comply with requirements of the New York State Energy Code.

3.5 ADJUSTING

A. Adjust devices and wall plates to be flush and level.

3.6 CLEANING

A. Clean exposed surfaces to remove dirt, paint, or other foreign material and restore to match original factory finish.

3.7 CLOSEOUT ACTIVITIES

A. Demonstration: Demonstrate proper operation of lighting control devices to Engineer, and correct deficiencies or make adjustments as directed.

END OF SECTION

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SECTION 262416 - PANELBOARDS

PART 1 GENERAL

1.1 SECTION INCLUDES

A. Lighting and appliance panelboards.

B. Overcurrent protective devices for panelboards.

1.2 REFERENCE STANDARDS

A. FS W-C-375 - Circuit Breakers, Molded Case; Branch Circuit and Service; Federal Specification; Revision E, 2013.

B. NECA 1 - Standard for Good Workmanship in Electrical Construction; 2010.

C. NECA 407 - Standard for Installing and Maintaining Panelboards; 2009.

D. NEMA 250 - Enclosures for Electrical Equipment (1000 Volts Maximum); 2014.

E. NEMA PB 1 - Panelboards; 2011.

F. NEMA PB 1.1 - General Instructions for Proper Installation, Operation and Maintenance of Panelboards Rated 600 Volts or Less; 2013.

G. NETA ATS - Acceptance Testing Specifications for Electrical Power Equipment and Systems; 2013.

H. NFPA 70 - National Electrical Code; Most Recent Edition Adopted by Authority Having Jurisdiction, Including All Applicable Amendments and Supplements.

I. UL 50 - Enclosures for Electrical Equipment, Non-Environmental Considerations; Current Edition, Including All Revisions.

J. UL 50E - Enclosures for Electrical Equipment, Environmental Considerations; Current Edition, Including All Revisions.

K. UL 67 - Panelboards; Current Edition, Including All Revisions.

L. UL 489 - Molded-Case Circuit Breakers, Molded-Case Switches and Circuit Breaker Enclosures; Current Edition, Including All Revisions.

M. UL 943 - Ground-Fault Circuit-Interrupters; Current Edition, Including All Revisions.

1.3 ADMINISTRATIVE REQUIREMENTS

A. Coordination:

1. Coordinate the work with other trades to avoid placement of ductwork, piping, equipment, or other potential obstructions within the dedicated equipment spaces and working clearances for electrical equipment required by NFPA 70.

2. Coordinate arrangement of electrical equipment with the dimensions and clearance requirements of the actual equipment to be installed.

3. Coordinate the work with other trades to provide walls suitable for installation of flush-mounted panelboards where indicated.

4. Verify with manufacturer that conductor terminations are suitable for use with the conductors to be installed.

5. Notify Engineer of any conflicts with or deviations from Contract Documents. Obtain direction before proceeding with work.

1.4 SUBMITTALS

A. Product Data: Provide manufacturer's standard catalog pages and data sheets for panelboards, enclosures, overcurrent protective devices, and other installed components and accessories.

1. Include characteristic trip curves for each type and rating of overcurrent protective device upon request.

B. Maintenance Materials: Furnish the following for Nanuet Union Free School District's use in maintenance of project.

1. Panelboard Keys: Two of each different key.

1.5 QUALITY ASSURANCE

A. Comply with requirements of NFPA 70.

B. Maintain at the project site a copy of each referenced document that prescribes execution requirements.

C. Manufacturer Qualifications: Company specializing in manufacturing the products specified in this section with minimum three years documented experience.

D. Product Listing Organization Qualifications: An organization recognized by OSHA as a Nationally Recognized Testing Laboratory (NRTL) and acceptable to authorities having jurisdiction.

1.6 DELIVERY, STORAGE, AND HANDLING

A. Receive, inspect, handle, and store panelboards in accordance with manufacturer's instructions and NECA 407.

B. Store in a clean, dry space. Maintain factory wrapping or provide an additional heavy canvas or heavy plastic cover to protect units from dirt, water, construction debris, and traffic.

C. Handle carefully in accordance with manufacturer's written instructions to avoid damage to panelboard internal components, enclosure, and finish.

1.7 FIELD CONDITIONS

A. Maintain ambient temperature within the following limits during and after installation of panelboards:

1. Panelboards Containing Circuit Breakers: Between 23 degrees F and 104 degrees F.

PART 2 PRODUCTS

2.1 MANUFACTURERS

A. Eaton Corporation: www.eaton.com.

B. General Electric Company: www.geindustrial.com.

C. Schneider Electric; Square D Products: www.schneider-electric.us.

2.2 PANELBOARDS - GENERAL REQUIREMENTS

A. Provide products listed, classified, and labeled as suitable for the purpose intended.

B. Unless otherwise indicated, provide products suitable for continuous operation under the following service conditions:

1. Altitude: Less than 6,600 feet.

2. Ambient Temperature:

a. Panelboards Containing Circuit Breakers: Between 23 degrees F and 104 degrees F.

C. Short Circuit Current Rating:

1. Provide panelboards with listed short circuit current rating as indicated on the drawings.

2. Listed series ratings are not acceptable.

D. Mains: Configure for top or bottom incoming feed as indicated or as required for the installation.

E. Branch Overcurrent Protective Devices: Replaceable without disturbing adjacent devices.

F. Bussing: Sized in accordance with UL 67 temperature rise requirements.

1. Provide fully rated neutral bus unless otherwise indicated, with a suitable lug for each feeder or branch circuit requiring a neutral connection.

2. Provide solidly bonded equipment ground bus in each panelboard, with a suitable lug for each feeder and branch circuit equipment grounding conductor.

G. Conductor Terminations: Suitable for use with the conductors to be installed.

H. Enclosures: Comply with NEMA 250, and list and label as complying with UL 50 and UL 50E.

1. Environment Type per NEMA 250: Unless otherwise indicated, as specified for the following installation locations:

a. Indoor Clean, Dry Locations: Type 1.

b. Outdoor Locations: Type 3R.

2. Boxes: Galvanized steel unless otherwise indicated.

a. Provide wiring gutters sized to accommodate the conductors to be installed.

b. Increase gutter space as required where sub-feed lugs, feed-through lugs, gutter taps, or oversized lugs are provided.

c. Provide removable end walls for NEMA Type 1 enclosures.

d. Provide painted steel boxes for surface-mounted panelboards, finish to match fronts.

3. Fronts:

a. Fronts for Surface-Mounted Enclosures: Same dimensions as boxes.

b. Fronts for Flush-Mounted Enclosures: Overlap boxes on all sides to conceal rough opening.

c. Finish for Painted Steel Fronts: Manufacturer's standard grey unless otherwise indicated.

4. Lockable Doors: All locks keyed alike unless otherwise indicated.

I. Future Provisions: Prepare all unused spaces for future installation of devices including bussing, connectors, mounting hardware and all other required provisions.

J. Selectivity: Where the requirement for selectivity is indicated, furnish products as required to achieve selective coordination.

K. Multi-Section Panelboards: Provide enclosures of the same height, with feed-through lugs or sub-feed lugs and feeders as indicated or as required to interconnect sections.

L. Load centers are not acceptable.

2.3 LIGHTING AND APPLIANCE PANELBOARDS

A. Description: Panelboards complying with NEMA PB 1, lighting and appliance branch circuit type, circuit breaker type, and listed and labeled as complying with UL 67; ratings, configurations and features as indicated on the drawings.

B. Conductor Terminations:

1. Main and Neutral Lug Material: Copper suitable for terminating copper conductors only.

2. Main and Neutral Lug Type: Mechanical.

C. Bussing:

1. Phase Bus Connections: Arranged for sequential phasing of overcurrent protective devices.

2. Phase and Neutral Bus Material: Copper.

3. Ground Bus Material: Copper.

D. Circuit Breakers: Thermal magnetic bolt-on type unless otherwise indicated.

E. Enclosures:

1. Provide surface-mounted or flush-mounted enclosures as indicated.

2. Fronts: Provide door-in-door trim with hinged cover for access to load terminals and wiring gutters, and separate lockable hinged door with concealed hinges for access to overcurrent protective device handles without exposing live parts.

3. Provide clear plastic circuit directory holder mounted on inside of door.

2.4 OVERCURRENT PROTECTIVE DEVICES

A. Molded Case Circuit Breakers:

1. Description: Quick-make, quick-break, over center toggle, trip-free, trip-indicating circuit breakers listed and labeled as complying with UL 489, and complying with FS W-C-375 where applicable; ratings, configurations, and features as indicated on the drawings.

2. Interrupting Capacity:

a. Provide circuit breakers with interrupting capacity as required to provide the short circuit current rating indicated, but not less than:

1) 10,000 rms symmetrical amperes at 240 VAC or 208 VAC.

2) 14,000 rms symmetrical amperes at 480 VAC.

b. Fully Rated Systems: Provide circuit breakers with interrupting capacity not less than the short circuit current rating indicated.

3. Conductor Terminations:

a. Provide mechanical lugs unless otherwise indicated.

b. Lug Material: Aluminum, suitable for terminating aluminum or copper conductors.

4. Thermal Magnetic Circuit Breakers: For each pole, furnish thermal inverse time tripping element for overload protection and magnetic instantaneous tripping element for short circuit protection.

5. Multi-Pole Circuit Breakers: Furnish with common trip for all poles.

6. Provide the following circuit breaker types where indicated:

a. Ground Fault Circuit Interrupter (GFCI) Circuit Breakers: Listed as complying with UL 943, class A for protection of personnel.

7. Provide listed switching duty rated circuit breakers with SWD marking for all branch circuits serving fluorescent lighting.

8. Do not use tandem circuit breakers.

9. Do not use handle ties in lieu of multi-pole circuit breakers.

10. Provide multi-pole circuit breakers for multi-wire branch circuits as required by NFPA 70.

11. Provide the following features and accessories where indicated or where required to complete installation:

a. Handle Pad-Lock Provision: For locking circuit breaker handle in OFF position.

2.5 SOURCE QUALITY CONTROL

A. Factory test panelboards according to NEMA PB 1.

PART 3 EXECUTION

3.1 EXAMINATION

A. Verify that field measurements are as indicated.

B. Verify that the ratings and configurations of the panelboards and associated components are consistent with the indicated requirements.

C. Verify that mounting surfaces are ready to receive panelboards.

D. Verify that conditions are satisfactory for installation prior to starting work.

3.2 INSTALLATION

A. Perform work in accordance with NECA 1 (general workmanship).

B. Install products in accordance with manufacturer's instructions.

C. Install panelboards in accordance with NECA 407 and NEMA PB 1.1.

D. Arrange equipment to provide minimum clearances in accordance with manufacturer's instructions and NFPA 70.

E. Provide required support and attachment in accordance with Section 260529.

F. Install panelboards plumb.

G. Install flush-mounted panelboards so that trims fit completely flush to wall with no gaps and rough opening completely covered.

H. Mount panelboards such that the highest position of any operating handle for circuit breakers or switches does not exceed 79 inches above the floor or working platform.

I. Provide minimum of six spare 1 inch trade size conduits out of each flush-mounted panelboard stubbed into accessible space above ceiling and below floor.

J. Provide grounding and bonding in accordance with Section 260526.

1. Terminate branch circuit equipment grounding conductors on solidly bonded equipment ground bus only. Do not terminate on isolated/insulated ground bus.

K. Install all field-installed branch devices, components, and accessories.

L. Where accessories are not self-powered, provide control power source as indicated or as required to complete installation.

M. Multi-Wire Branch Circuits: Group grounded and ungrounded conductors together in the panelboard as required by NFPA 70.

N. Set field-adjustable circuit breaker tripping function settingsas directed.

O. Provide filler plates to cover unused spaces in panelboards.

P. Identify panelboards in accordance with Section 260553.

3.3 FIELD QUALITY CONTROL

A. Inspect and test in accordance with NETA ATS, except Section 4.

B. Molded Case Circuit Breakers: Perform inspections and tests listed in NETA ATS, Section 7.6.1.1for all main circuit breakers. Tests listed as optional are not required.

C. Test GFCI circuit breakers to verify proper operation.

D. Procure services of a qualified manufacturer's representative to observe installation and assist in inspection, testing, and adjusting. Include manufacturer's reports with field quality control submittals.

E. Correct deficiencies and replace damaged or defective panelboards or associated components.

3.4 ADJUSTING

A. Adjust tightness of mechanical and electrical connections to manufacturer's recommended torque settings.

B. Adjust alignment of panelboard fronts.

C. Load Balancing: For each panelboard, rearrange circuits such that the difference between each measured steady state phase load does not exceed 20 percent and adjust circuit directories accordingly. Maintain proper phasing for multi-wire branch circuits.

3.5 CLEANING

A. Clean dirt and debris from panelboard enclosures and components according to manufacturer's instructions.

B. Repair scratched or marred exterior surfaces to match original factory finish.

END OF SECTION

SECTION 262421 - CIRCUIT BREAKERS FOR EXISTING PANELBOARDS

PART 1 GENERAL

1.1 SECTION INCLUDES

A. Circuit Breakers.

1.2 REFERENCES

A. NFPA 70 - National Electrical Code; National Fire Protection Association; Most Recent Edition Adopted by Authority Having Jurisdiction, Including All Applicable Amendments and Supplements.

1.3 SUBMITTALS

A. Not Required.

PART 2 PRODUCTS

2.1 MANUFACTURERS

A. Match existing circuit breaker manufacturer.

2.2 CIRCUIT BREAKERS

A. Match existing make and model.

B. Compatible with existing panelboard.

C. Trip rating and number of poles as indicated on drawings.

2.3 ACCESSORIES

A. As required to complete installation:

PART 3 EXECUTION

3.1 INSTALLATION

A. Install in accordance with manufacturer's instructions.

B. Install circuit breakers in existing panelboard(s) as indicated on drawings.

C. Provide updated typewritten circuit directory reflecting each branch circuit load.

3.2 FIELD QUALITY CONTROL

A. Perform inspections and tests listed in NETA STD ATS, Section 7.6 for circuit breakers.

3.3 ADJUSTING

A. Measure steady state load currents at each panelboard feeder; rearrange circuits in the panelboard to balance the phase loads to within 10 percent of each other. Maintain proper phasing for multi-wire branch circuits.

END OF SECTION

SECTION 262726 - WIRING DEVICES

PART 1 GENERAL

1.1 SECTION INCLUDES

A. Receptacles.

B. Wall plates.

1.2 REFERENCE STANDARDS

A. FS W-C-596 - Connector, Electrical, Power, General Specification for; Federal Specification; Revision G, 2001.

B. NECA 1 - Standard for Good Workmanship in Electrical Construction; 2010.

C. NECA 130 - Standard for Installing and Maintaining Wiring Devices; 2010.

D. NEMA WD 1 - General Color Requirements for Wiring Devices; 1999 (R 2010).

E. NEMA WD 6 - Wiring Devices - Dimensional Specifications; 2012.

F. NFPA 70 - National Electrical Code; Most Recent Edition Adopted by Authority Having Jurisdiction, Including All Applicable Amendments and Supplements.

G. UL 498 - Attachment Plugs and Receptacles; Current Edition, Including All Revisions.

H. UL 514D - Cover Plates for Flush-Mounted Wiring Devices; Current Edition, Including All Revisions.

I. UL 943 - Ground-Fault Circuit-Interrupters; Current Edition, Including All Revisions.

1.3 ADMINISTRATIVE REQUIREMENTS

A. Coordination:

1. Coordinate the placement of outlet boxes with millwork, furniture, equipment, etc. installed under other sections or by others.

2. Coordinate wiring device ratings and configurations with the electrical requirements of actual equipment to be installed.

3. Coordinate the installation and preparation of uneven surfaces, such as split face block, to provide suitable surface for installation of wiring devices.

4. Notify Engineer of any conflicts or deviations from Contract Documents to obtain direction prior to proceeding with work.

B. Sequencing:

1. Do not install wiring devices until final surface finishes and painting are complete.

1.4 SUBMITTALS

A. Product Data: Provide manufacturer's catalog information showing dimensions, colors, and configurations.

B. Maintenance Materials: Furnish the following for Nanuet Union Free School District's use in maintenance of project.

1. Screwdrivers for Tamper-Resistant Screws: Two for each type of screw.

2. Extra Wall Plates: One of each style, size, and finish.

1.5 QUALITY ASSURANCE

A. Comply with requirements of NFPA 70.

B. Maintain at the project site a copy of each referenced document that prescribes execution requirements.

C. Manufacturer Qualifications: Company specializing in manufacturing the products specified in this section with minimum three years documented experience.

D. Products: Listed, classified, and labeled as suitable for the purpose intended.

E. Product Listing Organization Qualifications: An organization recognized by OSHA as a Nationally Recognized Testing Laboratory (NRTL) and acceptable to authorities having jurisdiction.

1.6 DELIVERY, STORAGE, AND PROTECTION

A. Store in a clean, dry space in original manufacturer's packaging until ready for installation.

PART 2 PRODUCTS

2.1 MANUFACTURERS

A. Hubbell Incorporated: www.hubbell-wiring.com.

B. Leviton Manufacturing Company, Inc: www.leviton.com.

C. Lutron Electronics Company, Inc: www.lutron.com.

D. Pass & Seymour, a brand of Legrand North America, Inc: www.legrand.us

E. Source Limitations: Where possible, provide products for each type of wiring device produced by a single manufacturer and obtained from a single supplier.

F. Source Limitations: Where wall controls are furnished as part of lighting control system, provide accessory matching receptacles and wallplates by the same manufacturer in locations indicated.

2.2 WIRING DEVICE APPLICATIONS

A. Provide wiring devices suitable for intended use and with ratings adequate for load served.

B. For single receptacles installed on an individual branch circuit, provide receptacle with ampere rating not less than that of the branch circuit.

C. Provide weather resistant GFCI receptacles with specified weatherproof covers for receptacles installed outdoors or in damp or wet locations.

D. Provide GFCI protection for receptacles installed within 6 feet of sinks.

E. Provide GFCI protection for receptacles installed in kitchens.

F. Provide GFCI protection for receptacles serving electric drinking fountains.

G. Unless noted otherwise, do not use combination switch/receptacle devices.

2.3 WIRING DEVICE FINISHES

A. Provide wiring device finishes as described below unless otherwise indicated.

B. Wiring Devices, Unless Otherwise Indicated: White with white nylon wall plate.

C. Wiring Devices Installed in Finished Spaces: White with white nylon wall plate.

D. Wiring Devices Installed in Unfinished Spaces: Gray with galvanized steel wall plate.

E. Wiring Devices Installed in Wet or Damp Locations: White with specified weatherproof cover.

F. Wiring Devices Connected to Emergency Power: Red with red nylon wall plate.

2.4 RECEPTACLES

A. Manufacturers:

1. Hubbell Incorporated: www.hubbell-wiring.com.

2. Leviton Manufacturing Company, Inc: www.leviton.com/#sle.

3. Lutron Electronics Company, Inc; Designer Style: www.lutron.com/#sle.

4. Pass & Seymour, a brand of Legrand North America, Inc: www.legrand.us/#sle.

5. Source Limitations: Where wall controls are furnished as part of lighting control system, provide accessory matching receptacles and wallplates by the same manufacturer in locations indicated.

B. Receptacles - General Requirements: Self-grounding, complying with NEMA WD 1 and NEMA WD 6, and listed as complying with UL 498and where applicable FS W-C-596; types as indicated on the drawings.

1. Wiring Provisions: Terminal screws for side wiring or screw actuated binding clamp for back wiring with separate ground terminal screw.

C. Convenience Receptacles:

1. Standard Convenience Receptacles: Commercial specification grade, 20A, 125V, NEMA 5-20R; single or duplex as indicated on the drawings.

2. Weather Resistant Convenience Receptacles: Commercial specification grade, 20A, 125V, NEMA 5-20R, listed and labeled as weather resistant type complying with UL 498 Supplement SE suitable for installation in damp or wet locations; single or duplex as indicated on the drawings.

D. GFCI Receptacles:

1. GFCI Receptacles - General Requirements: Self-testing, with feed-through protection and light to indicate ground fault tripped condition and loss of protection; listed as complying with UL 943, class A.

a. Provide test and reset buttons of same color as device.

2. Standard GFCI Receptacles: Industrial specification grade, duplex, 20A, 125V, NEMA 5-20R, rectangular decorator style.

3. Weather Resistant GFCI Receptacles: Commercial specification grade, duplex, 20A, 125V, NEMA 5-20R, rectangular decorator style, listed and labeled as weather resistant type complying with UL 498 Supplement SE suitable for installation in damp or wet locations.

2.5 WALL PLATES

A. Manufacturers:

1. Hubbell Incorporated: www.hubbell-wiring.com/#sle.

2. Leviton Manufacturing Company, Inc: www.leviton.com/#sle.

3. Lutron Electronics Company, Inc: www.lutron.com.

4. Pass & Seymour, a brand of Legrand North America, Inc: www.legrand.us/#sle.

5. Source Limitations: Where wall controls are furnished as part of a pre-engineered lighting system, provide accessory matching wallplates by the same manufacturer.

B. Wall Plates: Comply with UL 514D.

1. Configuration: One piece cover as required for quantity and types of corresponding wiring devices.

2. Size: Standard.

3. Screws: Metal with slotted heads finished to match wall plate finish.

4. Provide screwless wallplates with concealed mounting hardware where indicated.

C. Nylon Wall Plates: Smooth finish, high-impact thermoplastic.

D. Stainless Steel Wall Plates: Brushed satin finish, Type 302 stainless steel.

E. Galvanized Steel Wall Plates: Rounded corners and edges, with corrosion resistant screws.

F. Premarked Wall Plates: Factory labeled as indicated; hot stamped for nylon wall plates and engraved for metal wall plates.

G. Weatherproof Covers for Damp Locations: Gasketed, cast aluminum, with self-closing hinged cover and corrosion-resistant screws; listed as suitable for use in wet locations with cover closed.

H. Weatherproof Covers for Wet Locations: Gasketed, cast aluminum, with hinged lockable cover and corrosion-resistant screws; listed as suitable for use in wet locations while in use with attachment plugs connected and identified as extra-duty type.

PART 3 EXECUTION

3.1 EXAMINATION

A. Verify that field measurements are as indicated.

B. Verify that outlet boxes are installed in proper locations and at proper mounting heights and are properly sized to accommodate devices and conductors in accordance with NFPA 70.

C. Verify that wall openings are neatly cut and will be completely covered by wall plates.

D. Verify that final surface finishes are complete, including painting.

E. Verify that branch circuit wiring installation is completed, tested, and ready for connection to wiring devices.

F. Verify that conditions are satisfactory for installation prior to starting work.

3.2 PREPARATION

A. Provide extension rings to bring outlet boxes flush with finished surface.

B. Clean dirt, debris, plaster, and other foreign materials from outlet boxes.

3.3 INSTALLATION

A. Perform work in accordance with NECA 1 (general workmanship) and, where applicable, NECA 130, including mounting heights specified in those standards unless otherwise indicated.

B. Coordinate locations of outlet boxes provided under Section 260533.16 as required for installation of wiring devices provided under this section.

1. Mounting Heights: Unless otherwise indicated, as follows:

2. Orient outlet boxes for vertical installation of wiring devices unless otherwise indicated.

3. Where multiple receptacles are installed at the same location and at the same mounting height, gang devices together under a common wall plate.

4. Locate receptacles for electric drinking fountains concealed behind drinking fountain according to manufacturer's instructions.

C. Install wiring devices in accordance with manufacturer's instructions.

D. Install permanent barrier between ganged wiring devices when voltage between adjacent devices exceeds 300 V.

E. Where required, connect wiring devices using pigtails not less than 6 inches long. Do not connect more than one conductor to wiring device terminals.

F. Connect wiring devices by wrapping conductor clockwise 3/4 turn around screw terminal and tightening to proper torque specified by the manufacturer. Where present, do not use push-in pressure terminals that do not rely on screw-actuated binding.

G. Unless otherwise indicated, connect wiring device grounding terminal to branch circuit equipment grounding conductor and to outlet box with bonding jumper.

H. Provide GFCI receptacles with integral GFCI protection at each location indicated. Do not use feed-through wiring to protect downstream devices.

I. Install wiring devices plumb and level with mounting yoke held rigidly in place.

J. Install wall switches with OFF position down.

K. Install vertically mounted receptacles with grounding pole on top and horizontally mounted receptacles with grounding pole on left.

L. Install wall plates to fit completely flush to wall with no gaps and rough opening completely covered without strain on wall plate. Repair or reinstall improperly installed outlet boxes or improperly sized rough openings. Do not use oversized wall plates in lieu of meeting this requirement.

M. Install blank wall plates on junction boxes and on outlet boxes with no wiring devices installed or designated for future use.

N. Identify wiring devices in accordance with Section 260553.

3.4 FIELD QUALITY CONTROL

A. Inspect each wiring device for damage and defects.

B. Operate each wall switch and wall dimmer with circuit energized to verify proper operation.

C. Verify that each receptacle device is energized.

D. Test each receptacle to verify operation and proper polarity.

E. Test each GFCI receptacle for proper tripping operation according to manufacturer's instructions.

F. Correct wiring deficiencies and replace damaged or defective wiring devices.

3.5 ADJUSTING

A. Adjust devices and wall plates to be flush and level.

B. Adjust presets for wall dimmers according to manufacturer's instructions as directed by Engineer.

3.6 CLEANING

A. Clean exposed surfaces to remove dirt, paint, or other foreign material and restore to match original factory finish.

END OF SECTION

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SECTION 262816.16 - ENCLOSED SWITCHES

PART 1 GENERAL

1.1 SECTION INCLUDES

A. Enclosed safety switches.

1.2 REFERENCE STANDARDS

A. NECA 1 - Standard for Good Workmanship in Electrical Construction; 2010.

B. NEMA 250 - Enclosures for Electrical Equipment (1000 Volts Maximum); 2014.

C. NEMA KS 1 - Heavy Duty Enclosed and Dead-Front Switches (600 Volts Maximum); 2013.

D. NETA ATS - Acceptance Testing Specifications for Electrical Power Equipment and Systems; 2013.

E. NFPA 70 - National Electrical Code; Most Recent Edition Adopted by Authority Having Jurisdiction, Including All Applicable Amendments and Supplements.

F. UL 50 - Enclosures for Electrical Equipment, Non-Environmental Considerations; Current Edition, Including All Revisions.

G. UL 50E - Enclosures for Electrical Equipment, Environmental Considerations; Current Edition, Including All Revisions.

H. UL 98 - Enclosed and Dead-Front Switches; Current Edition, Including All Revisions.

1.3 ADMINISTRATIVE REQUIREMENTS

A. Coordination:

1. Coordinate the work with other trades. Avoid placement of ductwork, piping, equipment, or other potential obstructions within the dedicated equipment spaces and within working clearances for electrical equipment required by NFPA 70.

2. Coordinate arrangement of electrical equipment with the dimensions and clearance requirements of the actual equipment to be installed.

3. Verify with manufacturer that conductor terminations are suitable for use with the conductors to be installed.

4. Notify Engineer of any conflicts with or deviations from Contract Documents. Obtain direction before proceeding with work.

1.4 SUBMITTALS

A. Product Data: Provide manufacturer's standard catalog pages and data sheets for enclosed switches and other installed components and accessories.

1.5 QUALITY ASSURANCE

A. Comply with requirements of NFPA 70.

B. Maintain at the project site a copy of each referenced document that prescribes execution requirements.

C. Manufacturer Qualifications: Company specializing in manufacturing the products specified in this section with minimum three years documented experience.

D. Product Listing Organization Qualifications: An organization recognized by OSHA as a Nationally Recognized Testing Laboratory (NRTL) and acceptable to authorities having jurisdiction.

1.6 DELIVERY, STORAGE, AND HANDLING

A. Store in a clean, dry space. Maintain factory wrapping or provide an additional heavy canvas or heavy plastic cover to protect units from dirt, water, construction debris, and traffic.

B. Handle carefully in accordance with manufacturer's written instructions to avoid damage to enclosed switch internal components, enclosure, and finish.

1.7 FIELD CONDITIONS

A. Maintain ambient temperature between -22 degrees F and 104 degrees F during and after installation of enclosed switches.

PART 2 PRODUCTS

2.1 MANUFACTURERS

A. Eaton Corporation: www.eaton.com.

B. General Electric Company: www.geindustrial.com.

C. Schneider Electric; Square D Products: www.schneider-electric.us.

2.2 ENCLOSED SAFETY SWITCHES

A. Description: Quick-make, quick-break enclosed safety switches listed and labeled as complying with UL 98; heavy duty; ratings, configurations, and features as indicated on the drawings.

B. Provide products listed, classified, and labeled as suitable for the purpose intended.

C. Unless otherwise indicated, provide products suitable for continuous operation under the following service conditions:

1. Altitude: Less than 6,600 feet.

2. Ambient Temperature: Between -22 degrees F and 104 degrees F.

D. Horsepower Rating: Suitable for connected load.

E. Voltage Rating: Suitable for circuit voltage.

F. Short Circuit Current Rating:

1. Minimum Ratings:

G. Provide with switch blade contact position that is visible when the cover is open.

H. Conductor Terminations: Suitable for use with the conductors to be installed.

I. Provide insulated, groundable fully rated solid neutral assembly where a neutral connection is required, with a suitable lug for terminating each neutral conductor.

J. Provide solidly bonded equipment ground bus in each enclosed safety switch, with a suitable lug for terminating each equipment grounding conductor.

K. Enclosures: Comply with NEMA 250, and list and label as complying with UL 50 and UL 50E.

1. Environment Type per NEMA 250: Unless otherwise indicated, as specified for the following installation locations:

a. Indoor Clean, Dry Locations: Type 1.

b. Outdoor Locations: Type 3R.

2. Finish for Painted Steel Enclosures: Manufacturer's standard, factory applied grey unless otherwise indicated.

L. Provide safety interlock to prevent opening the cover with the switch in the ON position with capability of overriding interlock for testing purposes.

M. Heavy Duty Switches:

1. Comply with NEMA KS 1.

2. Conductor Terminations:

a. Lug Material: Aluminum, suitable for terminating aluminum or copper conductors.

3. Provide externally operable handle with means for locking in the OFF position, capable of accepting three padlocks.

a. Provide means for locking handle in the ON position.

N. Provide the following features and accessories where indicated or where required to complete installation:

1. Hubs: As required for environment type; sized to accept conduits to be installed.

PART 3 EXECUTION

3.1 EXAMINATION

A. Verify that field measurements are as indicated.

B. Verify that the ratings of the enclosed switches are consistent with the indicated requirements.

C. Verify that mounting surfaces are ready to receive enclosed safety switches.

D. Verify that conditions are satisfactory for installation prior to starting work.

3.2 INSTALLATION

A. Install products in accordance with manufacturer's instructions.

B. Perform work in accordance with NECA 1 (general workmanship).

C. Arrange equipment to provide minimum clearances in accordance with manufacturer's instructions and NFPA 70.

D. Provide required support and attachment in accordance with Section 260529.

E. Install enclosed switches plumb.

F. Except where indicated to be mounted adjacent to the equipment they supply, mount enclosed switches such that the highest position of the operating handle does not exceed 79 inches above the floor or working platform.

G. Provide grounding and bonding in accordance with Section 260526.

H. Where accessories are not self-powered, provide control power source as indicated or as required to complete installation.

I. Identify enclosed switches in accordance with Section 260553.

3.3 FIELD QUALITY CONTROL

A. Inspect and test in accordance with NETA ATS, except Section 4.

B. Perform inspections and tests listed in NETA ATS, Section 7.5.1.1.

C. Correct deficiencies and replace damaged or defective enclosed safety switches or associated components.

3.4 ADJUSTING

A. Adjust tightness of mechanical and electrical connections to manufacturer's recommended torque settings.

3.5 CLEANING

A. Clean dirt and debris from switch enclosures and components according to manufacturer's instructions.

B. Repair scratched or marred exterior surfaces to match original factory finish.

END OF SECTION

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SECTION 265100 - INTERIOR LIGHTING

PART 1 GENERAL

1.1 SECTION INCLUDES

A. Interior luminaires.

B. Emergency lighting units.

C. Exit signs.

D. Ballasts and drivers.

E. Accessories.

1.2 REFERENCE STANDARDS

A. IEEE C62.41.2 - Recommended Practice on Characterization of Surges in Low-Voltage (1000 V and less) AC Power Circuits; 2002 (Cor 1, 2012).

B. IES LM-79 - Approved Method: Electrical and Photometric Measurements of Solid-State Lighting Products; 2008.

C. IES LM-79 - Approved Method: Electrical and Photometric Measurements of Solid-State Lighting Products; Illuminating Engineering Society; 2008.

D. IES LM-80 - Approved Method: Measuring Luminous Flux and Color Maintenance of LED Packages, Arrays, and Modules; Illuminating Engineering Society; 2015.

E. NECA/IESNA 500 - Standard for Installing Indoor Commercial Lighting Systems; 2006.

F. NECA/IESNA 502 - Standard for Installing Industrial Lighting Systems; 2006.

G. NEMA 410 - Performance Testing for Lighting Controls and Switching Devices with Electronic Drivers and Discharge Ballasts; 2011.

H. NEMA LE 4 - Recessed Luminaires, Ceiling Compatibility; 2012.

I. NFPA 70 - National Electrical Code; Most Recent Edition Adopted by Authority Having Jurisdiction, Including All Applicable Amendments and Supplements.

J. NFPA 101 - Life Safety Code; 2015.

K. UL 1598 - Luminaires; Current Edition, Including All Revisions.

L. UL 8750 - Light Emitting Diode (LED) Equipment for Use in Lighting Products; Current Edition, Including All Revisions.

1.3 ADMINISTRATIVE REQUIREMENTS

A. Coordination:

1. Coordinate the installation of luminaires with mounting surfaces installed under other sections or by others. Coordinate the work with placement of supports, anchors, etc. required for mounting. Coordinate compatibility of luminaires and associated trims with mounting surfaces at installed locations.

2. Coordinate the placement of luminaires with structural members, ductwork, piping, equipment, diffusers, fire suppression system components, and other potential conflicts installed under other sections or by others.

3. Notify Engineer of any conflicts or deviations from Contract Documents to obtain direction prior to proceeding with work.

1.4 SUBMITTALS

A. Product Data: Provide manufacturer's standard catalog pages and data sheets including detailed information on luminaire construction, dimensions, ratings, finishes, mounting requirements, listings, service conditions, photometric performance, installed accessories, and ceiling compatibility; include model number nomenclature clearly marked with all proposed features.

1. LED Luminaires:

a. Include estimated useful life, calculated based on IES LM-80 test data.

b. Submit only LED fixtures that are Energy Star or DLC listed.

c. Include IES LM-79 test report upon request.

B. Manufacturer's Installation Instructions: Indicate application conditions and limitations of use stipulated by product testing agency. Include instructions for storage, handling, protection, examination, preparation, and installation of product.

C. Operation and Maintenance Data: Instructions for each product including information on replacement parts.

D. Maintenance Materials: Furnish the following for Nanuet Union Free School District's use in maintenance of project.

1. Extra Lenses and Louvers: Two percent of total quantity installed for each type, but not less than one of each type.

2. Extra LED Engines: Two percent of total quantity installed for each type, but not less than two of each type.

3. Extra Drivers: Two percent of total quantity installed for each type, but not less than one of each type.

E. Project Record Documents: Record actual connections and locations of luminaires and any associated remote components.

1.5 QUALITY ASSURANCE

A. Comply with requirements of NFPA 70.

B. Maintain at the project site a copy of each referenced document that prescribes execution requirements.

C. Manufacturer Qualifications: Company specializing in manufacturing the products specified in this section with minimum three years documented experience.

D. Product Listing Organization Qualifications: An organization recognized by OSHA as a Nationally Recognized Testing Laboratory (NRTL) and acceptable to authorities having jurisdiction.

1.6 DELIVERY, STORAGE, AND PROTECTION

A. Receive, handle, and store products according to NECA/IESNA 500 (commercial lighting), NECA/IESNA 502 (industrial lighting), and manufacturer's written instructions.

B. Keep products in original manufacturer's packaging and protect from damage until ready for installation.

1.7 FIELD CONDITIONS

A. Maintain field conditions within manufacturer's required service conditions during and after installation.

1.8 WARRANTY

A. Provide three year manufacturer warranty for LED luminaires, including drivers.

B. Provide five year pro-rata warranty for batteries for emergency lighting units.

C. Provide ten year pro-rata warranty for batteries for self-powered exit signs.

PART 2 PRODUCTS

2.1 LUMINAIRE TYPES

A. Furnish products as indicated in luminaire schedule included on the drawings.

2.2 LUMINAIRES

A. Provide products that comply with requirements of NFPA 70.

B. Provide products that are listed and labeled as complying with UL 1598, where applicable.

C. Provide products listed, classified, and labeled as suitable for the purpose intended.

D. Unless otherwise indicated, provide complete luminaires including lamp(s) and all sockets, ballasts, reflectors, lenses, housings and other components required to position, energize and protect the lamp and distribute the light.

E. Unless specifically indicated to be excluded, provide all required conduit, boxes, wiring, connectors, hardware, supports, trims, accessories, etc. as necessary for a complete operating system.

F. Provide products suitable to withstand normal handling, installation, and service without any damage, distortion, corrosion, fading, discoloring, etc.

G. Recessed Luminaires:

1. Ceiling Compatibility: Comply with NEMA LE 4.

2. Luminaires Recessed in Insulated Ceilings: Listed and labeled as IC-rated, suitable for direct contact with insulation and combustible materials.

H. LED Luminaires:

1. Components: UL 8750 recognized or listed as applicable.

2. Tested in accordance with IES LM-79 and IES LM-80.

3. LED Estimated Useful Life: Minimum of 50,000 hours at 70 percent lumen maintenance, calculated based on IES LM-80 test data.

I. Luminaires Mounted in Continuous Rows: Provide quantity of units required for length indicated, with all accessories required for joining and aligning.

2.3 BALLASTS AND DRIVERS

A. Dimmable LED Drivers:

1. Dimming Range: Continuous dimming from 100 percent to one percent relative light output unless dimming capability to lower level is indicated, without flicker.

2. Control Compatibility: Fully compatible with the dimming controls to be installed.

a. Wall Dimmers: See Section 262726.

b. Wall Dimmers: See Section 26 09 23.

c. Daylighting Controls: See Section 260923.

PART 3 EXECUTION

3.1 EXAMINATION

A. Verify that field measurements are as indicated.

B. Verify that outlet boxes are installed in proper locations and at proper mounting heights and are properly sized to accommodate conductors in accordance with NFPA 70.

C. Verify that suitable support frames are installed where required.

D. Verify that branch circuit wiring installation is completed, tested, and ready for connection to luminaires.

E. Verify that conditions are satisfactory for installation prior to starting work.

3.2 PREPARATION

A. Provide extension rings to bring outlet boxes flush with finished surface.

B. Clean dirt, debris, plaster, and other foreign materials from outlet boxes.

3.3 INSTALLATION

A. Coordinate locations of outlet boxes provided under Section 260533.16 as required for installation of luminaires provided under this section.

B. Install products in accordance with manufacturer's instructions.

C. Install luminaires securely, in a neat and workmanlike manner, as specified in NECA 500 (commercial lighting) and NECA 502 (industrial lighting).

D. Provide required support and attachment in accordance with Section 260529.

E. Install luminaires plumb and square and aligned with building lines and with adjacent luminaires.

F. Suspended Ceiling Mounted Luminaires:

1. Do not use ceiling tiles to bear weight of luminaires.

2. Do not use ceiling support system to bear weight of luminaires unless ceiling support system is certified as suitable to do so.

3. Secure lay-in luminaires to ceiling support channels using listed safety clips at four corners.

4. In addition to ceiling support wires, provide two galvanized steel safety wire(s), minimum 12 gauge, connected from opposing corners of each recessed luminaire to building structure.

G. Recessed Luminaires:

1. Install trims tight to mounting surface with no visible light leakage.

2. Non-IC Rated Luminaires: Maintain required separation from insulation and combustible materials according to listing.

H. Wall-Mounted Luminaires: Unless otherwise indicated, specified mounting heights are to center of luminaire.

I. Support recessed luminaires larger than 1 x 2 size independent of ceiling framing using two 12 gauge slack wires at opposite corners connected directly to structure.

J. Install accessories furnished with each luminaire.

K. Bond products and metal accessories to branch circuit equipment grounding conductor.

L. Identify luminaires connected to emergency power system in accordance with Section 260553.

M. Install lamps in each luminaire.

3.4 FIELD QUALITY CONTROL

A. Inspect each product for damage and defects.

B. Operate each luminaire after installation and connection to verify proper operation.

C. Correct wiring deficiencies and repair or replace damaged or defective products. Repair or replace excessively noisy ballasts as determined by Engineer.

3.5 ADJUSTING

A. Aim and position adjustable luminaires to achieve desired illumination as indicated or as directed by Engineer. Secure locking fittings in place.

3.6 CLEANING

A. Clean surfaces according to NECA 500 (commercial lighting), NECA 502 (industrial lighting), and manufacturer's instructions to remove dirt, fingerprints, paint, or other foreign material and restore finishes to match original factory finish.

3.7 CLOSEOUT ACTIVITIES

A. Demonstration: Demonstrate proper operation of luminaires to Engineer, and correct deficiencies or make adjustments as directed.

B. Just prior to Substantial Completion, replace all fixtures that have failed.

3.8 PROTECTION

A. Protect installed luminaires from subsequent construction operations.

END OF SECTION

SECTION 271000 - STRUCTURED CABLING - VOICE AND DATA - INSIDE

PART 1 GENERAL

1.1 SECTION INCLUDES

A. Communications system design requirements.

B. Communications pathways.

C. Copper cable and terminations.

D. Communications equipment room fittings.

E. Communications outlets.

F. Communications identification.

1.2 REFERENCE STANDARDS

A. BICSI N1 - Installation Practices for Telecommunications and ICT Cabling and Related Cabling Infrastructure, 1st Edition; 2019.

B. ICEA S-90-661 - Category 3, 5, & 5e Individually Unshielded Twisted Pair Indoor Cables (With or Without An Overall Shield) For Use in General Purpose and LAN Communications Wiring Systems Technical Requirements; 2012.

C. NECA/BICSI 568 - Standard for Installing Building Telecommunications Cabling; National Electrical Contractors Association; 2006.

D. NFPA 70 - National Electrical Code; Most Recent Edition Adopted by Authority Having Jurisdiction, Including All Applicable Amendments and Supplements.

E. TIA-492AAAB-A - Detail Specification for 50-um Core Diameter/125-um Cladding Diameter Class Ia Graded-Index Multimode Optical Fibers; Rev A, 2009.

F. TIA-568 (SET) - Commercial Building Telecommunications Cabling Standard Set; 2015.

G. TIA-568.2 - Balanced Twisted-Pair Telecommunications Cabling and Components Standards; 2009c, with Addendum (2016).

H. TIA-569 - Telecommunications Pathways and Spaces; 2015d, with Addendum (2016).

I. TIA-568-C.2 - Balanced Twisted-Pair Telecommunications Cabling and Components Standards; Rev C, 2009 (with Addenda; 2014).

J. TIA-568-C.3 - Optical Fiber Cabling Components Standard; Rev C, 2008 (with Addenda; 2011).

K. TIA-569-D - Telecommunications Pathways and Spaces; 2015d, with Addendum (2016).

L. TIA-607 - Generic Telecommunications Bonding and Grounding (Earthing) for Customer Premises; 2015c, with Addendum (2017).

M. TIA-606-B - Administration Standard for the Telecommunications Infrastructure; Rev B, 2012.

N. TIA-607-C - Generic Telecommunications Bonding and Grounding (Earthing) for Customer Premises; 2015c, with Addendum (2017).

O. UL 444 - Communications Cables; Current Edition, Including All Revisions.

P. UL 514C - Nonmetallic Outlet Boxes, Flush-Device Boxes, and Covers; Current Edition, Including All Revisions.

Q. UL 1863 - Communications-Circuit Accessories; Current Edition, Including All Revisions.

1.3 ADMINISTRATIVE REQUIREMENTS

A. Coordination:

1. Coordinate requirements for service entrance and entrance facilities with Nanuet Central School District's IT representative.

2. Coordinate the work with other trades to avoid placement of other utilities or obstructions within the spaces dedicated for communications equipment.

1.4 SUBMITTALS

A. Product Data: Provide manufacturer's standard catalog pages and data sheets for each product.

B. Mock-Up. Prior to terminating cabling in MDF or IDF indicate proposed installation of cabling, rack, conduits, and wire management including required 20 foot slack and proper lacing and training of cables to the equipment rack. Indicate support methods to be used.

C. Evidence of qualifications for installer. Must be a certified installer with 5 years experience installing Cat 6 cabling systems of specified manufactuers.

D. Manufacturer's Installation Instructions: Indicate application conditions and limitations of use stipulated by product testing agency. Include instructions for storage, handling, protection, examination, preparation, installation, and operation of product.

E. Test Plan: Complete and detailed plan, with list of test equipment, procedures for inspection and testing, and intended test date; submit at least 60 days prior to intended test date.

F. Field Test Reports. Provide test results and include 20 year warranty for cable system.

G. Project Record Documents (As-Builts): Prepared and approved by BICSI Registered Communications Distribution Designer (RCDD).

1. Record actual locations of outlet boxes and distribution frames.

2. Show as-installed color coding, pair assignment, polarization, and cross-connect layout.

3. Identify distribution frames and equipment rooms by room number on drawings.

H. Operation and Maintenance Data: List of all components with part numbers, sources of supply, and operation and maintenance instructions; include copy of project record documents.

1.5 QUALITY ASSURANCE

A. Maintain at the project site a copy of each referenced document that prescribes execution requirements.

B. Manufacturer Qualifications: At least 3 years experience manufacturing products of the type specified.

C. Installer Qualifications: A company having at least 3 years experience in the installation and testing of the type of system specified, and:

1. Employing a BICSI Registered Communications Distribution Designer (RCDD).

2. Supervisors and installers factory certified by manufacturers of products to be installed.

3. Employing BICSI Registered Cabling Installation Technicians (RCIT) for supervision of all work.

D. Products: Listed, classified, and labeled as suitable for the purpose intended.

E. Product Listing Organization Qualifications: An organization recognized by OSHA as a Nationally Recognized Testing Laboratory (NRTL) and acceptable to authorities having jurisdiction.

1.6 DELIVERY, STORAGE, AND HANDLING

A. Store products in manufacturer's unopened packaging until ready for installation.

B. Keep stored products clean and dry.

1.7 WARRANTY

A. Correct defective Work within a 2 year period after Date of Substantial Completion.

B. Provide manufacturer's 20 year warranty.

PART 2 PRODUCTS

2.1 MANUFACTURERS

A. Cabling and Equipment:

1. Siemon Company: www.siemon.com.

2. ADC/Krone/Commscope.

3. Belden: www.belden.com.

4. Panduit.

5. Superior Essex: ce.superioressex.com.

6. Ortronics.

2.2 SYSTEM DESIGN

A. Provide a complete permanent system of cabling and pathways for voice and data communications, including cables, conduits and wireways, pull wires, support structures, enclosures and cabinets, and outlets.

1. Comply with TIA-568 (SET) (cabling) and TIA-569 (pathways) (commercial standards).

2. Comply with Communications Service Provider requirements.

3. Provide fixed cables and pathways that comply with NFPA 70 and TIA-607 and are UL listed or third party independent testing laboratory certified.

4. Provide connection devices that are rated for operation under conditions of 32 to 140 degrees F at relative humidity of 0 to 95 percent, noncondensing.

5. In this project, the term plenum is defined as return air spaces above ceilings, inside ducts, under raised floors, and other air-handling spaces.

B. System Description:

1. Offices and Work Areas: Provide one voice outlet and one data outlet in each work area or as indicated on the drawings.

C. Intermediate Distribution Frames (IDF): Support structures for terminating horizontal cables that extend to telecommunications outlets.

1. Locate intermediate distribution frames as indicated on the drawings.

D. Cabling to Outlets: Specified horizontal cabling, wired in star topology to distribution frame located at center hub of star; also referred to as "links".

2.3 PATHWAYS

A. Conduit: As specified in Section 260534. Use concealed in walls or where cabling must be run exposed or is subject to damage. Use J Hooks above accessible ceilings.

B. Firestop Sleeves: Listed; provide as required to preserve fire resistance rating of building elements.

1. Products:

a. HoldRite, a brand of Reliance Worldwide Corporation; HydroFlame Pro Series/HydroFlame Custom Built: www.holdrite.com/#sle.

2.4 COPPER CABLE AND TERMINATIONS

A. Copper Horizontal Cable:

1. Description: 100 ohm, balanced twisted pair cable complying with TIA-568.2 and listed and labeled as complying with UL 444.

2. Cable Type - Voice and Data: TIA-568 Category 6 UTP (unshielded twisted pair); 23 AWG.

a. Minimum compliance Cat 6 cable is not acceptable.

3. Cable Capacity: 4-pair.

4. Cable Applications:

a. Plenum Applications: Use listed NFPA 70 Type CMP plenum cable.

5. Cable Jacket Color -Data Cable: Blue.

a. Additional Colors willl be required depenednt on system: White, Yellow, and Green.

6. Product(s):

a. Commscope CMP-00423TE-7RB-06 (Formerly TE Connectivity TE620P-BL).

B. Copper Cable Terminations: Insulation displacement connection (IDC) type using appropriate tool; use screw connections only where specifically indicated.

C. Jacks and Connectors: Modular RJ-45, non-keyed, terminated with 110-style insulation displacement connectors (IDC); high impact thermoplastic housing; suitable for and complying with same standard as specified horizontal cable; UL 1863 listed.

1. Performance: 500 mating cycles.

2. Voice and Data Jacks: 8-position modular jack, color-coded for both T568A and T568B wiring configurations.

D. Copper Patch Cords:

1. Description: Factory-fabricated 4-pair cable assemblies with 8-position modular connectors terminated at each end.

2. Patch Cords for Patch Panels:

a. Quantity: For each cable installed as part of the work.

b. Length: 6 feet.

3. Patch Cords for Work Areas:

a. Quantity: For each cable installed as part of the work.

b. Length: 6 feet.

2.5 COMMUNICATIONS OUTLETS

A. Outlet Boxes: Comply with Section 260533.16.

1. Provide depth as required to accommodate cable manufacturer's recommended minimum conductor bend radius.

2. Minimum Size, Unless Otherwise Indicated:

a. Voice Only Outlets: 4 inch by 2 inch by 2-1/8 inch deep (100 by 50 by 54 mm) trade size.

b. Data or Combination Voice/Data Outlets: 4 inch square by 2-1/8 inch deep (100 by 54 mm) trade size.

B. Wall Plates:

1. Comply with system design standards and UL 514C.

2. Accepts modular jacks/inserts.

3. Capacity:

a. Voice Only Outlets: 1 ports.

b. Data or Combination Voice/Data Outlets: 2 ports.

c. Data Outlets in Computer Labs: Maximum 6 per faceplate.

4. Wall Plate Material/Finish - Flush-Mounted Outlets: Match wiring device and wall plate finishes specified on the drawings.

2.6 GROUNDING AND BONDING COMPONENTS

A. Comply with TIA-607.

B. Comply with Section 260526.

2.7 IDENTIFICATION PRODUCTS

A. Comply with TIA-606-B.

B. Comply with Section 260553.

2.8 SOURCE QUALITY CONTROL

A. Factory test cables according to TIA-568.

3.1 INSTALLATION - GENERAL

A. Comply with latest editions and addenda of TIA-568 (SET) (cabling), TIA-569 (pathways), TIA-607 (grounding and bonding), BICSI N1, NFPA 70, and SYSTEM DESIGN as specified in PART 2.

B. Comply with Nanuet Central School Districs's requirements.

C. Install firestopping to preserve fire resistance rating of partitions and other elements, using materials and methods specified in Section 078400.

3.2 INSTALLATION OF PATHWAYS

A. Install pathways with the following minimum clearances:

1. 48 inches from motors, generators, frequency converters, transformers, x-ray equipment, and uninterruptible power systems.

2. 12 inches from power conduits and cables and panelboards.

3. 5 inches from fluorescent and high frequency lighting fixtures.

4. 6 inches from flues, hot water pipes, and steam pipes.

B. Conduit, in Addition to Requirements of Section 260533.13:

1. Arrange conduit to provide no more than the equivalent of two 90 degree bend(s) between pull points.

2. Conduit Bends: Inside radius not less than 10 times conduit internal diameter.

3. Arrange conduit to provide no more than 100 feet between pull points.

4. Do not use conduit bodies.

C. Outlet Boxes:

1. Coordinate locations of outlet boxes provided under Section 260533.16 as required for installation of telecommunications outlets provided under this section.

a. Mounting Heights: Unless otherwise indicated, as follows:

1) Telephone and Data Outlets: 18 inches above finished floor.

2) Telephone Outlets for Side-Reach Wall-Mounted Telephones: 54 inches above finished floor to top of telephone.

3) Telephone Outlets for Forward-Reach Wall-Mounted Telephones: 48 inches above finished floor to top of telephone.

b. Orient outlet boxes for vertical installation of wiring devices unless otherwise indicated.

c. Provide minimum of 24 inches horizontal separation between flush mounted outlet boxes installed on opposite sides of fire rated walls.

d. Unless otherwise indicated, provide separate outlet boxes for line voltage and low voltage devices.

e. Locate outlet boxes so that wall plate does not span different building finishes.

f. Locate outlet boxes so that wall plate does not cross masonry joints.

3.3 INSTALLATION OF EQUIPMENT AND CABLING

A. Cabling:

1. Do not bend cable at radius less than manufacturer's recommended bend radius; for unshielded twisted pair use bend radius of not less than 4 times cable diameter.

2. Do not over-cinch or crush cables.

3. Do not exceed manufacturer's recommended cable pull tension.

4. When installing in conduit, use only lubricants approved by cable manufacturer and do not chafe or damage outer jacket.

B. Service Loops (Slack or Excess Length): Provide the following minimum extra length of cable, looped neatly:

1. At Distribution Frames (Copper): 180 inches.

2. At Distribution Frames (Fiber): 240 inches.

3. At Outlets - Copper: 12 inches.

C. Copper Cabling:

1. For 4-pair cables in conduit, do not exceed 25 pounds pull tension.

2. Use T568B wiring configuration.

D. Wall-Mounted Racks and Enclosures:

1. Install to plywood backboards only, unless otherwise indicated.

2. Mount so height of topmost panel does not exceed 78 inches above floor.

E. Identification:

1. Use wire and cable markers to identify cables at each end.

2. Use manufacturer-furnished label inserts, identification labels, or engraved wallplate to identify each jack at communications outlets with unique identifier.

3. Obtain the district's preferred labeling convention from district staff and provide proposed labeling for approval. Typical arrangement will be MDF-1, 2,3,4; IDF1-1,2,3,4; IDF2-1,2,3,4 where MDF or IDF corresponds to the location of the patch panel and the number corresponds to the sequential drop fed from that location.

3.4 FIELD QUALITY CONTROL

A. Comply with inspection and testing requirements of specified installation standards.

B. Visual Inspection:

1. Inspect cable jackets for certification markings.

2. Inspect cable terminations for color coded labels of proper type.

3. Inspect outlet plates and patch panels for complete labels.

C. Testing - Copper Cabling and Associated Equipment:

1. Category 5e and Above Links: Perform tests for wire map, length, attenuation, NEXT, and propagation delay.

D. Final Testing: After all work is complete, including installation of telecommunications outlets, and telephone dial tone service is active, test each voice jack for dial tone.

END OF SECTION

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SECTION 284600 - FIRE DETECTION AND ALARM

PART 1 GENERAL

1.1 SECTION INCLUDES

A. Fire alarm system design and installation, including all components, wiring, and conduit.

B. Removal and relocation of existing system components as indicated on drawings; including conduit and wiring. drawings.

1.2 REFERENCE STANDARDS

A. 36 CFR 1191 - Americans with Disabilities Act (ADA) Accessibility Guidelines for Buildings and Facilities; Architectural Barriers Act (ABA) Accessibility Guidelines; current edition.

B. ADA Standards - Americans with Disabilities Act (ADA) Standards for Accessible Design; 2010.

C. IEEE C62.41.2 - Recommended Practice on Characterization of Surges in Low-Voltage (1000 V and less) AC Power Circuits; 2002 (Cor 1, 2012).

D. NFPA 70 - National Electrical Code; Most Recent Edition Adopted by Authority Having Jurisdiction, Including All Applicable Amendments and Supplements.

E. NFPA 101 - Life Safety Code; 2015.

F. NFPA 72 - National Fire Alarm and Signaling Code; 2013.

1.3 SUBMITTALS

A. Evidence of designer qualifications.

B. Fire Watch / Impairment Plan.

C. Design Documents: Submit all information required for plan review and permitting by authorities having jurisdiction, including but not limited to floor plans, riser diagrams, and description of operation:

1. Copy (if any) of list of data required by authority having jurisdiction.

2. NFPA 72 "Record of Completion", filled out to the extent known at the time.

3. Clear and concise description of operation, with input/output matrix similar to that shown in NFPA 72 Appendix A-7-5-2.2(9), and complete listing of software required.

4. System zone boundaries and interfaces to fire safety systems.

5. Location of all components, circuits, and raceways; mark components with identifiers used in control unit programming.

6. Circuit layouts; number, size, and type of raceways and conductors; conduit fill calculations; spare capacity calculations; notification appliance circuit voltage drop calculations.

7. List of all devices on each signaling line circuit, with spare capacity indicated.

8. Manufacturer's detailed data sheet for each component, including wiring diagrams, installation instructions, and circuit length limitations.

9. Description of power supplies; if secondary power is by battery include calculations demonstrating adequate battery power.

10. Certification by either the manufacturer of the control unit or by the manufacturer of each other component that the components are compatible with the control unit.

11. Certification by the manufacturer of the control unit that the system design complies with Contract Documents.

12. Certification by Contractor that the system design complies with Contract Documents.

13. Do not show existing components to be removed.

D. Evidence of installer qualifications.

E. Inspection and Test Reports:

1. Submit inspection and test plan prior to closeout demonstration.

2. Submit documentation of satisfactory inspections and tests.

3. Submit NFPA 72 "Inspection and Test Form," filled out.

F. Project Record Documents: Have one set available during closeout demonstration:

1. Complete set of floor plans showing actual installed locations of components, conduit, and zones.

2. "As installed" wiring and schematic diagrams, with final terminal identifications.

3. "As programmed" operating sequences, including control events by device, updated input/output chart, and voice messages by event.

G. Closeout Documents:

1. Certification by manufacturer that the system has been installed in compliance with manufacturer's installation requirements, is complete, and is in satisfactory operating condition.

2. NFPA 72 "Record of Completion", filled out completely and signed by installer and authorized representative of authority having jurisdiction.

3. Certificate of Occupancy.

1.4 QUALITY ASSURANCE

A. Designer Qualifications: NICET Level III or IV (3 or 4) certified fire alarm technician or registered fire protection engineer, employed by fire alarm control panel manufacturer or installer with experience designing fire alarm systems in the jurisdictional area of the authorities having jurisdiction.

B. Installer Qualifications: Firm with minimum 3 years documented experience installing fire alarm systems of the specified type and providing contract maintenance service as a regular part of their business.

1. Authorized representative of control unit manufacturer; submit manufacturer's certification that installer is authorized; include name and title of manufacturer's representative making certification.

2. Installer Personnel: At least 2 years of experience installing fire alarm systems.

3. Supervisor: NICET level III or IV (3 or 4) certified fire alarm technician; furnish name and address.

4. Licensed in New York as fire alarm installer.

1.5 WARRANTY

A. Provide control panel manufacturer's warranty that system components other than wire and conduit are free from defects and will remain so for 1 year after date of Substantial Completion.

B. Provide installer's warranty that the installation is free from defects and will remain so for 1 year after date of Substantial Completion.

PART 2 PRODUCTS

2.1 MANUFACTURERS

A. Fire Alarm Control Units: High School is existing Edwards EST3 Voice Evacuation System. Elementary and Middle schools are existing Voice Evacuation Systems.

B. Fire Alarm Control Units and Accessories - Other Acceptable Manufacturers:

1. Honeywell Security & Fire Solutions/Notifier: www.notifier.com/#sle.

2. Simplex, a brand of Johnson Controls: www.simplex-fire.com/#sle.

C. Initiating Devices and Notification Appliances:

1. Provide initiating devices and notification appliances made by the same manufacturer, where possible.

2.2 FIRE ALARM SYSTEM

A. Fire Alarm System: Provide modifications to the existing fire detection and alarm systems throughout the various schools in the district shown on the drawings.

1. Provide all components necessary, regardless of whether shown in the contract documents or not.

2. Protected Premises: Entirity of each building shown on the drawings.

3. Comply with the following:

a. 2020 New York State Building Code.

b. 2020 Fire Code of New York.

c. ADA Standards.

d. ICC / ANSI A117.1.

e. The requirements of the State Fire Marshal.

f. The requirements of the local authority having jurisdiction.

g. Applicable local codes.

h. Contract Documents (drawings and specifications).

i. NFPA 72; where the word "should" is used consider that provision mandatory; where conflicts between requirements require deviation from NFPA 72, identify deviations clearly on design documents.

4. Evacuation Alarm: Single smoke zone; general evacuation of entire premises.

5. Hearing Impaired Occupants: Provide visible notification devices where shown on the plans.

6. Master Control Unit (Panel): New, located where indicated on drawings. High school is existing.

7. Combined Systems: Do not combine fire alarm system with other non-fire systems.

B. Supervising Stations and Fire Department Connections:

1. Public Fire Department Notification: By remote supervising station.
2. Remote Supervising Station: UL-listed central station under contract to facility.
3. Means of Transmission to Remote Supervising Station: Digital alarm communicator transmitter (DACT), 2 telephone lines.

C. Circuits:

1. Initiating Device Circuits (IDC): Class B, Style A.
2. Signaling Line Circuits (SLC) Within Single Building: Class B, Style 0.5.
3. Signaling Line Circuits (SLC) Between Buildings: Class A, Style 2.
4. Notification Appliance Circuits (NAC): Class B, Style W.

D. Spare Capacity:

1. Initiating Device Circuits: Minimum 50 percent spare capacity.
2. Notification Appliance Circuits: Minimum 50 percent spare capacity.
3. Fire Alarm Control Units: Capable of handling all circuits utilized to capacity without requiring additional components other than plug-in control modules.

E. Power Sources:

1. Primary: Dedicated branch circuits of the facility power distribution system.
2. Secondary: Storage batteries.
3. Capacity: Sufficient to operate entire system for period specified by NFPA 72.
4. Each Computer System: Provide uninterruptible power supply (UPS).

2.3 EXISTING COMPONENTS

A. Existing Fire Alarm Systems: Remove existing components indicated. Provide new components indicated and connect to existing system. Do not take existing portions of system out of service until new portions are fully operational, tested, and connected to existing system.

B. Remove components that are "Not In Service."

C. Remove unused existing components and materials from site and dispose of properly.

2.4 FIRE SAFETY SYSTEMS INTERFACES

A. Trouble Alarms: Provide trouble signals in accordance with NFPA 72 for the following:

1. AC Power Failure.

2. Fire alarm system low battery.

3. Open circuit, short circuit, ground fault.

4. Device fault such as dirty smoke detector, malfunctioning monitor module, etc.

5. Other faults of a monitored circuit, system, or component.

B. Supervision: Provide supervisory signals in accordance with NFPA 72 for the following:

1. Sprinkler water control valves.

2. Dry-pipe sprinkler system pressure.

3. Fire pump(s).

4. Elevator shut-down control circuits.

5. Diesel fire pump control panel.

6. CO detector Alarm.

C. Alarm: Provide alarm initiation in accordance with NFPA 72 for the following:

1. Any smoke or heat detector.

2. Any manual pull station.

3. Sprinkler water flow.

4. Kitchen hood suppression activation; also disconnect fuel source from cooking equipment.

5. Elevator lobby, elevator hoistway, and elevator machine room smoke detectors.

6. Fire pump room heat detector.

7. Duct smoke detectors.

8. Upon alarm of fire alarm system shut down HVAC equipment that is connected to the fire alarm system as indicated on the plans.

D. CO Detector Activation.

1. CO detectors shall report to the fire alarm panel alarm, supervisory, and trouble conditions. An alarm or supervisory signal from a CO detector shall appear at the main FACU as a supervisory alarm and will not cause the building fire alarm system to activate. A CO detector alarm will cause that CO detector to alarm (Temporal 4) and all CO detectors on the floor to alarm and transmit the location of the CO detector to the FACU. A CO alarm will be transmitted to the central supervising station. The CO alarms will be self restoring in that if the CO alarm that activated

clears an alarm condition all CO detectors will stop alarming unless the presence of CO is detected again by a CO detector.

E. Elevators:

1. Elevator lobby, hoistway, and machine room smoke detectors: Elevator recall for fire fighters' service.

   a. Upon alarm of any of those detector return elevator the primary recall floor unless the detector in alarm is on the primary recall floor. In that case recall elevator to secondary recall floor.

2. Elevator Machine Room Heat Detector: Shut down elevator power prior to hoistway sprinkler activation.

3. Sprinkler pressure or waterflow: Shut down elevator power prior to hoistway sprinkler activation.

F. HVAC:

1. Duct Smoke Detectors: Close dampers indicated; shut down air handlers indicated.

2. Exhaust and/or Transfer fans over 1000 CFM indicated on the plans: shut down upon general alarm of building.

G. Doors:

1. Smoke Barrier Door Magnetic Holders: Release upon activation of smoke detectors in smoke zone on either side of door, upon alarm from manual pull station on same floor, and upon sprinkler activation on same floor.

2. Electromagnetic Door Locks on Egress Doors: Unlock upon activation of any alarm initiating device or suppression system in smoke zone that doors serve as egress from.

3. Overhead Coiling Fire Doors: Release upon activation of smoke detectors in smoke zone on either side of door, upon alarm from manual pull station on same floor, and upon sprinkler activation on same floor.

2.5 COMPONENTS

A. General:

1. Provide flush mounted units where installed in finish areas; in unfinished areas, surface mounted unit are acceptable.

2. Provide legible, permanent labels for each control device, using identification used in operation and maintenance data.

B. Fire Alarm Control Units: Analog, addressable type; listed, classified, and labeled as suitable for the purpose intended.

C. Manual Fire Alarm Stations:

1. Semi-Flush mounted, dual action manual station and manufacturer's standard backbox.

2. Each manual station shall store the address of that unit.

D. Analog Smoke and Heat Sensors:

1. Analog Photo Sensors:

a. Each sensor shall store the sensor address and operating characteristics in non-volatile memory at the sensor. Sensor shall use a threshold received from the control unit to determine when an alarm condition exists.

b. Each sensor shall have two alarm LED's for 360 degree viewing. The alarm LED's shall flash when communicating with the control panel and shall illuminate steady during alarm conditions.

c. Sensitivity settings for photoelectric sensors shall be set and displayed on the LCD in percent obscuration per foot.

d. Each sensor shall be capable of compensating for dust and dirt accumulation within the sensing chamber.

e. A calibrated light source shall be used to calibrate the fire level of the photoelectric sensor. Sensors which use a fixed fire level limit are not acceptable.

f. Provide two-wire detector with common power supply and signal circuits.

2. Analog Thermal Sensors:

a. Each sensor shall store the sensor address and operating characteristics in non-volatile memory at the sensor; sensor shall use a threshold received from the control unit to determine when an alarm condition exists.

b. Each sensor shall have two alarm LED's for 360 degree viewing. The alarm LED's shall flash when communicating with the control panel and shall illuminate steady during alarm conditions.

c. Sensitivity settings for thermal sensors shall be set and displayed on the LCD in degrees fahrenheit. The set point for the thermal sensor shall be adjustable between 135 degrees and 200 degrees. The thermal detector shall operate on a combination rate of rise and fixed temperature principle adjustable at the fire alarm panel.

d. Provide two-wire detector with common power supply and signal circuits.

3. Analog Duct Mounted Smoke Detectors:

a. Each sensor shall store the sensor address and operating characteristics in non-volatile memory at the sensor; sensor shall use a threshold received from the control unit to determine when an alarm condition exists.

b. Sensitivity settings for photoelectric sensors shall be set and displayed on the LCD in percent obscuration per foot.

c. Equip duct smoke detectors with auxiliary SPDT relay contact and indication of detector actuation via an in duct-mounted housing and remote indicator indicating Normal and Alarm conditions.

d. Duct sampling tubes extending width of duct.

e. Provide two-wire detector with common power supply and signal circuits.

4. Addressable Combination Fire/Smoke//Carbon Monoxide (CO) Detector.

a. Ability to sense smoke, CO, and/or Heat.

b. Automatic drift compensation of smoke sensor and CO cell.

c. Separate CO detection signal.

d. Use in conjunction with intelligent sounder base, which can generate either a Temp 3 pattern for fire or a Temp 4 pattern for CO alarm indication.

E. Peripheral Fire Alarm Equipment:

1. Fast Response Contact Module:

a. Contact modules shall provide monitoring of dry contacts as initiating devices.

b. Each module shall store the sensor address and operating characteristics in non-volatile memory at the module.

c. Mount module to a standard junction box and provide visual indication of status via a status LED. Optional mounting shall be available to allowing mounting the module in a junction box with a monitored contact.

2. Supervised Output Module:

a. Each supervised output module shall be rated to operate listed notification appliances.

b. Circuit shall be rated for 2.0 amps at 24 VDC.

c. Each module shall store the sensor address and operating characteristics in non-volatile memory at the module.

d. Each module shall operate under up to 16 different conditions occurring in the system. These conditions include combining various zones and zone states.

3. Dual Relay Module:

a. Module shall provide two independently operating and configurable relays.

b. Each relay shall be rated for 2.0 amps at 24 VDC.

c. Each module shall store the sensor address and operating characteristics in non-volatile memory at the module.

d. Each module shall operate under up to 16 different conditions occurring in the system. These conditions include combining various zones and zone states.

e. Module shall operate both relays without requiring a separate power source.

F. Fire Alarm Notification Appliances:

1. Strobes: NFPA 72 lamp and flasher with red lettered "FIRE" on clear clear lens.

a. Meeting requirements of NFPA/ANSI standards and ADA Accessibility Guidelines.

b. Field adjustable from 15, 30, 75, and 110 candela.

2. Speakers: NFPA 72 Flush type fire alarm speaker.

a. High quality voice and tone reproduction with taps for 1/4 W, 1/2 W , 1W, or 2 W, at 25 VRMS or 70.7 VRMS.

b. Minimum rating of 76 decibels, field adjustable up to 86 decibels.

3. Speaker/Strobes.

a. Combination units with ratings of horn and strobe units specified.

G. Initiating Devices

1. Addressable Systems:

a. Addressable Devices: Individually identifiable by addressable fire alarm control unit.

b. Provide suitable addressable interface modules as indicated or as required for connection to conventional (non-addressable) devices and other components that provide a dry closure output.

2. Manual Pull Stations:Provide 2% extra.

3. Smoke Detectors: Provide 2% extra.

4. Duct Smoke Detectors: Provide 4 extra.

5. Heat Detectors: Provide 2% extra.

6. CO Detectors: Provide 2 extra.

7. Addressable Monitoring Devices: Provide 5 extra.

8. Addressable Control Devices: Provide 5 extra.

H. Notification Appliances:

1. Combination Speaker Strobe Unit: Provide 3 extra.

2. Strobes: Provide 2 extra.

I. Circuit Conductors: Copper.

J. Fire Alarm Wire and Cable.

1. Fire Alarm Power Branch Circuits: Building wire as specified in Section 16123.

2. Initiating Device and Indicating Appliance Circuits: Power limited fire-protective signaling cable classified for fire and smoke characteristics, copper conductor, 300 volts insulation rated 105 degrees C, suitable for use in air handling ducts, hollow spaces used as ducts, and plenums.

K. Surge Protection: In accordance with IEEE C62.41.2 category B combination waveform and NFPA 70; except for optical fiber conductors.

1. Equipment Connected to Alternating Current Circuits: Maximum let through voltage of 350 V(ac), line-to-neutral, and 350 V(ac), line-to-line; do not use fuses.

2. Initiating Device Circuits, Notification Appliance Circuits, and Communications Circuits: Provide surge protection at each point where circuit exits or enters a building; rated to protect applicable equipment; for 24 V(dc) maximum dc clamping voltage of 36 V(dc), line-to-ground, and 72 V(dc), line-to-line.

L. Instruction Charts: Printed instruction chart for operators, showing steps to be taken when a signal is received (normal, alarm, supervisory, and trouble); easily readable from normal operator's station.

1. Frame: Stainless steel or aluminum with polycarbonate or glass cover.

2. Provide one for each control unit where operations are to be performed.

3. Obtain approval of Nanuet Union Free School District prior to mounting; mount in location acceptable to Nanuet Union Free School District.

4. Provide extra copy with operation and maintenance data submittal.

PART 3 EXECUTION

3.1 INSTALLATION

A. Install in accordance with applicable codes, NFPA 72, NFPA 70, and Contract Documents.

B. Conceal all wiring, conduit, boxes, and supports where installed in finished areas or where wiring must be run in walls concealed provide conduit and cable. Where installed above drop ceilings fire alarm Type MC Cable may be used and must be colored red.

C. Install instruction cards and labels.

3.2 INSPECTION AND TESTING FOR COMPLETION

A. Notify Nanuet Union Free School District 7 days prior to beginning completion inspections and tests.

B. Notify authorities having jurisdiction and comply with their requirements for scheduling inspections and tests and for observation by their personnel.

C. Provide the services of the installer's supervisor or person with equivalent qualifications to supervise inspection and testing, correction, and adjustments.

D. Prepare for testing by ensuring that all work is complete and correct; perform preliminary tests as required.

E. Provide all tools, software, and supplies required to accomplish inspection and testing.

F. Perform inspection and testing in accordance with NFPA 72 and requirements of local authorities; document each inspection and test.

G. Correct defective work, adjust for proper operation, and retest until entire system complies with Contract Documents.

H. Diagnostic Period: After successful completion of inspections and tests, Operate system in normal mode for at least 14 days without any system or equipment malfunctions.

1. Record all system operations and malfunctions.

2. If a malfunction occurs, start diagnostic period over after correction of malfunction.

3. Nanuet Union Free School District will provide attendant operator personnel during diagnostic period; schedule training to allow Nanuet Union Free School District personnel to perform normal duties.

4. At end of successful diagnostic period, fill out and submit NFPA 72 "Inspection and Testing Form."

3.3 CLOSEOUT

A. Closeout Demonstration: Demonstrate proper operation of all functions to Nanuet Union Free School District.

1. Be prepared to conduct any of the required tests.

2. Have at least one copy of operation and maintenance data, preliminary copy of project record drawings, input/output matrix, and operator instruction chart(s) available during demonstration.

3. Have authorized technical representative of control unit manufacturer present during demonstration.

4. Demonstration may be combined with inspection and testing required by authority having jurisdiction; notify authority having jurisdiction in time to schedule demonstration.

5. Repeat demonstration until successful.

B. Substantial Completion of the project cannot be achieved until inspection and testing is successful and:

1. Specified diagnostic period without malfunction has been completed.

2. Approved operating and maintenance data has been delivered.

3. All aspects of operation have been demonstrated to Nanuet Union Free School District.

4. Final acceptance of the fire alarm system has been given by authorities having jurisdiction.

5. Occupancy permit has been granted.

C. Perform post-occupancy instruction within 3 months after Substantial Completion.

END OF SECTION