ATTACHMENT "B"
TECHNICAL SPECIFICATIONS

DIVISION 01 - GENERAL REQUIREMENTS

DIVISION 03 - CONCRETE

DIVISION 02 - EXISTING CONDITIONS

DIVISION 04 – MASONRY

SECTION 01 1000
SUMMARY

PART 1 GENERAL

1.01 PROJECT

A. Project Name: School 16 - Restoration of Building Envelope, Interiors, Security and Site.

B. Owner's Name: Yonkers Public Schools (YPS).

C. Architect's Name: CPL Architecture Engineering Planning.

D. The Project consists of the provision of installation of security cameras, card readers, and intercoms at select doors. Exterior site drainage, paving and playground surface installation. Interior finishes and door replacment. Plumbing, HVAC, electric upgrades, and AC in server room. Replacement of Public Address System.

E. The Contractor is further advised that there will be a full time on site Project Representative whose duties will be defined at the preconstruction meeting.

1.02 CONTRACT DESCRIPTION

A. Contract Type: Multiple prime contracts, each based on a Stipulated Price as described in Document 00 5000 - Contracting Forms and Supplements.

B. The work of each separate prime contract is identified in this section and on Drawings.

1.03 DESCRIPTION OF ALTERATIONS WORK

A. Work scope of Contract 1- Site Construction includes, but is not limited to, the following work:
   1. Installation of storm water piping and drains, including downspout boot relocation/installation.
   2. Relocation of existing guiderail.
   3. Concrete sidewalk replacement.
   4. Removal and replacement of exterior asphalt paving and pavement markings.
   5. Removal and replacement of curbing at the driveway and parking areas.
   6. Repointing and reconstruction of exterior stone retaining wall.
   7. Installation of waterproofing membrane on existing foundation wall.
   8. Removal of existing playground surface mats and installation of new poured in place rubber playground surface as shown on construction documents.

B. Work scope of Contract 2- General Construction includes, but is not limited to, the following work:
   1. Remove and replace existing windows as shown on construction documents.
   2. Repair, repointing of and cleaning existing exterior brick masonry.
   3. Remove and replace interior doors slabs and hardware in existing frames.
   4. Window and louver work to accomodate HVAC work.
   5. Demolition and reconstruction of walls, patching and painting to accommodate new HVAC work.
   6. Interior finishes including walls, ceilings and flooring.
   7. Abate hazardous materials impacted by work scope as noted in the contract documents.
   8. Provide firestopping for penetrations through rated assemblies as required.
   9. Provide cutting and patching as specified.

C. Work scope of Contract 3 - Plumbing includes, but is not limited to, the following work:
   1. All work related to interior alterations as noted in the contract documents including removals, and new plumbing configuration.
   2. Removal and replacement of bathroom fixtures at one classroom toilet.
   3. Removal and replacement of two classroom sinks.
   4. Removal of slop sink in storage room.
   5. Provide firestopping for penetrations through rated assemblies.
   6. Provide cutting and patching as specified.

D. Work scope of Contract 4 - HVAC Construction includes, but is not limited to, the following work:
   1. All work related to interior alterations as noted in the contract documents including removals, and new HVAC configuration.
   2. Remove and replace existing designated ceiling mounted unit ventilators and associated piping as shown on drawing H101.00.
   3. Refurbish one ceiling mounted steam radiator.
   4. One new ceiling mounted steam radiator.
   5. Provide new HVAC system in Gymnasium and storage rooms.
   6. New DDC type temperature controls.
   7. Provide firestopping for penetrations through rated assemblies.
   8. Provide cutting and patching as specified.

E. Work scope of Contract 5 - Electrical Construction includes, but is not limited to, the following work:
   1. All work related to interior alterations as noted in the contract documents including removals, and new lighting.
   2. Provision of interior power and wiring.
   3. Replace broken receptacles and all face plates in basement.
   4. Remove and replace existing Public Address System.
   5. Installation of a building wide security system.
      a. Security devices shown on the SE drawings will be furnished by the Contractor unless otherwise noted. Contractor shall install and terminate all devices and equipment.
      b. All wire, conduit, supporting devices, boxes, connection, stub ups and rough in will be provided by the Contractor (EC). EC shall connect and punch down the device to the patch panel / control panel designated in the SE drawings.
      c. EC shall machine label, tag on both ends, and test for continuity on all connections.
      d. EC shall certify network cabling and provide supporting reports to the Owner to ensure proper wire has been installed, proper installation and cable lengths.
      e. EC shall test for ground faults and wire integrity on card access, burglar alarm and door stations wiring prior to turn over to Owner.
      f. EC shall provide firestopping for all penetrations required for work of their contract.
      g. Commissioning shall be done by the Owner. EC shall have a responsible electrician/ foreman with knowledge of the project on site during commissioning to correct any gaps in continuity.
      h. The existing security system shall not be disconnected until the new system of this contract has been installed and approved.
   6. Provide disconnects and reconnections required for new HVAC equipment.
   7. Provide exterior door access control, power and control wiring.
   8. Remove and replace light fixtures at Basement level.
   9. All cutting, firestopping, patching and finish work required for the Public Address and Security Systems shall be the responsibility of the Electrical Contractor.
   10.
   11. Provide firestopping for penetrations through rated assemblies..
   12. Provide cutting and patching as specified.

1.04 OWNER OCCUPANCY

A. Owner intends to continue to occupy adjacent portions of the existing building during the entire construction period.

B. Owner intends to occupy the Project upon Substantial Completion.

C. Owner intends to occupy a certain portion of the Project prior to the completion date for the conduct of normal operations.

D. Cooperate with Owner to minimize conflict and to facilitate Owner's operations.

E. Schedule the Work to accommodate Owner occupancy.

1.05 CONTRACTOR USE OF SITE AND PREMISES

A. Construction Operations: Limited to areas noted on Drawings.

B. Arrange use of site and premises to allow:
   1. Owner occupancy.
   2. Work by Others.
   3. Work by Owner.
   4. Use of site and premises by the public.

C. Provide access to and from site as required by law and by Owner:
   1. Emergency Building Exits During Construction: Keep all exits required by code open during construction period; provide temporary exit signs if exit routes are temporarily altered.
   2. Do not obstruct roadways, sidewalks, or other public ways without prior approval from architect.
   3. All work and storage areas shall be completely enclosed by a fence or barricade at all times so that no student or the public can approach the area or the equipment. The Contractor shall maintain fences and barricades at all time and shall
      a. Post signs on fences 50 feet on center that read "Work Area - Keep Out"
      b. Maintain at all times, all exits and walkways from the building.
      c. When the barricade is removed for work, the Contractor performing such work shall provide adequate safety personnel to pervent unauthorized persons from approaching the work area.

D. Existing building spaces may not be used for storage.

1.06 WORK SEQUENCE

A. The Contractor is advised that time is of the essence of the contract for the completion of the construction of the facility.
   1. It is understood that the work is to be carried through to completion with the utmost speed consistent with good workmanship.
   2. Attention is directed to the mandated requirements for material and shop drawings submittals for as much of the work as practicable to occur between the time of award and the actual start date of the construction.

B. Work Schedule, Time Constraints and other Requirements of the Yonkers Public Schools are provided by "Information for Bidders" - Section XI.

C. Coordinate construction schedule and operations with Owner. See; Information for Bidders Section XI. B. 3 thru 5.

1.07 ADDITIONAL REQUIREMENTS

A. If it appears that some of the work cannot be completed by the scheduled date, the Contractor shall increase the work force or increase the hours of work, including evenings and weekends or necessary, at no additional cost to the Owner.
   1. If the work is complete but the area is not cleaned and debris or equipment is not removed, the Owner shall have the right to prepare the area for occupancy with his own forces and deduct the costs from the Contract Amount.

B. If the Contractor fails to staff the job adequately to meet the completion date, the Owner reserves the right to assume possession of the material and complete installation with the Owner's forces or other Contractors or to require the Contractor to work evenings and weekends.
   1. The school can be made available on weekends and evenings to allow the Contractor adequate time to complete the work before final completion date. Any custodial cost resulting in this after hours scheduling will be the Contractor's responsibility.

C. In addition to the above stated requirements for phasing of the work, the Contractors shall not do any noisy work in the areas where examinations will be conducted as per the published school calendar.

D. Work in each work period shall progress at least at a pace in proportion to the Contract time available.

E. The Contractor is responsible for temporary protection of all work until acceptance.

1. The Contractor shall, for all work covered under the Contract, establish a security control system for personnel and material involved with the work herein. The control system shall include indentification badges and the like so as to insure against unaurthorized entry to the site and resultant entry to the building proper.

F. Existing conditions are shown on the drawings to the best knowledge of the Architect. The Architect however, cannot guarantee the correctness of the existing conditions shown and assumes no responsibility therefore.
1. It shall be the responsibility of the Contractor to visit the site and verify all existing conditions.
2. Each Respective Contractor shall take all necessary field measurements prior to fabrication and installation of work and shall assume complete responsibility for accuracy of same.
3. This project is an Alteration and therefore necessitates additional attention to existing conditions receiving newly fabricated and installed equipment, i.e. note the requirements for field dimensioning of shop fabricated items whether or not so required by each technical section

1.08 PROOF OF ORDERS AND DELIVERY DATES

A. Within 2 weeks after the approval of shop drawings, samples, product data and the like, 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.

B. The General Construction Contractor shall coordinate with all Trades, obtain each Trades Construction Schedule and develop the Master Construction Schedule for owner approval.

1.09 INTENT OF DOCUMENTS

A. In cases of conflict between drawings and specifications as to extent or location of materials and/or work, the following order of precedence shall govern.
1. Large Scale Drawings.
   a. Small Scale Drawings.
   b. Schedules. (i.e. Finish, Door, Equipment, etc.)
   c. Technical Specifications.
2. In cases of conflict as to the type or quality of materials to be supplied, the Specifications shall govern.

END OF SECTION

SECTION 01 2200
UNIT PRICES

PART 1 GENERAL

1.01 SECTION INCLUDES

A. List of unit prices, for use in preparing Bids.

B. Measurement and payment criteria applicable to Work performed under a unit price payment method.

C. Defect assessment and non-payment for rejected work.

1.02 COSTS INCLUDED

A. Unit Prices included on the Bid Form shall include full compensation for all required labor, products, tools, equipment, plant, transportation, services and incidentals; erection, application or installation of an item of the Work; overhead and profit.

1.03 UNIT QUANTITIES SPECIFIED

A. Quantities indicated in the Bid Form are for bidding and contract purposes only. Quantities and measurements of actual Work will determine the payment amount.

1.04 MEASUREMENT OF QUANTITIES

A. Measurement methods delineated in the individual specification sections complement the criteria of this section. In the event of conflict, the requirements of the individual specification section govern.

B. Take all measurements and compute quantities. Measurements and quantities will be verified by Architect.

C. Assist by providing necessary equipment, workers, and survey personnel as required.

D. Measurement by Volume: Measured by cubic dimension using mean length, width and height or thickness.

E. Measurement by Area: Measured by square dimension using mean length and width or radius.

F. Linear Measurement: Measured by linear dimension, at the item centerline or mean chord.

G. Stipulated Price Measurement: Items measured by weight, volume, area, or linear means or combination, as appropriate, as a completed item or unit of the Work.

H. Perform surveys required to determine quantities, including control surveys to establish measurement reference lines. Notify Architect prior to starting work.

I. Engineer Responsibilities: Sign surveyor's field notes or keep duplicate field notes , calculate and certify quantities for payment purposes.

1.05 PAYMENT

A. Payment for Work governed by unit prices will be made on the basis of the actual measurements and quantities of Work that is incorporated in or made necessary by the Work and accepted by the Architect, multiplied by the unit price.

B. Payment will not be made for any of the following:
   1. Products wasted or disposed of in a manner that is not acceptable.
   2. Products determined as unacceptable before or after placement.
   3. Products not completely unloaded from the transporting vehicle.
   4. Products placed beyond the lines and levels of the required Work.
   5. Products remaining on hand after completion of the Work.
   6. Loading, hauling, and disposing of rejected Products.

1.06 DEFECT ASSESSMENT

A. If, in the opinion of Architect, it is not practical to remove and replace the Work, Architect will direct one of the following remedies:
   1. The defective Work may remain, but the unit price will be adjusted to a new unit price at the discretion of Architect.

2. The defective Work will be partially repaired to the instructions of the Architect, and the unit price will be adjusted to a new unit price at the discretion of Architect.

B. If, in the opinion of Owner, it is not practical to remove and replace the Work, Owner will direct one of the following remedies:
   1. The defective Work may remain, but the unit price will be adjusted to a new unit price at the discretion of Owner.
   2. The defective Work will be partially repaired to the instructions of the Owner, and the unit price will be adjusted to a new unit price at the discretion of Owner.

C. The individual specification sections may modify these options or may identify a specific formula or percentage price reduction.

D. The authority of Architect to assess the defect and identify payment adjustment is final.

1.07 SCHEDULE OF UNIT PRICES

A. GENERAL EARTH EXCAVATIONS - Provide general excavation as specified in Section 31 2200, and other sections referenced therein. This is a ‘per cubic yard’ price.
   1. Remove and replace unstable soil with control fill - Remove unstable soil and replace with controlled fill as specified in Sections 32 1123. This is a ‘per cubic yard’ price.
   2. Provide concrete walk - Provide concrete sidewalks, landings, and plazas as specified in Sections 02500, and other sections referenced therein. This is a ‘per square foot’ price.
   3. Remove existing concrete curb - Remove and properly dispose of existing concrete curbs as specified in Sections 32 1313. This is a ‘per linear foot’ price.
   4. Provide concrete curb - Provide 6" concrete curb as specified in Section 32 1313, and other sections referenced therein. This is a ‘per linear foot’ price.
   5. Provide Asphalt sidewalk - Provide Asphalt sidewalk as specified in Section 02500, and other sections referenced therein. This is a ‘per square foot’ price.

B. MASONRY
   1. Brick Repointing as per details indicated on drawing A-200 - Remove and replace deteriorated/cracked mortar joints. This is a 'per square foot' price.
   2. Brick Replacement as per details indicated on drawing A-200 - Remove and replace deteriorated/cracked brick masonry units. This is a 'per square foot' price.

C. PAINTING
   1. Paint Wall Surfaces - Paint gypsum wall surfaces, corner-to-corner, complete with wall preparation, as specified in Section 09900. This is a ‘per square foot’ price.

PART 2 PRODUCTS - NOT USED

PART 3 EXECUTION - NOT USED

END OF SECTION

SECTION 01 2300
ALTERNATES

PART 1 GENERAL

1.01 SECTION INCLUDES

A. Procedures for pricing alternates.

B. Documentation of changes to Contract Sum and Contract Time.

1.02 RELATED REQUIREMENTS

A. Document 00 2113 - Instructions to Bidders: Instructions for preparation of pricing for alternatives.

B. Document 00 4323 - Alternates Form: List of alternatives as supplement to Bid Form.

C. Document 00 5200 - Agreement Form: Incorporating monetary value of accepted alternatives.

1.03 ACCEPTANCE OF ALTERNATES

A. Alternates quoted on Bid Forms will be reviewed and accepted or rejected at Owner's option. Accepted alternates will be identified in the Owner-Contractor Agreement.

B. Coordinate related work and modify surrounding work to integrate the Work of each alternate.

1.04 SCHEDULE OF ALTERNATES

A. Add Alternate No. 1 - Site Contractor :
   1. Completion of approximately 60 LF of waterproofing membrane installation work scope of Alternate #1.
      a. Work items noted as Alternate #1 are shown on sheet C-100 and A-032.
      b. Items not noted as Alternate #1 on sheets C-100 and A-032 shall be included in base bid items.

PART 2 PRODUCTS - NOT USED

PART 3 EXECUTION - NOT USED

END OF SECTION

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SECTION 01 2500
SUBSTITUTION PROCEDURES

PART 1 GENERAL

1.01 SECTION INCLUDES

A. Procedural requirements for proposed substitutions.

1.02 RELATED REQUIREMENTS

A. Section 01 3000 - Administrative Requirements: Submittal procedures, coordination.

B. Section 01 6000 - Product Requirements: Fundamental product requirements, product options, delivery, storage, and handling.

1.03 DEFINITIONS

A. Substitutions: Changes from Contract Documents requirements proposed by to materials, products, assemblies, and equipment.

PART 2 PRODUCTS - NOT USED

PART 3 EXECUTION

3.01 GENERAL REQUIREMENTS

A. A Substitution Request for products, assemblies, materials, and equipment constitutes a representation that the submitter:
   1. Has investigated proposed product and determined that it meets or exceeds the quality level of the specified product, equipment, assembly, or system.
   2. Agrees to provide the same warranty for the substitution as for the specified product.
   3. Agrees to coordinate installation and make changes to other work that may be required for the work to be complete, with no additional cost to Owner.
   4. Waives claims for additional costs or time extension that may subsequently become apparent.

B. Document each request with complete data substantiating compliance of proposed substitution with Contract Documents. Burden of proof is on proposer.

C. Content: Include information necessary for tracking the status of each Substitution Request, and information necessary to provide an actionable response.

D. Limit each request to a single proposed substitution item.

3.02 SUBSTITUTION PROCEDURES DURING CONSTRUCTION

A. Submittal Form (after award of contract):

B. Architect will consider requests for substitutions only within 15 days after date of Agreement.

C. Submit request for Substitution for Cause within 14 days of discovery of need for substitution, but not later than 14 days prior to time required for review and approval by Architect, in order to stay on approved project schedule.

D. Submit request for Substitution for Convenience immediately upon discovery of its potential advantage to the project, but not later than 14 days prior to time required for review and approval by Architect, in order to stay on approved project schedule.
   1. In addition to meeting general documentation requirements, document how the requested substitution benefits the Owner through cost savings, time savings, greater energy conservation, or in other specific ways.
   2. Document means of coordinating of substitution item with other portions of the work, including work by affected subcontractors.
   3. Bear the costs engendered by proposed substitution of:
      a. Owner's compensation to the Architect for any required redesign, time spent processing and evaluating the request.

3.03 RESOLUTION

A. Architect may request additional information and documentation prior to rendering a decision. Provide this data in an expeditious manner.

B. Architect will notify in writing of decision to accept or reject request.
   1. Architect's decision following review of proposed substitution will be noted on the submitted form.

3.04 ACCEPTANCE

A. Accepted substitutions change the work of the Project. They will be documented and incorporated into work of the project by Change Order, Construction Change Directive, Architectural Supplementary Instructions, or similar instruments provided for in the Conditions of the Contract.

3.05 CLOSEOUT ACTIVITIES

A. See Section 01 7800 - Closeout Submittals, for closeout submittals.

END OF SECTION

SECTION 01 3000
ADMINISTRATIVE REQUIREMENTS

PART 1 GENERAL

1.01 SECTION INCLUDES

A. Preconstruction meeting.
B. Site mobilization meeting.
C. Progress meetings.
D. Construction progress schedule.
E. Progress photographs.
F. Coordination drawings.
G. Submittals for review, information, and project closeout.
H. Number of copies of submittals.
I. Submittal procedures.
J. Schedule of Reimbursements

1.02 RELATED REQUIREMENTS

A. Section 01 7000 - Execution and Closeout Requirements: Additional coordination requirements.
B. Section 01 7800 - Closeout Submittals: Project record documents.

1.03 PROJECT COORDINATION

A. Project Coordinator: Construction Manager, Architect or other designated client representative.
B. Cooperate with the Project Coordinator in allocation of mobilization areas of site; for field offices and sheds, for contractors access, traffic, and parking facilities.
C. During construction, coordinate use of site and facilities through the Construction Manager.
D. Comply with Construction Managers procedures for intra-project communications; submittals, reports and records, schedules, coordination drawings, and recommendations; and resolution of ambiguities and conflicts.
E. Comply with instructions of the Project Coordinator for use of temporary utilities and construction facilities.
F. Coordinate field engineering and layout work under instructions of the Project Coordinator.
G. Make the following types of submittals to Architect through the Project Coordinator:
    1. Requests for interpretation.
    2. Requests for substitution.
    3. Shop drawings, product data, and samples.
    4. Test and inspection reports.
    5. Design data.
    6. Manufacturer's instructions and field reports.
    7. Applications for payment and change order requests.
    8. Progress schedules.
    9. Coordination drawings.
    10. Closeout submittals.

PART 2 PRODUCTS - NOT USED

PART 3 EXECUTION

3.01 PRECONSTRUCTION MEETING

A. Architect will schedule a meeting after Notice of Award.
B. Attendance Required:
    1. Owner.

2. Architect.
3. Prime Contractors.

C. Agenda:
1. Execution of Owner- Agreement.
2. Submission of executed bonds and insurance certificates.
3. Distribution of Contract Documents.
4. Submission of list of Subcontractors, list of Products, schedule of values, and progress schedule.
5. Designation of personnel representing the parties to ContractContractor and .
6. Designation of personnel representing the parties to Contract, Owner representative and Architect.
7. Procedures and processing of field decisions, submittals, substitutions, applications for payments, proposal request, Change Orders, and Contract closeout procedures.
8. Scheduling.

D. Record minutes and distribute copies within two days after meeting to participants, with two copies to Architect, Owner, participants, and those affected by decisions made.

3.02 SITE MOBILIZATION MEETING

A. Architect will schedule a meeting at the Project site prior to occupancy.

B. Attendance Required:
1. Owner.
2. Architect.
3. Prime Contractor's Superintendent.

C. Agenda:
1. Use of premises by Owner and .
2. Owner's requirements and occupancy prior to completion.
3. Construction facilities and controls provided by Owner.
4. Temporary utilities provided by Owner.
5. Security and housekeeping procedures.
6. Schedules.
7. Application for payment procedures.
8. Procedures for testing.
9. Procedures for maintaining record documents.
10. Requirements for start-up of equipment.
11. Inspection and acceptance of equipment put into service during construction period.

D. Record minutes and distribute copies within two days after meeting to participants, with two copies to Architect, Owner, participants, and those affected by decisions made.

3.03 PROGRESS MEETINGS

A. Schedule and administer meetings throughout progress of the Work at maximum weekly intervals.

B. Architect will make arrangements for meetings, prepare agenda with copies for participants, preside at meetings.

C. Attendance Required: Job superintendent, major Subcontractors and suppliers, Owner, Architect, as appropriate to agenda topics for each meeting.

D. Agenda:
1. Review minutes of previous meetings.
2. Review of Work progress.
3. Field observations, problems, and decisions.
4. Identification of problems that impede, or will impede, planned progress.
5. Review of submittals schedule and status of submittals.
6. Review of off-site fabrication and delivery schedules.
7. Maintenance of progress schedule.
8. Corrective measures to regain projected schedules.
9. Planned progress during succeeding work period.
10. Coordination of projected progress.

11. Maintenance of quality and work standards.
12. Effect of proposed changes on progress schedule and coordination.
13. Other business relating to Work.

E. Record minutes and distribute copies within two days after meeting to participants, with two copies to Architect, Owner, participants, and those affected by decisions made.

3.04 CONSTRUCTION PROGRESS SCHEDULE - SEE SECTION 01 3216

A. If preliminary schedule requires revision after review, submit revised schedule within 10 days.

B. Within 20 days after review of preliminary schedule, submit draft of proposed complete schedule for review.
   1. Include written certification that major contractors have reviewed and accepted proposed schedule.

C. Within 10 days after joint review, submit complete schedule.

D. Submit updated schedule with each Application for Payment.

E. Submit updated schedule with each Application for Payment. No payments can be processed without an updated progress schedule.

3.05 APPROVED EQUAL CLAUSE AND SUBSTITUTION PROCEDURES - SEE SECTION 01 6000 PRODUCT REQUIREMENTS.

3.06 SUBMITTALS FOR REVIEW

A. Coordinate with Section 01 3114. Submit for review for all materials, equipment and furnishings to be supplied under Contract:
   1. Product data.
   2. Shop drawings.
   3. Samples for selection.
   4. Samples for verification.
   5. Certification of Specification Compliance.
   6. MSDS Sheets.

B. Submit to Architect for review for the limited purpose of checking for conformance with information given and the design concept expressed in the contract documents.

C. Samples will be reviewed only for aesthetic, color, or finish selection.

D. After review, provide copies and distribute in accordance with SUBMITTAL PROCEDURES article below and for record documents purposes described in Section 01 7800 - Closeout Submittals.

3.07 SUBMITTALS FOR PROJECT CLOSEOUT

A. When the following are specified in individual sections, submit them at project closeout:
   1. Project record documents.
   2. Operation and maintenance data.
   3. Warranties.
   4. Bonds.
   5. Consent of Surety.
   6. Waiver of Liens AIA G706.

3.08 NUMBER OF COPIES OF SUBMITTALS

3.09 SUBMITTAL PROCEDURES

1. The Contractor shall check the submittals of all sub-contractors for accuracy and contract compliance before submitting data for approval.
2. The Contractor shall note on the submittals stating that the Contractor has made this check.
3. Submittals not so checked shall be returned to the submitting contractor without examination by the architect.
4. 1 Where practical, in submitting data for approval, all associated drawings, product data and the like, relating to al complete assembly shall be submitted at one and the same time, so that each may be checked in relation to the entire proposed assembly.

B. Should any Contractor have need for resubmission or re-reviews of previously approved information of any material , all costs involved with said review incurred by the Design Professionals will be back charged at the rates set forth in Section 01 3000 to the Contractor.

C. Each Contractor shall be responsible for coordinating their work and submittal with other contractors performing work on the project.
   1. Contractor shall see that all work contiguous with, and having bearing on work indicated on drawings is accurately and distinctly illustrated and that work shown is in conformity with contract requirements.
   2. Should any Contractor cause the need for resubmission or re-reviews of previously approved information of another contractor, all costs involved with said review will be back charged at the rates set forth in Section 01 3000 to the Contractor creating the need for additional reviews.

D. For each submittal for review, allow 20 business days excluding delivery time to and from the Architect or Engineer.
   1. If the submittals show variations from contract requirements because of standard shop practices, or other reasons, Contractor shall make specific mention of such variation in his letter of transmittal.
   2. If the Contractor shall alter any information on previous submittals, besides the notations called for by the Architect, he must circle this new information to bring it to the Architect's attention.

E. Partial submissions will be returned without action taken.

F. Extraneous material on data sheets shall be struck prior to submittal.

G. For drawings returned "Resubmit", "Revise & Resubmit" or "Rejected", the original drawings shall be corrected, a new transparency made, and resubmitted until final approval.

H. For drawings returned "Approved", or "No Exceptions", "Approved as Noted" and "Make Corrections Noted", the Contractor shall obtain and provide sufficient prints as required for the field.

I. 1 NOTE: It is the responsibility of the Contractor to confirm all dimensions, quantities and the coordination of materials and products supplied by him with other trades. Approval of shop drawings containing errors does not relieve the Contractor from making corrections at his expense.

J. Materials shall not be ordered until approval is received in writing from the Architect.
   1. Mock ups and field samples shall be as specified in individual sections. They shall be full sized representations of construction assemblies as indicated in the contract documents and by the sample selections. The mockup shall be used to demonstrate aesthetics, materials and quality of execution and workmanship. Mockups shall establish the standard by which permanently installed work is judged.
   2. Mockups shall be reviewed by the Architect for approval. Should the mockups be disapproved, completely new mockups shall be constructed to remedy the non-conformances of the previous mockup and are approved by the Architect.
   3. Mockups may be removed pending the Architects approval, after the accepted standard of quality is established in the permanent work.
   4. DO NOT ORDER MATERIALS UNTIL MOCK UPS ARE APPROVED.

K. Approval of shop drawings is general. It shall not relieve the Contractor of the responsibility for accuracy of such drawings, nor for the furnishing of materials or provision or work required by the Contract and not shown on the shop drawings.

3.10 SCHEDULE OF REIMBURSEMENTS

A. When resubmittals of materials, equipment accessories to be incorporated into the project are necessary due to the failure of Contractors to properly coordinate submittals, as per Sections 01 3000 and 01 3114, or Contractors fail to complete punchlist work within the time frame designated within the contract as per Section 01 7000, and require additional reinspections, the Contractor shall compensate the Architect and Engineers for required re-reviews of said submittals and additional closeout inspections in accordance with the following fee schedule:

1. Principal's Time = $200/ hour
2. Associate's Time= $140/ hour
3. Employee's Time = Direct Personnel Expenses x 3.0
4. Engineer's Time= $155/ hour

B. The charges will be deducted from the contract amount of the responsible Contractor via Credit Change Order, at the direction of the Owner.

3.11

END OF SECTION

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SECTION 01 3114
COORDINATION SUBMITTALS AND PROCEDURES

PART 1 GENERAL

1.01 SECTION INCLUDES

A. Submittals - Shop Drawings
B. Coordination Documents
C. Coordination of Submittals
D. Meetings
E. Scheduling
F. Penalties

1.02 RELATED REQUIREMENTS

A. Section 01 1000 - Summary: Responsibilities of separate contractors.
B. Section 01 3000 - Administrative Requirements: Additional requirements for coordination, routing, and number of copies.
C. Section 01 6000 - Product Requirements: Spare parts and maintenance materials.
D. Section 01 7000 - Execution and Closeout Requirements: Starting of Systems. Systems Demonstration.
E. Section 01 7800 - Closeout Submittals: Project record documents.

1.03 SUBMITTALS - SHOP DRAWINGS

A. Development of coordination drawings shall begin immediately upon award and shall not be dependent upon structural information included on Contract Documents.
    1. The Contractor shall submit to the Architect with such promptness as to cause no delay in the work, layout, detail, schedule, setting, product data and shop drawings for each part of the work contained in the contract documents.
        a. Submission of data for review by the Structural and Mechancial/ Electrical Engineers shall be sent to the Architect. The Architect will transmit to the Engineers.
        b. Before submitting any data for approval the Contractor shall check the submittals of all subcontractors for accuracy and contract compliance.
        c. The Contractor shall see that all work contiguous with and having bearing on the work indicated on the drawings is accurately and distinctly illustrated and that work shown is in conformity with contract requirements.
        d. Incomplete submittals will be returned by the Architect without review.
B. Shop drawings shall be numbered consecutively and shall represent:
    1. All working and erection dimensions.
    2. Arrangement and sectional views.
    3. Necessary details, including information for making connections to other work.
    4. Kinds of materials and finishes. Colors where applicable.
C. Shop drawings shall be dated, and shall generally contain;
    1. Name and number of project.
    2. Name, address and telephone number of submitting Contractor.
    3. Description of required equipment, materials and classification item numbers.
    4. Locations ar which materials or equipment are to be installed in the Work.
    5. Identification of drawings, schedules, notes and/or details and specification sections and related paragraphs / articles to which they apply.
    6. Equipment of fixture identification corresponding to that used in the Contract Documents.
    7. Accessories and special or non-standard features and materials which are being furnished.
    8. Properly marked with external connection identification as related to the project where they consist of standard factory assembly or field installation drawings.

D. In addition to the general data required above, mechanical and electrical submissions shall contain:
   1. Manufacturer's specifications including materials of construction, metal gage, thickness and finish.
   2. Certified dimensional drawings including clearances required for maintenance or access.
   3. Performance data, ratings, operating characteristics, and operating limits.
   4. Electrical ratings and characteristics.
   5. Wiring and controls diagrams where applicable.
   6. Certifications requested, including UL label or listing.
   7. List of accessories which are required but are not being provided by the product manufacturer or are not being furnished under this Section. Identify the Section(s) under which the accessories are being furnished.

E. Submission of data for approval shall be accompanied by letter of transmittal, in duplicate, containing the name of the project, Contractor's name, number of drawings, titles and other pertinent data.

F. See section 01 3000 Administrative Requirements for Submittal Procedures, routing and number of copies.

G. During the final review of the coordination drawings, the approved structural shop/ fabrication drawings shall be checked and any conflicts identified. The General Contractor shall coordinate and insure structural shop drawings are processed so as to meet this requirement. Failure to implement this work in a timely manner will be cause for implementation of penalties as outlined in Article 3.05 herein.

H. The Sheet Metal specialty contractor or subcontractor shall provide initial drawings as indicated in Article 3.02 herein within six (6) weeks of issuance of Letter of Intent, or Contract, whichever is earliest. Time to complete all drawings may vary based on size and complexity of project. Extension to the six (6) weeks for final coordination drawings shall be determined prior to award by the Architect in consultation with the Contractor.

I. Each subsequent Contractor, as listed in 3.02 shall complete their work within three (3) weeks of receipt of the sheet metal shop drawings.

J. Progress of coordination drawings must be reported at every project meeting until accepted.

PART 2 PRODUCTS - NOT USED

PART 3 EXECUTION

3.01 COORDINATION REQUIRED

A. Coordinate the work listed below:
   1. Plumbing: Division 22. (
      a. Soil, waste and vent piping
      b. Water supply piping,
      c. Roof drain piping
      d. Heat tracing of piping
      e. Equipment support, anchors, guides, insulation and seismic restraints.
   2. Heating, Ventilating, and Air Conditioning: Division 23.
      a. Access panels
      b. Smoke and fire dampers
      c. HVAC piping and valves
      d. Sheet metal, coils, boxes, grilles, diffusers etc.
   3. Integrated Automation: Division 25.
   4. Electrical: Division 26.
      a. Light Fixtures and Access Panels
      b. Major electrical conduit runs, panel boards, feeder conduit and racks of branch circuits.
   5. Communications: Division 27.
   6. Electronic Safety and Security: Division 28.
   7. Site Utilities: Division 33.

8. Structure
    a. Above ceiling miscellaneous metal
9. Room layout
10. Ceiling tile and grid

B. All Contractors, subcontractors and sub-subcontractors, vendors and the like shall be required to familiarize themselves with said provisions.

C. Coordinate progress schedules, including dates for submittals and for delivery of products. See Section 01 3216 Construction Progress Schedule, for information on creation of a Master Schedule from all individual Prime schedules.

3.02 COORDINATION DOCUMENTS

A. Each Contractor shall coordinate its construction operations with those of other contractors and entities to ensure efficient and orderly installation of each part of the work. Each Contractor shall coordinate its operations with operations, included in different sections, that depend on each other for proper installation, connection and operations, and to identify potential conflicts.
    1. Such drawings shall consist of dimensioned plans and elevations, and shall give complete information, particularly to size and location of sleeves, attachments, openings, conduits, ducts boxes and structural interferences.
    2. These composite shop drawings and field installation layouts shall be coordinated in the field among the Contractors to verify the proper relationship to the work of other trades based on field conditions, and shall be checked for accuracy and approved by the Contractors before submission to the Architect for his review and concurrence.
    3. General Construction work shall be coordinated as indicated by the following procedure:
        a. The GC shall prepare composite shop drawings and field installation layouts for such work as directed by the Architect and/ or required by job requirements as to resolve tight field conditions.
        b. Base drawings for ceiling work for each area will be reflected ceiling plans with overlay of contract drawing structural steel framing. Elevations or bottom of steel and ceiling heights shall be clearly identified.
        c. These composite shop drawings and field installation layouts shall be coordinated in the field among the Contractors to verify the proper relationship to the work of other trades based on field conditions, and shall be checked for accuracy and approved by the Contractors before submission to the Architect for his review and concurrence.
        d. Contract drawings may not be used.
        e. Minimum scale 1/4" = 1'-0"
        f. Forward the reflected ceiling drawings to the succeeding contractors (as applicable) in the following order:
            1) Sheet Metal Subcontractor
            2) Fire Protection Contractor
            3) HVAC piping and associated controls systems
            4) Plumbing
            5) Electrical
            6) GC for final structural review
    4. Mechanical/ Electrical work shall be coordinated as indicated by the following procedure:
        a. The Heating Contractor shall prepare a base transparency of each area, at a scale not less than 3/8" = 1'-0", or as is customary in the sheet metal fabrication industry, showing his work in plan and elevation so as to indicate and resolve any conflicts with architectural restrictions, structural encumbrances, plumbing, fire protection HVAC piping and electrical.
        b. All firewalls and smoke partitions must be highlighted on the sheet metal drawings for appropriate coordination.
        c. The main paths of egress and for equipment removal, from main mechanical and electrical rooms must be clearly shown on the coordination plans.

d. Specialty information is required for fan rooms and mechanical rooms, horizontal exits from duct shafts, crossovers, and for spaces in and above ceilings where congestion or work may occur such as corridors, and even entire floors. Drawings shall indicate horizontal and vertical dimensions, to avoid interference with structural framing, ceilings partitions and other services.
e. Each of the specialty trades shall add its work to the background drawings with appropriate elevations and grid dimensions using a color coding system to be developed between trades.
f. Each specialty contractor shall sign and date each mylar coordination drawing. Return drawing to the Sheet Metal Subcontractor, who shall route them sequentially to all specialty trade.
g. Where conflicts occur with placement of of material of various trades, The Sheet Metal Subcontractor will be responsible to coordinate the available space to accommodate all trades. Any resulting adjustments shall be initialed and dated by the specialty trade. The Sheet Metal Subcontractor shall then final date and sign each drawing. If the conflict cannot be resolved, the decision of the Architect/ Engineer shall be final.
h. A Subcontractor who fails to promptly review and incorporate his work on the drawings shall assume full responsibility of any installation conflicts affecting his work and of any schedule ramifications.
i. The Sheet metal subcontractor shall make copies of all coordination drawings. Fabrication shall not start until such transparencies of completed coordination drawings are received by the Architect/ Engineer and have been reviewed.
    1) The sheet metal subcontractor shall provide the following distribution of documents: one vellum of each coordination drawing to each specialty trade and affected Contractor, one to the Owner, one to the General Contractor, and one vellum to the Construction Manager
j. Review of coordination drawings shall not diminish responsibility under this Contract for final coordination on installation and maintenance clearances of all systems and equipment with Architectural, Structural, Mechanical, Electrical and other work.

3.03 COORDINATION MEETINGS

A. Coordination meeting to resolve interferences in the work will be held at the project site under the direction of the Architect and the Owner's Representative.

B. Representatives of each Contractor shall be present at each meeting.

C. Each Contractor shall provide the necessary manpower and / or overtime to insure that the coordination process described herein does not delay the project.

3.04 COORDINATION OF SUBSTITUTIONS AND MODIFICATIONS

A. Review proposals and requests for substitution prior to submission to Architect.

B. Verify compliance with Contract Documents and for compatibility with work of other sections.

C. Submit with recommendation for action.

3.05 PENALTIES

A. Failure of any individual prime contractor to participate in the preparation of said coordination drawings and to obtain the Architect's review and concurrence thereof will result in forfeiture of their right of payment until said drawings are accepted.

B. Repeated violations of this contractual requirement may result in technical default of the agreement between the Owner and the offending Contractor. However, the failure of the Owner to so terminate shall not relieve the Contractor from future compliance with the terms of this section.

C. Should any Contractor cause the need for resubmission or re-reviews of previously approved information of himself or another contractor, all costs involved with said review will be back charged at the rates set forth in Section 01 3000 to the Contractor creating the need for additional reviews.

END OF SECTION

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SECTION 01 3552
UNIFORM SAFETY STANDARDS FOR SCHOOL CONSTRUCTION AND MAINTENANCE PROJECTS

GENERAL

1.01 REQUIREMENTS SET FORTH HEREIN REFLECT THE 'REGULATIONS OF THE COMMISSIONER OF EDUCATION 155.5' AND SHALL BE ADHERED TO BY ALL CONTRACTORS, SUBCONTRACTORS, SUB-SUBCONTRACTORS, VENDORS AND THE LIKE FOR ALL SUCH SCHOOL CONSTRUCTION AND MAINTENANCE PROJECTS.

A. Requirements set forth herein are in addition to and shall be considered as complementary to the Conditions of the Contract and the balance of Division #1 and Technical Specifications.

B. All Contractors, Subcontractors, Sub_subcontractors, Vendors and the like shall be required to familiarize themselves with said provisions.

SAFETY STANDARDS

2.01 MAINTENANCE OF CERTIFICATE OF OCCUPANCY

A. The occupied portion of any school building shall always comply with the minimum requirements necessary to maintain a certificate of occupancy. Contractor shall ensure that no work will cause the current Certificate of Occupancy to be revoked for any reason.

2.02 GENERAL SAFETY AND SECURITY STANDARDS FOR CONSTRUCTION PROJECTS.

A. All construction materials shall be stored in a safe and secure manner.

B. Fences around construction supplies or debris shall be maintained.

C. Gates shall always be locked unless a worker is in attendance to prevent unauthorized entry.

D. 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.

E. Workers shall be required to wear photo-identification badges at all times for identification and security purposes while working at occupied sites.

2.03 SEPARATION OF CONSTRUCTION AREAS FROM OCCUPIED SPACES

A. Construction areas which are under the control of a contractor and therefore not occupied by district staff or students shall be separated from occupied areas. The construction area and all storage and staging areas shall be enclosed by a fence as specified in Section 01 5001 1.11.

B. The Contractor shall make provisions to prevent the passage of dust and contaminants into occupied parts of the building.

C. The Contractor shall make periodic inspections and repairs of the containment barriers to prevent exposure to dust or contaminants.

D. Gypsum board partitions shall be provided in exit ways or other areas that require fire rated separation.

E. Heavy duty plastic sheeting may be used only for a vapor, fine dust or air infiltration barrier, but shall not be used to separate occupied spaces from construction areas.

F. When required by the construction operations, a specific stairwell and/or elevator will 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.

G. Large amounts of debris must be removed by using enclosed chutes or a similar sealed system provided by the Contractor. 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.

H. 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.

2.04 EXITING REQUIREMENTS

A. For the entire contract period, Contractors shall maintain required exits from the building. Additionally, all Contractors shall strictly adhere to the exiting plan if provided on the Contract Drawings.

2.05 VENTILATION REQUIREMENTS

A. The Contractor shall reroute, disconnect or cap existing ductwork in order to prevent contaminants from construction operations from entering occupied portions of the building.

B. The Contractor shall maintain ventilation to occupied areas of the building affected by the construction operations.

C. All Contractors shall strictly adhere to the temporary ventilation plan provided on the Contract Drawings.

2.06 FIRE AND HAZARD PREVENTION.

A. Areas of buildings under construction that are to remain occupied shall maintain a certificate of occupancy.

B. In addition, the following shall be strictly enforced:
   1. No smoking is allowed on public school property, including construction areas.
   2. During construction daily inspections of district occupied areas shall be conducted by school district personnel to assure that construction materials, equipment or debris do not block fire exits or emergency egress windows.
   3. Proper operation of fire extinguishers, fire alarm, and smoke/fire detection systems shall be maintained throughout the project.

2.07 CONSTRUCTION NOISE

A. Construction and maintenance operations shall not produce noise in excess of 60 dba in occupied spaces.

B. For all operations that may produce noise in excess of 60dba the Contractor shall schedule the work during times when the building or affected building spaces are not occupied, or acoustical abatement measures shall be taken.

2.08 CONTROL OF CHEMICAL FUMES, GASSES AND OTHER CONTAMINANTS

A. The Contractor shall ensure that measures are taken to prevent chemical fumes, gases, and other contaminates produced by welding, gasoline or diesel engines, roofing, paving, painting, etc. do not enter occupied portions of the building or air intakes.

2.09 OFF-GASSING OF VOLATILE ORGANIC COMPOUNDS

A. The Contractor shall take necessary measures to ensure that activities and materials which result in "off-gassing" of volatile organic compounds such as glues, paints, furniture, carpeting, wall covering, drapery, etc. are scheduled, cured or ventilated in accordance with manufacturers recommendations before a space can be occupied.

B. The Contractor shall contact material manufacturers 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.

C. 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.

D. Manufacturer's Material Safety Data Sheets (MSDS) 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.

2.10 ASBESTOS REGULATIONS

A. All school areas to be disturbed during renovation or demolition have been or will be tested for asbestos.

B. 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).

C. 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.

D. The term "building", as referenced in this section, means a wing or major section of a building that can be completely isolated from the rest of the building with sealed non combustible construction. The isolated portion of the building must contain exits that do not pass through the occupied portion and ventilation systems must be physically separated and sealed at the isolation barrier.

E. Exterior work such as roofing, flashing, siding, or soffit work may be performed on occupied buildings provided proper variances are in place as required, and complete isolation of ventilation systems and at windows is provided. Care must be taken to schedule work so that classes are not disrupted by noise or visual distraction.

2.11 LEAD PAINT REGULATIONS

A. All school areas to be disturbed during renovation or demolition have been tested for lead. See drawings for scope and effected areas.

B. 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).

C. Projects which disturb surfaces that contain lead shall have in the specifications a plan prepared by a certified Lead Risk Assessor or Supervisor which details provisions for occupant protection, worksite preparation, work methods, cleaning and clearance testing which are in general accordance with the HUD Guidelines.

****END OF SECTION****

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SECTION 01 4000
QUALITY REQUIREMENTS

PART 1 GENERAL

1.01 SECTION INCLUDES

A. Quality assurance submittals.

B. Testing and inspection services.

C. Manufacturers' field services.

1.02 RELATED REQUIREMENTS

A. Document 00 7200 - General Conditions: Inspections and approvals required by public authorities.

B. Section 01 3000 - Administrative Requirements: Submittal procedures.

C. Section 01 6000 - Product Requirements: Requirements for material and product quality.

1.03 REFERENCE STANDARDS

A. ASTM C1021 - Standard Practice for Laboratories Engaged in Testing of Building Sealants 2008 (Reapproved 2014).

B. ASTM C1077 - Standard Practice for Agencies Testing Concrete and Concrete Aggregates for Use in Construction and Criteria for Testing Agency Evaluation 2017.

C. ASTM C1093 - Standard Practice for Accreditation of Testing Agencies for Masonry 2019.

D. ASTM D3740 - Standard Practice for Minimum Requirements for Agencies Engaged in the Testing and/or Inspection of Soil and Rock as Used in Engineering Design and Construction 2019.

E. ASTM E329 - Standard Specification for Agencies Engaged in Construction Inspection, Testing, or Special Inspection 2020.

F. ASTM E543 - Standard Specification for Agencies Performing Nondestructive Testing 2015.

1.04 TESTING AND INSPECTION AGENCIES

A. Owner will employ and pay for services of an independent testing agency to perform other specified testing and inspection.
   1. The Owner will employ and pay for the services of an Independent Testing Laboratory to perform all specified services other than mechanical equipment and system balancing.

B. Requirements related to testing services and specified elsewhere in these documents include:
   1. Inspections and testing as required by laws, ordinances, rules, regulations or orders of public authorities having jurisdiction over the work.
   2. Certification of compliance as required by individual specification sections.
   3. Testing, adjusting and balancing of mechanical equipment and systems.
   4. Project record documents, including operation and maintenance manuals, record drawings and the like.
   5. Inspection, sampling and testing is required for the following;
      a. Concrete, formwork, reinforcing and the like.
      b. Masonry and mortar.

C. TESTS REQUIRED
   1. General Construction Tests: More detailed testing requirements are given in individual Specification Sections. The Owner shall retain the right to make any additional tests the Architect deem necessary or appropriate. The Contractor is responsible for providing his own tests to determine that materials meet specified requirements. The scope of tests required and paid for by the Owner (unless otherwise noted below) shall include as a minimum the following:
      a. Concrete Paving and General Concrete Work: Concrete test cylinders as specified in Section 03300.

b. Masonry Mortar: Three cylinders tested for compressive strength at 10 days; ASTM C 91 tests.
c. Sealants: Chemical analysis; adhesive strength; compatibility with adjacent materials; elasticity.
d. Paints and Finishes: Chemical analysis, coating thickness.

D. Where tests are required by the Architect to substantiate conformance to the specifications, the Owner shall pay all costs of such tests and engineering services, unless said tests indicate that the workmasnship or materials used by the Contractor are not in conformance with the Drawings, Specifications, Approved Shop Drawings or the approved materials.

E. In such event, the Contractor shall pay for the tests, remove all work and material so failing to conform, and replace with work and materials which are in full conformity.

F. Employment of agency in no way relieves the contractor of obligation to perform Work in accordance with requirements of Contract Documents.

G. Employed Agency:
1. Inspection agency: Comply with requirements of ASTM D3740, ASTM E329, ASTM E329, and ASTM D3740.
2. Laboratory: Authorized to operate in Yonkers, NY.
3. Testing Equipment: Calibrated at reasonable intervals either by NIST or using an NIST established Measurement Assurance Program, under a laboratory measurement quality assurance program.

PART 2 PRODUCTS - NOT USED

PART 3 EXECUTION

3.01 CONTROL OF INSTALLATION

A. Monitor quality control over suppliers, manufacturers, products, services, site conditions, and workmanship, to produce Work of specified quality.

B. Comply with manufacturers' instructions, including each step in sequence.

C. Should manufacturers' instructions conflict with Contract Documents, request clarification from Architect before proceeding.

D. Comply with specified standards as minimum quality for the Work except where more stringent tolerances, codes, or specified requirements indicate higher standards or more precise workmanship.

E. Have Work performed by persons qualified to produce required and specified quality.

F. Verify that field measurements are as indicated on shop drawings or as instructed by the manufacturer.

G. Secure products in place with positive anchorage devices designed and sized to withstand stresses, vibration, physical distortion, and disfigurement.

3.02 MOCK-UPS

A. Tests will be performed under provisions identified in this section and identified in the respective product specification sections.

B. Assemble and erect specified items with specified attachment and anchorage devices, flashings, seals, and finishes.

C. Accepted mock-ups shall be a comparison standard for the remaining Work.

D. Where mock-up has been accepted by Architect and is specified in product specification sections to be removed, remove mock-up and clear area when directed to do so.

3.03 TOLERANCES

A. Monitor fabrication and installation tolerance control of products to produce acceptable Work. Do not permit tolerances to accumulate.

B. Comply with manufacturers' tolerances. Should manufacturers' tolerances conflict with Contract Documents, request clarification from Architect before proceeding.

C. Adjust products to appropriate dimensions; position before securing products in place.

3.04 TESTING AND INSPECTION

A. See individual specification sections for testing and inspection required.

B. Testing Agency Duties:
   1. Test samples of mixes submitted by .
   2. Provide qualified personnel at site. Cooperate with Architect and in performance of services.
   3. Perform specified sampling and testing of products in accordance with specified standards.
   4. Ascertain compliance of materials and mixes with requirements of Contract Documents.
   5. Promptly notify Architect and of observed irregularities or non-conformance of Work or products.
   6. Perform additional tests and inspections required by Architect.
   7. Attend preconstruction meetings and progress meetings.
   8. Submit reports of all tests/inspections specified.

C. Limits on Testing/Inspection Agency Authority:
   1. Agency may not release, revoke, alter, or enlarge on requirements of Contract Documents.
   2. Agency may not approve or accept any portion of the Work.
   3. Agency may not assume any duties of .
   4. Agency has no authority to stop the Work.

D. Contractor's Responsibilities:
   1. Deliver to agency at designated location, adequate samples of materials proposed to be used that require testing, along with proposed mix designs.
   2. Cooperate with laboratory personnel, and provide access to the Work and to manufacturers' facilities.
   3. Provide incidental labor and facilities:
      a. To provide access to Work to be tested/inspected.
      b. To obtain and handle samples at the site or at source of Products to be tested/inspected.
      c. To facilitate tests/inspections.
      d. To provide storage and curing of test samples.
   4. Notify Architect and laboratory 24 hours prior to expected time for operations requiring testing/inspection services.
   5. Employ services of an independent qualified testing laboratory and pay for additional samples, tests, and inspections required by beyond specified requirements.
   6. Arrange with Owner's agency and pay for additional samples, tests, and inspections required by beyond specified requirements.

E. Re-testing required because of non-conformance to specified requirements shall be performed by the same agency on instructions by Architect.

F. Re-testing required because of non-conformance to specified requirements shall be paid for by .

G. Re-testing required because of non-conformance to specified requirements shall be performed by the same agency on instructions by Architect. If tests indicate that materials or work do not comply with requirements, payment for re testing will be charged to the Contractor by deducting testing charges from the Contract Price. The Contractor shall further remove and replace all non-complying work at no additional cost to the Owner.

3.05 MANUFACTURERS' FIELD SERVICES

A. When specified in individual specification sections, require material or product suppliers or manufacturers to provide qualified staff personnel to observe site conditions, conditions of surfaces and installation, quality of workmanship, start-up of equipment, test, adjust and balance of equipment and [_____] as applicable, and to initiate instructions when necessary.

B. Submit qualifications of observer to Architect 30 days in advance of required observations.
   1. Observer subject to approval of Architect.

C. Report observations and site decisions or instructions given to applicators or installers that are supplemental or contrary to manufacturers' written instructions.

3.06 DEFECT ASSESSMENT

A. Replace Work or portions of the Work not conforming to specified requirements at no additional cost to the Owner.

B. If, in the opinion of Architect, it is not practical to remove and replace the Work, Architect will direct an appropriate remedy or adjust payment.

END OF SECTION

SECTION 01 4523
TESTING AND INSPECTION SERVICES

APPLICABLE PROVISIONS OF THE CONDITIONS OF THE CONTRACT AND DIVISION 00, GENERAL REQUIREMENTS, GOVERN WORK IN THIS SECTION.

1.01 GENERAL

A. DESCRIPTION OF WORK
1. Requirements set forth herein are in addition to and shall be considered as complementary to the Conditions of the Contract and the balance of Division #1 and Technical Specifications.
2. See "Statement of Special Inspections and Tests" attached at the end of this section for a complete listing of required tests and inspections.
3. All Contractors, Subcontractors, Sub-subcontractors, Vendors and the like shall be required to familiarize themselves with said provisions.
4. Pursuant to the provisions of Section 01 3000, Submittal Procedures , it is further required that unless otherwise specified, tests called for in the Specifications applicable to the work and/or required to implement the work shall be paid for by the Owner.
5. Where tests are required by the Architect to substantiate conformance to the specifications the Owner will pay all costs of such tests and engineering services unless said tests indicate that the workmanship or materials used by the Contractor are not in conformance with the Drawings, Specifications, Approved Shop Drawings or the approved materials.
    a. In such event, the Contractor shall pay for the tests, remove all work and material so failing to conform, replace with work and materials which are in full conformity.
        1) Requirements related to testing services and specified elsewhere in these documents include:
            (a) Inspections and testing as required by laws, ordinances, rules, regulations or orders of public authorities having jurisdiction over the work.
            (b) Certification of compliance as required by individual specification sections.
            (c) Testing, adjusting and balancing of mechanical equipment and systems.
            (d) Project record documents, including operation and maintenance manuals, record drawings and the like.
            (e) Subsurface exploration records.
            (f) Tests and standards governing work and/or materials as may be specified throughout these specifications and/or as shown on the drawings.
            (g) The Owner will employ and pay for the services of an Independent Testing Laboratory to perform all specified services other than mechanical equipment and system balancing.
            (h) Inspection, sampling and testing is required for the following,
            (i) Soils materials and compaction.
            (j) Paving systems.
            (k) Concrete, formwork, reinforcing and the like.
            (l) Structural steel systems, joists, decking, light metal framing and the like.
            (m) Welding.
            (n) Masonry and mortar.
            (o) Roofing and flashing systems.
        2) However, this listing is to be considered as partial only with the burden placed on the Contractor to advise, and the Laboratory to provide, all such inspections, sampling and testing as may be specified and/or required by these Contract documents and the applicable laws and ordinances of the jurisdiction.

(a) Employment of the Testing Laboratory shall not relieve the Contractor of his obligation to perform work in accordance with the Contract.

b. REQUIREMENTS INCLUDED
c. Laboratory Qualifications.
d. Laboratory Duties
e. Contractor's responsibilities
f. Tests Required.
g. LABORATORY QUALIFICATIONS
h. Laboratory shall meet:

B. The "Recommended Requirements for Independent Laboratory Qualifications," latest edition as published by the American Council of Independent Laboratories.

C. Basic requirements of ASTM E 329, latest edition, governing "Standards of Recommended Practice for Inspection and Testing Agencies for Concrete and Steel as Used in Construction."

D. Laboratory shall submit copy of inspection of facilities as made by Materials Reference Laboratory of the National Bureau of Standards during most recent tour of inspection; with memorandum of remedies of any deficiencies reported by inspection.

E. Testing equipment shall be calibrated at maximum 12 month intervals by devices of accuracy traceable to either National Bureau of Standards or accepted values of natural physical constraints; submit copy of certificate of calibration as executed by an accredited calibration agency.

1. LABORATORY DUTIES
   a. Cooperate with Architect and Contractor; provide qualified personnel promptly on notice.
   b. Perform Specified inspections, sampling and testing of materials and methods of construction in conformance with specified standards, recognized authorities and the like so as to ascertain compliance with the requirements of the Contract Documents.
   c. Promptly notify Architect and Contractor of irregularities or deficiencies of work which are observed during performance of services.
   d. Promptly submit sufficient copies (minimum 5) of reports and tests to Architect for distribution. Reports shall contain:
      1) Issue date
      2) Project title and number
      3) Testing laboratory name and address
      4) Name and signature of inspector
      5) Date of inspection and sampling
      6) Temperature and weather observations
      7) Test date
      8) Identification of product and specification section
      9) Location in project
      10) Type of inspection or test
      11) Observations regarding Contract Document compliance.
      12) Perform additional services as required by the Owner and/or Architect.
         (a) The laboratory is not authorized to release, revoke, alter or enlarge on, requirements of the Contract Documents; approve or accept any portion of Work; perform any duties of the Contractor.
   e. CONTRACTOR'S RESPONSIBILITIES
   f. The Contractor shall to the best of his ability:
      1) Cooperate with laboratory personnel, provide access to the Work and to Manufacturer's operations as may be necessary.
      2) Provide to the laboratory preliminary representative samples of materials to be tested in required quantities.
      3) Furnish copies of mill test reports.
      4) Provide casual labor and facilities as required to provide access to work to be tested; to obtain and handle samples at the site; to facilitate inspections

and tests; for laboratory's exclusive use for storage and curing of test samples.

5) Notify laboratory sufficiently in advance of operations to allow for his assignment of personnel and scheduling of tests.
6) Arrange with laboratory and pay for additional sampling and testing required for the Contractor's convenience.
7) Employ, and pay for, services of a separate, equally qualified Independent Testing Laboratory to perform additional inspections, sampling and testing required when initial tests indicate work does not comply with Contract Documents. Coordinate with Paragraph 1.5 A.4. above.

g. TESTS REQUIRED
1) General Construction Tests: See "Statement of Special Inspections and Testing" attached at the end of this section. More detailed testing requirements are given in individual Specification Sections. The Owner shall retain the right to make any additional tests the Architect deem necessary or appropriate. The Contractor is responsible for providing his own tests to determine that materials meet specified requirements. The scope of tests required and paid for by the Owner (unless otherwise noted below) shall include as a minimum the following:
   (a) Masonry Mortar: Three cylinders tested for compressive strength at 10 days; ASTM C 91 tests.
   (b) Sealants: Chemical analysis; adhesive strength; compatibility with adjacent materials; elasticity.
   (c) Paints and Finishes: Chemical analysis, coating thickness.
2) Contractor's Responsibilities: The Contractor shall notify the Owner, Architect, and Testing Laboratory personnel at least 48 hours prior to performance of work requiring testing. The Contractor shall fully cooperate with testing agencies and permit free access to all areas at all times. The Contractor shall permit taking samples at any time during construction, either before or after installation. Prior to notice to proceed with construction, the Contractor shall submit a Testing Log of planned tests and scheduled test dates. Tests shall be numbered based on type of work, type of test, and sequence. The Testing Log shall be maintained by the Contractor and updated weekly.
   (a) Coordination: The Contractor shall coordinate all testing, including all testing and inspections to be paid for by the Owner. The Contractor will arrange testing and sampling performed by the Owner's testing agency and will have prepared test record forms. Upon receipt of test results, the Owner will distribute two (2) copies to the Contractor and two (2) copies to the Architect with test results.
   (b) Follow-up and Corrective Action: The Contractor and the Owner will note the test record on the Testing Log to acknowledge test procedures and results. If the follow-up or corrective action is needed, the Contractor shall submit to the Owner two (2) written copies of proposed follow-up or corrective plans and obtain the Owner's written approval before proceeding.
      (1) Cost of Testing: If tests indicate that materials or work do not comply with requirements, the Contractor shall pay for all retesting, and shall remove and replace non-complying work at no additional cost to the Owner.
   (c) Local Owner Inspections: The Contractor is also responsible for coordinating and cooperating with local requirements for inspections.

**** END OF SECTION ****

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NYS EDUCATION DEPARTMENT **Office of Facilities Planning** **Room 1060 EBA** **Albany, NY 12234**	**STATEMENT OF SPECIAL INSPECTIONS AND TESTS** As required by the Building Code of NYS (BCNYS)

BCNYS § 1704.1.1 requires the project Design Professional to complete the Statement of Special Inspections and Tests. Completion of the Statement of Special Inspections & Tests and submission to the Office of Facilities Planning with the Construction Permit Application is a condition for issuance of the Building Permit.

School District **Yonkers Public Schools**	Building **School 16**
Project Title **Restoration of Building Envelope, Interiors, security and Site**	
SED Project # **66-23-00-01-0-016-009**	Project Address **759 N. Broadway Yonkers, NY 10701**
Architect/Engineer **Sammel Architecture PLLC**	
Name of Person Completing this Statement **David Sammel**	Phone **(914) 276-0777** Date
Comments	

INSPECTION AND TESTING (Continuous & Periodic is as Defined by the BCNYS)	**CONTINUOUS**	**PERIODIC**	**REFERENCE STANDARD**	**BCNYS REFERENCE**	**CHECK IF REQUIRED**	**IDENTIFY SPEC SECTION AND PROVIDE CLARIFYING NOTES IF NECESSARY**
A. Steel Construction						
1. Material verification of high-strength bolts, nuts and washers.		X	Applicable ASTM material specifications. AISC ASD, Section A3.4; AISC LRFD, Section A3.3	1704.3	☐	
2. Inspection of high-strength bolting.	X	X	AISC LRFD, Section M2.5	1704.3, 1704.3.3	☐	
3. Material verification of structural steel.			ASTM A 6 or A 568	1704.3, 1708.4	☐	
4. Material verification of weld filler materials.			AISC, ASD, Section A3.6; AISC LRFD, Section A3.5	1704.3	☐	
5. Inspection of welding:			AWS D1.1, D1.3, D1.4; ACI 318: 3.5.2	1704.3, 1704.3.1, 1903.5.2	☐	
a. Structural steel	X	X			☐	
b. Reinforcing steel	X	X			☐	
6. Inspection of steel frame joint details.		X		1704.3, 1704.3.2	☐	
B. Concrete Construction						
1. Inspection of reinforcing steel, including prestressing tendons, and placement.		X	ACI 318: 3.5, 7.1-7.7	1704.4, 1903.5, 1907.1, 1907.7, 1914.4	X	

INSPECTION AND TESTING (Continuous & Periodic is as Defined by the BCNYS)	CONTINUOUS	PERIODIC	REFERENCE STANDARD		BCNYS REFERENCE	CHECK IF REQUIRED	IDENTIFY SPEC SECTION AND PROVIDE CLARIFYING NOTES IF NECESSARY
2. Inspection of reinforcing steel welding.			AWS D1.4; ACI 318: 3.5.2		1704.4, 1903.5.2	☐	
3. Inspection of bolts to be installed in concrete prior to and during placement.	X				1704.4, 1912.5	☐	
4. Verify use of required design mix.		X	ACI 318: Ch. 4, 5.2-5.4		1704.4, 1904, 1905.2-1905.4, 1914.2, 1914.3	X	
5. Sampling fresh concrete: slump, air content, temperature, strength test specimens.	X		ASTM C 172, C 31; ACI 318: 5.6, 5.8		1704.4, 1905.6, 1914.10	X	
6. Inspection of placement for proper application techniques.	X		ACI, 318: 5.9, 5.10		1704.4, 1905.9, 1905.10, 1914.6, 1914.7, 1914.8	X	
7. Inspection for maintenance of specified curing temperature and techniques.		X	ACI, 318: 5.11, 5.13		1704.4, 1905.11, 1905.13, 1914.9	X	
8. Inspection of pre-stressed concrete.	X		ACI 318: 18.18, 18.164		1704.4	☐	
9. Erection of precast concrete members.		X	ACI 318: Ch. 16		1704.4	☐	
10. Verification of in-situ concrete strength prior to stressing of tendons and prior to removal of shores and forms from beams and slabs.		X	SVI 318: 6.2		1704.4, 1906.2	☐	
C. Masonry Construction L1 = Level 1 Inspection required for nonessential facilities. L2 = Level 2 Inspection required for essential facilities. In general, schools are not considered essential facilities unless they are a designated emergency shelter.			ACI 530/ ASCE 5/TMS 402, Ch. 35	ACI 530.1/ ASCE 6/TMS 602, Ch. 35			
1. Verify to ensure compliance:							
a. Proportions of site prepared mortar and grout.		X L1 L2		2.6A	1704.5	X	
b. Placement of masonry units and construction of mortar joints.		X L1 L2		3.3B	1704.5	☐	
c. Location and placement of reinforcement, connectors, tendons, anchorages.		X L1 L2		3.4, 3.6A	1704.5	☐	

INSPECTION AND TESTING (Continuous & Periodic is as Defined by the BCNYS)	CONTINUOUS	PERIODIC	REFERENCE STANDARD		BCNYS REFERENCE	CHECK IF REQUIRED	IDENTIFY SPEC SECTION AND PROVIDE CLARIFYING NOTES IF NECESSARY
d. Prestressing technique and installation.		X L1 L2		3.6A, 3.6B	1704.5	☐	
e. Grade and size of tendons and anchorages.		X L1 L2		2.4B, 2.4H	1704.5	☐	
f. Grout specs prior to grouting.	X L2			3.2D	1704.5	☐	
g. Placement of grout.	X L2			3.5	1704.5	☐	
h. Grouting of tendons.	X L2			3.6C	1704.5	☐	
2. Inspection shall verify:					1704.5	☐	
a. Size and location of structural elements.		X L1 L2		3.3G	1704.5	☐	
b. Type, size, and location of anchors.	X L2	X L1	1.15.4, 2.1.1		1704.5	☐	
c. Specified size, grade, and type of reinforcement.		X L1 L2	1012	2.4, 3.4	1704.5	☐	
d. Welding of reinforcing bars.	X L1 L2		2.1.8.6, 2.1.8.6		1704.5, 2108.9.2.11	☐	
e. Cold/hot weather protection of masonry construction.		X L1 L2		108	1704.5, 2104.3, 2104.4	☐	
f. Prestressing force measurement and application.	X L2	X L1		3.6B	1704.5	☐	
3. Inspection prior to grouting.		X L1 L2	1.12	3.2D, 3.4, 2.6B, 3.3B	1704.5	☐	
4. Grout placement.	X L1 L2			3.5, 3.6C	1704.5	☐	
5. Preparation of grout specimens, mortar specimens, and/or prisms.	X L1 L2			1.4	1704.5	☐	
6. Compliance with documents and submittals.		X L1 L2		1.5	1704.5	☐	
D. Wood Construction: Fabrication of wood structured elements and assemblies.					1704.6, 1704.2	☐	
E. Soils							
1. Site preparation.					1704.7.1	X	
2. During fill placement.					1704.7.2	X	
3. Evaluation of in-place density.					1704.7.3	X	

INSPECTION AND TESTING (Continuous & Periodic is as Defined by the BCNYS)	CONTINUOUS	PERIODIC	REFERENCE STANDARD	BCNYS REFERENCE	CHECK IF REQUIRED	IDENTIFY SPEC SECTION AND PROVIDE CLARIFYING NOTES IF NECESSARY
F. Pile Foundations: Installation and load tests.				1704.8	☐	
G. Pier Foundations: Seismic Design Category C, D, E. F.				1704.9, 1616.3	☐	
H. Wall Panels and Veneers: Seismic Design Category E, F.				1704.10, 1616.3, 1704.5	☐	
I. Sprayed Fire-Resistant Materials						
1. Structural member surface conditions.				1704.11.1	☐	
2. Application.				1704.11.2	☐	
3. Thickness.			ASTM E 605	1704.11.3	☐	
4. Density.			ASTM E 605	1704.11.4	☐	
5. Bond strength.			ASTM E 736	1704.11.5	☐	
J. Exterior Insulation and Finish Systems (EIFS)				1704.12	☐	
K. Special Cases				1704.13	☐	
L. Smoke Control				1704.14	☐	
M. Special Inspections for Seismic Resistance: Applicable to specific structures, systems, and components.						
1. Structural steel.	X		AISC Seismic	1707.2	☐	
2. Structural wood.	X			1707.3	☐	
3. Cold-formed steel framing.		X		1707.4	☐	
4. Storage racks and access floors.		X		1707.5	☐	
5. Architectural components.		X		1707.6	☐	
6. Mechanical and electrical components.		X		1707.7	☐	
7. Seismic isolation system.		X		1707.8	☐	
N. Structural Testing for Seismic Resistance: Applicable to specific structures, systems, and components.						
1. Testing and verification of masonry materials and assemblies.				1708.1	☐	
2. Testing for seismic resistance.				1708.2	☐	
3. Reinforcing and prestressing steel.			ACI 318	1708.3, 1903.5.2	☐	
4. Structural steel.			AISC Seismic	1708.5	☐	
5. Mechanical and electrical equipment.				1708.5	☐	
6. Seismically isolated structures.				1708.6, 1623.8	☐	
O. Structural Observations				1709.1	☐	

INSPECTION AND TESTING (Continuous & Periodic is as Defined by the BCNYS)	CONTINUOUS	PERIODIC	REFERENCE STANDARD	BCNYS REFERENCE	CHECK IF REQUIRED	IDENTIFY SPEC SECTION AND PROVIDE CLARIFYING NOTES IF NECESSARY
Applicable to specific structures.						
P. Test Safe Load				1712.1	☐	
Q. In-Situ Load Tests				1713.1	☐	
R. Preconstruction Load Tests				1714.1	☐	
S. Other (list)						

SECTION 01 5000
TEMPORARY FACILITIES AND CONTROLS

PART 1 GENERAL

1.01 SECTION INCLUDES

A. Temporary utilities.

B. Temporary telecommunications services.

C. Temporary sanitary facilities.

D. Temporary Controls: Barriers, enclosures, and fencing.

E. Security requirements.

F. Vehicular access and parking.

G. Waste removal facilities and services.

H. Project identification sign.

I. Field offices.

1.02 RELATED REQUIREMENTS

A. Section 01 5813 - Temporary Project Signage.

1.03 TEMPORARY UTILITIES - SEE SECTION 01 5100

A. Provide and pay for all electrical power, lighting, water, heating and cooling, and ventilation required for construction purposes.

B. Existing facilities may not be used.

C. Use trigger-operated nozzles for water hoses, to avoid waste of water.

1.04 TELECOMMUNICATIONS SERVICES

A. Provide, maintain, and pay for telecommunications services to field office at time of project mobilization.

B. Telecommunications services shall include:

1.05 TEMPORARY SANITARY FACILITIES

A. Provide and maintain required facilities and enclosures. Provide at time of project mobilization.

B. Maintain daily in clean and sanitary condition.

C. At end of construction, return facilities to same or better condition as originally found.

1.06 BARRIERS

A. Provide barriers to prevent unauthorized entry to construction areas, to prevent access to areas that could be hazardous to workers or the public, to allow for owner's use of site and to protect existing facilities and adjacent properties from damage from construction operations and demolition.

B. Provide barricades and covered walkways required by governing authorities for public rights-of-way and for public access to existing building.

C. Provide protection for plants designated to remain. Replace damaged plants.

D. Protect non-owned vehicular traffic, stored materials, site, and structures from damage.

1.07 FENCING

A. Construction: Commercial grade chain link fence.

B. Provide 6 foot high fence around construction site; equip with vehicular and pedestrian gates with locks.

1.08 EXTERIOR ENCLOSURES

A. Provide temporary insulated weather tight closure of exterior openings to accommodate acceptable working conditions and protection for Products, to allow for temporary heating and maintenance of required ambient temperatures identified in individual specification

sections, and to prevent entry of unauthorized persons. Provide access doors with self-closing hardware and locks.

1.09 INTERIOR ENCLOSURES

A. Provide temporary partitions and ceilings as indicated to separate work areas from Owner-occupied areas, to prevent penetration of dust and moisture into Owner-occupied areas, and to prevent damage to existing materials and equipment.

B. Construction: Framing and reinforced polyethylene sheet materials with closed joints and sealed edges at intersections with existing surfaces:

1.10 SECURITY - SEE SECTION 01 3553

A. Provide security and facilities to protect Work, existing facilities, and Owner's operations from unauthorized entry, vandalism, or theft.

B. Coordinate with Owner's security program.

1.11 VEHICULAR ACCESS AND PARKING - SEE SECTION 01 5500

A. Coordinate access and haul routes with governing authorities and Owner.

B. Provide and maintain access to fire hydrants, free of obstructions.

C. Provide means of removing mud from vehicle wheels before entering streets.

D. Designated existing on-site roads may be used for construction traffic.

E. Provide temporary parking areas to accommodate construction personnel. When site space is not adequate, provide additional off-site parking.

F. Do not allow vehicle parking on existing pavement.

1.12 WASTE REMOVAL

A. See Section 01 7419 - Waste Management, for additional requirements.

B. Provide waste removal facilities and services as required to maintain the site in clean and orderly condition.

C. Provide containers with lids. Remove trash from site weekly.

D. If materials to be recycled or re-used on the project must be stored on-site, provide suitable non-combustible containers; locate containers holding flammable material outside the structure unless otherwise approved by the authorities having jurisdiction.

E. Open free-fall chutes are not permitted. Terminate closed chutes into appropriate containers with lids.

1.13 PROJECT IDENTIFICATION

A. Erect on site at location indicated.

B. Erect on site at location established by Architect.

C. No other signs are allowed without Owner permission except those required by law.

1.14 REMOVAL OF UTILITIES, FACILITIES, AND CONTROLS

A. Remove temporary utilities, equipment, facilities, materials, prior to Final Application for Payment inspection.

B. Remove underground installations to a minimum depth of 2 feet. Grade site as indicated.

C. Clean and repair damage caused by installation or use of temporary work.

D. Restore existing facilities used during construction to original condition.

E. Restore new permanent facilities used during construction to specified condition.

PART 2 PRODUCTS - NOT USED

PART 3 EXECUTION - NOT USED

END OF SECTION

SECTION 01 5713
TEMPORARY EROSION AND SEDIMENT CONTROL

PART 1 GENERAL

1.01 SECTION INCLUDES

A. Prevention of erosion due to construction activities.

B. Prevention of sedimentation of waterways, open drainage ways, and storm and sanitary sewers due to construction activities.

C. Restoration of areas eroded due to insufficient preventive measures.

D. Performance bond.

E. Compensation of Owner for fines levied by authorities having jurisdiction due to non-compliance by .

1.02 RELATED REQUIREMENTS

A. Section 31 1000 - Site Clearing: Limits on clearing; disposition of vegetative clearing debris.

B. Section 31 2200 - Grading: Temporary and permanent grade changes for erosion control.

C. Section 32 1123 - Aggregate Base Courses: Temporary and permanent roadways.

1.03 REFERENCE STANDARDS

A. ASTM D4751 - Standard Test Methods for Determining Apparent Opening Size of a Geotextile 2020a.

B. ASTM D4873/D4873M - Standard Guide for Identification, Storage, and Handling of Geosynthetic Rolls and Samples 2017.

C. EPA 832-R-92-005 - Storm Water Management for Construction Activities; U.S. Environmental Protection Agency; 1992.

1.04 PERFORMANCE REQUIREMENTS

A. Comply with all requirements of U.S. Environmental Protection Agency for erosion and sedimentation control, as specified for the National Pollutant Discharge Elimination System (NPDES), Phases I and II, under requirements for the 2003 Construction General Permit (CGP), whether the project is required by law to comply or not.

B. Best Management Practices Standard: EPA 832-R-92-005.

C. Best Management Practices Standard: State of New York Erosion and Sedimentation Control Manual.

D. Develop and follow an Erosion and Sedimentation Prevention Plan and submit periodic inspection reports.

E. Do not begin clearing, grading, or other work involving disturbance of ground surface cover until applicable permits have been obtained; furnish all documentation required to obtain applicable permits.
   1. Obtain and pay for permits and provide security required by authority having jurisdiction.
   2. Owner will withhold payment to equivalent to all fines resulting from non-compliance with applicable regulations.

F. Provide to Owner a Performance Bond covering erosion and sedimentation preventive measures only, in an amount equal to 100 percent of the cost of erosion and sedimentation control work.

G. Timing: Put preventive measures in place as soon as possible after disturbance of surface cover and before precipitation occurs.

H. Storm Water Runoff: Control increased storm water runoff due to disturbance of surface cover due to construction activities for this project.
   1. Prevent runoff into storm and sanitary sewer systems, including open drainage channels, in excess of actual capacity or amount allowed by authorities having jurisdiction, whichever is less.

2. Anticipate runoff volume due to the most extreme short term and 24-hour rainfall events that might occur in 25 years.

I. Erosion On Site: Minimize wind, water, and vehicular erosion of soil on project site due to construction activities for this project.
   1. Control movement of sediment and soil from temporary stockpiles of soil.
   2. Prevent development of ruts due to equipment and vehicular traffic.
   3. If erosion occurs due to non-compliance with these requirements, restore eroded areas at no cost to Owner.

J. Erosion Off Site: Prevent erosion of soil and deposition of sediment on other properties caused by water leaving the project site due to construction activities for this project.
   1. Prevent windblown soil from leaving the project site.
   2. Prevent tracking of mud onto public roads outside site.
   3. Prevent mud and sediment from flowing onto sidewalks and pavements.
   4. If erosion occurs due to non-compliance with these requirements, restore eroded areas at no cost to Owner.

K. Sedimentation of Waterways On Site: Prevent sedimentation of waterways on the project site, including rivers, streams, lakes, ponds, open drainage ways, storm sewers, and sanitary sewers.
   1. If sedimentation occurs, install or correct preventive measures immediately at no cost to Owner; remove deposited sediments; comply with requirements of authorities having jurisdiction.
   2. If sediment basins are used as temporary preventive measures, pump dry and remove deposited sediment after each storm.

L. Sedimentation of Waterways Off Site: Prevent sedimentation of waterways off the project site, including rivers, streams, lakes, ponds, open drainage ways, storm sewers, and sanitary sewers.
   1. If sedimentation occurs, install or correct preventive measures immediately at no cost to Owner; remove deposited sediments; comply with requirements of authorities having jurisdiction.

M. Open Water: Prevent standing water that could become stagnant.

N. Maintenance: Maintain temporary preventive measures until permanent measures have been established.

1.05 SUBMITTALS

A. Erosion and Sedimentation Control Plan:
   1. Submit within 2 weeks after Notice to Proceed.
   2. Include:
      a. Site plan identifying soils and vegetation, existing erosion problems, and areas vulnerable to erosion due to topography, soils, vegetation, or drainage.
      b. Measurements of existing turbidity of waterways.
      c. Site plan showing grading; new improvements; temporary roads, traffic accesses, and other temporary construction; and proposed preventive measures.
      d. Where extensive areas of soil will be disturbed, include storm water flow and volume calculations, soil loss predictions, and proposed preventive measures.
      e. Schedule of temporary preventive measures, in relation to ground disturbing activities.
      f. Other information required by law.
      g. Format required by law is acceptable, provided any additional information specified is also included.
   3. Obtain the approval of the Plan by authorities having jurisdiction.
   4. Obtain the approval of the Plan by Owner.

B. Certificate: Mill certificate for silt fence fabric attesting that fabric and factory seams comply with specified requirements, signed by legally authorized official of manufacturer; indicate actual minimum average roll values; identify fabric by roll identification numbers.

C. Inspection Reports: Submit report of each inspection; identify each preventive measure, indicate condition, and specify maintenance or repair required and accomplished.

D. Maintenance Instructions: Provide instructions covering inspection and maintenance for temporary measures that must remain after Substantial Completion.

PART 2 PRODUCTS

2.01 MATERIALS

A. Mulch: Use one of the following:
1. Straw or hay.
2. Wood waste, chips, or bark.
3. Erosion control matting or netting.
4. Cutback asphalt.
5. Polyethylene film, where specifically indicated only.

B. Bales: Air dry, rectangular straw bales.
1. Cross Section: 14 by 18 inches, minimum.
2. Bindings: Wire or string, around long dimension.

C. Bale Stakes: One of the following, minimum 3 feet long:
1. Wood, 2 by 2 inches in cross section.

D. Silt Fence Fabric: Polypropylene geotextile resistant to common soil chemicals, mildew, and insects; non-biodegradable; in longest lengths possible; fabric including seams with the following minimum average roll lengths:
1. Average Opening Size: 30 U.S. Std. Sieve, maximum, when tested in accordance with ASTM D4751.
2. Manufacturers:
a. TenCate; [_____]: www.tencate.com/#sle.
b. Propex Geosynthetics; [_____]: www.geotextile.com/#sle.

E. Silt Fence Posts: One of the following, minimum 5 feet long:
1. Steel U- or T-section, with minimum mass of 1.33 lb per linear foot.
2. Softwood, 4 by 4 inches in cross section.
3. Hardwood, 2 by 2 inches in cross section.

F. Gravel: See Section 32 1123 for aggregate.

G. Concrete: See Section 03 3000.

PART 3 EXECUTION

3.01 EXAMINATION

A. Examine site and identify existing features that contribute to erosion resistance; maintain such existing features to greatest extent possible.

3.02 PREPARATION

A. Schedule work so that soil surfaces are left exposed for the minimum amount of time.

3.03 SCOPE OF PREVENTIVE MEASURES

A. In all cases, if permanent erosion resistant measures have been installed temporary preventive measures are not required.

B. Linear Sediment Barriers: Made of silt fences.
1. Provide linear sediment barriers:
a. Along downhill perimeter edge of disturbed areas, including soil stockpiles.
b. Along the top of the slope or top bank of drainage channels and swales that traverse disturbed areas.
c. Along the toe of cut slopes and fill slopes.
d. Perpendicular to flow across the bottom of existing and new drainage channels and swales that traverse disturbed areas or carry runoff from disturbed areas; space at maximum of 200 feet apart.
e. Across the entrances to culverts that receive runoff from disturbed areas.

2. Space sediment barriers with the following maximum slope length upslope from barrier:
   a. Slope of Less Than 2 Percent: 100 feet..
   b. Slope Between 2 and 5 Percent: 75 feet.
   c. Slope Between 5 and 10 Percent: 50 feet.
   d. Slope Between 10 and 20 Percent: 25 feet.
   e. Slope Over 20 Percent: 15 feet.

C. Storm Drain Curb Inlet Sediment Trap: Protect each curb inlet using one of the following measures:
   1. Filter fabric wrapped around hollow concrete blocks blocking entire inlet face area; use one piece of fabric wrapped at least 1-1/2 times around concrete blocks and secured to prevent dislodging; orient cores of blocks so runoff passes into inlet.
   2. Straw bale row blocking entire inlet face area; anchor into pavement.

D. Storm Drain Drop Inlet Sediment Traps: As detailed on drawings.

E. Temporary Splash Pads: Stone aggregate over filter fabric; size to suit application; provide at downspout outlets and storm water outlets.

F. Soil Stockpiles: Protect using one of the following measures:
   1. Cover with polyethylene film, secured by placing soil on outer edges.
   2. Cover with mulch at least 4 inches thickness of pine needles, sawdust, bark, wood chips, or shredded leaves, or 6 inches of straw or hay.

G. Mulching: Use only for areas that may be subjected to erosion for less than 6 months.
   1. Wood Waste: Use only on slopes 3:1 or flatter; no anchoring required.
   2. Asphalt: Use only where no traffic, either vehicular or pedestrian, is anticipated.

H. Temporary Seeding: Use where temporary vegetated cover is required.

3.04 INSTALLATION

A. Silt Fences:
   1. Store and handle fabric in accordance with ASTM D4873/D4873M.
   2. Where slope gradient is less than 3:1 or barriers will be in place less than 6 months, use nominal 16 inch high barriers with minimum 36 inch long posts spaced at 6 feet maximum, with fabric embedded at least 4 inches in ground.
   3. Where slope gradient is steeper than 3:1 or barriers will be in place over 6 months, use nominal 28 inch high barriers, minimum 48 inch long posts spaced at 6 feet maximum, with fabric embedded at least 6 inches in ground.
   4. Where slope gradient is steeper than 3:1 and vertical height of slope between barriers is more than 20 feet, use nominal 32 inch high barriers with woven wire reinforcement and steel posts spaced at 4 feet maximum, with fabric embedded at least 6 inches in ground.
   5. Install with top of fabric at nominal height and embedment as specified.
   6. Embed bottom of fabric in a trench on the upslope side of fence, with 2 inches of fabric laid flat on bottom of trench facing upslope; backfill trench and compact.
   7. Do not splice fabric width; minimize splices in fabric length; splice at post only, overlapping at least 18 inches, with extra post.
   8. Fasten fabric to wood posts using one of the following:
   9. Wherever runoff will flow around end of barrier or over the top, provide temporary splash pad or other outlet protection; at such outlets in the run of the barrier, make barrier not more than 12 inches high with post spacing not more than 4 feet.

B. Straw Bale Rows:
   1. Install bales in continuous rows with ends butting tightly, with one bale at each end of row turned uphill.
   2. Install bales so that bindings are not in contact with the ground.
   3. Embed bales at least 4 inches in the ground.
   4. Anchor bales with at least two stakes per bale, driven at least 18 inches into the ground; drive first stake in each bale toward the previously placed bale to force bales together.

5. Fill gaps between ends of bales with loose straw wedged tightly.
6. Place soil excavated for trench against bales on the upslope side of the row, compacted.

C. Mulching Over Large Areas:
1. Dry Straw and Hay: Apply 2-1/2 tons per acre; anchor using dull disc harrow or emulsified asphalt applied using same spraying machine at 100 gallons of water per ton of mulch.
2. Wood Waste: Apply 6 to 9 tons per acre.
3. Asphalt: Apply at 1200 gallons per acre.
4. Erosion Control Matting: Comply with manufacturer's instructions.

D. Mulching Over Small and Medium Areas:
1. Dry Straw and Hay: Apply 4 to 6 inches depth.
2. Wood Waste: Apply 2 to 3inches depth.
3. Asphalt: Apply 1/4 gallon per square yard.
4. Erosion Control Matting: Comply with manufacturer's instructions.

3.05 MAINTENANCE

A. Inspect preventive measures weekly, within 24 hours after the end of any storm that produces 0.5 inches or more rainfall at the project site, and daily during prolonged rainfall.

B. Repair deficiencies immediately.

C. Silt Fences:
1. Promptly replace fabric that deteriorates unless need for fence has passed.
2. Remove silt deposits that exceed one-third of the height of the fence.
3. Repair fences that are undercut by runoff or otherwise damaged, whether by runoff or other causes.

D. Straw Bale Rows:
1. Promptly replace bales that fall apart or otherwise deteriorate unless need has passed.
2. Remove silt deposits that exceed one-half of the height of the bales.
3. Repair bale rows that are undercut by runoff or otherwise damaged, whether by runoff or other causes.

E. Clean out temporary sediment control structures weekly and relocate soil on site.

F. Place sediment in appropriate locations on site; do not remove from site.

3.06 CLEAN UP

A. Remove temporary measures after permanent measures have been installed, unless permitted to remain by Architect.

B. Clean out temporary sediment control structures that are to remain as permanent measures.

C. Where removal of temporary measures would leave exposed soil, shape surface to an acceptable grade and finish to match adjacent ground surfaces.

END OF SECTION

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SECTION 01 6000
PRODUCT REQUIREMENTS

PART 1 GENERAL

1.01 SECTION INCLUDES

A. General product requirements.

B. Transportation, handling, storage and protection.

C. Product option requirements.

D. Substitution limitations

1.02 RELATED REQUIREMENTS

A. Section 01 1000 - Summary: Lists of products to be removed from existing building.

B. Section 01 3000 (01300) - Administrative Requirements: Penalty for re-review of submittals.

C. Section 01 4000 - Quality Requirements: Product quality monitoring.

D. Section 01 7000 (01700) - Execution and Closeout Requirements: Penalty for additional Closeout Inspections.

1.03 REFERENCE STANDARDS

A. 16 CFR 260.13 - Guides for the Use of Environmental Marketing Claims; Federal Trade Commission; Recycled Content Current Edition.

B. CAN/CSA Z809 - National Standard for Sustainable Forest Management; CSA International Inc. 2016.

C. NFPA 70 - National Electrical Code Most Recent Edition Adopted by Authority Having Jurisdiction, Including All Applicable Amendments and Supplements.

1.04 SUBMITTALS

A. Proposed Products List: Submit list of major products proposed for use, with name of manufacturer, trade name, and model number of each product.
   1. Submit within 15 days after date of Agreement.
   2. For products specified only by reference standards, list applicable reference standards.

B. Product Data Submittals: Submit manufacturer's standard published data. Mark each copy to identify applicable products, models, options, and other data. Supplement manufacturers' standard data to provide information specific to this Project.

C. Shop Drawing Submittals: Prepared specifically for this Project; indicate utility and electrical characteristics, utility connection requirements, and location of utility outlets for service for functional equipment and appliances.

D. Sample Submittals: Illustrate functional and aesthetic characteristics of the product, with integral parts and attachment devices. Coordinate sample submittals for interfacing work.
   1. For selection from standard finishes, submit samples of the full range of the manufacturer's standard colors, textures, and patterns.

PART 2 PRODUCTS

2.01 APPROVED EQUAL CLAUSE

A. Throughout the specifications, types of material may be specified by manufacuturer's name and catalog number in order to establish standards of quality and performance and not for the purpose of limiting competition.

B. Inclusion by name, of more than one manufacturer or fabricator does NOT necessarily imply acceptability of standard products of those named. All manufacturers, named or proposed, shall conform, with modification as necessary, to criteria established by Contract Documents for performance, efficiency, materials and special accessories.

C. The Contractor may assume the phrase "or approved equal" except that the burden is upon the Contractor to prove such equality and to satisfy the Architect that the proposed substitute is equivalent to, or superior to, the item specified.

D. If the Contractor elects to prove such equivalency, he must request the Architect's and the Owner's approval in writing for substitution of such items for the specified items, stating the differences involved with and submitting supporting data and samples, if required to permit a fiar evaluation of the proposed substitution with respect to:
   1. Performance
   2. Capacity
   3. Delivery times and effect on schedules, if any
   4. Change in space requirements or effect on other elements of work (if applicable)
   5. Effiiciency
   6. Safety
   7. Function
   8. Appearance
   9. Quality
   10. Cost Data comparing the proposed substitution with the product specified
   11. Any required license fees or royalties
   12. Availability of maintenance service, and source or replacement materials
   13. Warranty terms and conditions.

E. The Contractor shall submit a separate request for each product, supported with complete data, with drawings and samples as area appropriate, or requested by the Architect, to substantiate the above.

F. When resubmittals of materials equipment and accessories to be incorporated in the project are necessary due to failure of Contractors to properly coordinate submittals, the submitting Contractor shall compensate the Design Professionals for required re-reviews of said submittals in accordance with the Schedule of Reimbursement included in Section 01 3000.

G. The Architect will review requests for substitutions with reasonable promptness, and notify the Contractor, in writing, of the decision to accept or reject the requested substitution.

2.02 NEW PRODUCTS

A. Provide new products unless specifically required or permitted by the Contract Documents.

B. Where all other criteria are met, shall give preference to products that:
   1. If used on interior, have lower emissions, as defined in Section 01 6116.
   2. If wet-applied, have lower VOC content, as defined in Section 01 6116.
   3. Are extracted, harvested, and/or manufactured closer to the location of the project.
   4. Have longer documented life span under normal use.
   5. Result in less construction waste.
   6. Are made of vegetable materials that are rapidly renewable.

C. Regionally-Sourced Products:
   1. Overall Project Requirement: Provide materials amounting to a minimum of 10 percent of the total value of all materials (excluding plumbing, HVAC, electrical, elevators, and other equipment) that have been extracted, harvested, or recovered, as well as manufactured, within a radius of 500 miles from the project site.
      a. This provision is applicable to LEED Credit MR 5.1; show quantity on LEED report.

D. Urea-Formaldehyde Prohibition:
   1. Overall Project Requirement: Provide composite wood and agrifiber products having no added urea-formaldehyde resins.
      a. Require each installer to certify compliance and submit product data showing product content.
   2. Specific Product Categories: Comply with limitations specified elsewhere.

E. Adhesives and Joint Sealants:
   1. Provide only products having lower volatile organic compound (VOC) content than required by South Coast Air Quality Management District Rule No.1168.
      a. Require each installer to certify compliance and submit product data showing product content.
   2. Specific Product Categories: Comply with limitations specified elsewhere.

F. Joint Sealants, Including Duct Sealers:

1. Provide only products having lower volatile organic compound (VOC) content than required by Bay Area Air Quality Management District Regulation 8, Rule No.51.
   a. Require each installer to certify compliance and submit product data showing product content.
2. Specific Product Categories: Comply with limitations specified elsewhere.

G. Provide interchangeable components of the same manufacture for components being replaced.

2.03 PRODUCT OPTIONS

A. Products Specified by Naming One or More Manufacturers with a Provision for Substitutions: Submit a request for substitution for any manufacturer not named.

B. Where the Technical Specifications permit the Contractor to select optional materials, items, systems or equipment, the selection of such options is subject to the following considerations:
   1. Once an option has been selected and approved, it shall be used for the entire contract.
   2. The Contractor shall coordinate his selection with the drawings and specifications and make all necessary adjustments without additional cost to the Owner.

2.04 MAINTENANCE MATERIALS

A. Furnish extra materials, spare parts, tools, and software of types and in quantities specified in individual specification sections.

B. Deliver to Project site; obtain receipt prior to final payment.

PART 3 EXECUTION

3.01 SUBSTITUTION LIMITATIONS

A. See Section 01 2500 - Substitution Procedures.

B. Document each request with complete data substantiating compliance of proposed substitution with Contract Documents.

C. A request for substitution constitutes a representation that the submitter:
   1. Has investigated proposed product and determined that it meets or exceeds the quality level of the specified product.
   2. Agrees to provide the same warranty for the substitution as for the specified product.
   3. Agrees to coordinate installation and make changes to other Work that may be required for the Work to be complete with no additional cost to Yonkers Public Schools.
   4. Waives claims for additional costs or time extension that may subsequently become
   5. Will reimburse Yonkers Public Schools and Sammel Architecture for review or redesignservices associated with re-approval by authorities. See Section 01 3000 Administrative Procedures for Reimbursement Schedule.

D. Substitutions will not be considered when they are indicated or implied on shop drawing or product data submittals, without separate written request, or when acceptance will requirerevision to the Contract Documents.

3.02 TRANSPORTATION AND HANDLING

A. Package products for shipment in manner to prevent damage; for equipment, package to avoid loss of factory calibration.

B. If special precautions are required, attach instructions prominently and legibly on outside of packaging.

C. Coordinate schedule of product delivery to designated prepared areas in order to minimize site storage time and potential damage to stored materials.

D. Transport and handle products in accordance with manufacturer's instructions.

E. Transport materials in covered trucks to prevent contamination of product and littering of surrounding areas.

F. Promptly inspect shipments to ensure that products comply with requirements, quantities are correct, and products are undamaged.

G. Provide equipment and personnel to handle products by methods to prevent soiling, disfigurement, or damage.

H. Arrange for the return of packing materials, such as wood pallets, where economically feasible.

3.03 STORAGE AND PROTECTION

A. Designate receiving/storage areas for incoming products so that they are delivered according to installation schedule and placed convenient to work area in order to minimize waste due to excessive materials handling and misapplication.

B. Store and protect products in accordance with manufacturers' instructions.

C. Store with seals and labels intact and legible.

D. Store sensitive products in weather tight, climate controlled, enclosures in an environment favorable to product.

E. For exterior storage of fabricated products, place on sloped supports above ground.

F. Provide off-site storage and protection when site does not permit on-site storage or protection.

G. Protect products from damage or deterioration due to construction operations, weather, precipitation, humidity, temperature, sunlight and ultraviolet light, dirt, dust, and other contaminants.

H. Comply with manufacturer's warranty conditions, if any.

I. Cover products subject to deterioration with impervious sheet covering. Provide ventilation to prevent condensation and degradation of products.

J. Store loose granular materials on solid flat surfaces in a well-drained area. Prevent mixing with foreign matter.

K. Prevent contact with material that may cause corrosion, discoloration, or staining.

L. Provide equipment and personnel to store products by methods to prevent soiling, disfigurement, or damage.

M. Arrange storage of products to permit access for inspection. Periodically inspect to verify products are undamaged and are maintained in acceptable condition.

END OF SECTION

SECTION 01 6116
VOLATILE ORGANIC COMPOUND (VOC) CONTENT RESTRICTIONS

PART 1 GENERAL

1.01 SECTION INCLUDES

A. Requirements for Indoor-Emissions-Restricted products.

B. Requirements for VOC-Content-Restricted products.

1.02 RELATED REQUIREMENTS

A. Section 01 3000 - Administrative Requirements: Submittal procedures.

1.03 DEFINITIONS

A. Indoor-Emissions-Restricted Products: All products in the following product categories, whether specified or not:

B. VOC-Content-Restricted Products: All products in the following product categories, whether specified or not:
   1. Interior paints and coatings applied on site.
   2. Interior adhesives and sealants applied on site, including flooring adhesives.

C. Interior of Building: Anywhere inside the exterior weather barrier.

D. Adhesives: All gunnable, trowelable, liquid-applied, and aerosol adhesives, whether specified or not; including flooring adhesives, resilient base adhesives, and pipe jointing adhesives.

E. Sealants: All gunnable, trowelable, and liquid-applied joint sealants and sealant primers, whether specified or not; including firestopping sealants and duct joint sealers.

F. Inherently Non-Emitting Materials: Products composed wholly of minerals or metals, unless they include organic-based surface coatings, binders, or sealants; and specifically the following:
   1. Concrete.
   2. Clay brick.
   3. Metals that are plated, anodized, or powder-coated.
   4. Glass.
   5. Ceramics.
   6. Solid wood flooring that is unfinished and untreated.

1.04 SUBMITTALS

A. See Section 01 3000 - Administrative Requirements, for submittal procedures.

B. Product Data: For each VOC-restricted product used in the project, submit evidence of compliance.

1.05 QUALITY ASSURANCE

A. Indoor Emissions Standard and Test Method: CAL (CDPH SM), using Standard Private Office exposure scenario and the allowable concentrations specified in the method, and range of total VOC's after 14 days.
   1. Wet-Applied Products: State amount applied in mass per surface area.
   2. Paints and Coatings: Test tinted products, not just tinting bases.
   3. Evidence of Compliance: Acceptable types of evidence are the following;
      a. Current UL (GGG) certification.
      b. Current SCS (CPD) Floorscore certification.
      c. Current SCS (CPD) Indoor Advantage Gold certification.
      d. Current listing in CHPS (HPPD) as a low-emitting product.
      e. Current CRI (GLP) certification.
      f. Test report showing compliance and stating exposure scenario used.
   4. Product data submittal showing VOC content is NOT acceptable evidence.
   5. Manufacturer's certification without test report by independent agency is NOT acceptable evidence.

B. VOC Content Test Method: 40 CFR 59, Subpart D (EPA Method 24), or ASTM D3960, unless otherwise indicated.
   1. Evidence of Compliance: Acceptable types of evidence are:
      a. Report of laboratory testing performed in accordance with requirements.

C. Testing Agency Qualifications: Independent firm specializing in performing testing and inspections of the type specified in this section.

PART 2 PRODUCTS

2.01 MATERIALS

A. All Products: Comply with the most stringent of federal, State, and local requirements, or these specifications.

B. Indoor-Emissions-Restricted Products: Comply with Indoor Emissions Standard and Test Method, except for:
   1. Inherently Non-Emitting Materials.

C. VOC-Content-Restricted Products: VOC content not greater than required by the following:
   1. Adhesives, Including Flooring Adhesives: SCAQMD 1168 Rule.
   2. Joint Sealants: SCAQMD 1168 Rule.
   3. Paints and Coatings: Each color; most stringent of the following:
      a. 40 CFR 59, Subpart D.
      b. SCAQMD 1113 Rule.
      c. CARB (SCM).

PART 3 EXECUTION

3.01 FIELD QUALITY CONTROL

A. Owner reserves the right to reject non-compliant products, whether installed or not, and require their removal and replacement with compliant products at no extra cost to Owner.

B. Additional costs to restore indoor air quality due to installation of non-compliant products will be borne by .

END OF SECTION

SECTION 01 7000
EXECUTION AND CLOSEOUT REQUIREMENTS

PART 1 GENERAL

1.01 SECTION INCLUDES

A. Examination, preparation, and general installation procedures.

B. Requirements for alterations work, including selective demolition, except removal, disposal, and/or remediation of hazardous materials and toxic substances.

C. Pre-installation meetings.

D. Cutting and patching.

E. Surveying for laying out the work.

F. Cleaning and protection.

G. Substantial Completion

H. Project Closeout Inspections

I. Closeout procedures, except payment procedures.

1.02 RELATED REQUIREMENTS

A. Section 01 1000 - Summary: Limitations on working in existing building; continued occupancy; work sequence; identification of salvaged and relocated materials.

B. Section 01 3000 - Administrative Requirements: Submittals procedures.

C. Section 01 4000 - Quality Requirements: Testing and inspection procedures.

D. Individual Product Specification Sections:
   1. Advance notification to other sections of openings required in work of those sections.

1.03 SUBMITTALS

A. See Section 01 3000 - Administrative Requirements, for submittal procedures.

B. Survey work: Submit name, address, and telephone number of Surveyor before starting survey work.
   1. On request, submit documentation verifying accuracy of survey work.
   2. Submit a copy of site drawing signed by the Land Surveyor, that the elevations and locations of the work are in conformance with Contract Documents.
   3. Submit surveys and survey logs for the project record.

C. Project Record Documents: Accurately record actual locations of capped and active utilities.

1.04 QUALIFICATIONS

A. For demolition work, employ a firm specializing in the type of work required.
   1. Minimum of 5 years of documented experience.

B. For survey work, employ a land surveyor registered in Yonkers, NY and acceptable to Architect. Submit evidence of Surveyor's Errors and Omissions insurance coverage in the form of an Insurance Certificate.

C. For field engineering, employ a professional engineer of the discipline required for specific service on Project, licensed in Yonkers, NY.

1.05 PROJECT CONDITIONS

A. Grade site to drain. Maintain excavations free of water. Provide, operate, and maintain pumping equipment.

B. Protect site from puddling or running water. Provide water barriers as required to protect site from soil erosion.

C. Dust Control: Execute work by methods to minimize raising dust from construction operations. Provide positive means to prevent air-borne dust from dispersing into atmosphere and over adjacent property.

D. Erosion and Sediment Control: Plan and execute work by methods to control surface drainage from cuts and fills, from borrow and waste disposal areas. Prevent erosion and sedimentation.
   1. Minimize amount of bare soil exposed at one time.
   2. Provide temporary measures such as berms, dikes, and drains, to prevent water flow.
   3. Construct fill and waste areas by selective placement to avoid erosive surface silts or clays.
   4. Periodically inspect earthwork to detect evidence of erosion and sedimentation; promptly apply corrective measures.

E. Noise Control: Provide methods, means, and facilities to minimize noise produced by construction operations.

F. Pest and Rodent Control: Provide methods, means, and facilities to prevent pests and insects from damaging the work.

G. Rodent Control: Provide methods, means, and facilities to prevent rodents from accessing or invading premises.

H. Pollution Control: Provide methods, means, and facilities to prevent contamination of soil, water, and atmosphere from discharge of noxious, toxic substances, and pollutants produced by construction operations. Comply with federal, state, and local regulations.

1.06 COORDINATION

A. See Section 01 1000 for occupancy-related requirements.

B. Coordinate scheduling, submittals, and work of the various sections of the Project Manual to ensure efficient and orderly sequence of installation of interdependent construction elements, with provisions for accommodating items installed later.

C. Notify affected utility companies and comply with their requirements.

D. Verify that utility requirements and characteristics of new operating equipment are compatible with building utilities. Coordinate work of various sections having interdependent responsibilities for installing, connecting to, and placing in service, such equipment.

E. Coordinate space requirements, supports, and installation of mechanical and electrical work that are indicated diagrammatically on Drawings. Follow routing shown for pipes, ducts, and conduit, as closely as practicable; place runs parallel with lines of building. Utilize spaces efficiently to maximize accessibility for other installations, for maintenance, and for repairs.

F. In finished areas except as otherwise indicated, conceal pipes, ducts, and wiring within the construction. Coordinate locations of fixtures and outlets with finish elements.

G. Coordinate completion and clean-up of work of separate sections.

H. After Owner occupancy of premises, coordinate access to site for correction of defective work and work not in accordance with Contract Documents, to minimize disruption of Owner's activities.

PART 2 PRODUCTS

2.01 PATCHING MATERIALS

A. New Materials: As specified in product sections; match existing products and work for patching and extending work.

B. Type and Quality of Existing Products: Determine by inspecting and testing products where necessary, referring to existing work as a standard.

C. Product Substitution: For any proposed change in materials, submit request for substitution described in Section 01 6000.

PART 3 EXECUTION

3.01 EXAMINATION

A. Verify that existing site conditions and substrate surfaces are acceptable for subsequent work. Start of work means acceptance of existing conditions.

B. Verify that existing substrate is capable of structural support or attachment of new work being applied or attached.

C. Examine and verify specific conditions described in individual specification sections.

D. Take field measurements before confirming product orders or beginning fabrication, to minimize waste due to over-ordering or misfabrication.

E. Verify that utility services are available, of the correct characteristics, and in the correct locations.

F. Prior to Cutting: Examine existing conditions prior to commencing work, including elements subject to damage or movement during cutting and patching. After uncovering existing work, assess conditions affecting performance of work. Beginning of cutting or patching means acceptance of existing conditions.

3.02 PREPARATION

A. Clean substrate surfaces prior to applying next material or substance.

B. Seal cracks or openings of substrate prior to applying next material or substance.

C. Apply manufacturer required or recommended substrate primer, sealer, or conditioner prior to applying any new material or substance in contact or bond.

3.03 PREINSTALLATION MEETINGS

A. When required in individual specification sections, convene a preinstallation meeting at the site prior to commencing work of the section.

B. Require attendance of parties directly affecting, or affected by, work of the specific section.

C. Notify Architect four days in advance of meeting date.

D. Prepare agenda and preside at meeting:
   1. Review conditions of examination, preparation and installation procedures.
   2. Review coordination with related work.

E. Record minutes and distribute copies within two days after meeting to participants, with two copies to Architect, Owner, participants, and those affected by decisions made.

3.04 LAYING OUT THE WORK

A. Verify locations of survey control points prior to starting work.

B. Promptly notify Architect of any discrepancies discovered.

C. Owner will locate and protect survey control and reference points.

D. Control datum for survey is that indicated on Drawings.

E. Protect survey control points prior to starting site work; preserve permanent reference points during construction.

F. Promptly report to Architect the loss or destruction of any reference point or relocation required because of changes in grades or other reasons.

G. Replace dislocated survey control points based on original survey control. Make no changes without prior written notice to Architect.

H. Utilize recognized engineering survey practices.

I. Establish a minimum of two permanent bench marks on site, referenced to established control points. Record locations, with horizontal and vertical data, on project record documents.

J. Establish elevations, lines and levels. Locate and lay out by instrumentation and similar appropriate means:
   1. Site improvements including pavements; stakes for grading, fill and topsoil placement; utility locations, slopes, and invert elevations.

3.05 GENERAL INSTALLATION REQUIREMENTS

A. Install products as specified in individual sections, in accordance with manufacturer's instructions and recommendations, and so as to avoid waste due to necessity for

replacement.

B. Make vertical elements plumb and horizontal elements level, unless otherwise indicated.

C. Install equipment and fittings plumb and level, neatly aligned with adjacent vertical and horizontal lines, unless otherwise indicated.

D. Make consistent texture on surfaces, with seamless transitions, unless otherwise indicated.

E. Make neat transitions between different surfaces, maintaining texture and appearance.

3.06 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 alterations work constitutes acceptance of existing conditions.

B. Keep areas in which alterations are being conducted separated 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. Maintain weatherproof exterior building enclosure except for interruptions required for replacement or modifications; take care to prevent water and humidity damage.
   1. Where openings in exterior enclosure exist, provide construction to make exterior enclosure weatherproof.
   2. Insulate existing ducts or pipes that are exposed to outdoor ambient temperatures by alterations work.

D. Remove existing work as indicated and as required to accomplish new work.
   1. Remove rotted wood, corroded metals, and deteriorated masonry and concrete; replace with new construction specified.
   2. Remove items indicated on drawings.
   3. Relocate items indicated on drawings.
   4. Where new surface finishes are to be applied to existing work, perform removals, patch, and prepare existing surfaces as required to receive new finish; remove existing finish if necessary for successful application of new finish.
   5. Where new surface finishes are not specified or indicated, patch holes and damaged surfaces to match adjacent finished surfaces as closely as possible.

E. Services (Including but not limited to HVAC, Plumbing, Fire Protection, Electrical, and Telecommunications): Remove, relocate, and extend existing systems to accommodate new construction.
   1. Maintain existing active systems that are to remain in operation; maintain access to equipment and operational components; if necessary, modify installation to allow access or provide access panel.
   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.
      a. Disable existing systems only to make switchovers and connections; minimize duration of outages.
      b. See Section 01 1000 for other limitations on outages and required notifications.
      c. Provide temporary connections as required to maintain existing systems in service.
   3. Verify that abandoned services serve only abandoned facilities.
   4. Remove abandoned pipe, ducts, conduits, and equipment ; remove back to source of supply where possible, otherwise cap stub and tag with identification; patch holes left by removal using materials specified for new construction.

F. Protect existing work to remain.
   1. Perform cutting to accomplish removals neatly and as specified for cutting new work.
   2. Repair adjacent construction and finishes damaged during removal work.
   3. Patch as specified for patching new work.

G. Adapt existing work to fit new work: Make as neat and smooth transition as possible.
   1. When existing finished surfaces are cut so that a smooth transition with new work is not possible, terminate existing surface along a straight line at a natural line of division and make recommendation to Architect.
   2. Where removal of partitions or walls results in adjacent spaces becoming one, rework floors, walls, and ceilings to a smooth plane without breaks, steps, or bulkheads.
   3. Where a change of plane of 1/4 inch or more occurs in existing work, submit recommendation for providing a smooth transition for Architect review and request instructions.

H. Patching: Where the existing surface is not indicated to be refinished, patch to match the surface finish that existed prior to cutting. Where the surface is indicated to be refinished, patch so that the substrate is ready for the new finish.

I. Clean existing systems and equipment.

J. Remove demolition debris and abandoned items from alterations areas and dispose of off-site; do not burn or bury.

K. Do not begin new construction in alterations areas before demolition is complete.

L. Comply with all other applicable requirements of this section.

3.07 CUTTING AND PATCHING

A. Whenever possible, execute the work by methods that avoid cutting or patching.

B. See Alterations article above for additional requirements.

C. Perform whatever cutting and patching is necessary to:
   1. Complete the work.
   2. Fit products together to integrate with other work.
   3. Provide openings for penetration of mechanical, electrical, and other services.
   4. Match work that has been cut to adjacent work.
   5. Repair areas adjacent to cuts to required condition.
   6. Repair new work damaged by subsequent work.
   7. Remove samples of installed work for testing when requested.
   8. Remove and replace defective and non-conforming work.

D. Execute work by methods that avoid damage to other work and that will provide appropriate surfaces to receive patching and finishing. In existing work, minimize damage and restore to original condition.

E. Cut rigid materials using masonry saw or core drill. Pneumatic tools not allowed without prior approval.

F. Restore work with new products in accordance with requirements of Contract Documents.

G. Fit work air tight to pipes, sleeves, ducts, conduit, and other penetrations through surfaces.

H. At penetrations of fire rated walls, partitions, ceiling, or floor construction, completely seal voids with fire rated material in accordance with Section 07 8400, to full thickness of the penetrated element.

I. Patching:
   1. Finish patched surfaces to match finish that existed prior to patching. On continuous surfaces, refinish to nearest intersection or natural break. For an assembly, refinish entire unit.
   2. Match color, texture, and appearance.
   3. Repair patched surfaces that are damaged, lifted, discolored, or showing other imperfections due to patching work. If defects are due to condition of substrate, repair substrate prior to repairing finish.

J. Refinish surfaces to match adjacent finish. For continuous surfaces, refinish to nearest intersection or natural break. For an assembly, refinish entire unit.

K. Make neat transitions. Patch work to match adjacent work in texture and appearance. Where new work abuts or aligns with existing, perform a smooth and even transition.

L. Patch or replace surfaces that are damaged, lifted, discolored, or showing other imperfections due to patching work. Repair substrate prior to patching finish. Finish patches to produce uniform finish and texture over entire area. When finish cannot be matched, refinish entire surface to nearest intersections.

3.08 PROGRESS CLEANING

A. Maintain areas free of waste materials, debris, and rubbish. Maintain site in a clean and orderly condition.

B. Remove debris and rubbish from pipe chases, plenums, attics, crawl spaces, and other closed or remote spaces, prior to enclosing the space.

C. Broom and vacuum clean interior areas prior to start of surface finishing, and continue cleaning to eliminate dust.

D. Collect and remove waste materials, debris, and trash/rubbish from site periodically and dispose off-site; do not burn or bury.

3.09 PROTECTION OF INSTALLED WORK

A. Protect installed work from damage by construction operations.

B. Provide special protection where specified in individual specification sections.

C. Provide temporary and removable protection for installed products. Control activity in immediate work area to prevent damage.

D. Provide protective coverings at walls, projections, jambs, sills, and soffits of openings.

E. Protect finished floors, stairs, and other surfaces from traffic, dirt, wear, damage, or movement of heavy objects, by protecting with durable sheet materials.

F. Prohibit traffic or storage upon waterproofed or roofed surfaces. If traffic or activity is necessary, obtain recommendations for protection from waterproofing or roofing material manufacturer.

G. Prohibit traffic from landscaped areas.

H. Remove protective coverings when no longer needed; reuse or recycle plastic coverings if possible.

3.10 SYSTEM STARTUP

A. Coordinate schedule for start-up of various equipment and systems.

B. Notify Architect and owner seven days prior to start-up of each item.

C. Verify that each piece of equipment or system has been checked for proper lubrication, drive rotation, belt tension, control sequence, and for conditions that may cause damage.

D. Verify tests, meter readings, and specified electrical characteristics agree with those required by the equipment or system manufacturer.

E. Verify that wiring and support components for equipment are complete and tested.

F. Execute start-up under supervision of applicable personnel and manufacturer's representative in accordance with manufacturers' instructions.

G. When specified in individual specification Sections, require manufacturer to provide authorized representative to be present at site to inspect, check, and approve equipment or system installation prior to start-up, and to supervise placing equipment or system in operation.

H. Submit a written report that equipment or system has been properly installed and is functioning correctly.

3.11 SUBSTANTIAL COMPLETION

A. Preliminary Procedures: Before requesting inspection for determining date of Substantial Completion, complete the following items:

1. When the Work has reached such a point of completion that the building or buildings, equipment, apparatus or phase of construction or any part thereof required by the Owner for occupancy or use can be so occupied and used for the purpose intended,

the Contractor prior to notification of the Architect, shall make a preliminary inspection of the Work to insure that all the requirements of the Contract have been met and the Work is substantially complete and is acceptable.

2. Advise Owner of pending insurance changeover requirements.
3. Submit specific warranties, maintenance service agreements, final certificates and similar documents.
4. Obtain and submit releases permitting Owner unrestricted use of the Work and access to services and utilities. Include occupancy permits, operating certificates and similar releases.
5. Prepare and submit Project Record Documents, operation and maintenance manuals, required surveys and similar final record information.
6. Deliver tools, spare parts, extra materials and similar items to locations designated by Owner. Label with manufacturers name and model number where applicable.
7. Make final changeover or permanent locks and deliver keys to the Owner. Advise Owner's personnel of changeover in sercurity provisions.
8. Complete startup of testing systems.
9. Submit test/ adjust/ balance records.
10. Terminate and remove temporary facilities from the Project site, along with mockups, construction items and similar elements.
11. Advise Owner of changeover in heat and other utilities.
12. Submit changeover information related to Owner's occupancy, use, operation and maintenance.
13. Complete final cleaning and touch up painting.
14. Touch up and repair and restore marred, exposed finishes to eliminate visual defects.

3.12 PROJECT CLOSEOUT INSPECTIONS

A. Upon completion of the Preliminary Procedures noted above, the Contractor shall notify the Architect in writing, that all of the requirements of the Contract have been met, and the Work is substantially complete and acceptable, and is ready for inspection.

B. Closeout Inspection: Upon receipt of such notification, the Owner, Construction Manager or the Architect shall make a detailed inspection of the Work to insure that all the requirements of the Contract have been met and that the Work is complete and is acceptable.

C. A copy of the report of the inspection shall be furnished to the Contractor as the inspection progresses so that the Contractor may proceed without delay with any part of the Work found to be incomplete or defective.

D. Final Inspection: When the items on the report of the inspection have been completed or corrected, the Contractor shall so advise the Architect in writing. Upon receipt of this notification, the Architect shall inform the Contractor of the date and time of the Final Inspection.

E. Upon completion of reinspection, the Architect will prepare a Certificate of Substantial Completion or will furnish to the Contractor a copy of the report of the Architect's reinspection detailing Work that is incomplete or obligations that have not been fulfilled but are required for final acceptance.

F. Reinspection: The Contractor shall pay the Architect for services performed in inspection beyond the original inspection and the one "Final Inspection" of the same area, through a "credit" change order to the Owner in accordance with the fees outlined in Section 01 3000.

G. Results of completed inspection will form the basis of requirements for Final Completion.

3.13 FINAL COMPLETION

A. Preliminary Procedures- Before requesting final inspection for determining the date of Final Completion, complete the following:
   1. Submit copy of Architect's Substantial Completion Inspection list of items to be completed or corrected (punch list). The certified copy of the list shall state that each item has been completed or otherwise resolved for acceptance.
   2. Submit evidence of final continuing insurance coverage complying with Owner's insurance requirements.

3. Instruct Owner's personnel in operation, adjustment and maintenance or product, equipment and systems.

B. Inspection - Submit a written request for final inspection for acceptance. On receipt of request, Architect and Construction Manager will eithter proceed with the inspection or notify Contractor of unfulfilled requirements. Architect will prepare a final Certificate for Payment after inspection, or will notify Contractor of construction thta must be completed or corrected before certificate will be issued.
   1. Reinspection - Request reinspection when the work identified in previous inspections as incomplete is completed or corrected.

3.14 LIST OF INCOMPLETE ITEMS (PUNCH LIST)

A. Preparation - Submit three (3) copies of list to the Architect. Include name and identification of each space and area affected by construction operations for incomplete items and items needing correction including, if necessary, areas disturbed by Contractor that are outside the limits of construction.
   1. Organize list of spaces in sequential order, starting with exterior areas first and proceeding from lowest to highest floors.
   2. Organize items applying to each space in order of priority and/or logical construction sequencing.
   3. Include the following on each page:
      a. Project name
      b. Date Prepared
      c. Architect name
      d. Contractor name
      e. Schedule of dates when work will be started and dates of completion for each itme. Coordinate schedule with Owner to avoid conflicts in occupied spaces.
      f. Page numbers

3.15 DEMONSTRATION AND INSTRUCTION

A. See Section 01 7900 - Demonstration and Training.

B. Demonstrate start-up, operation, control, adjustment, trouble-shooting, servicing, maintenance, and shutdown of each item of equipment at scheduled time, at equipment location.

C. For equipment or systems requiring seasonal operation, perform demonstration for other season within six months.

D. Provide a qualified person who is knowledgeable about the Project to perform demonstration and instruction of owner personnel.

E. ADJUSTING
   1. Adjust operating products and equipment to ensure smooth and unhindered operation.

F. FINAL CLEANING
   1. See Section 01 7422, Cleaning.
   2. Execute final cleaning prior to Substantial Completion.
      a. Clean areas to be occupied by Owner prior to final completion before Owner occupancy.
   3. Use cleaning materials that are nonhazardous.

G. Remove all labels that are not permanent. Do not paint or otherwise cover fire test labels or nameplates on mechanical and electrical equipment.
   1. Clean equipment and fixtures to a sanitary condition with cleaning materials appropriate to the surface and material being cleaned.
   2. Clean filters of operating equipment.
   3. Clean site; sweep paved areas, rake clean landscaped surfaces.
   4. Remove waste, surplus materials, trash/rubbish, and construction facilities from the site; dispose of in legal manner; do not burn or bury.
   5. Clean Owner-occupied areas of work.

3.16 CLOSEOUT PROCEDURES

A. Demonstrate operation and maintenance of products to Owner School District's personnel. See Section 01 7900 for Demonstration and Training requirements.

B. Provide Maintenance Scheduling information for all systems, equipment and mechanisms. See Section 01 9313 for Maintenance Scheduling requirements and submittal procedures.

C. Make submittals that are required by governing or other authorities.
   1. See Section 01 7800, Closeout Documents for required closeout documents.
   2. Submit copies to Architect.

D. Prepare Final Payment request. See Section 01 2000, Price and Payment Procedures, for final payment application information.

E. Notify Architect when work is considered ready for Substantial Completion.

F. Submit written certification that Contract Documents have been reviewed, work has been inspected, and that work is complete in accordance with Contract Documents and ready for Architect's review.

G. Owner will occupy all of the building as specified in Section 01 1000.

H. Correct items of work listed in executed Certificates of Substantial Completion and comply with requirements for access to Owner-occupied areas.

END OF SECTION

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SECTION 01 7329
CUTTING AND PATCHING

GENERAL

1.01 REQUIREMENTS SET FORTH HEREIN ARE IN ADDITION TO AND SHALL BE CONSIDERED AS COMPLEMENTARY TO THE CONDITIONS OF THE CONTRACT AND THE BALANCE OF DIVISION #1 AND TECHNICAL SPECIFICATIONS.

A. All Contractors, Subcontractors, Sub-subcontractors, Vendors and the like shall be required to familiarize themselves with said provisions.

B. Provide materials, labor, equipment and services necessary and/or required to execute the work of this Section as shown on the drawings, specified herein and/or required by job conditions.

1.02 DEFINITIONS

A. "Cutting" - those operations required to expose existing construction, or required to permit the installation of work under this contract, or passage of new or relocated work through existing construction.

B. "Patching" - Those operations required to bring surfaces to a level to permit the application of a finish treatment.
   1. The Contractor responsible for performing the patching shall be responsible for the restoration of the substrate to match adjacent areas, whether new or existing, except for the following conditions:
   2. Exposed masonry, concrete or similar surfaces which do not require or call for painting.
   3. Those patched surfaces which are wholly contained within an area which is to receive a new finish treatment as called for elsewhere in the Contract Documents.

C. "Replace" - To furnish and install an entirely new element which matches the original element's material, color, dimension and design.

D. "Repair"- To make the existing element nearly as complete and as fully functional as new, by the means and methods indicated for each element.

E. "Fill" - To carefully and throughly remove, by approved methods, loose and deteriorated surface material and to install "new" material in the element so that the original contour is completely restored and color matched if exposed as a finish element.

F. "Match Original" - This type of replacement will match the best available representative element, in design, dimension and installation, with improvements, which represent the best standards of fabrication, so that even if an existing best example of an element is gouged or pitted or otherwise worn, the new element shall be unworn, and without defects and fabricated of new material. The Architect will designate areas of original elements for matching.

1.03 CUTTING AND PATCHING REQUIREMENTS

A. Where cutting, drilling or removals are required in existing wall, floor or roof construction, the work shall be done in a manner that will safeguard and not endanger the structure, and shall, in all cases, be as approved by the Architect.
   1. Prior to any cutting, drilling or removals, the Contractor shall investigate both sides of the surface involved, shall determine the exact location of adjacent structural members by visual examination, and shall avoid interference with such members.
   2. No structural members such as joists, beams, columns supporting work that is to remain shall be cut, drilled or removed unless such conditions are shown in detail on the Contract Documents and reinforcing of members affected or new members to compensate for such drilling, cutting and removals are shown.
   3. Positive instructions shall be obtained from the Architect before cutting beams or other structural members, arches, lintels and the like and the Contractor shall be guided by such instructions.

B. Each Trade Contractor shall furnish and install all sleeves, inserts, hangers and the like required for the execution of his work; failing to provide such, he shall do all necessary

cutting and patching required for the execution of his work.

1. Coordinate with MEP drawings and specifications for packing of sleeves, pipe penetrations and duct openings for firesafing material and/or caulking.

C. The Contractor shall not endanger any work by cutting or drilling or otherwise, and shall not cut or alter the work of any other contractor except with the written consent of the Architect.

D. All holes cut through masonry exposed to view in the finished work and concrete slabs shall be core drilled except for specific holes that have been structurally detailed per Contract Documents.
   1. The Contractor shall locate adjacent structural members before core drilling to insure that structural members are not damaged.
   2. No jack hammering will be permitted in the work.

E. Exposed patches and repairs shall be as inconspicuous as possible.
   1. Where new work does not match exactly the color, finish, dimension, size and the like of the existing, the new work shall be carried across the surface to which it is applied and be continued to a natural stopping point or corner.

F. All cutting and patching shall be performed using skilled mechanics of the trade or craft involved.

G. Where two or more contractors are involved with work within same penetration, firesafing shall be performed by the trade with the largest share of the opening being used.
   1. Example : Ducts, electrical conduits, sprinkler piping, drainage piping. HVAC Contractor due to duct penetration; otherwise, largest diameter pipe is governing criteria.
   2. Firesafing and smoke stopping shall be accomplished in accordance with requirements set forth in ASTM E814 and as specified in Section 07270.

1.04 SPECIFIC REQUIREMENTS BY CONTRACTOR

A. The Contractor shall perform :
   1. All cutting and patching required to install his work under the Contract and as indicated on the Architectural drawings.
   2. Finish patching of openings at walls and slabs created by the removal of existing ductwork, piping, conduit, equipment or installation of new work.
      a. Those removals and/or openings shall be as indicated on the Drawings
   3. Subsections 4.2.2.1 and .2 as noted below.
   4. Cutting and patching of existing and/or new roof membrane, insulation and the like for installation of work.
   5. If existing pipes or conduits are removed by other Contractors and those openings are indicated on the Architectural drawings, patching work shall be accomplished by the Contractor for General Construction (CGC).
      a. If said resultant openings are not indicated on the drawings, then said patching work shall be accomplished by the respective Prime Contractor removing said pipe, duct or conduit.

B. The HVAC Contractor or Subcontractors directly related to the "HVAC" operations shall perform:
   1. All cutting required to install his work under the Contract.
   2. Cutting and patching of existing interior and exterior walls necessary for the installation of new duct work, piping and equipment except for the following which will be performed by the "CGC" as above.
      a. Cutting and patching of existing ceilings, for the installation of new ductwork, piping and equipment, which are beyond the extent of ceiling areas that will be removed/replaced by the General Contractor as indicated on the Architectural, Structural and Site drawings.
      b. Cutting and patching of existing slabs for the installation of new ductwork and piping shall be accomplished by the "CGC" if shown on the Architectural, Structural and Site drawings.
         1) If said openings are not indicated on those drawings, then cutting and patching work shall be accomplished by the Contractor performing the required work except as maybe defined in 4.1 above.

c. Cutting and patching of existing slabs_on_grade for the installation of new underground piping under his Contract.

C. The Electrical Contractor or Subcontractors directly related to the "Electrical" operations shall perform:
1. All cutting and patching required to install his work under the Contract.
2. Cutting and patching of existing interior and exterior walls and existing slabs necessary for the installation of new conduits, busducts, equipment or other materials except shall be accomplished by the "CGC" if shown on the Architectural, Structural and Site series drawings.
a. If said openings are not indicated on those drawings, then cutting and patching work shall be accomplished by the Contractor performing the required work except as maybe defined in 4.1 above.
3. Cutting and patching of existing ceilings, for the installation of new conduits, busduct, feeders, fixtures and equipment, which are beyond the extent of ceiling areas that will be removed/replaced by the General Contractor as indicated on the Architectural, Structural and Site drawings.

D. The Plumbing Contractor or Subcontractors directly related to the "Plumbing" operations shall perform :
1. All cutting and rough patching required to install his work under the Contract.
2. Cutting and patching of existing interior and exterior walls and existing slabs necessary for the installation of new water supply, waste and vent pipes, or other materials except shall be accomplished by the “CGC” if shown on the Architectural, Structural and Site drawings.

****END OF SECTION****

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SECTION 01 7422
CLEANING

GENERAL

1.01 REQUIREMENTS SET FORTH HEREIN ARE IN ADDITION TO AND SHALL BE CONSIDERED AS COMPLEMENTARY TO THE CONDITIONS OF THE CONTRACT AND THE BALANCE OF DIVISION #1 AND TECHNICAL SPECIFICATIONS.

A. All Contractors, Subcontractors, Sub-subcontractors, Vendors and the like shall be required to familiarize themselves with said provisions.

1.02 DESCRIPTION

A. In addition to that work required under Articles 3.15 and 6.3 of the AIA General Conditions, the Work included shall generally consist of the following:
   1. Maintain premises and all properties free from accumulations of waste, debris and rubbish caused by operations connected with the Work.
   2. The General Contractor shall provide for the continual removal of rubbish and debris from the area until completion of the Work.
   3. Contractor shall sweep up and gather together daily, all his own rubbish and deposit same at a location (s) as directed by the Contractor.
   4. At completion of Work, Contractor shall remove waste materials, rubbish, tools, equipment, machinery and surplus materials, and clean all sight exposed surfaces; leave project clean and ready for occupancy;
      a. Staging areas, walkways, grounds and any areas affected by the work shall be cleaned of debris and restored to " new" condition.
         1) Related Work Specified Elsewhere
         2) Description of Work
         3) Alterations to Existing Facilities
         4) Mechanical and Electrical Coordination
         5) Cutting and Patching
         6) Dust Control
         7) Temporary Facilities
         8) Project Closeout
            (a) Cleaning for specific products or work: Reference specific Section for that work.
   5. SAFETY REQUIREMENTS
      a. Standards: Maintain project in accord with following safety and insurance standards:
      b. Occupational Safety and Health Administration (OSHA)
      c. Building Code of New York State and amendments thereto.
      d. State Education Department Manual of Planning Standards, Regulation of the Commissioner 155.5 .
      e.
      f. New York State Department of Transportation, Office of Engineering, Standard Specification, Construction and Materials, dated January 2, 1985, and latest addendum thereto.
      g. Life Safety Code - NFPA 101,88
      h. Hazards Control
      i. Store volatile wastes in covered metal containers, and remove from premises daily.
      j. Prevent accumulation of wastes which create hazardous conditions.
      k. Provide adequate ventilation during use of volatile or noxious substances.
      l. Conduct cleaning and disposal operations to comply with local ordinances and anti_pollution laws.
      m. Do not burn or bury rubbish and waste materials on project site.
      n. Do not dispose of volatile wastes such as mineral spirits, oil, or paint thinner in storm or sanitary drains.
      o. Do not dispose of wastes into streams or waterways.

6. MATERIALS
   a. Use only cleaning materials recommended by manufacturer of surface to be cleaned.
   b. Use cleaning materials only on surfaces recommended by cleaning material manufacturer.
7. CLEANING DURING CONSTRUCTION
   a. Execute cleaning to ensure that building, grounds, and public properties are maintained free from accumulations of waste materials and rubbish, on a daily basis. The construction manager shall perform an inspection each afternoon to determine that the work areas have been properly cleaned. In the event that areas are not properly cleaned, the construction manager shall advise the offending contractor(s) to clean as required herein. If clean up is not performed in accordance herewith, the owner shall engage the services of a cleaning company each time the requirement is not met without further notice to the contractor. The cost of such cleaning company, together with the cost of any custodial costs by the owner will be charged to the offending contractor.
      1) Contracts #1, as responsible
   b. Wet down dry materials and rubbish to lay dust and prevent blowing dust.
      1) Contracts #1, as responsible
   c. At reasonable intervals during progress of work, and no less than once at the end of each work day, broom sweep all construction areas, clean site and public properties, and dispose of waste materials, debris and rubbish.
      1) Contract #1, as responsible
   d. Clean areas where work is in progress, involving more than one trade, to the level of cleanliness for the proper execution of the work.
      1) Contract #1, as responsible.
   e. Provide on-site containers for collection of waste materials, debris and rubbish.
      1) Contract #1, as responsible.
   f. All packaging materials, boxes, wood crates, wood pallets, foam protectors, wrappings, metal ties and similar items, shall be deposited in its most feasible compacted form in the rubbish containers. Boxes and other collapsible packaging shall be made flat.
      1) Contracts #1 as responsible
   g. Remove, clean and dry liquid spills immediately.
      1) Contracts #1, as responsible
   h. Remove waste materials, debris and rubbish from site and legally dispose of at public or private dumping areas off Owner's property.
      1) Contract #1
   i. 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.
      1) Contract #1
   j. Handle materials in a controlled manner with as few handlings as possible; do not drop or throw materials from heights.
      1) Contract #1 , as responsible
   k. Any damage resulting in the failure to use proper precautions to this work shall be replaced or altered to the satisfaction of the Architect.
      1) Contracts #1, as responsible
8. FINAL CLEANING
   a. Employ experienced workmen, or professional cleaners, for final cleaning.
   b. In preparation for substantial completion or occupancy, conduct final inspection of sight exposed interior and exterior surfaces, and of concealed spaces.
   c. Remove grease, dust, dirt, stains, labels, mortar droppings, fingerprints, adhesives and other foreign materials, from sight_exposed interior and exterior finished surfaces; polish surfaces so designated to shine finish.
      1) Contracts #1, as responsible
   d. Cleaning and polishing of all hardware, grilles, fixtures, equipment and architectural metal.

1) Contracts #1 as responsible

e. Repair, patch and touch up marred surfaces to specified finish, to match adjacent surfaces.
   1) Contract #1, as responsible
f. Removal of all temporary protections (tape, oil, cosmoline, etc.).
   1) Contract #1, as responsible
g. Broom clean paved surfaces; rake clean other surfaces of grounds. Remove petrochemical spills, stains, adhesives and other foreign substances.
   1) Contract #1, as responsible
h. Replace air conditioning filters if units were operated during construction.
   1) Contract # 2
   2) Clean plumbing fixtures to a sanitary condition, free of stains, including stains resulting from water exposure.
      (a) Contract #2
i. Clean ducts, blowers and coils, if air conditioning units were operated without filters during construction.
j. Contract #2
k. Clean light fixtures, globes and reflectors to function with full efficiency. Replace burned out bulbs and those which are dim. Replace defective and noisy starters in fixtures utilizing such equipment to comply with requirements of new fixtures.
l. Maintain cleaning until project, or portion thereof, is occupied by Owner.
   1) Contract #1, as responsible

****END OF SECTION****

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SECTION 01 7800
CLOSEOUT SUBMITTALS

PART 1 GENERAL

1.01 SECTION INCLUDES

A. Project Record Documents.

B. Operation and Maintenance Data.

C. Warranties and bonds.

1.02 RELATED REQUIREMENTS

A. Section 00 7200 - General Conditions: Performance bond and labor and material payment bonds, warranty, and correction of work.

B. Section 01 3000 - Administrative Requirements: Submittals procedures, shop drawings, product data, and samples.

C. Section 01 7000 - Execution and Closeout Requirements: Contract closeout procedures.

D. Individual Product Sections: Specific requirements for operation and maintenance data.

E. Individual Product Sections: Warranties required for specific products or Work.

1.03 SUBMITTALS

A. Project Record Documents: Submit documents to Architect with claim for final Application for Payment.

B. Operation and Maintenance Data:
   1. Submit six sets of Operations and Maintenance manuals.

C. Warranties and Bonds:
   1. For equipment or component parts of equipment put into service during construction with Owner's permission, submit documents within 10 days after acceptance.
   2. Make other submittals within 10 days after Date of Substantial Completion, prior to final Application for Payment.
   3. For items of Work for which acceptance is delayed beyond Date of Substantial Completion, submit within 10 days after acceptance, listing the date of acceptance as the beginning of the warranty period.

D. Consent of Surety to Final Payment - AIA Document G707, 1994 ed.

E. Waiver of Liens AIA G706
   1. Submit one waiver from each subcontractor and supplier. Waiver is to be for amount of final payment.

F. Contractors General Guarantee - See section 01 7836 Guarantees and Warranties, for terms and durations.

G. Specific Guarantees - guarantees of material, equipment and systems installed in the work. See Section 01 7836 Guarantees and Warranties.

H. Submit all keys, tools, screens, spare construction materials, attic stock and equipment required to be furnished to the Owner as part of the work.

I. Submit Preventive Maintenance Schedule sheets. See section 01 9313, Maintenance Scheduling.

J. Submit Copies of all Certification of Specification Compliance.

K. Final survey if required by Municipality and/or Owner.

PART 2 PRODUCTS - NOT USED

PART 3 EXECUTION

3.01 PROJECT RECORD DOCUMENTS

A. Maintain on site one set of the following record documents; record actual revisions to the Work:
   1. Drawings.

2. Specifications.
3. Addenda.
4. Change Orders and other modifications to the Contract.
5. Reviewed shop drawings, product data, and samples.
6. Manufacturer's instruction for assembly, installation, and adjusting.
7. Copy of all test data taken in connection with the work.

B. Ensure entries are complete and accurate, enabling future reference by Owner.

C. Store record documents separate from documents used for construction.

D. Record information concurrent with construction progress.

E. Specifications: Legibly mark and record at each product section description of actual products installed, including the following:
1. Manufacturer's name and product model and number.
2. Product substitutions or alternates utilized.
3. Changes made by Addenda and modifications.

F. Record Drawings and Shop Drawings: Legibly mark each item to record actual construction including:
1. Measured depths of foundations in relation to finish first floor datum.
2. Measured horizontal and vertical locations of underground utilities and appurtenances, referenced to permanent surface improvements.
3. Measured locations of internal utilities and appurtenances concealed in construction, referenced to visible and accessible features of the Work.

3.02 OPERATION AND MAINTENANCE DATA

A. Source Data: For each product or system, list names, addresses and telephone numbers of Subcontractors and suppliers, including local source of supplies and replacement parts.

B. Product Data: Mark each sheet to clearly identify specific products and component parts, and data applicable to installation. Delete inapplicable information.

C. Drawings: Supplement product data to illustrate relations of component parts of equipment and systems, to show control and flow diagrams. Do not use Project Record Documents as maintenance drawings.

D. Typed Text: As required to supplement product data. Provide logical sequence of instructions for each procedure, incorporating manufacturer's instructions.

3.03 OPERATION AND MAINTENANCE DATA FOR MATERIALS AND FINISHES

A. For Each Product, Applied Material, and Finish:
1. Product data, with catalog number, size, composition, and color and texture designations.
2. Information for re-ordering custom manufactured products.

B. Moisture protection and weather-exposed products: Include product data listing applicable reference standards, chemical composition, and details of installation. Provide recommendations for inspections, maintenance, and repair.

C. Additional information as specified in individual product specification sections.

D. Where additional instructions are required, beyond the manufacturer's standard printed instructions, have instructions prepared by personnel experienced in the operation and maintenance of the specific products.

E. Provide a listing in Table of Contents for design data, with tabbed fly sheet and space for insertion of data.

3.04 OPERATION AND MAINTENANCE DATA FOR EQUIPMENT AND SYSTEMS

A. For Each Item of Equipment and Each System:
1. Description of unit or system, and component parts.
2. Identify function, normal operating characteristics, and limiting conditions.
3. Include performance curves, with engineering data and tests.
4. Complete nomenclature and model number of replaceable parts.

B. Where additional instructions are required, beyond the manufacturer's standard printed instructions, have instructions prepared by personnel experienced in the operation and maintenance of the specific products.

C. Operating Procedures: Include start-up, break-in, and routine normal operating instructions and sequences. Include regulation, control, stopping, shut-down, and emergency instructions. Include summer, winter, and any special operating instructions.

D. Maintenance Requirements: Include routine procedures and guide for preventative maintenance and trouble shooting; disassembly, repair, and reassembly instructions; and alignment, adjusting, balancing, and checking instructions.

E. Provide servicing and lubrication schedule, and list of lubricants required.

F. Include manufacturer's printed operation and maintenance instructions.

G. Provide original manufacturer's parts list, illustrations, assembly drawings, and diagrams required for maintenance.

H. Provide list of original manufacturer's spare parts, current prices, and recommended quantities to be maintained in storage.

I. Include test and balancing reports.

J. Additional Requirements: As specified in individual product specification sections.

3.05 ASSEMBLY OF OPERATION AND MAINTENANCE MANUALS

A. Assemble operation and maintenance data into durable manuals for Owner's personnel use, with data arranged in the same sequence as, and identified by, the specification sections.

B. Where systems involve more than one specification section, provide separate tabbed divider for each system.

C. Binders: Commercial quality, 8-1/2 by 11 inch three D side ring binders with durable plastic covers; 2 inch maximum ring size. When multiple binders are used, correlate data into related consistent groupings.

D. Cover: Identify each binder with typed or printed title OPERATION AND MAINTENANCE INSTRUCTIONS; identify title of Project; identify subject matter of contents.

E. Tables of Contents: List every item separated by a divider, using the same identification as on the divider tab; where multiple volumes are required, include all volumes Tables of Contents in each volume, with the current volume clearly identified.

F. Dividers: Provide tabbed dividers for each separate product and system; identify the contents on the divider tab; immediately following the divider tab include a description of product and major component parts of equipment.

G. Text: Manufacturer's printed data, or typewritten data on 20 pound paper.

H. Drawings: Provide with reinforced punched binder tab. Bind in with text; fold larger drawings to size of text pages.

I. Arrange content by systems under section numbers and sequence of Table of Contents of this Project Manual.

J. Contents: Prepare a Table of Contents for each volume, with each product or system description identified, in three parts as follows:
   1. Certificates.
   2. Photocopies of warranties and bonds.

K. Provide a listing in Table of Contents for design data, with tabbed dividers and space for insertion of data.

L. Table of Contents: Provide title of Project; names, addresses, and telephone numbers of Architect , Consultants, and with name of responsible parties; schedule of products and systems, indexed to content of the volume.

3.06 WARRANTIES AND BONDS

A. Obtain warranties and bonds, executed in duplicate by responsible Subcontractors, suppliers, and manufacturers, within 10 days after completion of the applicable item of

work. Except for items put into use with Owner's permission, leave date of beginning of time of warranty until the Date of Substantial completion is determined.

B. Verify that documents are in proper form, contain full information, and are notarized.

C. Co-execute submittals when required.

D. Retain warranties and bonds until time specified for submittal.

E. Include originals of each in operation and maintenance manuals, indexed separately on Table of Contents.

END OF SECTION

SECTION 01 7836
GUARANTEES AND WARRANTIES

GENERAL

1.01 REQUIREMENTS SET FORTH HEREIN ARE IN ADDITION TO AND SHALL BE CONSIDERED AS COMPLEMENTARY TO THE CONDITIONS OF THE CONTRACT AND THE BALANCE OF DIVISION #1 AND TECHNICAL SPECIFICATIONS.

A. All Contractors, Subcontractors, Sub-subcontractors, Vendors and the like shall be required to familiarize themselves with said provisions.

B. The following Clauses indicate extended terms of Guarantee/Warranties required for this Project.

C. The Contractor further guarantees to make permanent repairs forthwith to restore the affected areas and to make such temporary and permanent repairs without reference to or consideration of the cause of any defects in the Work.

D. Work required to correct defective material or workmanship during the guarantee periods shall be borne by the Contractor without cost to the Owner.

E. Should the Contractor fail to remedy defects immediately, the owner may furnish such materials and labor as are necessary to bring the work to the standard called for and the Contractor shall reimburse the owner in full immediately.

1.02 GUARANTEE OF WORK

A. Except as otherwise specified, all work performed under the Contract shall be guaranteed by the Contractor against defects resulting from the use of inferior materials, equipment or workmanship for one (1) year, unless otherwise stated, from the guarantee starting date (which shall be defined as the date of Substantial Completion or the date of actual full occupancy of the building, whichever is earlier.). The building, section thereof, or item of equipment, shall be occupied or put into actual use by the owner only after judged completed by the Architect and approved by him as ready for occupancy.
   1. Duration of Guarantees for heating systems shall be - one (1) year plus any time necessary to include one (1) continuous heating season from November 1 to April 1.
   2. Duration of Guarantees for refrigeration systems shall be - one (1) year plus any time necessary to include one (1) continuous cooling season from May 1 to October 1.
      a. Include five (5) years of guarantee on all compressors.
   3. Non-durable replaceable items such as mechanical air filter media and electric lamps do not require replacement after the date of acceptance.
   4. Manufacturers disclaimers and limitations on product warranties do not relieve the contractor of the warranty on the work that incorporates the products. Manufacturers disclaimers and limitations on product warranties do not relieve suppliers, manufacturers and subcontractors required to countersign special warranties with the contractor.

B. If, within any guarantee period, repairs or changes are required in connection with guaranteed work, which in the opinion of the Architect is rendered necessary as the result of the use of materials, equipment or workmanship which are inferior, defective, or not in accordance with terms of the Contract, regardless of whether the owner has benefitted from use of the work, the Contractor shall promptly upon receipt of notice from the Owner and without expense to the Owner:
   1. Place in satisfactory condition, in every particular, all of such guaranteed work, correct all defects thereof, and;
   2. Make good all damages to the building or site, or equipment or contents thereof, and;
   3. Make good any work or material, or equipment and contents of said building or site disturbed in fulfilling any such guarantee, and;
   4. Reinstate the warranty with written endorsement. Reinstated warranty shall be equal to the original warranty with adjustment for depreciation.

C. In any case where in fulfilling requirements of the Contract or of any guarantee embraced in or required thereby the Contractor disturbs any work, he shall restore such disturbed work to a condition satisfactory to the Owner.

D. The owner reserves the right to reject products that are not in conformance with the warranty requirements of the contract.

1.03 SECTION 07900; CAULKING AND SEALING - TWO (2) YEARS.

1.04 EACH CONTRACTOR SHALL EVALUATE GUARANTEE/WARRANTY REQUIREMENTS SPECIFIED WITHIN THESE TECHNICAL SPECIFICATIONS AND SHALL COMPLY WITH ALL TERMS AND REQUIREMENTS PLACED THEREON AS IF RESTATED "IN TOTAL" WITHIN THIS SECTION.

****END OF SECTION****

SECTION 01 7900
DEMONSTRATION AND TRAINING

PART 1 GENERAL

1.01 SUMMARY

A. Demonstration of products and systems where indicated in specific specification sections.

B. Training of Owner personnel in operation and maintenance is required for:
   1. HVAC systems and equipment.
   2. Plumbing equipment.
   3. Electrical systems and equipment.
   4. Items specified in individual product Sections.

C. Training of Owner personnel in care, cleaning, maintenance, and repair is required for:
   1. Roofing, waterproofing, and other weather-exposed or moisture protection products.
   2. Items specified in individual product Sections.

1.02 RELATED REQUIREMENTS

A. Section 01 7800 - Closeout Submittals: Operation and maintenance manuals.

B. Other Specification Sections: Additional requirements for demonstration and training.

1.03 SUBMITTALS

A. See Section 01 3000 - Administrative Requirements, for submittal procedures.

B. Training Plan: Owner will designate personnel to be trained; tailor training to needs and skill-level of attendees.
   1. Submit to Architect for transmittal to Owner.
   2. Submit not less than four weeks prior to start of training.
   3. Revise and resubmit until acceptable.
   4. Provide an overall schedule showing all training sessions.
   5. Include at least the following for each training session:
      a. Identification, date, time, and duration.
      b. Description of products and/or systems to be covered.
      c. Name of firm and person conducting training; include qualifications.
      d. Intended audience, such as job description.
      e. Objectives of training and suggested methods of ensuring adequate training.
      f. Methods to be used, such as classroom lecture, live demonstrations, hands-on, etc.
      g. Media to be used, such a slides, hand-outs, etc.
      h. Training equipment required, such as projector, projection screen, etc., to be provided by .

C. Training Manuals: Provide training manual for each attendee; allow for minimum of two attendees per training session.
   1. Include applicable portion of O&M manuals.
   2. Include copies of all hand-outs, slides, overheads, video presentations, etc., that are not included in O&M manuals.
   3. Provide one extra copy of each training manual to be included with operation and maintenance data.

D. Training Reports:
   1. Identification of each training session, date, time, and duration.
   2. Sign-in sheet showing names and job titles of attendees.
   3. List of attendee questions and written answers given, including copies of and references to supporting documentation required for clarification; include answers to questions that could not be answered in original training session.

1.04 QUALITY ASSURANCE

A. Instructor Qualifications: Familiar with design, operation, maintenance and troubleshooting of the relevant products and systems.

1. Provide as instructors the most qualified trainer of those contractors and/or installers who actually supplied and installed the systems and equipment.
2. Where a single person is not familiar with all aspects, provide specialists with necessary qualifications.

PART 2 PRODUCTS - NOT USED

PART 3 EXECUTION

3.01 DEMONSTRATION - GENERAL

A. Demonstration may be combined with Owner personnel training if applicable.

B. Non-Operating Products: Demonstrate cleaning, scheduled and preventive maintenance, and repair procedures.
   1. Perform demonstrations not less than two weeks prior to Substantial Completion.

3.02 TRAINING - GENERAL

A. Conduct training on-site unless otherwise indicated.

B. Owner will provide classroom and seating at no cost to .

C. Provide training in minimum two hour segments.

D. Training schedule will be subject to availability of Owner's personnel to be trained; re-schedule training sessions as required by Owner; once schedule has been approved by Owner failure to conduct sessions according to schedule will be cause for Owner to charge for personnel "show-up" time.

E. Review of Facility Policy on Operation and Maintenance Data: During training discuss:
   1. The location of the O&M manuals and procedures for use and preservation; backup copies.
   2. Typical contents and organization of all manuals, including explanatory information, system narratives, and product specific information.
   3. Typical uses of the O&M manuals.

F. Product- and System-Specific Training:
   1. Review the applicable O&M manuals.
   2. Provide hands-on training on all operational modes possible and preventive maintenance.
   3. Emphasize safe and proper operating requirements; discuss relevant health and safety issues and emergency procedures.
   4. Discuss common troubleshooting problems and solutions.
   5. Discuss any peculiarities of equipment installation or operation.
   6. Discuss warranties and guarantees, including procedures necessary to avoid voiding coverage.
   7. Review spare parts suppliers and sources and procurement procedures.

G. Be prepared to answer questions raised by training attendees; if unable to answer during training session, provide written response within three days.

END OF SECTION

SECTION 02 4100
DEMOLITION

PART 1 GENERAL

1.01 SECTION INCLUDES

A. Selective demolition of built site elements.

B. Selective demolition of building elements for alteration purposes.

1.02 RELATED REQUIREMENTS

A. Section 01 1000 - Summary: Limitations on 's use of site and premises.

B. Section 01 5000 - Temporary Facilities and Controls: Site fences, security, protective barriers, and waste removal.

C. Section 31 2200 - Grading: Topsoil removal.

D. Section 31 2200 - Grading: Fill material for filling holes, pits, and excavations generated as a result of removal operations.

1.03 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 2019.

1.04 SUBMITTALS

A. Site Plan: Showing:
   1. Vegetation to be protected.
   2. Areas for temporary construction and field offices.
   3. Areas for temporary and permanent placement of removed materials.

B. Demolition Plan: Submit demolition plan as specified by OSHA and local authorities.
   1. Indicate extent of demolition, removal sequence, bracing and shoring, and location and construction of barricades and fences.

C. Project Record Documents: Accurately record actual locations of capped and active utilities and subsurface construction.

1.05 QUALITY ASSURANCE

A. Demolition Firm Qualifications: Company specializing in the type of work required.
   1. Minimum of 5 years of documented experience.

1.06 PROJECT CONDITIONS

A. 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.

B. Comply with other requirements specified in Section 01 7000.

PART 3 EXECUTION

2.01 SCOPE

A. Remove paving and curbs as required to accomplish new work.

B. Fill excavations, open pits, and holes in ground areas generated as result of removals, using specified fill; compact fill as specified in Section 31 2200.

2.02 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. Provide, erect, and maintain temporary barriers and security devices.
   5. Use physical barriers to prevent access to areas that could be hazardous to workers or the public.

6. Conduct operations to minimize effects on and interference with adjacent structures and occupants.
7. Do not close or obstruct roadways or sidewalks without permit.
8. 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.
9. Obtain written permission from owners of adjacent properties when demolition equipment will traverse, infringe upon or limit access to their property.

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. Dismantle existing construction and separate materials.
2. Set aside reusable, recyclable, and salvageable materials; store and deliver to collection point or point of reuse.

H. Partial Removal of Paving and Curbs: Neatly saw cut at right angle to surface.

2.03 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.

2.04 SELECTIVE DEMOLITION FOR ALTERATIONS

A. Drawings showing existing construction and utilities are based on casual field observation and existing record documents only.
1. Report discrepancies to Architect before disturbing existing installation.
2. 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.
2. Provide sound retardant partitions of construction indicated on drawings in locations indicated on drawings.

C. Maintain weatherproof exterior building enclosure except for interruptions required for replacement or modifications; take care to prevent water and humidity damage.

D. Remove existing work as indicated and as required to accomplish new work.
   1. Remove rotted wood, corroded metals, and deteriorated masonry and concrete; replace with new construction specified.
   2. Remove items indicated on drawings.

E. Services (Including but not limited to PA/ Clocks, PA/ Clocks, PA/ Clocks, PA/ Clocks, PA/ Clocks, and PA/ Clocks): 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.

F. 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.

2.05 DEBRIS AND WASTE REMOVAL

A. Remove debris, junk, and trash from site.

B. Leave site in clean condition, ready for subsequent work.

C. Clean up spillage and wind-blown debris from public and private lands.

END OF SECTION

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SECTION 02 8200
ASBESTOS REMOVAL

PART 1 GENERAL

1.01 SCOPE OF WORK

A. This asbestos abatement Project will consist of the removal and disposal of asbestos containing materials (ACM) and presumed asbestos containing materials (PACM) at the Yonkers City School District; Yonkers Public School 16; 759 North Broadway; Yonkers, New York 10701.

B. The work shall include but not be limited to the removal of the following materials:

1. Remove and dispose of asbestos containing floor tile accent strip. Typ. for 40 sq. ft.
2. Remove and dispose of asbestos containing floor tile, leveling compound and mastics. Typ. for 745 sq. ft.
3. Remove and dispose of asbestos containing tar vapor barrier under wood flooring. Top 3 layers of flooring may be removed and disposed of as general construction debris. Typ. for 785 sq. ft.
4. Remove and dispose of lights and electrical wiring. Typ. for 12 lights / 24 lin. ft. wiring.

All as indicated on the drawings and as contained within the Renovation Survey for Asbestos Containing Materials & Lead Based Paint attached as Appendix 'A' to the end of this section.

C. The Contractor shall be aware of all conditions of the Project and is responsible for verifying quantities and locations of all Work to be performed. Failure to do so shall not relieve the Contractor of its obligation to furnish all labor and materials necessary to perform the Work.

D. All Work shall be performed in strict accordance with the Project Documents and all governing codes, rules, and regulations. Where conflicts occur between the Project Documents and applicable codes, rules, and regulations, the more stringent shall apply.

E. Working hours shall be as required and approved by the Owner. Asbestos abatement activities including, but not limited to, work area preparation, gross removal activities, cleaning activities, waste removal, etc. may need to be performed during 'off-hours' (including nights and weekends). In addition, multiple mobilizations may be required to perform the work identified in this project. The Contractor shall coordinate and schedule all Work with the facility and Owner's representative.

1.02 SPECIAL JOB CONDITIONS

A. All final air clearances associated with this project must be run by TEM, as described in 40 CFR Part 763 Asbestos, Subpart E, 763.90 and as per New York State Education Department Requirements.

1.03 PERMITS AND COMPLIANCE

A. The Contractor shall assume full responsibility and liability for compliance with all applicable Federal, State, and local laws, rules, and regulations pertaining to Work practices, protection of Workers, authorized visitors to the site, persons, and property adjacent to the Work.

B. Perform asbestos related Work in accordance with New York State Industrial Code Rule 56 (herein referred to as Code Rule 56), 40 CFR 61, and 29 CFR 1926. Where more stringent requirements are specified, adhere to the more stringent requirements.

C. The Contractor must maintain current licenses, permits and certifications pursuant to New York State Department of Labor and Department of Environmental Conservation for all Work related to this Project, including the removal, handling, transport, and disposal of asbestos containing materials.

D. The Contractor must have and submit proof upon request that any persons employed by the Contractor to engage in or supervise Work on any asbestos Project have a valid NYS asbestos handling certificate pursuant to Code Rule 56.

E. The Contractor shall comply fully with any Variance secured from regulatory agencies by the Owner in the performance of the Work. Any Variance applications previously submitted are included as an appendix of this specification.

F. The Contractor shall be responsible for obtaining all Variances as may be required for the Project or as requested by the Owner. Approval of the Owner is required prior to submission of a Variance application to any regulatory agency. Failure to obtain Owner approval may result in Owner not permitting variance to be used on the project.

G. The Contractor shall be responsible for compliance with The New York State Uniform Fire Prevention and Building Code, or its successor during all Work at the site.

H. Failure to adhere to the Project Documents shall constitute a breach of the Contract and the Owner shall have the right to and may terminate the Contract provided, however, the failure of the Owner to so terminate shall not relieve the Contractor from future compliance.

1.04 SUBMITTALS

A. Pre-Work Submittals: Within 7 days prior to the pre-construction conference, the Contractor shall submit 3 copies of the documents listed below, with 1 copy going directly to the Owner for review and approval prior to the commencement of asbestos abatement activities:
   1. Contractor license issued by New York State Department of Labor.
   2. A list of Projects performed within the past two (2) years including the dollar value of all Projects. Provide Project references to include Owner, consultant, and air monitoring firm's name, contact persons, address, and phone number.
   3. Progress Schedule:
      a. Show the complete sequence of abatement activities and the sequencing of Work within each building or building section.
      b. Show the dates for the beginning and completion of each major element of Work including substantial completion dates for each Work Area, building, or phase.
   4. Project Notifications: As required by Federal and State regulatory agencies together with proof of transmittal (i.e. certified mail return receipt).
   5. Building Occupant Notification: As required by regulatory agencies.
   6. Abatement Work Plan: Provide plans that clearly indicate the following:
      a. All Work Areas/containments numbered sequentially.
      b. Locations and types of all decontamination enclosures.
      c. Entrances and exits to the Work Areas/containments.

d. Type of abatement activity/technique for each Work Area/containment.
e. Number and location of negative air units and exhaust. Also provide calculations for determining number of negative air pressure units.
f. Location of water and electrical connections to building services.
g. Waste transport routes through the building to the waste storage container.

7. Disposal Site/Landfill Permit from applicable regulatory agency.
8. NYS Department of Environmental Conservation Waste Transporter Permit.

B. On-Site Submittals: Refer to Part 3.1.C & D for all submittals, documentation, and postings required to be maintained on-site during abatement activities.

C. Project Close-out Submittals: Within 30 days of the completion of each abatement phase, the Contractor shall submit one copy of the documents listed below to Owner and one copy to the envirionmental consultant for review and approval prior to Contractor's final payment. Once Owner approves the close-out submittal, the Contractor shall provide three sets of the approved close-out documents (double-sided and bound) to Owner Project Management, including one set to be distributed to the facility.

1. All waste disposal manifests and disposal logs
2. OSHA compliance air monitoring records conducted during the Work.
3. Daily progress log, including the entry/exit log.
4. Provide the Contractor's Acknowledgement Statement that lists all Workers used in the performance of the Project, including name and NYS DOL certification number. The Statement shall be notarized (Original notarized statement shall be sent to Owner).
5. Disposal Site/Landfill Permit from applicable regulatory agency.
6. Project notifications, amended notifications, Variances.

1.05 PRE-CONSTRUCTION CONFERENCE

A. Prior to start of preparatory Work under this Contract, the Contractor shall attend a pre-construction conference attended by Owner, Facility Personnel, and Environmental Consultant.

B. Agenda for this conference shall include but not necessarily be limited to:

1. Contractor's scope of Work, Work plan, and schedule to include number of workers and shifts.
2. Contractor's safety and health precautions including protective clothing and equipment and decontamination procedures.
3. Environmental Consultant's duties, functions, and authority.
4. Contractor's Work procedures including:
   a. Methods of job site preparation and removal methods.
   b. Respiratory protection.
   c. Disposal procedures.
   d. Cleanup procedures.
   e. Fire exits and emergency procedures.
5. Contractor's required pre-work and on-site submittals, documentation, and postings.
6. Contractor's plan for twenty-four (24) hour Project security both for prevention of theft and for barring entry of unauthorized personnel into Work Areas.
7. Temporary utilities.
8. Handling of furniture and other moveable objects.
9. Storage of removed asbestos containing materials.

10. Waste disposal requirements and procedures, including use of the Owner supplied waste manifest.

C. In conjunction with the conference the Contractor shall accompany the Owner and Environmental Consultant on a pre-construction walk-through documenting existing condition of finishes and furnishings, reviewing overall Work plan, location of fire exits, fire protection equipment, water supply and temporary electric tie-in.

1.06 APPLICABLE STANDARDS AND REGULATIONS

A. The Contractor shall comply with the following codes and standards, except where more stringent requirements are shown or specified:

B. Federal Regulations:
1. 29 CFR 1910.1001, "Asbestos" (OSHA)
2. 29 CFR 1910.1200, "Hazard Communication" (OSHA)
3. 29 CFR 1910.134, "Respiratory Protection" (OSHA)
4. 29 CFR 1910.145, "Specification for Accident Prevention Signs and Tags" (OSHA)
5. 29 CFR 1926, "Construction Industry" (OSHA)
6. 29 CFR 1926.1101, "Asbestos, Tremolite, Anthophyllite, and Actinolite" (OSHA)
7. 29 CFR 1926.500 "Guardrails, Handrails and Covers" (OSHA)
8. 40 CFR 61, Subpart A, "General Provisions" (EPA)
9. 40 CFR 61, Subpart M, "National Emission Standard for Asbestos" (EPA)
10. 49 CFR 171-172, Transportation Standards (DOT)

C. New York State Regulations:
1. 12 NYCRR, Part 56, "Asbestos", Industrial Code Rule 56 (DOL)
2. 6 NYCRR, Parts 360, 364, Disposal and Transportation (DEC)
3. 10 NYCRR, Part 73, "Asbestos Safety Program Requirements" (DOH)
4. “New York State Uniform Fire Prevention and Building Code”
5. New York State Education Department – Manual of Planning Standards

D. Standards and Guidance Documents:
1. American National Standard Institute (ANSI) Z88.2-80, Practices for Respiratory Protection
2. ANSI Z9.2-79, Fundamentals Governing the Design and Operation of Local Exhaust Systems
3. EPA 560/585-024, Guidance for Controlling Asbestos Containing Materials in Buildings (Purple Book)
4. EPA 530-SW-85-007, Asbestos Waste Management Guidance
5. ASTM Standard E1368 “Standard Practice for Visual Inspection of Asbestos Abatement Projects”

1.07 NOTICES

A. The Contractor shall provide notification of intent to commence asbestos abatement activities as indicated below.

1. At least ten (10) Working days prior to beginning abatement activities, send written notification to:

U.S. Environmental Protection Agency
National Emissions Standards for Hazardous Air Pollutants (NESHAPS) Coordinator
26 Federal Plaza
New York, NY 10007

2. At least ten (10) days prior to beginning abatement activities send written notification to:

New York State Department of Labor
Division of Safety and Health, Asbestos Control Program.
State Office Campus
Building 12 - Room 161B
Albany, NY 12240

B. The Contractor is required to send notifications to regulatory agencies via electronic, mail, or package delivery service that will provide proof of delivery and receipt.

C. The Contractor shall be responsible for maintaining current project filings with regulatory agencies for the duration of the project.

D. The Contractor shall post and/or provide Building Occupant Notification at least 10 days prior to beginning abatement activities as required by Code Rule 56.

1.08 PROJECT MONITORING AND AIR SAMPLING

A. The Owner shall engage the services of an Environmental Consultant (the Consultant) who shall serve as the Owner's Representative in regard to the performance of the asbestos abatement Project and provide direction as required throughout the entire abatement Project period. The consultant and all subconsultants shall not have any contractual relationship with the Contractor for the duration of the asbestos project.

B. The Contractor is required to ensure cooperation of its personnel with the Consultant for the air sampling and Project monitoring functions described in this section. The Contractor shall comply with all direction given by the Consultant during the course of the Project.

C. The Consultant shall provide the following administrative services:
1. Review and approve or disapprove all submittals, shop drawings, schedules, and samples.
2. Assure that all notifications to governmental agencies by the Contractor are submitted in a timely manner and are correct in content.

D. The Consultant shall staff the Project with a trained and certified person(s) to act on the Owner's behalf at the job site. This individual shall be designated as the Abatement Project Monitor (APM).
1. The APM shall be on-site at all times the Contractor is on-site. The Contractor shall not be permitted to conduct any Work unless the APM is on-site (except for inspection of barriers and negative air system during non-working days).
2. The APM shall have the authority to direct the actions of the Contractor verbally and in writing to ensure compliance with the Project documents and all regulations. The APM shall have the authority to Stop Work when gross Work practice deficiencies or unsafe

practices are observed, or when ambient fiber concentrations outside the removal area exceed .01 f/cc or background level.

a. Such Stop Work order shall be effective immediately and remain in effect until corrective measures have been taken and the situation has been corrected.
b. Standby time and air sample collection and analysis required to resolve the situation shall be at the Contractor's expense.

3. The APM shall provide the following services:
   a. Inspection of the Contractor's Work, practices, and procedures, including temporary protection requirements, for compliance with all regulations and Project specifications.
   b. Provide abatement Project air sampling as required by applicable regulations (NYS, AHERA) and the Owner. Sampling will include, but not be limited to background, work area preparation, asbestos handling, final cleaning, and clearance air sampling.
   c. Verify daily that all Workers used in the performance of the Project are certified by the appropriate regulatory agency.
   d. Monitor the progress of the Contractor's Work, and report any deviations from the schedule to the Owner.
   e. Monitor, verify, and document all waste load-out operations including placement of generator and location labels on each waste container, as required by federal regulations.
   f. Verify that the Contractor is performing personal air monitoring daily, and that results are being returned and posted at the site as required.
   g. The APM shall maintain a log on site that documents all project related and Consultant and Contractor actions, activities, and occurrences.
   h. Verify landfill to be used for waste disposal with waste transporter(driver) and Contractor prior to waste trailer/dumpster leaving site. Confirm the waste transporter firm and landfill are listed on the regulatory notifications for the project and the waste transport vehicle license number is listed on the current NYS DEC Waste Transporter permit.
4. The following minimum inspections shall be conducted by the APM, accompanied by the Contractor’s supervisor. Additional inspections shall be conducted as required by Project conditions and/or the Owner’s direction. Progression from one phase of Work to the next by the Contractor is only permitted with the written approval of the APM.
   a. Pre-Construction Inspection: The purpose of this inspection is to verify the existing conditions of the Work Areas and to document these conditions.
   b. Pre-Commencement Inspection: The purpose of this inspection is to verify the integrity of each containment system prior to disturbance of any asbestos containing material. This inspection shall take place only after the Work Area is fully prepped for removal.
   c. Work Inspections: The purpose of this inspection is to monitor the Work practices and procedures employed on the Project and to monitor the continued integrity of the containment system. Inspections within the removal areas shall be conducted by the APM during all preparation, removal, and cleaning activities at least twice every Work shift. Additional inspections shall be conducted as warranted.
   d. Pre-Encapsulation Inspection: The purpose of this inspection is to ensure the complete removal of Asbestos Containing Material (ACM), from all surfaces in the Work Area prior to encapsulation.

e. Visual Clearance Inspection: The purpose of this inspection is to verify that: all materials in the scope of work have been properly removed; no visible asbestos debris/residue remains; no pools of liquid or condensation remains; and all required cleanings are complete. This inspection shall be conducted before final air clearance testing.

f. Post-Clearance Inspection: The purpose of this inspection is to ensure the complete removal of ACM, including debris, from the Work Area after satisfactory final clearance sampling and removal of all isolation and critical barriers and equipment from the Work Area.

g. Punch List Inspection: The purpose of this inspection is to verify the Contractor's certification that all Work has been completed as contracted and the existing condition of the area prior to its release to the Owner.

E. The Consultant shall provide abatement Project air sampling and analysis as required by applicable regulations (New York State and/or AHERA). Sampling will include but is not limited to, background, work area preparation, asbestos handling, and final cleaning and clearance air sampling.

1. Unless otherwise required by applicable regulations, the Consultant shall have samples analyzed by Phase Contrast Microscopy (PCM). Results shall be available within 24 hours of completion of sampling.
2. Samples shall be collected as required by applicable regulations (New York State and/or AHERA) and these specifications. If Transmission Electron Microscopy (TEM) clearance air sampling is utilized by the owner, the clearance criteria and sampling protocols must be in compliance with AHERA. If PCM air sample analysis results exceed the satisfactory clearance criteria, then TEM analysis of the entire set of clearance air samples may be used, provided that a standard NIOSH/ELAP accepted laboratory analysis method is utilized that shall report each air sample result in fibers per cubic centimeter.
3. If the air sampling during any phase of the abatement project reveals airborne fiber levels at or above .01 fibers/cc or the established background level, whichever is greater, outside the regulated Work Area, Work shall stop immediately and corrective measures required by Code Rule 56 shall be initiated. Notify all employers and occupants in adjacent areas. The Contractor shall bear the burden of any and all costs incurred by this delay.
4. The Environmental Consultant shall submit copies of all elevated air sampling results collected during abatement and all final air clearance results to the Commissioner of Labor, as required by regulation.
5. All final air clearances associated with this project must be run by TEM, as described in 40 CFR Part 763 Asbestos, Subpart E, 763.90 and as per New York State Education Department Requirements.

1.09 CONTRACTOR AIR SAMPLING

A. In addition to the requirements of OSHA 1926.1101, the Contractor shall be required to perform personal air monitoring every Work shift in each Work Area during which abatement activities occur in order to determine that appropriate respiratory protection is being worn and utilized.

B. The Contractor shall conduct air sampling that is representative of both the 8-hour time weighted average and 30-minute short-term exposures to indicate compliance with the permissible exposure and excursion limits.

C. The Contractor's laboratory analysis of air samples shall be conducted by an NYS DOH ELAP approved laboratory. The consultant shall not collect or analyze the Contractor's air samples.

D. Results of personnel air sample analyses shall be available, verbally, within twenty-four (24) hours of sampling and shall be posted upon receipt. Written laboratory reports shall be delivered and posted at the Work site within five (5) days. Failure to comply with these requirements may result in all work being stopped until compliance is achieved.

1.10 PROJECT SUPERVISOR

A. The Contractor shall designate a full-time Project Supervisor who shall meet the following qualifications:
   1. The Project Supervisor shall hold New York State certification as an Asbestos Supervisor.
   2. The Project Supervisor shall meet the requirements of a "Competent Person" as defined by OSHA 1926.1101 and shall have a minimum of one year experience as a supervisor.
   3. The Project Supervisor must be able to speak, read, and write English fluently, as well as communicate in the primary language of the Workers.

B. If the Project Supervisor is not on-site at any time whatsoever, all Work shall be stopped. The Project Supervisor shall remain on-site until the Project is complete. The Contractor may not remove the Project Supervisor from the Project without the written consent of the Owner and the Environmental Consultant; however the Project Supervisor shall be removed from the Project if so requested by the Owner.

C. The Project Supervisor shall maintain the bound Daily Project Log and the entry/exit logs as required by New York State Department of Labor and section 2.3 of the specifications and the Waste Disposal Log (Appendix B) required by section 4.3 of the specifications.

D. The Project Supervisor shall be responsible for the performance of the Work and shall represent the Contractor in all respects at the Project site. The Supervisor shall be the primary point of contact for the Asbestos Project Monitor.

1.11 MEDICAL REQUIREMENTS

A. Before exposure to airborne asbestos fibers, provide Workers with a comprehensive medical examination as required by 29 CFR 1910.1001, and 29 CFR 1926.1101.
   1. This examination is not required if adequate records show the employee has been examined as required by 29 CFR 1910.1001, and 29 CFR 1926.1101 within the past year.
   2. The same medical examination shall be given on an annual basis to employees engaged in an occupation involving potential disturbance of asbestos fibers.

1.12 TRAINING

A. As required by applicable regulations, prior to assignment to asbestos Work instruct each employee with regard to the hazards of asbestos, safety and health precautions, and the use and requirements of protective clothing and equipment.

B. Establish a respirator program as required by ANSI Z88.2 and 29 CFR 1910.134, and 29 CFR 1926.1101. Provide respirator training and fit testing.

1.13 RESPIRATORY PROTECTION

A. Select respirators from those approved by the National Institute for Occupational Safety and Health (NIOSH).

B. Respirators shall be individually fit-tested to personnel under the direction of an Industrial Hygienist on a yearly basis. Fit-tested respirators shall be permanently marked to identify the individual fitted, and use shall be limited to that individual.

C. Where fiber levels permit, and in compliance with regulatory requirements, Powered Air Purifying Respirators (PAPR) are the minimum allowable respiratory protection permitted to be utilized during gross removal operations of OSHA Class I or OSHA Class II friable ACM.

D. No respirators shall be issued to personnel without such personnel participating in a respirator training program.

E. High Efficiency Particulate Air (HEPA) respirator filters shall be approved by NIOSH and shall conform to the OSHA requirements in 29 CFR 1910.134 and 29 CFR 1926.1101.

F. A storage area for respirators shall be provided by the Contractor in the clean room side of the personnel decontamination enclosure where they will be kept in a clean environment.

G. The Contractor shall provide and make available a sufficient quantity of respirator filters so that filter changes can be made as necessary during the work day.

H. Filters used with negative pressure air purifying respirators shall not be used any longer than one eight (8) hour work day. Any loose respirator filters found within the regulated area, must be disposed of as asbestos waste.

I. Any authorized visitor, Worker, or supervisor found in the Work Area not wearing the required respiratory protection shall be removed from the Project site and not be permitted to return.

J. The Contractor shall have at least two (2) Powered Air Purifying Respirators stored on site designated for authorized visitors use. Appropriate respirator filters for authorized visitors shall be made available by the Contractor.

1.14 DELIVERY AND STORAGE

A. Deliver all materials to the job site in original packages with containers bearing manufacturer's name and label.

B. Store all materials at the job site in a suitable and designated area.

1. Store materials subject to deterioration or damage away from wet or damp surfaces and under cover.
2. Protect materials from unintended contamination and theft.
3. Storage areas shall be kept clean and organized.

C. Remove damaged or deteriorated materials from the job site. Materials contaminated with asbestos shall be disposed of as asbestos debris as herein specified. This includes unused Contractor supplies located in the regulated work area.

1.15 TEMPORARY UTILITIES

A. Shut down and lock out all electrical power to the asbestos Work Areas, including lighting circuits. Any electrical power passing through the Work Areas that can't be shut down due to health and safety reasons, shall be protected as per the requirements of Industrial Code Rule 56.

B. Provide temporary 120-240 volt, single phase, three wire, 100 amp electric service with Ground Fault Circuit Interrupters (GFCI) for all electric requirements within the asbestos Work Area.
1. Where available, obtain from Owner's existing system. Otherwise provide power from other sources (i.e. generator).
2. Provide temporary wiring and "weatherproof" receptacles in sufficient quantity and location to serve all HEPA equipment and tools.
3. Provide wiring and receptacles as required by the Environmental Consultant for project monitoring and air sampling equipment (pumps, fans, leaf blowers, etc.).
4. All power to the Work Area shall be brought in from outside the area through GFCI's at the source.

C. Provide temporary lighting with "weatherproof" fixtures for all Work Areas including decontamination chambers.
1. The entire Work Area shall be kept illuminated at all times.
2. Provide lighting as required by the Environmental Consultant for the purposes of performing required inspections.

D. All temporary devices and wiring used in the Work Area shall be capable of decontamination procedures including HEPA vacuuming and wet-wiping.

E. Utilize domestic water service, if available, from Owner's existing system. Provide hot water heaters with sufficient capacity to meet Project demands.

PART 2 PRODUCTS

2.01 PROTECTIVE CLOTHING

A. Provide personnel utilized during the Project with disposable protective whole body clothing, head coverings, gloves and foot coverings. Provide disposable plastic or rubber gloves to protect hands. Cloth gloves may be worn inside the plastic or rubber for comfort, but shall not be used alone. Make sleeves secure at the wrists and make foot coverings secure at the ankles by the use of tape, or provide disposable coverings with elastic wrists or tops.

B. Provide sufficient quantities of protective clothing to assure a minimum of four (4) complete disposable outfits per day for each individual performing abatement Work.

C. Eye protection and hard hats shall be provided and made available for all personnel entering any Work Area.

D. Authorized visitors shall be provided with suitable protective clothing, headgear, eye protection, and footwear whenever they enter the Work Area.

2.02 SIGNS AND LABELS

A. Provide warning signs and barrier tapes at all approaches to asbestos Work Areas. Locate signs at such distance that personnel may read the sign and take the necessary protective steps required before entering the area.
1. Provide danger signs in vertical format conforming to 29 CFR 1926.1101, minimum 20" x 14" displaying the following legend.

DANGER
ASBESTOS CANCER AND LUNG DISEASE
HAZARD
AUTHORIZED PERSONNEL ONLY
RESPIRATORS AND PROTECTIVE CLOTHING
ARE REQUIRED IN THIS AREA

2. Provide 3" wide yellow barrier tape printed with black lettered, "DANGER ASBESTOS REMOVAL". Locate barrier tape across all corridors, entrances and access routes to asbestos Work Area. Install tape 3' to 4' AFF.

B. Provide asbestos danger labels affixed to all asbestos materials, scrap, waste, debris and other products contaminated with asbestos.
1. Provide asbestos danger labels of sufficient size to be clearly legible, displaying the following legend:

DANGER
CONTAINS ASBESTOS FIBERS
AVOID CREATING DUST
CANCER AND LUNG DISEASE HAZARD

2. Provide the following asbestos labels, of sufficient size to be clearly legible, for display on waste containers (bags or drums) which will be used to transport asbestos contaminated material in accordance with United States Department of Transportation 49 CFR Parts 171 and 172: (Note: Include “RQ” for friable asbestos waste only.)

RQ, NA2212, (WASTE) ASBESTOS, 9, PGIII

3. Generator identification information shall be affixed to each waste container or any packaging used to containerize asbestos waste indicating the following printed in indelible ink:

Generator Name
Facility Name
Facility Address
Date

2.03 DAILY PROJECT LOG & WORK AREA ENTRY/EXIT LOG

A. Provide a bound Daily Project Log. The log shall contain on title page the Project name; name, address and phone number of Owner; name, address and phone number of Environmental Consultant; name, address and phone number of Abatement Contractor; emergency numbers including, but not limited to local Fire/Rescue department and all other New York State Department of Labor requirements.

B. All entries into the log shall be made in non-washable, permanent ink and such pen shall be strung to or otherwise attached to the log to prevent removal from the log-in area. Under no circumstances shall pencil entries be permitted.

C. All persons entering and exiting the Work Area shall sign the entry/exit log and include name, certification number, and time.

D. The Project Supervisor shall document all Work performed daily and note all inspections required by Code Rule 56, i.e. testing and inspection of barriers and enclosures.

2.04 SCAFFOLDING AND LADDERS

A. Provide all scaffolding and/or staging as necessary to accomplish the Work of this Contract. Scaffolding may be of suspension type or standing type such as metal tube and coupler, tubular welded frame, pole or outrigger type or cantilever type. The type, erection and use of all scaffolding and ladders shall comply with all applicable OSHA construction industry standards.

B. Provide scaffolding and ladders as required by the Environmental Consultant for the purposes of performing required inspections.

2.05 SURFACTANT (AMENDED WATER)

A. Wet all asbestos-containing materials prior to removal with surfactant mixed and applied in accordance with manufacturer's printed instructions.

2.06 ENCAPSULANT

A. Encapsulant shall be tinted or pigmented so that application when dry is readily discernible.

B. The encapsulant solvent or vehicle shall not contain a volatile hydrocarbon.

2.07 WASTE DISPOSAL BAGS, DRUMS, AND CONTAINERS

A. Provide 6 mil polyethylene disposal bags printed with asbestos caution labels. Bags shall also be imprinted with U.S. Department of Transportation required markings.

B. Provide 30 or 55 gallon capacity fiber, plastic, or metal drums capable of being sealed air and water tight if asbestos waste has the potential to damage or puncture disposal bags. Affix asbestos caution labels on lids and at one-third points around drum circumference to assure ready identification.

C. Containers and bags must be labeled accordance with 40 CFR Part 61 NESHAPS and Code Rule 56. When the bags/containers are moved to the holding area, lockable trailer, or lockable hardtop dumpster from the waste decontamination system washroom, each bag/container must also be appropriately labeled with the date moved in waterproof markings.

D. Labeled ACM waste containers or bags shall not be used for non-ACM waste or trash. Any material placed in labeled containers or bags, whether turned inside out or not shall be handled and disposed of as ACM waste.

2.08 HEPA VACUUM EQUIPMENT

A. All vacuuming performed under this contract shall be performed with High Efficiency Particulate Air (HEPA) filter equipped industrial vacuums conforming to ANSI Z9.2.

2.09 POWER TOOLS

A. Any power tools used to drill, cut into, or otherwise disturb asbestos material shall be manufacturer equipped with HEPA filtered local exhaust ventilation.

2.10 FIRE RETARDANT PLASTIC SHEETING

A. All polyethylene (plastic) sheeting used on the Project (including but not limited to sheeting used for critical and isolation barriers, fixed objects, walls, floors, ceilings, waste container) shall be at least 6 mil fire retardant sheeting.

B. Decontamination enclosure systems shall utilize at least 6 mil opaque fire retardant plastic sheeting. At least 2 layers of 6 mil reinforced fire retardant plastic sheeting shall be used for the flooring.

PART 3 EXECUTION

3.01 GENERAL REQUIREMENTS

A. Should visible emissions or water leaks be observed outside the Work Area, immediately stop Work and institute emergency procedures per Code Rule 56. Should there be elevated fiber levels outside the Work Area, immediately stop Work, institute emergency procedures per Code Rule 56, and notify all employers and occupants in adjacent areas. All costs incurred in decontaminating such non-Work Areas and the contents thereof shall be borne by the Contractor, at no additional cost to the Owner.

B. Valid NYS DOL Asbestos Handler certification cards shall be on site prior to admittance of any Contractor’s employees to the asbestos Work Area.

C. The following submittals, documentation, and postings shall be maintained on-site by the Contractor during abatement activities at a location approved by the Abatement Project Monitor:
1. Valid Contractor handling license issued by New York State Department of Labor.
2. NYS DOL Asbestos Handler certification cards for each person employed in the removal, handling, or disturbance of asbestos.

3. Daily OSHA personal air monitoring results.
4. NYS Department of Health ELAP certification for the laboratory that will be analyzing the OSHA personnel air samples.
5. NYS Department of Environmental Conservation Waste Transporter Permit.
6. Project documents (specifications and drawings.)
7. Notifications, Variances, Approved Work Plan. Ensure that the most up-to-date notifications and Variances are on-site.
8. Applicable regulations.
9. Material Safety Data Sheets of supplies/chemicals used on the Project.
10. Disposal Site/Landfill Permit from applicable regulatory agency.
11. List of emergency telephone numbers.
12. Magnahelic manometer semi-annual calibration certification.
13. Waste Disposal Log.
14. Daily Project Log.
15. Entry/Exit Logs.

D. The following documentation shall be maintained on-site by the Abatement Project Monitor during abatement activities:
1. Valid Contractor handling license issued by New York State Department of Labor.
2. Air Sample Log.
3. Air sample results.
4. Project Monitor Daily Log
5. Asbestos Survey Report.
6. A copy of ASTM Standard E1368 “Standard Practice for Visual Inspection of Asbestos Abatement Projects.”
7. Calibration chart for rotometer(s) used on-site.

E. The Work Area must be vacated by building occupants prior to decontamination enclosure construction and Work Area preparation.

F. All demolition necessary to access asbestos containing materials for removal must be conducted within negative pressure enclosures by licensed asbestos handlers. Demolition debris may be disposed of as construction and demolition debris provided the Abatement Project Monitor determines that it is not contaminated with asbestos and there has been no disturbance of ACM within the enclosure. If the demolition debris is determined to be contaminated or ACM has been disturbed, it must be disposed of as asbestos waste.

3.02 PERSONNEL DECONTAMINATION ENCLOSURE

A. Provide personnel decontamination enclosure contiguous to the Work Area or as per Variance. The decontamination enclosure shall be attached to the Work Area and not located within it unless isolation barriers are installed. If the decontamination chamber is accessible to the public it shall be fully framed, sheathed, and lockable to prevent unauthorized entry.

B. Access to the Work Area will be from the clean room through an air-lock to the shower and through an air lock to the equipment room. Each airlock shall be a minimum of three feet from door to door. Additional air locks shall be provided as required by Code Rule 56 for remote decontamination enclosures.

C. The decontamination enclosure ceiling and walls shall be covered with one layer of opaque 6 mil fire retardant plastic sheeting. Two layers of reinforced fire retardant plastic sheeting shall be used to cover the floor.

D. The entrance to the clean room shall have a lockable door with adequate small openings for Work Area make-up air. Provide suitable lockers for storage of Worker's street clothes. Storage for respirators along with replacement filters and disposable towels shall also be provided.

E. Provide a temporary shower with individual hot and cold water supplies and faucets. Provide a sufficient supply of soap and shampoo. There shall be one shower for every six Workers. The shower room shall be constructed in such a way so that travel through the shower chamber shall be through the shower. The shower shall not be able to be bypassed.

F. Shower water shall be drained, collected and filtered through a system with at least a 5.0 micron particle size collection capability containing a series of several filters with progressively smaller pore sizes to avoid rapid clogging of the system. The filtered waste water shall then be discharged in accordance with applicable codes and the contaminated filters disposed of as asbestos waste.

G. The equipment room shall be used for the storage of tools and equipment. A walk-off pan filled with water shall be located in the Work Area outside the equipment room for Workers to clean foot coverings when leaving the Work Area. A labeled 6 mil plastic ACM waste bag for collection of contaminated clothing shall be located in this room.

H. The personal decontamination enclosure shall be cleaned and disinfected minimally at the end of each Work shift and as otherwise directed by the Asbestos Project Monitor.

3.03 WASTE DECONTAMINATION ENCLOSURE

A. Provide a waste decontamination enclosure contiguous to the Work area. The decontamination enclosure shall be attached to the Work Area and not located within it unless isolation barriers are installed. If the decontamination chamber is accessible to the public it shall be fully framed, sheathed, and lockable to prevent unauthorized entry.

B. The waste decontamination enclosure system shall consist of a holding area, air lock and washroom. The airlock shall be a minimum of three feet from door to door. The entrance to the holding area shall have a lockable door.

C. The decontamination enclosure ceiling and walls shall be covered with one layer of opaque 6 mil fire retardant plastic sheeting on walls and ceiling. Two layers of reinforced fire retardant plastic sheeting shall be used to cover the floor.

D. Where there is only one egress from the Work Area, the holding area of the waste decontamination enclosure system may branch off from the personnel decontamination enclosure equipment room, which then serves as the waste wash room.

E. The waste wash room water shall be drained, collected, and filtered through a system with at least a 5.0 micron particle size collection capability containing a series of several filters with progressively smaller pore sizes to avoid rapid clogging of the system. The filtered waste

water shall then be discharged in accordance with applicable codes and the contaminated filters disposed of as asbestos waste.

F. In small asbestos Projects where only one egress from the Work Area exists, the shower room may be used as a waste washroom. In this instance, the clean room shall not be used for waste storage, but shall be used for waste transfer to carts, which shall immediately be removed from this enclosure.

3.04 WORK AREA ENTRY AND EXIT PROCEDURES

A. Access to and from the asbestos Work Area is permitted only through the personnel decontamination enclosure unless otherwise stipulated in a Site Specific Variance.

B. Workers shall sign the entry/exit log upon every entry and exit.

C. The following procedures shall be followed when entering the Work Area:
   1. Before entering the Work Area, Workers shall proceed to the clean room, remove all street clothes, and don protective clothing, equipment, and respirators.
   2. Workers shall proceed from the clean room through the shower room and the equipment room and into the Work Area.

D. The following procedures shall be followed when exiting the Work Area:
   1. Before leaving the Work Area, gross asbestos contamination will be removed by brushing, wet cleaning and/or HEPA vacuuming, followed by use of the walk-off pan.
   2. In the equipment room, Workers shall remove disposable clothing, but not respirators, and shall place clothing in plastic disposal bags for disposal as contaminated debris prior to entering the shower room. Reusable equipment shall be removed and stored in the equipment room (e,g, work boots).
   3. Workers shall shower thoroughly while wearing respirators, then wash respirator with soap and water prior to removal.
   4. Upon exiting the shower, Workers shall enter the clean room and don new disposable clothing if the Work shift is to continue or street clothes to exit area. Under no circumstances shall Workers enter public non-Work Areas in disposable protective clothing.

E. If remote decontamination enclosures are permitted by Code Rule 56 or a Site Specific Variance, workers shall wear two disposable suits for all phases of Work. Workers exiting the work area shall HEPA vacuum the outer suit, enter the airlock, remove the outer suit and then place it back into the Work Area. A clean second suit shall be donned before exiting the airlock and proceeding to the decontamination enclosure or another work area via the designated pathway required by Code Rule 56.

3.05 WORK AREA PREPARATION

A. Asbestos danger signs shall be posted at all approaches to the asbestos Work Area. Post all emergency exits as emergency exits only on the Work Area side, post with asbestos caution signs on the non-Work Area side. Provide all non-Work Area stairs and corridors accessible to the asbestos Work Area with warning tapes at the base of stairs and beginning of corridors. Warning tapes shall be in addition to caution signs.

B. Shut down and lock out the building heating, ventilating, and air conditioning systems. Electrical systems and circuits shall also be shut down unless permitted to remain active per Code Rule 56 and appropriately protected and labeled. Existing lighting sources shall not be utilized. Provide temporary electric power and lighting as specified herein.

C. All non-ACM surfaces and objects within the Work Area shall be pre-cleaned using HEPA vacuuming and/or wet-wiping methods. Dry sweeping and any other methods that raise dust shall be prohibited. ACM shall not be disturbed during pre-cleaning.

D. Movable objects within the Work Area shall be HEPA vacuumed and/or wet-wiped and removed from the Work Area.

E. All non-movable equipment in the Work Area shall be completely covered with 2 layers of fire retardant plastic sheeting, at least 6 mil in thickness, and secured in place with duct tape and/or spray adhesive. Active Fire Protection System components in the Work Area shall not be covered with fire retardant plastic sheeting or any other obstruction.

F. Provide enclosure of the asbestos Work Area necessary to isolate it from unsealed areas of the building in accordance with the approved asbestos Work plan and as specified herein.

G. Provide critical barriers by sealing off all openings including but not limited to operable windows and skylights, doorways, diffusers, grills, electrical outlets and boxes, doors, floor drains, and any other penetrations to surfaces in the Work Area enclosure, using 2 layers of at least 6 mil fire retardant plastic sheeting.

H. Provide isolation barriers by installing temporary framing and sheathing at openings larger than 32 square feet forming the limits of the asbestos Work Area. Sheathing thickness must be a minimum of 3/8 inch and all sheathing shall be caulked and the Work Area side sealed with two layers of 6 mil fire retardant plastic sheeting. Isolation barriers in stairwells and at work area egress locations shall not be covered with sheathing, only two layers of 6 mil fire retardant plastic sheeting.

I. Isolation barriers shall be installed at all elevator openings in the Work Area. .Elevators running through the regulated abatement work area shall be shut down or isolated as per Code Rule 56. Elevator controls shall be modified so that elevators bypass the Work Area

J. Provide two independent layers of 6 mil fire retardant plastic sheeting over all floor, wall, and ceiling surfaces. Isolation barriers shall also be covered with two independent layers (for a total of four layers). Sheeting shall be secured with duct tape. All joints in fire retardant plastic sheeting shall overlap 12" minimum. Carpeting left in place shall be covered with 3/8 inch plywood sheathing prior to plasticizing.

K. Unless otherwise specified for removal, the Contractor shall either protect all fiberglass insulation on piping, ductwork, tanks, etc. in the Work Area using two layers of six mil fire retardant plastic sheeting or remove the insulation as asbestos containing waste. If the Contractor elects to remove the fiberglass insulation as asbestos-contaminated, he/she shall be responsible for reinsulation if reinsulation of removed insulations is part of the Contract or Project.

L. Frame out emergency exits from Work Area. Provide double layer 6 mil fire retardant plastic sheeting and tape seal opening. Post as emergency exits only and tape utility knife to the Work Area side of each exit. Within the Work Area, mark the locations and directions of emergency exits throughout the Work Area using exit signs and/or duct tape.

M. Remove all items attached to or in contact with ACM only after the Work Area enclosure is in place. HEPA vacuum and wet wipe with amended water all items prior to their removal from the Work Area and before the start of asbestos removal operations.

N. Suspended ceiling tiles shall only be removed after Work Area preparation is complete. If possible, non-contaminated ceiling tiles shall be HEPA vacuumed and removed from the Work Area before asbestos removals begin. Contaminated ceiling tiles shall be disposed of as asbestos waste.

3.06 NEGATIVE AIR PRESSURE FILTRATION SYSTEM

A. Provide a portable asbestos filtration system that develops a minimum pressure differential of negative 0.02 in. of water column within all full enclosure areas relative to adjacent unsealed areas and that provides a minimum of 4 air changes per hour in the Work Area during abatement and 6 air changes for non-friable flooring and/or mastic removal.

B. Such filtration systems must be made operational after critical and isolation barriers are installed but before wall, floor, and ceilings are plasticized and shall be operated 24 hours per day during the entire Project until the final cleanup is completed and satisfactory results of the final air samples are received from the laboratory.

C. The system shall include a series of pre-filters and filters to provide High Efficiency Particulate Air (HEPA) filtration of particles down to 0.3 microns at 100% efficiency and below 0.3 microns at 99.9% efficiency. Provide sufficient replacement filters to replace pre-filters every 2 hours, secondary pre-filters every 24 hours, and primary HEPA filters every 600 hours (25 continuous days) of operation. HEPA filter sides shall be marked with installation date during all new HEPA filter installations on project.

D. A minimum of one additional filtration unit of at least the same capacity as the primary unit(s) shall be installed and fully functional to be used during primary unit (s) filter changing and in case of primary failure.

E. At no time will the unit exhaust indoors, within 15 feet of a receptor, including but not limited to windows and doors, or adversely affect the air intake of the building. Exhaust ducting shall not exceed 25’ in length, except as allowed by Industrial Code Rule 56. Provide construction fencing at ground level exhaust termination locations per Code Rule 56.

F. Upon electric power failure or shut-down of any filtration unit, all abatement activities shall stop immediately and only resume after power is restored and all filtration units are fully operating. For shut-downs longer than one hour, all openings into the Work Area, including the decontamination enclosures, shall be sealed.

G. For all OSHA Class I removal Work Areas, the Contractor shall provide a manometer to verify negative air pressure. Manometers shall be read twice daily and recorded within the Daily Project Log.

H. There shall be at least a 4 hour settling period after the Work Area is fully prepared and the negative filtration units have been started to ensure integrity of the barriers.

I. Once installed and operational, the Contractor's Supervisor shall conduct daily inspections of the Work Area to insure the airtight integrity of the enclosure and operation of the negative air system. Findings shall be recorded within the Daily Project Log. Inspections shall also be conducted on days when no abatement activities are in progress per Code Rule 56 (i.e. weekends).

3.07 REMOVAL OF ASBESTOS CONTAINING MATERIALS

A. Asbestos-containing materials shall be removed in accordance with the Contract Documents and the approved Asbestos Work Plan. Only one type of ACM shall be abated at a time within a Work Area. Where there are multiple types of ACM requiring abatement, Code Rule 56 procedures for sequential abatement shall be followed.

B. Sufficiently wet asbestos materials with a low pressure, airless fine spray of surfactant to ensure full penetration prior to material removal. Re-wet material that does not display evidence of saturation.

C. One Worker shall continuously apply amended water while ACM is being removed.

D. Perform cutting, drilling, abrading, or any penetration or disturbance of asbestos containing material in a manner to minimize the dispersal of asbestos fibers into the air. Use equipment and methods specifically designed to limit generation of airborne asbestos particles. All power operated tools used shall be provided with manufacturer HEPA equipped filtered local exhaust ventilation, as required by regulation.

E. Upon removal of ACM from the substrate, the newly exposed surfaces shall be HEPA vacuumed and/or wet cleaned. Surfaces must be thoroughly cleaned using necessary methods and any required solvents to completely remove any adhesive, mastic, etc.

F. All removed material shall be placed into 6 mil plastic disposal bags or other suitable container upon detachment from the substrate. Cleanup of accumulations of loose debris or waste shall be performed whenever there is enough accumulation to fill a single bag or container and minimally at the end of each workshift.

G. Large components shall be wrapped in two layers of 6 mil fire retardant plastic sheeting. Sharp components likely to tear disposal bags shall be placed in fiber drums or boxes and then wrapped with sheeting.

H. Power or pressure washers are not permitted for asbestos removal or clean-up procedures unless approved in a Site Specific Variance and allowed by owner.

I. All open ends of pipe and duct insulation not scheduled for removal shall be encapsulated using lag cloth.

J. All construction and demolition debris determined by the Environmental Consultant to be contaminated with asbestos shall be handled and disposed of as asbestos waste.

K. The use of metal shovels, metal dust pans, etc. are not permitted inside the work area.

3.08 EQUIPMENT AND WASTE CONTAINER DECONTAMINATION AND REMOVAL PROCEDURES

A. External surfaces of contaminated containers and equipment shall be cleaned by wet cleaning and/or HEPA vacuuming in the Work Area before moving such items into the waste decontamination enclosure system airlock by persons assigned to this duty. The persons in the Work Area shall not enter the airlock. No gross removal operations are permitted when waste transfer is in progress.

B. The containers and equipment shall be removed from the airlock by persons stationed in the washroom during waste removal operations. The external surfaces of containers and equipment shall be cleaned a second time by wet cleaning.

C. The cleaned containers of asbestos material and equipment are to be dried of any excessive pooled or beaded liquid, placed in uncontaminated 6 mil plastic bags or sheeting, as the item's physical characteristics demand, and sealed airtight.

D. The clean recontainerized items shall be moved into the airlock that leads to the holding area. Workers in the washroom shall not enter this airlock.

E. Containers and equipment shall be moved from the airlock and into the holding area by persons dressed in clean personal protective equipment, who have entered from the holding area.

F. The cleaned containers of asbestos material and equipment shall be placed in water tight carts with doors or tops that shall be closed and secured. These carts shall be held in the holding until transfer to the waste container. The carts shall be wet cleaned and/or HEPA vacuumed at least once each day.

G. The exit from the decontamination enclosure system shall be secured to prevent unauthorized entry.

H. Where the waste removal enclosure is part of the personnel decontamination enclosure, waste removal shall not occur during shift changes or when otherwise occupied. Precautions shall be taken to prevent short circuiting and cycling of air outward through the shower and clean room.

3.09 WORK AREA DECONTAMINATION, CLEANING, AND CLEARANCE PROCEDURES

A. Following completion of gross abatement and after all accumulations of asbestos waste materials have been containerized, the following decontamination procedures shall be followed unless modified by a Site Specific Variance.

B. First Cleaning:
1. All bagged asbestos waste and unnecessary equipment shall be decontaminated and removed from the Work Area.
2. All surfaces in the Work Area shall be wet cleaned, except active fire protection system components that may be damaged by water. A wet-purpose shop vacuum may be used

to pick up excess liquid, and may either be decontaminated prior to removal from the Work Area or disposed of as asbestos waste.

3. The Abatement Project Monitor (APM) shall conduct a visual inspection of the Work Area for cleanliness and completion of abatement.
4. The Contractor shall then apply a thin coat of encapsulant to all surfaces in the Work Area that were not the subject of removal. In no event shall encapsulant be applied to any surface that was the subject of removal prior to obtaining satisfactory air monitoring results. Encapsulants shall be pigmented or tinted to provide an indication for completeness of coverage. The APM shall determine adequacy of coverage.
5. After the encapsulant has been applied and the required waiting/settling / drying time has elapsed, the first layer of fire retardant plastic sheeting shall then be removed and bagged as asbestos waste.

C. Second Cleaning
1. All surfaces in the Work Area shall be HEPA vacuumed and then wet cleaned. Wet cleaning of active fire protection system components is not necessary if damage may occur.
2. The APM shall conduct a second visual inspection of the Work Area for cleanliness.
3. After the required waiting/settling/drying time has elapsed, the second layer of fire retardant plastic sheeting shall be removed and bagged as asbestos waste.

D. Third Cleaning
1. All surfaces in the Work Area shall be HEPA vacuumed and then wet cleaned. Wet cleaning of active fire protection system components is not necessary if damage may occur.
2. After the required waiting/settling/drying time has elapsed, the APM shall conduct a third visual inspection of the Work Area for completeness of abatement and cleanliness. The APM shall document the results of the visual inspection in the Project Monitor Log and Contractor's Daily Project Log.
3. After satisfactory APM visual inspection, aggressive final clearance air sampling shall then be conducted by the Environmental Consultant provided no visible asbestos debris/residue; pools of liquid, or condensation remains. NOTE: TEM samples should be used vs. PCM if demolition or other dust-generating evolutions are taking place in adjacent areas, as evident from excessive loading.
4. Upon receipt of satisfactory final clearance air sampling results, the negative air pressure equipment can then be shut down, and the isolation and critical barriers removed and bagged as asbestos waste. Following this and satisfactory inspections by the project supervisor and the APM for cleanliness, the decontamination enclosures shall be removed.

E. As a result of any visual inspection by the APM or should air sampling results indicate high fiber levels, the Contractor will reclean the affected areas at no additional expense to the Owner.

3.10 TENT ENCLOSURES

A. Tent enclosures may only be used where specifically permitted by Code Rule 56 or a Site Specific Variance issued by the NYS Department of Labor.

B. The Contractor shall restrict access to the immediate area where tent removal procedures are taking place using barrier tape and/or construction barriers. Caution signs shall be posted.

C. Remote personnel decontamination enclosures shall be constructed. Configuration shall be as required by Project size and a washroom with attached airlock shall be constructed contiguous to the tent enclosure for small and large size tent enclosure work areas. For tent enclosures with gross abatement of friable materials, a contiguous decontamination system shall be constructed, maintained and utilized, except for minor size tent enclosure work areas where an adjacent decontamination room or area is permitted by Code Rule 56.

D. The Work Area shall be precleaned. All objects and equipment that will remain in the restricted area during abatement shall be sealed with two layers of six mil polyethylene and tape.

E. The tent shall be a single use barrier constructed with a rigid frame and at least two layers of six mil polyethylene unless one layer of six mil polyethylene is otherwise permitted by Code Rule 56. Tents with twenty (20) square feet or less of floor space or no gross removal of friable ACM shall be constructed of one (1) layer of six mil polyethylene and shall include walls, ceilings and a floor (except portions of walls, floors and ceilings that are the removal surface) with double folded seams. All seams shall be sealed airtight using duct tape and/or spray adhesive.

F. The tent shall be constructed with at least one airlock for worker/waste egress.

G. A manometer shall be used for all OSHA Class I abatement.

H. Negative air shall be maintained at four (4) air changes per hour for non-friable and glovebag abatement tent enclosure work areas. Eight (8) air changes shall be maintained for friable gross removal tent enclosure work areas. In a Minor size abatement tent enclosure work area a HEPA vacuum may be used to maintain the required air changes.

I. OSHA compliance air monitoring is required per section 1.9.

J. ACM removal shall follow procedures defined in section 3.7.

K. Waste material shall be placed in properly labeled 6 mil plastic bags or other appropriate containers. The outside of the bags or containers shall be wet wiped and/or HEPA vacuumed in the washroom and shall then be placed in a second bag/container before being transferred to the waste storage container. All transportation of waste bags and containers outside the Work Area shall be in watertight carts. These carts shall be held in the holding area until transfer to the waste container. The carts shall be wet cleaned and/or HEPA vacuumed at least once each day.

L. Following completion of gross abatement and after all accumulations of asbestos waste materials have been containerized, the following decontamination procedures shall be followed.
   1. All bagged asbestos waste and unnecessary equipment shall be decontaminated and removed from the Work Area.

2. All surfaces in the Work Area shall be wet cleaned. A wet-purpose shop vacuum may be used to pick up excess liquid, and shall be decontaminated prior to removal from the Work Area.
3. The Contractor shall then apply a thin coat of encapsulant to all non-removal surfaces covered with plastic in the Work Area. In no event shall encapsulant be applied to any surface that was the subject of removal prior to obtaining satisfactory air monitoring results. Encapsulants shall be pigmented or tinted to provide an indication for completeness of coverage. The APM shall determine adequacy of coverage.
3. After the waiting/settling/drying time requirements have elapsed, the Asbestos Project Monitor shall conduct a visual inspection of the Work Area for cleanliness and completion of abatement. The APM shall document the results of the visual inspection in the Project Monitor Log and Contractor's Daily Project Log.
4. After satisfactory APM visual inspection, aggressive final clearance air sampling shall then be conducted by the Environmental Consultant.
5. Upon receipt of satisfactory final clearance air sampling results, the tent shall be collapsed into itself, placed in suitable disposal bags, and tranferred through the washroom to the waste decontamination enclosure. Isolation and critical barriers shall then be removed and bagged as asbestos waste followed by satisfactory visual inspections by the project supervisor and the APM for cleanliness.

3.11 GLOVEBAG REMOVAL

A. Glovebag removals may only be used as specifically permitted by Code Rule 56 or a Site Specific Variance issued by the NYS Department of Labor. Glovebags may only be used on pipe or duct insulation.

B. In addition to conformance with applicable regulations and variances, glovebag removals are only permitted to be conducted within tent enclosures complying with these specifications.

C. The Contractor shall restrict access to the immediate area where tent/glovebag removal procedures are taking place using barrier tape and/or construction barriers. Caution signs shall be posted.

D. Remote personnel decontamination enclosures shall be constructed. Configuration shall be as required by Project size and a washroom with attached airlock shall be constructed contiguous to the tent enclosure.

E. Glovebag removals shall utilize commercially available glovebags of at least six mil thickness. Use shall be in accordance with the manufacturer's instructions and the following minimum requirements:
1. The sides of the glovebag shall be cut to fit the size pipe being removed. Tools shall be inserted into the attached tool pocket.
2. The glovebag shall be placed around the pipe and the open edges shall be folded and sealed with staples and duct tape. The glovebag shall also be sealed at the pipe to form a tight seal.
3. Openings shall be made in the glovebag for the wetting tube and HEPA vacuum hose. The opening shall be sealed to form a tight seal.
4. All glovebags shall be smoke tested by the Asbestos Project Monitor under negative pressure using the HEPA vacuum before removal operations commence. Glovebags that do not pass the smoke test shall be resealed and then retested.

5. After first wetting the materials to be removed, removal may commence. ACM shall be continuously wetted. After removal of the ACM, the piping shall be scrubbed or brushed so that no visible ACM remains. Open ends of pipe insulation shall be encapsulated.
6. After the piping is cleaned, the inside of the glovebag shall be washed down and the wetting tube removed. Using the HEPA vacuum, the glovebag shall be collapsed and then twisted and sealed with tape with the ACM at the bottom of the bag.
7. A disposal bag shall be placed around the glovebag that is then detached from the pipe. The disposal bag is then sealed and transferred through the washroom to the waste storage container.

F. After glovebag removals are complete, tent decontamination procedures shall be followed.

3.12 REMOVALS OF EXTERIOR NON-FRIABLE ACM

A. Except as modified by this section, removal of exterior non-friable ACM (i.e. roof flashings, built-up roofing, siding, caulking, glazing compound, transite, tars, sealers, coatings, and other NOB ACM) shall conform to all provisions of this specification.

B. Unless Site Specific Variances have been otherwise obtained, removals shall be conducted in accordance with the provisions of Code Rule 56.

C. The Work Area shall be the area from which ACM materials are being removed and shall extend 25 feet from the perimeter of the removal area.

D. Non-certified Workers are not allowed in the Work Area until the Work Area is cleared by the Asbestos Project Monitor (APM).

E. Remote personnel decontamination enclosures shall be constructed at a location in accordance with the approved Work Plan. Unless located outside the Work Area, decontamination enclosures are not permitted to be constructed on the roof. Decontamination enclosures shall be constructed as close to the regulated abatement work area as physically possible, but no greater than 50 feet from the building. It shall be cordoned off at a distance of 25 feet to separate it from public areas.

F. All openings (including but not limited to operable windows, doors, hatches, vents, ducts, and grilles) one story above, one story below, and within 25 feet of the work area shall be sealed with two layers of six mil polyethylene. Alternately, a polyethylene drape may be used instead of sealing windows individually where permitted by Code Rule 56.

G. The removal of the ACM may require the use of scrapers, solvents, mastic removal chemicals, or other methods/procedures to ensure complete removal.

H. The Contractor is required to provide temporary protection of the building (i.e. roof, window openings, construction joints, etc.) at the end of each Work shift so as to maintain the building in a watertight condition.

I. Dumpsters used for waste storage shall be lined with two layers of six mil polyethylene and shall have a hard top. Where open-top dumpsters are permitted by ICR 56 or a Site Specific

Variance, the top shall be closed with polyethylene flaps that are sealed at the end of each work shift.

J. Personal protective equipment, including respirators, shall be utilized and worn during all removal operations until the Work Area is cleared by the APM.

K. The Owner may, at his discretion, choose to conduct air sampling. If air samples collected during abatement indicate any airborne asbestos fiber concentration(s) at or above 0.01 f/cc, Work shall be stopped immediately and Work methods shall be altered to reduce the airborne asbestos fiber concentration(s).

L. Following completion of gross abatement and after all accumulations of asbestos waste materials have been containerized, the following decontamination procedures shall be followed:
   1. All surfaces in the Work Area shall be HEPA vacuumed and then wet cleaned.
   2. The APM shall conduct a visual inspection of the Work Area for cleanliness and completeness of abatement. The APM shall document the results of the visual inspection in the Project Monitor Log and Contractor's Daily Project Log.
   3. Upon satisfactory visual inspection results, the isolation and critical barriers shall be removed and bagged as asbestos waste. Following this, the decontamination enclosures shall be removed.

3.13 NON-FRIABLE FLOORING AND/OR MASTIC REMOVALS

A. The following procedures may only be used for the removal of non-friable flooring and/or mastic materials using manual and chemical methods. These procedures shall not apply to beadblaster use or other abrasive abatement methods.

B. The Contractor shall restrict access to the immediate Work Area where non-friable ACM removal procedures are taking place using barrier tape and/or construction barriers. Caution signs shall be posted.

C. Remote personnel decontamination enclosures may be utilized and shall be constructed at a location in accordance with the approved Work Plan. A washroom with attached airlock shall be constructed contiguous to each Work area enclosure.

D. The Work Area shall be prepared per section 3.5, except that ceilings, walls, and floors need not be fully plasticized However, a four-foot high single layer of 6-mil fire retardant plastic sheeting shall be installed as a splashguard at all walls adjoining mastic removal portions of the work area, to prevent damage to the existing walls.

E. Negative air shall be maintained at six (6) air changes per hour.

F. OSHA compliance air monitoring is required per section 1.9.

G. ACM removal shall follow procedures defined in section 3.7.

H. Waste material shall be placed in properly labeled 6 mil plastic bags or other appropriate containers. The outside of the bags or containers shall be wet wiped and/or HEPA vacuumed in the washroom and double-bagged before being passed into the airlock. The bags or

containers shall then be transported to the waste storage container. All transportation of waste bags and containers outside the Work Area shall be in watertight carts.

I. Following completion of gross abatement and after all accumulations of asbestos waste materials have been containerized, the following decontamination procedures shall be followed.
   1. All bagged asbestos waste and unnecessary equipment shall be decontaminated and removed from the Work Area.
   2. All plastic sheeting splashguards shall be removed and containerized, followed by all surfaces in the Work Area being wet cleaned. A wet-purpose shop vacuum may be used to pick up excess liquid, and shall be decontaminated prior to removal from the Work Area.
   3. The Contractor shall then apply a thin coat of encapsulant to all non-removal surfaces in the Work Area. In no event shall encapsulant be applied to any surface that was the subject of removal prior to obtaining satisfactory air monitoring results. Encapsulants shall be pigmented or tinted to provide an indication for completeness of coverage. The APM shall determine adequacy of coverage.
   4. After the waiting/settliong/drying time requirements have elapsed, the Asbestos Project Monitor (APM) shall conduct a visual inspection of the Work Area for cleanliness and completion of abatement. The APM shall document the results of the visual inspection in the Project Monitor Log and Contractor's Daily Project Log.
   5. After satisfactory APM visual inspection, aggressive final clearance air sampling shall then be conducted by the Environmental Consultant.
   6. Upon receipt of satisfactory final clearance air sampling results, the isolation and critical barriers shall be removed and bagged as asbestos waste. Following this and satisfactory inspections by the project supervisor and the APM for cleanliness the decontamination enclosures shall be removed.

3.14 RESTORATION OF UTILITIES, FIRESTOPPING, AND FINISHES

A. After final clearance, remove locks and restore electrical and HVAC systems. All temporary power shall be disconnected, power lockouts removed and power restored. All temporary plumbing shall be removed.

B. Finishes damaged by asbestos abatement activities including, but not limited to, plaster/paint damage due to duct tape, staples, and spray adhesives, and floor tile lifted due to wet or humid conditions, shall be restored prior to final payment.
   1. Finishes unable to be restored shall be replaced under this Contract at the Contractor's expense.
   2. All foam and expandable foam products and materials used to seal Work Area openings shall be completely removed upon completion of abatement activities.

C. All penetrations (including, but not limited to, pipes, ducts, etc.) through fire rated construction shall be firestopped using materials and systems tested in accordance with ASTM E814 on Projects where reinsulation is part of the required work.

PART 4 DISPOSAL OF ASBESTOS WASTE

4.01 TRANSPORTATION AND DISPOSAL SITE

A. The Contractor's Hauler and Disposal Site shall be approved by the Owner. All waste generated during the asbestos project shall be disposed of as RACM asbestos waste.

B. The Contractor shall give twenty-four (24) hour notification prior to removing any waste from the site. Waste shall be removed from the site only during normal working hours unless otherwise specified. No waste may be taken from the site unless the Contractor and Environmental Consultant are present and the Environmental Consultant authorizes the release of the waste as described herein.

C. All waste generated as part of the asbestos project shall be removed from the site within ten (10) calendar days after successful completion of all asbestos abatement work.

D. Upon arrival at the Project Site, the Hauler must possess and present to the Environmental Consultant a valid New York State Department of Environmental Conservation Part 364 Asbestos Hauler's Permit. The Environmental Consultant may verify the authenticity of the hauler's permit with the proper authority.

E. The Hauler, with the Contractor and the Environmental Consultant, shall inspect all material in the transport container prior to taking possession and signing the Asbestos Waste Manifests.

4.02 WASTE STORAGE CONTAINERS

A. All waste containers shall be fully enclosed and lockable (i.e. enclosed dumpster, trailer, etc.). No open containers will be permitted on-site (i.e. open dumpster with canvas cover, etc.) unless specifically permitted by applicable regulation or a Site Specific Variance. When asbestos contaminated waste must be kept on the work site overnight or longer, it shall be double bagged and stored in accordance with Federal, State, and local laws.

B. The Environmental Consultant shall verify that the waste storage container and/or truck tags (license plates) match that listed on the New York State Department of Environmental Conservation Part 364 permit. Any container not listed on the permit shall be removed from the site immediately.

C. The container shall be plasticized and sealed with two (2) layers of 6 mil polyethylene. Once on site, it shall be kept locked at all times, except during load out. The waste container shall not be used for storage of equipment or contractor supplies.

D. While on-site, the container shall be labeled with EPA Danger signage:

DANGER
CONTAINS ASBESTOS FIBERS
AVOID CREATING DUST
CANCER AND LUNG DISEASE HAZARD

E. The New York State Department of Environmental Conservation Asbestos Hauler's Permit number shall be stenciled on both sides and back of the container.

F. The container is not permitted to be loaded unless it is properly plasticized, has the appropriate danger signage affixed, and has the permit number appropriately stenciled on the container.

G. Waste generated off-site is not permitted to be brought onto the Project site and loaded into the waste container.

H. All asbestos waste removed from the project site shall be transported directly to the disposal site without any addtional waste being added to the container during transport.

4.03 OWNER'S AND HAULER'S ASBESTOS WASTE MANIFESTS

A. An Asbestos Waste Manifest shall be provided to the Owner and shall be utilized in conjunction with the Asbestos Hauler's Manifest.

B. The Owner's Manifest and the Hauler's Manifest shall be completed by the Contractor and verified by the Environmental Consultant that all the information and amounts are accurate and the proper signatures are in place.

C. The Manifests shall have the appropriate signatures of the Environmental Consultant, the Contractor, and the Hauler representatives prior to any waste being removed from the site.

D. Copies of the completed Owner's Manifest and the Hauler's Manifest shall be retained by the Environmental Consultant and the Contractor and shall remain on site for inspection.

E. Upon arrival at the Disposal Site, the Owner's Manifest and the Hauler's Manifest shall be signed by the Disposal Facility operator to certify receipt of ACM covered by the manifest.

F. The Disposal Facility operator shall return the original Owner's Manifest and the Hauler's Manifest to the Contractor.

G. The Contractor shall forward copies of the Owner's Manifest and the Hauler's Manifest to the Environmental Consultant within 14 days of the waste container being removed from the site. Failure to do so may result in payment being withheld from the Contractor.

H. The Contractor shall utilize the Waste Disposal Log. This log shall be maintained by the Project Supervisor and shall be kept on site at all times.

I. All waste disposal manifests and disposal logs shall be submitted by the Contractor to the Owner with the final close-out documentation.

Appendix 'A' – Insepection Reports

RENOVATION SURVEY FOR ASBESTOS CONTAINING MATERIALS & LEAD BASED PAINT

PERFORMED AT:

Yonkers City School District
Yonkers Public School 16
759 North Broadway
Yonkers, New York 10701

Adelaide
ENVIRONMENTAL HEALTH

1511 Route 22, Suite C24
Brewster, NY 10509 845.278.7710
90 State Street, Suite 700
Albany, NY 12207 518.874.0617
1967 Wehrle Drive, Suite One
Buffalo, NY 14221 716.402.4580
E-mail: adelaidemail@adelaidellc.com
Fax: 845.278.7750

RENOVATION SURVEY
FOR
ASBESTOS-CONTAINING MATERIALS & LEAD-BASED PAINT

PERFORMED AT:

Yonkers Public School 16
759 North Broadway
Yonkers, New York 10701
Adelaide Project# SAMM: 18436.00-IN

PREPARED FOR:

Charlene Gabriel
Sammel Architecture, PLLC
332 Route 100
Somers, New York 10589

PREPARED BY:
David Seddon
January 10, 2019

REVIEWED BY:

Stephanie A. Soter
President

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APPENDICES

1.0 Introduction

1.1 Scope of Work / Project Personnel

Adelaide Environmental Health Associates, Inc. **(Adelaide)** performed an Asbestos and Lead Survey for Building/Structure Demolition, Renovation, Remodeling and/or Repair, in conformance with ALL Federal, State and Local regulations, on December 7th and 17th, 2018 for Sammel Architecture throughout the exterior for (repointing of brick and stone work, drainage system work,), basement classrooms 10, 12, 14 and 15 for (floor replacement, light replacement and minor electrical work), basement gym for (flooring replacement, light replacement and HVAC upgrades), first and second floor hallways for (light replacement) and addition of a cooling system for the server area, located at Yonkers Public School 16 in Yonkers, New York. The survey included 1) review of building/structure plans, provided by Sammel Architecture dated October 21, 2018, for references to the scope of work potentially affecting hazardous materials used in construction, renovation or repair; and, 2) a visual inspection/assessment for hazardous materials throughout accessible interior and/or exterior spaces of the building/structure or portion thereof identified to be demolished, renovated, remodeled or repaired. Certified **Adelaide** personnel (Appendix E), David Seddon (NYS Asbestos Inspector/Cert. #09-08546 and EPA Lead-based Paint Inspector/Cert. #LBP-I-101120-1), performed the visual assessment throughout inspection area(s) identified.

1.2 Executive Summary

A. Renovation to Gymnasium
Recommendations:
1. HVAC: Remove and replace the three existing ceiling mounted unit ventilators with associated connecting piping, ductwork, louvers, mounting hardware and temperature controls. Provide new DDC type temperature controls. Verify/modify existing relief shafts are open from Basement up to
Roof. Provide two new wall registers in Gymnasium at relief wall penetrations. Refurbish existing ceiling mounted steam radiator including removal, reinstallation, scraping, priming and painting, Provide connecting piping, steam trap, vent and DDC type control valve. Provide new horizontal type radiator mounted in ceiling of adjacent Storage Room with connecting piping, steam trap, vent and DDC type control valve. Remove existing steam and condensate return distribution piping from existing unit ventilators back to existing piping mains located at pipe soffits on opposite side of Gymnasium. Disconnect existing steam supply and condensate return risers from above for reconnection to new distribution. Provide new steam and condensate return distribution piping and connect to new unit ventilators, existing and new
risers and radiators
2. ELECTRICAL: All the lighting should be replaced by LED type. Switches
need to be replaced. Occupancy sensors should be added. Emergency
Lighting needs to be added. Exit Lights should be replaced. Power is needed
for the three (3) UV-Unit replacement

B. Renovations to Basement Corridor
Recommendations:
1. HVAC: Insulate and label existing 6" diameter steam main and 4" diameter condensate return main crossing the Basement Corridor.
2. ELECTRICAL: All the lighting should be replaced by LED type. Switches need to be replaced. Occupancy sensors should be added. Emergency Lighting needs to be added. Exit Lights should be replaced.

C. Renovations to Four (4) Basement Classrooms
Recommendations:
1. ELECTRICAL: All the lighting should be replaced by LED type. Switches need to be replaced. Occupancy sensors should be added. Photocells need to be added to conform with the Energy Code. Exit Lights should be replaced. Receptacles and data drops need to be added to each classroom.

D. First Floor
Recommendations:
1. HVAC: Provide dedicated two-ton ductless split system with wall mounted type heat-pump unit located in Data Closet and grade mounted condensing unit located behind school. Provide connecting refrigerate piping, condensate drain piping (down to Boiler Room drain below), mounting hardware and hard-wired controls. Provide lockable chain-link fence enclosure (including top) and concrete housekeeping pad for condensing unit installation. All piping in occupied areas shall be concealed.
2. PLUMBING: Replace two (2) sinks in classrooms.
3. ELECTRICAL: Power for Air Conditioning is needed in the data closet

E. Entire Building-Security
Recommendations:
1. ELECTRICAL: Power for Air Conditioning is needed in the data closet

Adelaide collected one hundred and thirty (130) suspect asbestos samples/layers and fifty one (51) XRF readings [including calibrations] from the above-mentioned area(s). Six (6) samples/homogenous areas tested positive for asbestos and ten (10) XRF readings tested positive for lead-based paint.

The lighting for the basement classrooms and gym along with the hallway lights in the basement, first and second floors on the south end of the building are vinyl wire, it was observed that the whips for the hallway lights were vinyl up to the junction box. As new electrical outlets will be added the wire for the classroom outlets was not inspected. All doors were wood filled.

The following indicates assumed materials due to inaccessibility at the time of the inspection. Two (2) homogeneous areas are assumed positive for asbestos due to safety reasons. The electricity will need to be locked out to safely sample electrical wire for the hallway lights on the first and second floors, and basement outlets.

1.2.1 Conclusions and Recommendations

The following conclusions and recommendations are prepared by **Adelaide** as per the provided scope of work for Building/Structure Demolition, Renovation, Remodeling and/or Repair. Should the scope of work change, it is recommended that the findings be revisited to determine if additional sampling will be required to satisfy ALL Federal, State and Local regulations.

1.2.2 Asbestos-containing Materials (ACM)

- This survey concluded that the materials listed in Section 2.1 tested and/or are assumed ***positive for asbestos***.

- Subpart 56-5(h) of 12 NYCRR Part 56 requires that no demolition, renovation, remodeling, or repair work be commenced by any owner or the owner's agent prior to the completion of asbestos abatement. Asbestos abatement must be performed by an asbestos abatement contractor that maintains a current asbestos handling license, and employs NYSDOL/NYCDEP certified asbestos handlers and supervisors. It is recommended that a 12 NYCRR 56 certified Project Monitor oversee abatement activities.

- Subpart 56-5(g) of 12 NYCRR Part 56 specifies requirements for transmittal of asbestos survey information by the owner or owner's agent. (1) One copy of the asbestos survey report shall be sent to the local government entity charged with issuing a permit for such demolition, renovation, remodeling, or repair work under applicable State or local laws. (2)If controlled demolition or pre-demolition activities will be performed, one copy of the asbestos survey report shall be submitted to the appropriate Asbestos Control Bureau district office. (3) One copy of the asbestos survey report must be kept on the construction site throughout the duration of the asbestos project and any associated demolition, renovation, remodeling, or repair project.

1.2.3 Lead-based Paint (LBP)

- This survey concluded that the materials listed in Section 2.4 tested ***positive for lead-based paint.***

- These areas must be either abated or Lead safe work practices must be implemented during the demolition, renovation, remodeling, or repair activities if these areas are to be disturbed.

2.0 Summary of Hazardous Materials

2.1 Summary of Identified ACM/PACM

KEY: **ACM** = Materials containing greater than 1% of asbestos; **HA** = Homogeneous Area; **LF** = Linear Feet; **SF** = Square Feet; **PACM** = Presumed Asbestos-containing Materials; **Friable** = ACM capable of being released into air, and which can be crumbled, pulverized, powdered, crushed or exposed by hand-pressure.

Samples collected by **Adelaide** December 7th and 17th, 2018

HA	Identified ACM	ACM Location(s)	Approx. Qty.	Condition	Friable? (Yes or No)
001	12x12 Black Border Floor Tile	Gym	40 SF	Good	No
020	Leveler	Classroom 14	745 SF	Good	No
021	9x9 Green Floor Tile under 12x12	Classroom 14 Closet	60 SF	Good	No
022	9x9 Gray Floor Tile under 12x12		60 SF	Good	No
023	9x9 Floor Tile Mastic		120 SF	Good	No
049	Flooring Layer – 4th Layer - Tar	Classroom 10	785 SF	Good	No
Assumed	Main Electrical Wire Feed for Light	First Floor North Hallway	Approx. 12 Lights Approx. 12-24 LF (for wire hook up)	Good	No
		Second Floor North Hallway	Approx. 7 Lights Approx. 7-14 LF (for wire hook up)	Good	No

2.2 Summary of Identified Non-ACM

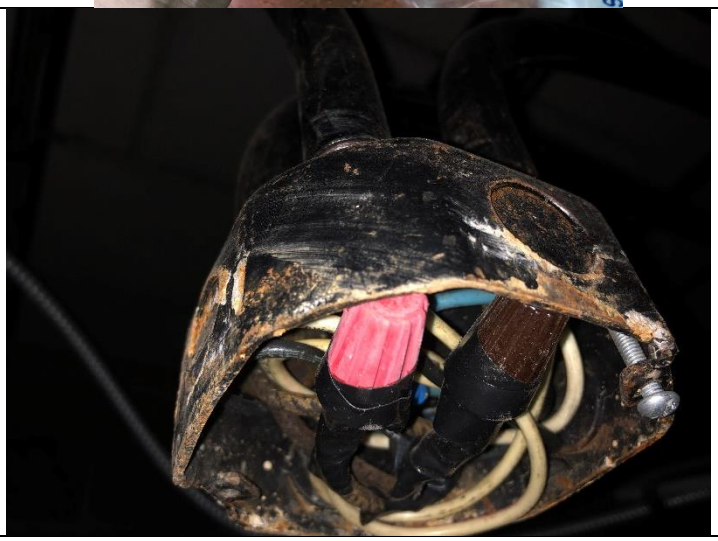
Samples collected by **Adelaide** December 7th and 17th, 2018

Identified Non-ACM	Sample Location(s) & HA's
12x12 Floor Tile -Brown Mottled – Main Tile	Gym
12x12 Floor Tile -Tan Mottled	
12x12 Floor Tile -Tan with Brown Streaks	
12x12 Floor Tile -Pink Mottled	
12x12 Floor Tile -Dark Blue Mottled	
12x12 Floor Tile -Light Blue Mottled	
12x12 Floor Tile -Orange Mottled	
12x12 Floor Tile -Off White with Gray	
12x12 Floor Tile -White with Gray, Blue and Red	
12x12 Floor Tile -Dark Gray Mottled	
12x12 Floor Tile -Light Gray Mottled	
12x12 Floor Tile -Brown with Brown Mottled	
Yellow Adhesive Mastic	
Black Mastic	

Identified Non-ACM	Sample Location(s) & HA's
Bottom Layer Concrete	Classroom 10
Ceiling Plaster – Top and Base Coats	Gym
	Classroom 10
	Classroom 12
	Basement thru Second Floor Hallway
12x12 Floor Tile – Gray and Dark Gray Mottled	Classroom 14
Pink Sink Coating	Classroom 12
Fiberglass Pipe Wrap	
12x12 Floor Tile – Tan and Gray Mottled	Classroom 10
12x12 Floor Tile – Tan and Gray Mottled	
12x12 Floor Tile – Orange Mottled	
12x12 Floor Tile-Green Mottled	
12x12 Floor Tile-Mauve Mottled	
Yellow/Brown Mastic on Wood	Classrooms 10,12,14 and 15
Black Covebase with Adhesive	Throughout Basement
6" Covebase with Adhesive	
Concrete Wall	
Black Tar (Waterproofing) on Stone	Exterior
Plaster at Entrance Ceiling	
Ceiling Tile – Mountains with Holes	First and Second Floors Hallway North End
Ceiling Tile – Creators with Holes	
Black Flooring Material on Concrete	Classrooms 10 and 12, Storage Rooms
Brick Mortar	Exterior
Concrete Wall Foundation	
Stone Mortar	
Caulking at Window	
Red Mortar for Bricks	
Curb/Sidewalk Concrete	
Driveway/Walkway Asphalt	
Flooring Layer – 2nd Layer under 1/2'' plywood	Classroom 10
Flooring Layer – 3rd Layer Cloth Type Vapor Barrier	
Flooring Layer – Bottom Layer – Tar Paper	
Flooring Layer – 2nd Layer under 1/2'' plywood	Classroom 12
Bottom Later under Wood Floor	Gym
Wall Plaster – Top and Base Coat	First and Second Floors Hallway
	Classroom 22
Drywall and Joint Compound	Server Area

2.3 ACM Photos

HA 001 12x12 Black Border Floor Tile 1.8% Chrysotile		
HA 020 Leveler 4.1% Chrysotile		
HA 021 and 022 9x9 Floor Tile under 12x12 Floor Tile 5.7% and 6.9% Chrysotile		

HA 023 9x9 Floor Tile Mastic 3.2% Chrysotile	
HA 049 Tar – 4th Layer of Flooring 1.4% Chrysotile	
Assumed Main Electrical Wire Feed Cloth Type Hallway Ceiling Lights	

Assumed Main Electrical Wire Feed Braided Type Hallway Wall Lights	

2.4 Summary of Identified LBP

Based on review of the data generated by the Thermo Scientific Niton XLp 300A Analyzer, the following surfaces tested were identified as lead-based, as defined by HUD/EPA (equal to or in excess of 1.0 milligram per square centimeter):

Readings collected by **Adelaide** December 7th and 17th, 2018

Location of LBP	LBP Component	Substrate	Color	Condition	Readings (mg/cm2)
Basement - Gym	Ceiling	Plaster	White	Intact	*1.6*
Basement - Classroom 12	Wall Lower	Concrete	Green	Intact	*1.9*
Basement - Classroom 12	Door-Interior	Metal	Green	Intact	*2.5*
Basement - Storage	Floor	Concrete	Grey	Intact	*1.3*
Basement - Hallway	Wall	Plaster	Light Blue	Intact	*6.6*
Basement - Hallway	Ceiling	Plaster	White	Peeling	*1.6*
South Entrance	Trim	Wood	Yellow	Intact	*32.55*
South Entrance	Rail	Metal	Brown	Poor	*2.4*
Hallway	Ceiling	Plaster	White	Intact	*6.15*
Classroom 22 Closet	Wall	Plaster	Mint	Intact	*8.7*
Hallway	Wall Upper	Plaster	Cream	Intact	*4.65*
Hallway	Wall Upper	Plaster	Brown	Intact	*3.45*
Server Room	Wall Upper	Plaster	Beige	Intact	*3.7*

2.5 Observations

ASBESTOS-CONTAINING MATERIALS (ACM)

A visual inspection was performed and homogeneous material types were established based on appearance, color and texture. The findings presented in this report are based upon reasonably available information and observed site conditions at the time the assessment was performed. The findings and conclusions of this report are not meant to be indicative of future conditions at the site and does not warrant against conditions that were not evident from visual observations or historical information obtained from others.

Representative bulk sampling was performed on suspect building materials for laboratory analysis and the following is a summary of installed building materials sampled as per the scope of work provided:

- Ceiling Materials – Plaster, Ceiling Tiles (multiple types).
- Wall Materials – Plaster, Sheetrock, Joint Compound, Cove Base Molding & Adhesive (multiple types), Stone Mortar, Brick Mortar (multiple types), Concrete.
- Flooring Materials – Floor Tile and Mastic (multiple types), Vapor Barrier and Tar (multiple types).
- Thermal System Insulation – Pipe Insulation Wrap.
- Miscellaneous Materials – Caulk, Sink Coating., Asphalt, Concrete.
- Non-suspect Materials (not sampled) – Fiberglass Insulation, Silicone, Wood, Glass, Metal.

3.0 Asbestos-containing Materials (ACM)

3.1 Field Procedures and Analysis Methodology

Guidelines used for the inspection were established by the U.S. Environmental Protection Agency (EPA) in the Guidance for Controlling Asbestos Containing Materials in Buildings, Office of Pesticides and Toxic Substances, DOC# 560/5-85-024 and 40 CFR Part 763, Asbestos Hazard Emergency Response Act (AHERA) and Title 12 NYCRR Part 56-5.1. Field information was organized as per the AHERA concept of a homogeneous area (HA); that is, suspect Asbestos-containing Materials (ACM) with similar age, appearance, and texture were grouped together, sampled and assessed for condition.

For the purposes of this inspection, suspect ACM has been placed in three material categories: thermal, surfacing, and miscellaneous. 1) Surfacing materials are those that are sprayed on, troweled on or otherwise applied to surfaces for fireproofing, acoustical, or decorative purposes (e.g., wall and ceiling plaster). 2) Thermal materials are those applied to heat pipes or other structural components to prevent heat loss or gain or prevent water condensation (e.g., pipe and fitting insulation, duct insulation, boiler flue). 3) Miscellaneous materials are interior building materials on structural components, structural members or fixtures, such as floor and ceiling tiles, etc. and do not include surfacing material or thermal system insulation.

SURFACING MATERIALS

Surfacing materials were grouped into homogeneous sampling areas. A homogeneous area contains material that is uniform in color and texture and appears identical in every other respect. Materials installed at different times belong to different sampling areas. Homogeneous areas were determined on per floor basis.

The following protocol was used for determining the number of samples to be collected:

- At least three bulk samples were collected from each homogeneous area that is 1,000 square feet or less.
- At least five bulk samples were collected from each homogeneous area that is greater than 1,000 square feet but less than or equal to 5,000 square feet.
- At least seven bulk samples were collected from each homogeneous area that is greater than 5,000 square feet.

THERMAL SYSTEM INSULATION (TSI)

The concept of homogeneous sampling areas applies equally well to thermal insulation as to surfacing material. A "typical" building may contain multiple insulated pipe runs from any combination of the following categories:

- Hot water supply and/or return
- Cold water supply
- Chilled water supply
- Steam supply and/or return
- Roof or system drain

The following protocol was used for determining the number of samples to be collected.

- Collect at least three bulk samples from each homogeneous area of thermal system insulation.
- Collect at least one bulk sample from each homogeneous area of patched thermal system insulation if the patched section is less than 6 linear or square feet.
- In a manner sufficient to determine whether the material is ACM or not ACM, collect a minimum of three bulk samples from each homogeneous insulated mechanical system tee, elbow, and valve.

Bulk samples are not collected from any homogeneous area where the certified inspector has determined that the thermal system insulation is fiberglass, foam glass, or rubber.

MISCELLANEOUS MATERIALS

Miscellaneous materials are grouped into different homogeneous areas and at least two bulk samples are collected from each homogeneous area as per the clarification letter from the EPA and the Professional Abatement Contractors of New York, Inc in November of 2007.

Samples collected were analyzed by a laboratory approved under the New York State Department of Health Environmental Laboratory Approval Program (NYSDOH ELAP). Samples were analyzed in the laboratory by Polarized Light Microscopy (PLM), Polarized Light Microscopy-NOB (PLM-NOB) and/or Quantitative Transmission Electron Microscopy (QTEM), as required. Sample collection and laboratory analysis were conducted in compliance with the requirements of Title 12 NYCRR Part 56-5.1, 29 CFR 1926.1101 and standard EPA & OSHA accepted methods. Samples consisting of multiple layers were separated and analyzed independently in the laboratory.

3.2 Regulatory Guidelines and Requirements for ACM

FEDERAL

In accordance with the Clean Air Act (CAA), the U.S. Environmental Protection Agency (EPA) established National Emission Standards for hazardous Air Pollutants (NESHAP) to protect the public from exposure to airborne pollutants. Asbestos was one of the air pollutants, which was addressed under the NESHAP 40 CFR Part 61. The purpose of asbestos NESHAP regulations is to protect the public health by minimizing the release of asbestos when facilities, which contain ACM, are being renovated or demolished. EPA is responsible for enforcing regulations related to asbestos during renovations and demolition, however, the CAA allows the EPA to delegate this authority to State and Local Agencies. Even after EPA delegate's responsibility to a state or Local agency, EPA retains the authority to oversee agency performance and to enforce NESHAP regulations as appropriate.

NEW YORK STATE

Asbestos in New York State is regulated under the Labor Law Section 906, Part 56 of Title 12 of the Official Compilation of Codes, Rules, and Regulations. Within the department and for the purpose of the Department of Labor, this part (rule) is known as Industrial Code Rule No. 56 (ICR 56) relating to hazards to the public safety and health, during the removal, encapsulation, or disturbance of friable asbestos, or any handling of ACM that may result in the release of asbestos fiber.

As specified in Title 12 NYCRR Part 56-5.1 (h) and (i), "If the building/structure asbestos survey finds that the portion of the building/structure to be demolished, renovated, remodeled, or have repair work contains ACM, PACM, suspect miscellaneous ACM assumed to be ACM, or asbestos material, which is impacted by the work, the owner or the owner's agent shall conduct, or cause to have conducted, asbestos removal performed by a licensed asbestos abatement contractor in conformance with all standards set forth in this Part. All ACM, PACM, suspect miscellaneous ACM assumed to be ACM, or asbestos material impacted by the demolition, renovation, remodeling or repair project shall be removed as per this Part, prior to access or disturbance by other uncertified trades or personnel. No demolition, renovation, remodeling or repair work shall be commenced by any owner or the owner's agent prior to the completion of the asbestos abatement in accordance with the notification requirements of this Part…All building/structure owners and asbestos abatement contractors on a demolition, renovation, remodeling, or repair project, which includes work covered by this part, shall inform all trades on the work site about PACM, ACM, asbestos material and suspect miscellaneous ACM…Bids may be advertised and contracts awarded for demolition, remodeling, renovation, or repair work, but no work on the current intermediate portion of the project shall commence on the demolition, renovation, remodeling or repair work by any owner or agent prior to completion of all necessary asbestos abatement work for the current intermediate portion of the entire project, in conformance with all standards set forth in this Part." All work conducted should be in accordance with all legal requirements, including but not limited to U.S. Environmental Protection Agency (EPA) National Emissions Standards for Hazardous Air Pollutants (NESHAP) [40 CFR Part 61], New York State Industrial Code Rule 56 Asbestos Regulations (ICR 56) and Chapter 1 of Title 15 of the Rules of the City of New York Regulations, as applicable. Advance notification of the asbestos project to the USEPA, NYSDOL, and NYCDEP may be required.

NEW YORK CITY

Asbestos Control Program (ACP), Title 15, Chapter 1 of the New York City Department of Environmental Protection (NYCDEP) regulates all asbestos abatement activities occurring within the City of New York.

The ACR regulations also require asbestos surveys and abatement work to be performed by a NYCDEP certified asbestos investigator and asbestos workers, respectively.

The New York City Department of Buildings (NYCDOB) requires an ACP notification to be included with the renovation/demolition permit applications. The notification is performed using an ACP 5 or ACP 20/21 forms.

All confirmed ACM will need to be removed prior to any building renovation or demolition. The removal and disposal of ACM must be performed by a NYS-DOL licensed asbestos handling contractor in accordance with Federal, state, and local regulations. Proper notifications must be filed with the US-EPA, NYS-DOL, NYC-DEP and other regulatory agencies prior to performing such activities.

As required by the NYS-DOL and NYC-DEP regulations, the abatement project must be monitored by a NYS-DOL certified project monitor. The project monitor oversees contractor's work practices and also performs pre, during, and final clearance post abatement air sampling in accordance with the state and city regulations.

CONCEALED ACM

In addition to the ACMs identified at the site, there is a possibility that concealed suspect ACM may exist at the building/structure. As such, if any concealed suspect ACM is encountered during future construction related activities, the work should immediately stop. Prior to resuming the work, the suspect ACM should either be 1) Sampled by an appropriately-certified asbestos professional and submitted to an Approved NYSDOH ELAP laboratory for asbestos analysis or 2) Presumed to be ACM (PACM) and removed by a licensed asbestos abatement contractor for disposal in accordance with all applicable regulations.

4.0 Lead-based Paint (LBP)

4.1 Applicable Standards/Guidelines for LBP

The U.S Department of Housing and Urban Development (HUD) defines the action level for lead-based paint as a lead content equal to or greater than 1.0 milligrams of lead per square centimeter of painted surface ($\geq$1.0 mg Pb/cm^2) when measured with an XRF analyzer or 0.5 percent by weight when chemically tested. This definition is described in the HUD "Lead-Based Paint: Interim Guidelines for Hazard Identification and Abatement in Public and Indian Housing, September 1990". The state of New York's definition of the action level for lead-based paint is consistent with the level established by HUD.

Please note that although the HUD defines lead based paint as paint having lead concentrations equal or greater than 1.0 mg/cm2, the Occupational Safety and Health Administration (OSHA) considers any concentration of lead in paint to be lead containing paint. Regardless of the lead concentrations in paint, the contractor shall comply with 29 CFR 1926.62, OSHA regulations, and take precautionary measures for dust control and limit employee exposure to lead dust during the renovations.

Painted surfaces that would be impacted by planned activities such as drilling, cutting, scrapping, etc. and create dust should be properly addressed by following safe work practices, good housekeeping procedures and/or following proper abatement procedures. Grinding and sanding of paint without HEPA filter exhaust, open flame gas fired torch, unconfined abrasive blasting, and chemical strippers containing methylene chloride or other human carcinogenic chemicals are not recommended.

The Federal Resource Conservation and Recovery Act (RCRA) regulation governs the handling, transportation, and disposal of hazardous materials. Every demolition/renovation debris generator has the responsibility to determine whether the debris exhibits one or more of the characteristic wastes listed in subpart C of 40 CFR Part 261. In the case of demolition debris, lead in LBP is a characteristic waste, and therefore, it is the responsibility of the renovation/demolition debris generator to characterize the waste prior to its disposal and, if found to be hazardous waste as defined by Federal Statutes, to be properly handled and disposed.

Metal objects painted with LBP are exempt from disposal regulations applicable to lead, provided they are properly recycled. All metal objects that are painted with LBP should be sent to a certified recycling facility.

This report is not Lead-based Paint abatement specification and should not be used for specifying removal methods or techniques.

4.2 XRF Information

Thermo Scientific Niton XLp 300A X-Ray Fluorescence (XRF) Analyzer(s) were used to survey the building/structure or portion thereof identified to be demolished, renovated, remodeled or repaired for the presence of LBP. The XRF analyzers are using a sealed source of Cd109 with 40mCi sources, meeting HUD requirements for the analysis of paint films. During the analysis, the intensity of the x-rays is converted by the instrument's internal software into an estimate of the concentration of lead in the substance being analyzed. The results are interpreted as concentrations of lead in milligrams per square centimeter. This device is a field-screening tool, used to collect multiple readings in a short period of time. The method of measurement is based on spectrometric analysis of lead x-ray fluorescence within a controlled depth of interrogation. The reading is an estimate of lead content in all layers of paint. The results are displayed in milligrams per square centimeter (mg/cm2). The device(s) used for this inspection were the Thermo Scientific Niton XLp 300A Analyzer(s), Serial number 90719, Source date 3/15/14, Serial number 102951, Source date 9/15/17 and/or Serial number 101094, Source date 2/15/17.

5.0 General Discussion

All construction personnel as well as individuals who have access to locations where asbestos-containing materials (ACM), lead-based paints (LBP) and/or polychlorinated biphenyls (PCB) exists should be informed of its presence and the proper work practices in these areas. Conspicuous labeling of all ACM is suggested to ensure personnel is adequately informed. Personnel should be informed not to rest, lean or store material or equipment on or near these surfaces and not to cut, saw, drill, sand or disturb ACM. All removal, disturbance, and repair of ACM should be performed in compliance with Title 12 NYCRR Part 56 by persons properly trained to handle ACM. Facility custodial and maintenance personnel should receive training commensurate with their work activities; as defined in 29 CFR 1910.1001.

6.0 Disclaimers

Adelaide certifies that the information contained within this report is based solely upon site observations and the results of laboratory analysis for samples collected during this survey/assessment. These observations and results are time dependent, subject to changing site conditions and revisions to Federal, State and Local regulations. **Adelaide** warrants that these findings have been promulgated after being prepared in general accordance with generally accepted practices in the abatement industries. **Adelaide**

also recognizes that inspection laboratory data is not usually sufficient to make all abatement and management decisions. No other warranties are expressed or implied.

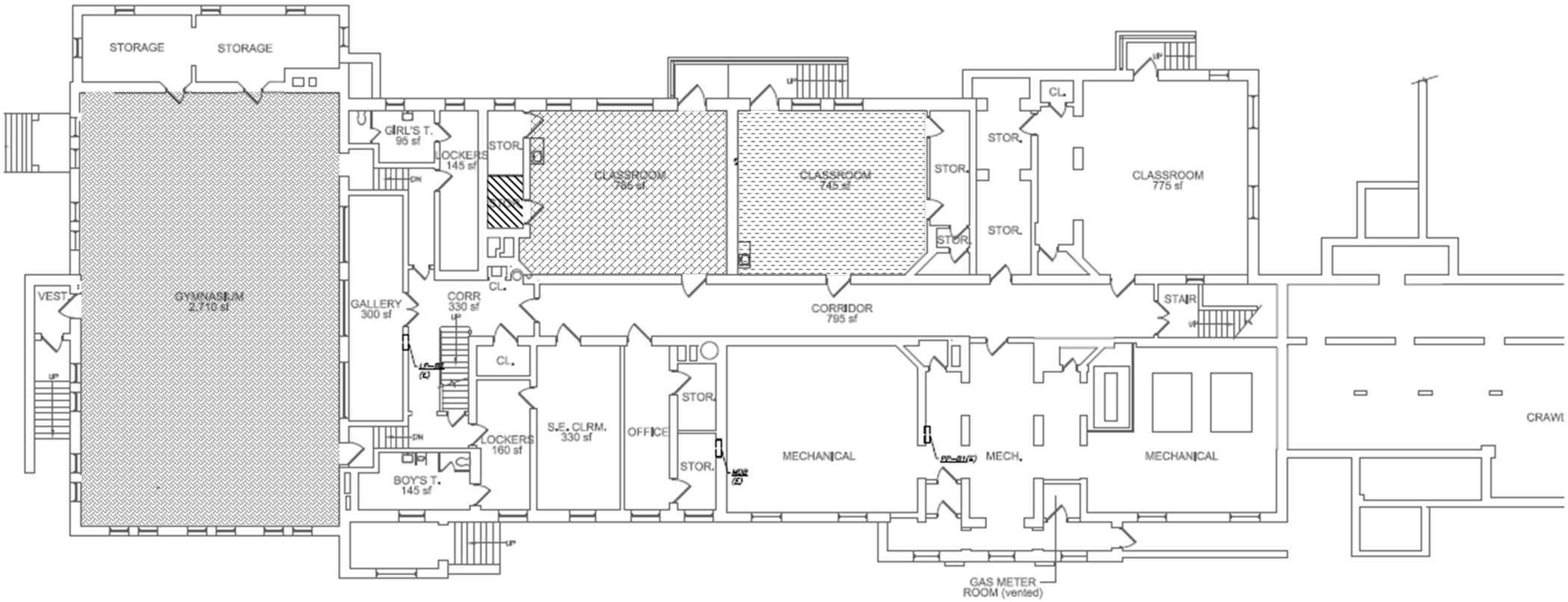
Due to the potential for concealed Asbestos-containing Materials (ACM) and/or other regulated materials, this report should not be construed to represent all ACM and/or regulated materials within the site(s). All quantities of ACM and/or other regulated materials identified, and all dimensions listed within this report are approximate and should be verified On-site.

This inspection report is not intended to be used as the sole basis for soliciting pricing for asbestos abatement. An abatement plan, specification, drawing and/or Variances should be developed to identify scope, timing, phasing and remediation means & methods for any asbestos project. The Linear and/or Square Footages (LF / SF) listed within this Report are only approximates. Abatement Contractor(s) are required to visit the building(s) in order to take actual field measurements within each listed location.

NYSDOH issued an Interim Guidance Letter, on July 9, 2013, which outlined the approved testing alternative for materials containing vermiculite. Specifically, "...Where TSI, surfacing materials, or other PACM or miscellaneous suspect ACM contain greater than 10% vermiculite, Item 198.6 may be used to evaluate the asbestos content of the material; provided, however, that any test results using this method must be reported with the following conspicuous disclaimer: *"This method does not remove vermiculite and may underestimate the level of asbestos present in a sample containing greater than 10% vermiculite."* On July 22, 2014, NYSDOH issued a Regulatory Guidance Letter outlining the new approved analytical methods for testing sprayed-on fireproofing (SOFP) that contains vermiculite. NYSDOH authorized the use of ***two*** analytical methods to evaluate the asbestos content of SOFP that contains vermiculite. As per NYSDOH Guidelines, *"After October 31, 2014, one of the new methods **must** be used to test SOF-V, regardless of the percent of vermiculite."* On May 6, 2016, NYSDOH issued a Regulatory Guidance Letter outlining the new protocol for analytical procedure for surfacing materials (ie. plaster, stucco, etc.) that contain vermiculite. As per NYSDOH Guidelines, "*The original July 2013 and July 2014 letters addressed SOF-V only. Both NYS DOH's Item 198.8 and RJ Lee Group Method 055 shall now be applied to test for vermiculite in other Surfacing Material (SM) as defined in 12 NYCRR Part 56 (NYS Industrial Code Rule 56).*"

APPENDIX A

ACM LOCATION MAP(S)



Basement Floor Plan - ACM Locations

Drawing Not to Scale

ACM LEGEND: (see report for details)
Positive: 12x12 Black Border Floor Tile
Positive: Floor Leveler
Positive: 9x9 Floor Tile and Mastic
Positive: 4th Layer Tar

Yonkers Public School 16
759 North Broadway
Yonkers, New York 10701

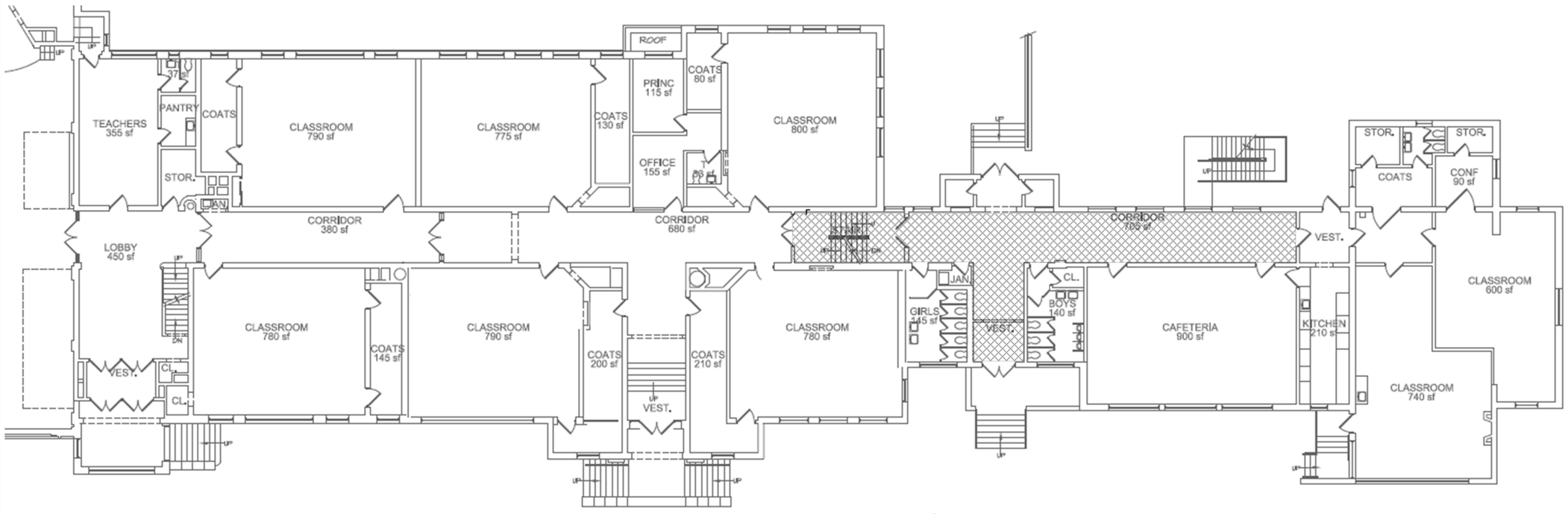
Sammel Architecture, PLLC
332 Route 100
Somers, New York 10589

Client Project No.
N/A

Adelaide ENVIRONMENTAL HEALTH
1511 Route 22
Brewster, NY 10509
Phone: (845) 278-7710
Fax: (845) 278-7750

Date: 01-07-2019
Version # 1
Issued For: Renovation Asbestos Survey
Adelaide Project NO. SAMM:18436.00-IN
Drawing Prepared By: David Seddon

ASB -01



First Floor Plan - ACM Locations

Drawing Not to Scale

ACM LEGEND: (see report for details)	
	Positive: Assumed Main Electrical Feed for Lights

Yonkers Public School 16
759 North Broadway
Yonkers, New York 10701

Sammel Architecture, PLLC
332 Route 100
Somers, New York 10589

Client Project No.
N/A

Adelaide ENVIRONMENTAL HEALTH
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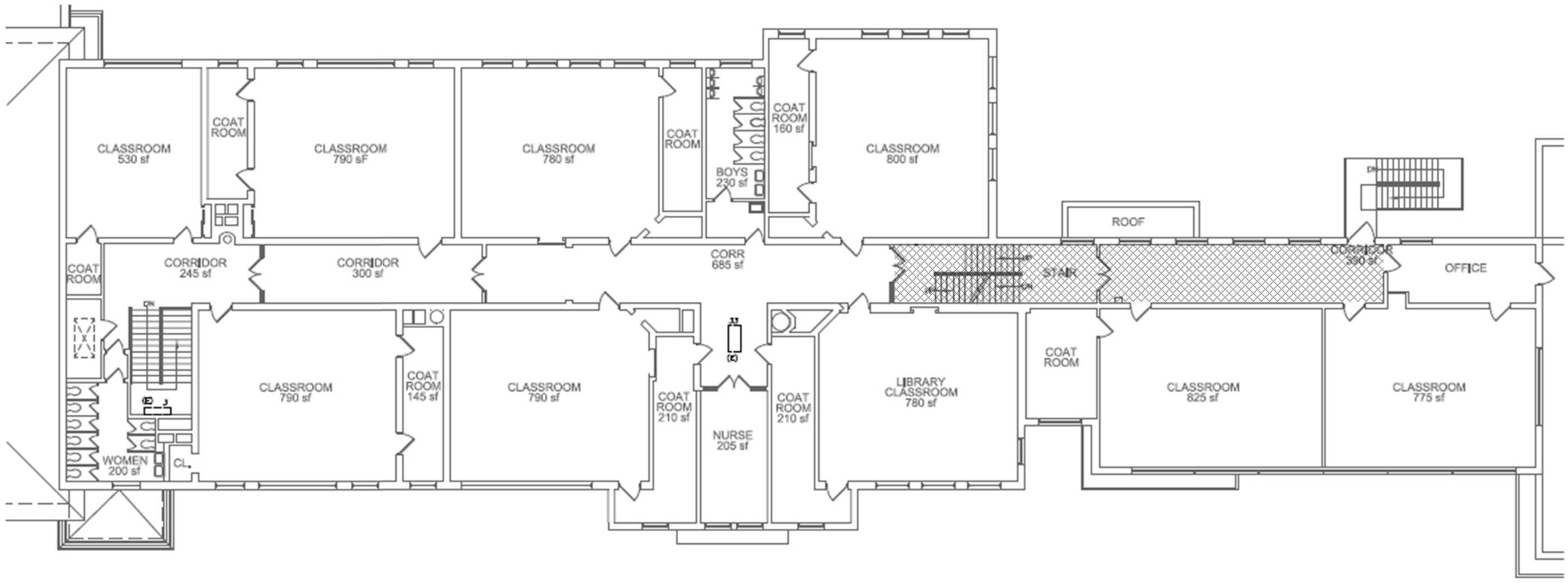
Date: 01-07-2019 **Version #** 1

Issued For: Renovation Asbestos Survey

Adelaide Project NO. SAMM:18436.00-IN

Drawing Prepared By: David Seddon

ASB -02



Second Floor Plan - ACM Locations

Drawing Not to Scale

ACM LEGEND: (see report for details)

	Positive: Assumed Main Electrical Feed for Lights

Yonkers Public School 16
759 North Broadway
Yonkers, New York 10701

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332 Route 100
Somers, New York 10589

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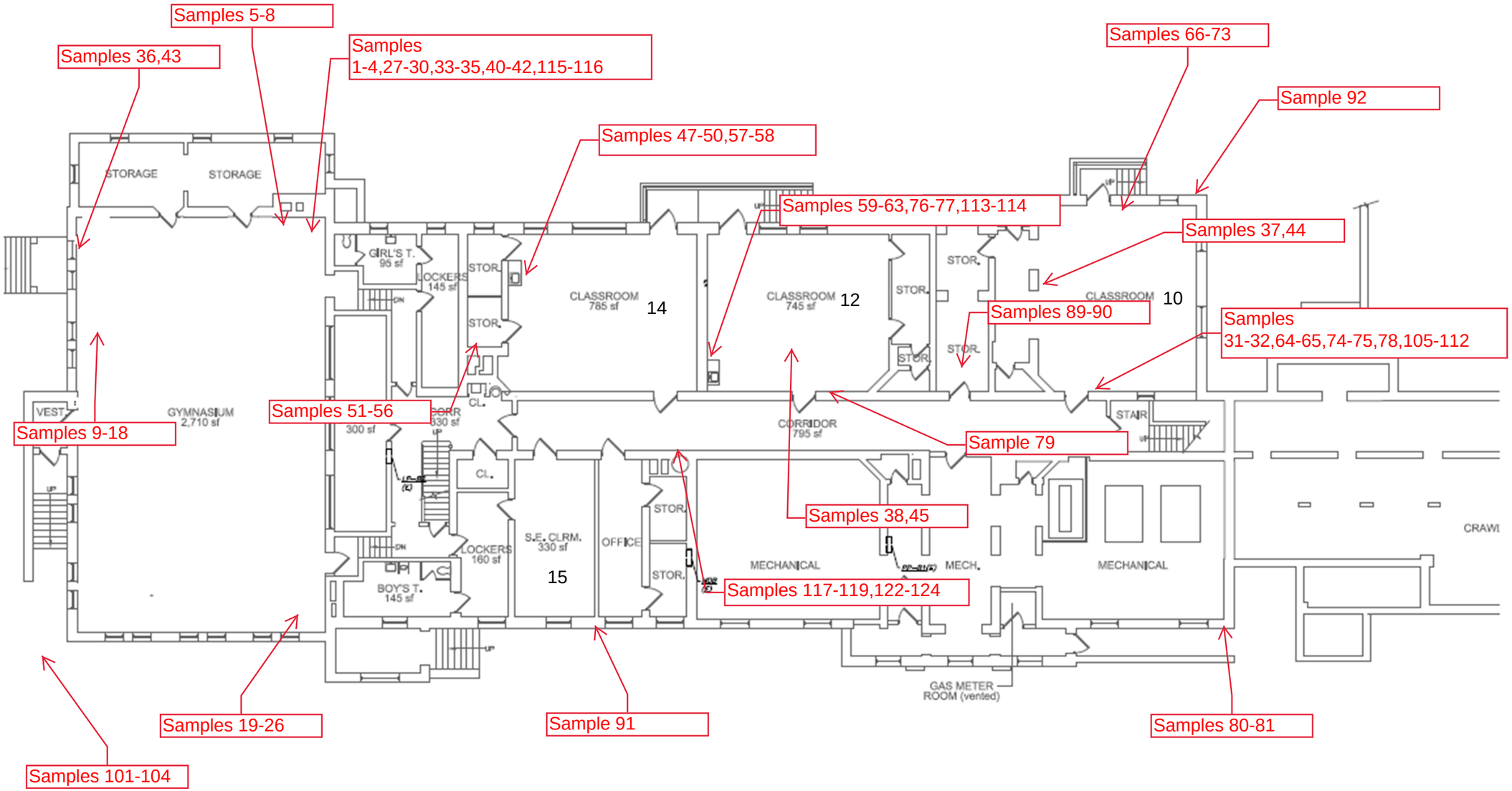
Date: 01-07-2019
Version # 1
Issued For: Renovation Asbestos Survey
Adelaide Project NO. SAMM:18436.00-IN
Drawing Prepared By: David Seddon

ASB -03

APPENDIX B

SAMPLE LOCATION MAP(S)



Basement Floor Plan - Sample Locations

Drawing Not to Scale

Yonkers Public School 16
759 North Broadway
Yonkers, New York 10701

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N/A

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Date: 01-07-2019
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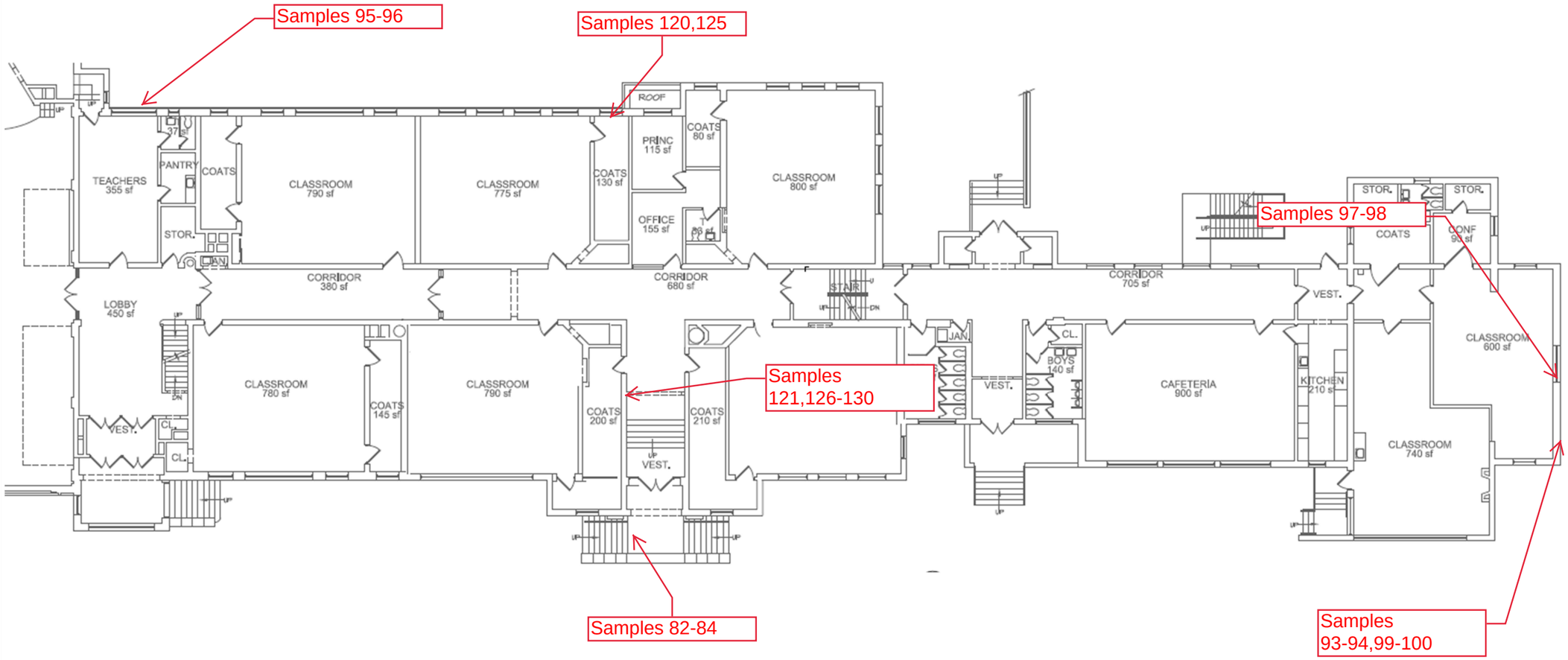
Adelaide Project NO. SAMM:18436.00-IN
Drawing Prepared By: David Seddon

SLM -01



First Floor Plan - Sample Locations

Drawing Not to Scale

Yonkers Public School 16
759 North Broadway
Yonkers, New York 10701

Sammel Architecture, PLLC
332 Route 100
Somers, New York 10589

Client Project No.
N/A

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Date: 01-07-2019
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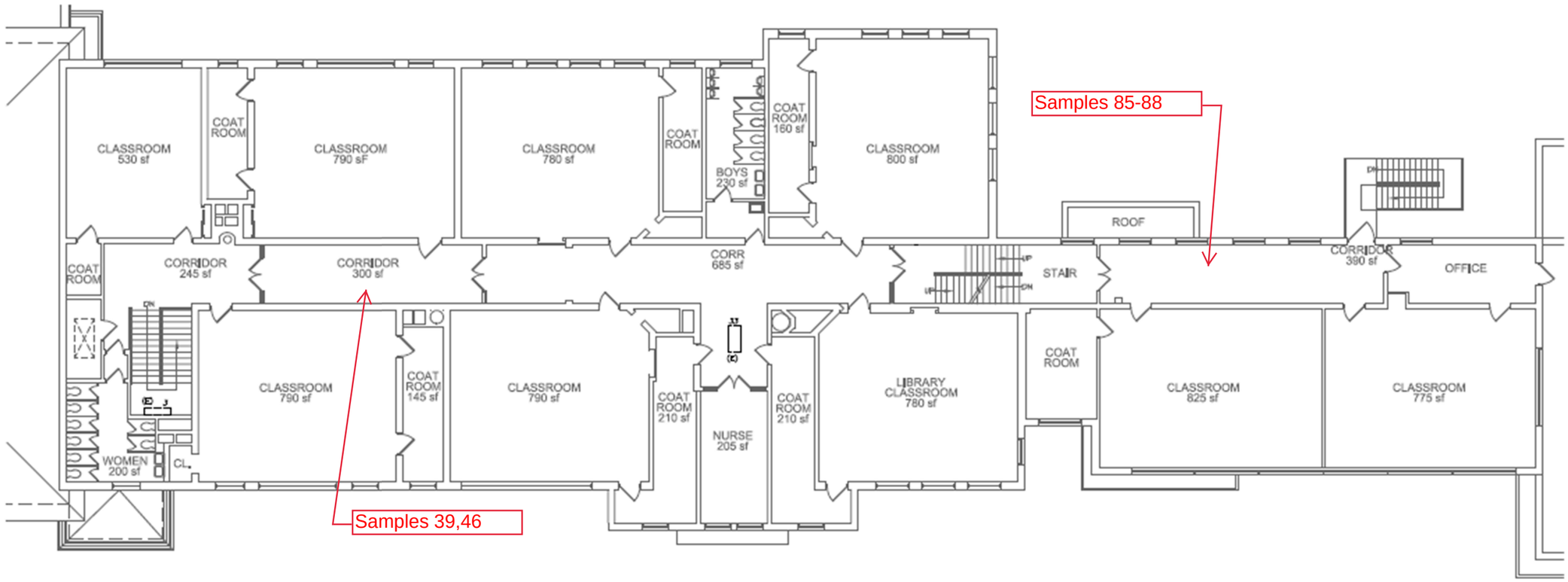
Adelaide Project NO. SAMM:18436.00-IN
Drawing Prepared By: David Seddon

SLM -02



Second Floor Plan - Sample Locations

Drawing Not to Scale

Yonkers Public School 16
759 North Broadway
Yonkers, New York 10701

Sammel Architecture, PLLC
332 Route 100
Somers, New York 10589

Client Project No.
N/A

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Date: 01-07-2019
Version # 1
Issued For: Renovation Asbestos Survey
Adelaide Project NO. SAMM:18436.00-IN
Drawing Prepared By: David Seddon

SLM -03

APPENDIX C

ASBESTOS ANALYTICAL RESULTS

Table I
Summary of Bulk Asbestos Analysis Results
SAMM:18436.00-IN; Yonkers PS 16; 759 N Broadway, Yonkers, NY 10701

AmeriSci Sample #	Client Sample#	HG Area	Sample Weight (gram)	Heat Sensitive Organic %	Acid Soluble Inorganic %	Insoluble Non-Asbestos Inorganic %	** Asbestos % by PLM/DS	** Asbestos % by TEM
01	1	1	0.203	23.2	68.0	7.1	Chrysotile <0.25	Chrysotile 1.8
Location: Fl. LB - Gym - 12 x 12 Floor Tile (Black Border Tile)								
02	2	1	0.181	24.3	67.4	8.3	Chrysotile <0.25	NA/PS
Location: Fl. LB - Gym - 12 x 12 Floor Tile (Black Border Tile)								
03	3	2	0.222	21.2	72.1	6.8	NAD	NAD
Location: Fl. LB - Gym - 12 x 12 Floor Tile (Brown Mottled / Main Tile)								
04	4	2	0.199	20.6	74.4	5.0	NAD	NAD
Location: Fl. LB - Gym - 12 x 12 Floor Tile (Brown Mottled / Main Tile)								
05	5	3	0.190	22.1	73.2	4.7	NAD	NAD
Location: Fl. LB - Gym - 12 x 12 Floor Tile (Tan Mottled)								
06	6	3	0.172	18.0	78.5	3.5	NAD	NAD
Location: Fl. LB - Gym - 12 x 12 Floor Tile (Tan Mottled)								
07	7	4	0.144	25.0	64.6	10.4	NAD	NAD
Location: Fl. LB - Gym - 12 x 12 Floor Tile (Tan W/ Brown Streaks)								
08	8	4	0.146	23.3	63.7	13.0	NAD	NAD
Location: Fl. LB - Gym - 12 x 12 Floor Tile (Tan W/ Brown Streaks)								
09	9	5	0.194	21.6	59.8	18.6	NAD	NAD
Location: Fl. LB - Gym - 12 x 12 Floor Tile (Pink Mottled)								
10	10	5	0.162	21.0	62.3	16.7	NAD	NAD
Location: Fl. LB - Gym - 12 x 12 Floor Tile (Pink Mottled)								
11	11	6	0.254	18.5	61.4	20.1	NAD	NAD
Location: Fl. LB - Gym - 12 x 12 Floor Tile (Dark Blue Mottled)								
12	12	6	0.287	19.5	57.5	23.0	NAD	NAD
Location: Fl. LB - Gym - 12 x 12 Floor Tile (Dark Blue Mottled)								
13	13	7	0.217	18.9	65.9	15.2	NAD	NAD
Location: Fl. LB - Gym - 12 x 12 Floor Tile (Lt. Blue Mottled)								
14	14	7	0.235	18.7	68.1	13.2	NAD	NAD
Location: Fl. LB - Gym - 12 x 12 Floor Tile (Lt. Blue Mottled)								
15	15	8	0.242	20.7	57.0	22.3	NAD	NAD
Location: Fl. LB - Gym - 12 x 12 Floor Tile (Orange Mottled)								
16	16	8	0.225	20.0	61.3	18.7	NAD	NAD
Location: Fl. LB - Gym - 12 x 12 Floor Tile (Orange Mottled)								

See Reporting notes on last page

Table I
Summary of Bulk Asbestos Analysis Results
SAMM:18436.00-IN; Yonkers PS 16; 759 N Broadway, Yonkers, NY 10701

AmeriSci Sample #	Client Sample#	HG Area	Sample Weight (gram)	Heat Sensitive Organic %	Acid Soluble Inorganic %	Insoluble Non-Asbestos Inorganic %	** Asbestos % by PLM/DS	** Asbestos % by TEM
17	17	9	0.215	18.6	63.3	18.1	NAD	NAD
Location: Fl. LB - Gym - 12 x 12 Floor Tile (Off-White W/ Gray)								
18	18	9	0.212	17.0	62.7	20.3	NAD	NAD
Location: Fl. LB - Gym - 12 x 12 Floor Tile (Off-White W/ Gray)								
19	19	10	0.209	17.2	74.2	8.6	NAD	NAD
Location: Fl. LB - Gym - 12 x 12 Floor Tile (White W/ Gray, Blue & Red)								
20	20	10	0.231	17.3	77.1	5.6	NAD	NAD
Location: Fl. LB - Gym - 12 x 12 Floor Tile (White W/ Gray, Blue & Red)								
21	21	11	0.204	18.6	57.8	23.5	NAD	NAD
Location: Fl. LB - Gym - 12 x 12 Floor Tile (Dark Gray Mottled)								
22	22	11	0.172	19.2	61.0	19.8	NAD	NAD
Location: Fl. LB - Gym - 12 x 12 Floor Tile (Dark Gray Mottled)								
23	23	12	0.211	20.9	58.3	20.9	NAD	NAD
Location: Fl. LB - Gym - 12 x 12 Floor Tile (Lt. Gray Mottled)								
24	24	12	0.209	21.1	59.3	19.6	NAD	NAD
Location: Fl. LB - Gym - 12 x 12 Floor Tile (Lt. Gray Mottled)								
25	25	13	0.285	19.3	55.1	25.6	NAD	NAD
Location: Fl. LB - Gym - 12 x 12 Floor Tile (Brown W/ Brown Mottled)								
26	26	13	0.196	15.8	62.2	21.9	NAD	NAD
Location: Fl. LB - Gym - 12 x 12 Floor Tile (Brown W/ Brown Mottled)								
27	27	14	0.150	50.7	4.0	45.3	NAD	NAD
Location: Fl. LB - Gym - Yellow Adhesive Mastic								
28	28	14	0.144	44.4	15.3	40.3	NAD	NAD
Location: Fl. LB - Gym - Yellow Adhesive Mastic								
29	29	15	0.136	80.9	6.6	12.5	NAD	NAD
Location: Fl. LB - Gym - Black Mastic								
30	30	15	0.081	80.2	11.1	8.6	NAD	NAD
Location: Fl. LB - Gym - Black Mastic								
31	31	16	0.207	18.8	63.8	17.4	NAD	NAD
Location: Fl. B - Classroom 10 - Bottom Layer On Concrete								
32	32	16	0.204	16.7	58.3	24.8	NAD	Chrysotile <1.0
Location: Fl. B - Classroom 10 - Bottom Layer On Concrete								

See Reporting notes on last page

Table I
Summary of Bulk Asbestos Analysis Results
SAMM:18436.00-IN; Yonkers PS 16; 759 N Broadway, Yonkers, NY 10701

AmeriSci Sample #	Client Sample#	HG Area	Sample Weight (gram)	Heat Sensitive Organic %	Acid Soluble Inorganic %	Insoluble Non-Asbestos Inorganic %	** Asbestos % by PLM/DS	** Asbestos % by TEM
33	33	17	----	----	----	----	NAD	NA
Location: Fl. LB - Gym - Ceiling Plaster (Top Coat)								
34	34	17	----	----	----	----	NAD	NA
Location: Fl. LB - Gym - Ceiling Plaster (Top Coat)								
35	35	17	----	----	----	----	NAD	NA
Location: Fl. LB - Gym - Ceiling Plaster (Top Coat)								
36	36	17	----	----	----	----	NAD	NA
Location: Fl. LB - Gym - Ceiling Plaster (Top Coat)								
37	37	17	----	----	----	----	NAD	NA
Location: Fl. B - Classroom 10 - Ceiling Plaster (Top Coat)								
38	38	17	----	----	----	----	NAD	NA
Location: Fl. B - Classroom 12 - Ceiling Plaster (Top Coat)								
39	39	17	----	----	----	----	NAD	NA
Location: Fl. 2 - Hallway - Ceiling Plaster (Top Coat)								
40	40	18	----	----	----	----	NAD	NA
Location: Fl. LB - Gym - Ceiling Plaster (Base Coat)								
41	41	18	----	----	----	----	NAD	NA
Location: Fl. LB - Gym - Ceiling Plaster (Base Coat)								
42	42	18	----	----	----	----	NAD	NA
Location: Fl. LB - Gym - Ceiling Plaster (Base Coat)								
43	43	18	----	----	----	----	Chrysotile <0.25	NA
Location: Fl. LB - Gym - Ceiling Plaster (Base Coat)								
44	44	18	----	----	----	----	Chrysotile <0.25	NA
Location: Fl. B - Classroom 10 - Ceiling Plaster (Base Coat)								
45	45	18	----	----	----	----	Chrysotile <0.25	NA
Location: Fl. B - Classroom 12 - Ceiling Plaster (Base Coat)								
46	46	18	----	----	----	----	NAD	NA
Location: Fl. 2 - Hallway - Ceiling Plaster (Base Coat)								
47	47	19	0.228	21.1	68.4	10.5	NAD	NAD
Location: Fl. B - Classroom 14 - 12 x 12 Floor Tile (Gray & Dark Gray Mottled)								
48	48	19	0.176	19.9	65.3	14.8	NAD	NAD
Location: Fl. B - Classroom 14 - 12 x 12 Floor Tile (Gray & Dark Gray Mottled)								

See Reporting notes on last page

Table I
Summary of Bulk Asbestos Analysis Results
SAMM:18436.00-IN; Yonkers PS 16; 759 N Broadway, Yonkers, NY 10701

AmeriSci Sample #	Client Sample#	HG Area	Sample Weight (gram)	Heat Sensitive Organic %	Acid Soluble Inorganic %	Insoluble Non-Asbestos Inorganic %	** Asbestos % by PLM/DS	** Asbestos % by TEM
49	49	20	0.186	37.6	23.7	34.6	Chrysotile 4.1	NA
Location: Fl. B - Classroom 14 - Leveler								
50	50	20	0.103	39.8	23.3	36.9	NA/PS	NA
Location: Fl. B - Classroom 14 - Leveler								
51	51	21	0.156	31.4	23.7	38.0	Chrysotile 6.9	NA
Location: Fl. B - Classroom 14 / Closet - 9 x 9 Green (Under 12 x 12)								
52	52	21	0.211	29.9	28.0	42.2	NA/PS	NA
Location: Fl. B - Classroom 14 / Closet - 9 x 9 Green (Under 12 x 12)								
53	53	22	0.234	22.6	35.9	35.8	Chrysotile 5.7	NA
Location: Fl. B - Classroom 14 / Closet - 9 x 9 Grey (Under 12 x 12)								
54	54	22	0.236	24.2	33.9	41.9	NA/PS	NA
Location: Fl. B - Classroom 14 / Closet - 9 x 9 Grey (Under 12 x 12)								
55	55	23	0.109	88.1	2.8	9.0	NAD	Chrysotile <1.0
Location: Fl. B - Classroom 14 / Closet - 9 x 9 Tile Mastic								
56	56	23	0.151	74.8	9.3	12.7	Chrysotile <0.25	Chrysotile 3.2
Location: Fl. B - Classroom 14 / Closet - 9 x 9 Tile Mastic								
57	57	24	0.142	22.5	42.3	35.2	NAD	NAD
Location: Fl. B - Classroom 14 - Pink Sink Coating								
58	58	24	0.138	21.7	41.3	37.0	NAD	NAD
Location: Fl. B - Classroom 14 - Pink Sink Coating								
59	59	25	0.194	16.5	67.0	16.5	NAD	NAD
Location: Fl. B - Classroom 12 - 12 x 12								
60	60	25	0.246	16.7	65.9	17.5	NAD	NAD
Location: Fl. B - Classroom 12 - 12 x 12								
61	61	26	----	----	----	----	NAD	NA
Location: Fl. B - Classroom 12 - Fiberglass Pipe Wrap								
62	62	26	----	----	----	----	NAD	NA
Location: Fl. B - Classroom 12 - Fiberglass Pipe Wrap								
63	63	26	----	----	----	----	NAD	NA
Location: Fl. B - Classroom 12 - Fiberglass Pipe Wrap								
64	64	27	0.184	20.7	60.9	18.5	NAD	NAD
Location: Fl. B - Classroom 10 - 12 x 12 Tan & Gray Mottled								

See Reporting notes on last page

Table I
Summary of Bulk Asbestos Analysis Results
SAMM:18436.00-IN; Yonkers PS 16; 759 N Broadway, Yonkers, NY 10701

AmeriSci Sample #	Client Sample#	HG Area	Sample Weight (gram)	Heat Sensitive Organic %	Acid Soluble Inorganic %	Insoluble Non-Asbestos Inorganic %	** Asbestos % by PLM/DS	** Asbestos % by TEM
65	65	27	0.211	19.9	65.4	14.7	NAD	NAD
Location: Fl. B - Classroom 10 - 12 x 12 Tan & Gray Mottled								
66	66	28	0.212	22.2	64.2	13.7	NAD	NAD
Location: Fl. B - Classroom 10 - 12 x 12 Orange Mottled								
67	67	28	0.259	20.1	64.9	15.1	NAD	NAD
Location: Fl. B - Classroom 10 - 12 x 12 Orange Mottled								
68	68	29	0.263	18.6	68.1	13.3	NAD	NAD
Location: Fl. B - Classroom 10 - 12 x 12 Green Mottled								
69	69	29	0.298	19.1	67.4	13.4	NAD	NAD
Location: Fl. B - Classroom 10 - 12 x 12 Green Mottled								
70	70	30	0.197	19.8	70.1	10.2	NAD	NAD
Location: Fl. B - Classroom 10 - 12 x 12 Mauve Mottled								
71	71	30	0.228	18.4	66.7	14.9	NAD	NAD
Location: Fl. B - Classroom 10 - 12 x 12 Mauve Mottled								
72	72	31	0.196	63.3	9.7	27.0	NAD	NAD
Location: Fl. B - Classroom 10 - Yellow / Brown Mastic On Wood								
73	73	31	0.172	70.3	5.2	24.4	NAD	NAD
Location: Fl. B - Classroom 10 - Yellow / Brown Mastic On Wood								
74L1	74	32	0.158	50.6	46.2	3.2	NAD	NAD
Location: Fl. B - Classroom 10 - Black Cove Base W/ Adhesive / Cove Base								
74L2	74	32	0.202	24.8	70.8	4.5	NAD	NAD
Location: Fl. B - Classroom 10 - Black Cove Base W/ Adhesive / Adhesive								
75L1	75	32	0.136	52.2	45.6	2.2	NAD	NAD
Location: Fl. B - Classroom 10 - Black Cove Base W/ Adhesive / Cove Base								
75L2	75	32	0.220	24.5	72.7	2.7	NAD	NAD
Location: Fl. B - Classroom 10 - Black Cove Base W/ Adhesive / Adhesive								
76L1	76	33	0.147	36.1	63.3	0.7	NAD	NAD
Location: Fl. B - Classroom 12 - 6" Cove Base W/ Adhesive / Cove Base								
76L2	76	33	0.168	24.4	72.6	3.0	NAD	NAD
Location: Fl. B - Classroom 12 - 6" Cove Base W/ Adhesive / Adhesive								
77L1	77	33	0.167	35.9	61.1	3.0	NAD	NAD
Location: Fl. B - Classroom 12 - 6" Cove Base W/ Adhesive / Cove Base								

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Table I
Summary of Bulk Asbestos Analysis Results
SAMM:18436.00-IN; Yonkers PS 16; 759 N Broadway, Yonkers, NY 10701

AmeriSci Sample #	Client Sample#	HG Area	Sample Weight (gram)	Heat Sensitive Organic %	Acid Soluble Inorganic %	Insoluble Non-Asbestos Inorganic %	** Asbestos % by PLM/DS	** Asbestos % by TEM
77L2	77	33	0.218	20.2	78.4	1.4	NAD	NAD
Location:	Fl. B - Classroom 12 - 6" Cove Base W/ Adhesive / Adhesive							
78	78	34	----	----	----	----	NAD	NA
Location:	Fl. B - Classroom 10 - Concrete Wall							
79	79	34	----	----	----	----	NAD	NA
Location:	Fl. B - Classroom 12 - Concrete Wall							
80	80	35	0.156	83.3	2.6	14.1	NAD	NAD
Location:	Ext. - Black Tar (Waterproofing) On Stone							
81	81	35	0.203	66.5	7.9	25.6	NAD	NAD
Location:	Ext. - Black Tar (Waterproofing) On Stone							
82	82	36	----	----	----	----	NAD	NA
Location:	Ext. - Plaster @ Entrance							
83	83	36	----	----	----	----	NAD	NA
Location:	Ext. - Plaster @ Entrance							
84	84	36	----	----	----	----	NAD	NA
Location:	Ext. - Plaster @ Entrance							
85	85	37	0.218	17.0	62.8	20.2	NAD	NAD
Location:	Fl. 2 - Hallway - Ceiling Tile (Mountains W/ Holes)							
86	86	37	0.211	13.7	68.2	18.0	NAD	NAD
Location:	Fl. 2 - Hallway - Ceiling Tile (Mountains W/ Holes)							
87	87	38	0.272	16.5	33.8	49.6	NAD	NAD
Location:	Fl. 2 - Hallway - Ceiling Tile (Craters W/ Holes)							
88	88	38	0.194	15.5	42.3	42.3	NAD	NAD
Location:	Fl. 2 - Hallway - Ceiling Tile (Craters W/ Holes)							
89	89	39	0.237	13.1	47.7	39.2	NAD	NAD
Location:	Fl. B - Supply Room - Black Flooring Material On Concrete							
90	90	39	0.387	12.9	48.1	39.0	NAD	NAD
Location:	Fl. B - Supply Room - Black Flooring Material On Concrete							
91	91	40	----	----	----	----	NAD	NA
Location:	Ext. - Brick Mortar							
92	92	40	----	----	----	----	NAD	NA
Location:	Ext. - Brick Mortar							

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Table I
Summary of Bulk Asbestos Analysis Results
SAMM:18436.00-IN; Yonkers PS 16; 759 N Broadway, Yonkers, NY 10701

AmeriSci Sample #	Client Sample#	HG Area	Sample Weight (gram)	Heat Sensitive Organic %	Acid Soluble Inorganic %	Insoluble Non-Asbestos Inorganic %	** Asbestos % by PLM/DS	** Asbestos % by TEM
93	93	41	----	----	----	----	NAD	NA
Location: Ext. - Concrete Wall (Foundation)								
94	94	41	----	----	----	----	NAD	NA
Location: Ext. - Concrete Wall (Foundation)								
95	95	42	----	----	----	----	NAD	NA
Location: Ext. - Stone Mortar								
96	96	42	----	----	----	----	NAD	NA
Location: Ext. - Stone Mortar								
97	97	43	0.142	46.5	50.0	3.5	NAD	NAD
Location: Ext. - Caulking @ Window								
98	98	43	0.156	47.4	49.4	3.2	NAD	NAD
Location: Ext. - Caulking @ Window								
99	99	44	----	----	----	----	NAD	NA
Location: Ext. - Red Brick Mortar (Repair)								
100	100	44	----	----	----	----	NAD	NA
Location: Ext. - Red Brick Mortar (Repair)								
101	101	45	----	----	----	----	NAD	NA
Location: Ext. - Concrete Curb / Sidewalk								
102	102	45	----	----	----	----	NAD	NA
Location: Ext. - Concrete Curb / Sidewalk								
103	103	46	0.219	5.5	77.6	16.9	NAD	NAD
Location: Ext. - Asphalt Driveway / Walkway								
104	104	46	0.285	2.8	50.2	47.0	NAD	NAD
Location: Ext. - Asphalt Driveway / Walkway								
105	105	47	0.172	16.3	76.7	7.0	NAD	NAD
Location: Fl. B - Classroom 10 - Under 1/2 Plywood (2nd Layer)								
106	106	47	0.184	17.9	73.9	8.2	NAD	NAD
Location: Fl. B - Classroom 10 - Under 1/2 Plywood (2nd Layer)								
107	107	48	----	----	----	----	NAD	NA
Location: Fl. B - Classroom 10 - Cloth Type Vapor Barrier (3rd Layer)								
108	108	48	----	----	----	----	NAD	NA
Location: Fl. B - Classroom 10 - Cloth Type Vapor Barrier (3rd Layer)								

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Table I
Summary of Bulk Asbestos Analysis Results
SAMM:18436.00-IN; Yonkers PS 16; 759 N Broadway, Yonkers, NY 10701

AmeriSci Sample #	Client Sample#	HG Area	Sample Weight (gram)	Heat Sensitive Organic %	Acid Soluble Inorganic %	Insoluble Non-Asbestos Inorganic %	** Asbestos % by PLM/DS	** Asbestos % by TEM
109	109	49	0.173	86.7	6.4	5.5	Chrysotile <0.25	Chrysotile 1.4
Location: Fl. B - Classroom 10 - Tar (4th Layer)								
110	110	49	0.113	85.8	5.3	8.8	Chrysotile <0.25	NA/PS
Location: Fl. B - Classroom 10 - Tar (4th Layer)								
111	111	50	0.163	92.6	3.1	4.3	NAD	NAD
Location: Fl. B - Classroom 10 - Tar Paper Vapor Barrier (Bottom Layer)								
112	112	50	0.143	91.6	4.2	4.2	NAD	NAD
Location: Fl. B - Classroom 10 - Tar Paper Vapor Barrier (Bottom Layer)								
113L1	113	51	0.263	22.1	59.3	18.6	NAD	NAD
Location: Fl. B - Classroom 12 - Under 1/2 Plywood (2nd Layer)								
113L2	113	51	0.204	19.6	71.6	8.8	NAD	NAD
Location: Fl. B - Classroom 12 - Under 1/2 Plywood (2nd Layer)								
114L1	114	51	0.234	22.6	59.8	17.5	NAD	NAD
Location: Fl. B - Classroom 12 - Under 1/2 Plywood (2nd Layer)								
114L2	114	51	0.207	18.8	72.9	8.2	NAD	NAD
Location: Fl. B - Classroom 12 - Under 1/2 Plywood (2nd Layer)								
115	115	52	0.315	30.8	21.6	47.6	NAD	NAD
Location: Fl. LB - Gym - Under Wood (Bottom Layer)								
116	116	52	0.329	49.8	7.6	42.6	NAD	NAD
Location: Fl. LB - Gym - Under Wood (Bottom Layer)								
117	117	53	----	----	----	----	NAD	NA
Location: Fl. B - Hallway - Wall Plaster (Top Coat)								
118	118	53	----	----	----	----	NAD	NA
Location: Fl. B - Hallway - Wall Plaster (Top Coat)								
119	119	53	----	----	----	----	NAD	NA
Location: Fl. B - Hallway - Wall Plaster (Top Coat)								
120	120	53	----	----	----	----	NAD	NA
Location: Fl. 1 - Classroom 22 (CL) - Wall Plaster (Top Coat)								
121	121	53	----	----	----	----	NAD	NA
Location: Fl. 1 - Server Area - Wall Plaster (Top Coat)								
122	122	54	----	----	----	----	NAD	NA
Location: Fl. B - Hallway - Wall Plaster (Base Coat)								

See Reporting notes on last page

Table I
Summary of Bulk Asbestos Analysis Results
SAMM:18436.00-IN; Yonkers PS 16; 759 N Broadway, Yonkers, NY 10701

AmeriSci Sample #	Client Sample#	HG Area	Sample Weight (gram)	Heat Sensitive Organic %	Acid Soluble Inorganic %	Insoluble Non-Asbestos Inorganic %	** Asbestos % by PLM/DS	** Asbestos % by TEM
123	123	54	----	----	----	----	NAD	NA
Location: Fl. B - Hallway - Wall Plaster (Base Coat)								
124	124	54	----	----	----	----	NAD	NA
Location: Fl. B - Hallway - Wall Plaster (Base Coat)								
125	125	54	----	----	----	----	NAD	NA
Location: Fl. 1 - Classroom 22 (CL) - Wall Plaster (Base Coat)								
126	126	54	----	----	----	----	NAD	NA
Location: Fl. 1 - Server Area - Wall Plaster (Base Coat)								
127	127	55	----	----	----	----	NAD	NA
Location: Fl. 1 - Server Area - Drywall								
128	128	55	----	----	----	----	NAD	NA
Location: Fl. 1 - Server Area - Drywall								
129	129	56	----	----	----	----	NAD	NA
Location: Fl. 1 - Server Area - Joint Compound								
130	130	56	----	----	----	----	NAD	NA
Location: Fl. 1 - Server Area - Joint Compound								

Analyzed by: Karol H. Lu  ; Date Analyzed 1/8/2019

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

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

Reviewed By:_____

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

PLM Bulk Asbestos Report

Adelaide Environmental Health
Attn: John Soter
1511 Rte. 22 Suite C24

Brewster, NY 10509

Date Received 01/07/19 **AmeriSci Job #** 219011438
Date Examined 01/07/19 **P.O. #**
ELAP # 11480 **Page** 1 **of** 24
RE: SAMM:18436.00-IN; Yonkers PS 16; 759 N Broadway, Yonkers, NY 10701

Client No. / HGA	Lab No.	Asbestos Present	Total % Asbestos
1	219011438-01	*Yes*	Trace (<0.25 % pc) [1,2]
1	**Location:** Fl. LB - Gym - 12 x 12 Floor Tile (Black Border Tile)		(EPA 400 PC) by Valeriu Voicu on 01/07/19
Analyst Description: Black, Homogeneous, Non-Fibrous, Bulk Material **Asbestos Types:** Chrysotile <0.25 % pc **Other Material:** Non-fibrous 8.9 %			
2	219011438-02	*Yes*	Trace (<0.25 % pc) [3]
1	**Location:** Fl. LB - Gym - 12 x 12 Floor Tile (Black Border Tile)		(EPA 400 PC) by Valeriu Voicu on 01/07/19
Analyst Description: Black, Homogeneous, Non-Fibrous, Bulk Material **Asbestos Types:** Chrysotile <0.25 % pc **Other Material:** Non-fibrous 8.3 %			
3	219011438-03	*No*	NAD
2	**Location:** Fl. LB - Gym - 12 x 12 Floor Tile (Brown Mottled / Main Tile)		(by NYS ELAP 198.6) by Valeriu Voicu on 01/07/19
Analyst Description: Brown, Homogeneous, Non-Fibrous, Bulk Material **Asbestos Types:** **Other Material:** Non-fibrous 6.8 %			
4	219011438-04	*No*	NAD
2	**Location:** Fl. LB - Gym - 12 x 12 Floor Tile (Brown Mottled / Main Tile)		(by NYS ELAP 198.6) by Valeriu Voicu on 01/07/19
Analyst Description: Brown, Homogeneous, Non-Fibrous, Bulk Material **Asbestos Types:** **Other Material:** Non-fibrous 5 %			
5	219011438-05	*No*	NAD
3	**Location:** Fl. LB - Gym - 12 x 12 Floor Tile (Tan Mottled)		(by NYS ELAP 198.6) by Valeriu Voicu on 01/07/19
Analyst Description: Beige, Homogeneous, Non-Fibrous, Bulk Material **Asbestos Types:** **Other Material:** Non-fibrous 4.7 %			

See Reporting notes on last page

PLM Bulk Asbestos Report

SAMM:18436.00-IN; Yonkers PS 16; 759 N Broadway,
Yonkers, NY 10701

Client No. / HGA	Lab No.	Asbestos Present	Total % Asbestos
6 3	219011438-06 **Location:** Fl. LB - Gym - 12 x 12 Floor Tile (Tan Mottled)	***No***	NAD (by NYS ELAP 198.6) by Valeriu Voicu on 01/07/19
Analyst Description: Beige, Homogeneous, Non-Fibrous, Bulk Material **Asbestos Types:** **Other Material:** Non-fibrous 3.5 %			
7 4	219011438-07 **Location:** Fl. LB - Gym - 12 x 12 Floor Tile (Tan W/ Brown Streaks)	***No***	NAD (by NYS ELAP 198.6) by Valeriu Voicu on 01/07/19
Analyst Description: Beige, Homogeneous, Non-Fibrous, Bulk Material **Asbestos Types:** **Other Material:** Non-fibrous 10.4 %			
8 4	219011438-08 **Location:** Fl. LB - Gym - 12 x 12 Floor Tile (Tan W/ Brown Streaks)	***No***	NAD (by NYS ELAP 198.6) by Valeriu Voicu on 01/07/19
Analyst Description: Beige, Homogeneous, Non-Fibrous, Bulk Material **Asbestos Types:** **Other Material:** Non-fibrous 13 %			
9 5	219011438-09 **Location:** Fl. LB - Gym - 12 x 12 Floor Tile (Pink Mottled)	***No***	NAD (by NYS ELAP 198.6) by Valeriu Voicu on 01/07/19
Analyst Description: Pink, Homogeneous, Non-Fibrous, Bulk Material **Asbestos Types:** **Other Material:** Non-fibrous 18.6 %			
10 5	219011438-10 **Location:** Fl. LB - Gym - 12 x 12 Floor Tile (Pink Mottled)	***No***	NAD (by NYS ELAP 198.6) by Valeriu Voicu on 01/07/19
Analyst Description: Pink, Homogeneous, Non-Fibrous, Bulk Material **Asbestos Types:** **Other Material:** Non-fibrous 16.7 %			
11 6	219011438-11 **Location:** Fl. LB - Gym - 12 x 12 Floor Tile (Dark Blue Mottled)	***No***	NAD (by NYS ELAP 198.6) by Valeriu Voicu on 01/07/19
Analyst Description: Dark Blue, Homogeneous, Non-Fibrous, Bulk Material **Asbestos Types:** **Other Material:** Non-fibrous 20.1 %			

See Reporting notes on last page

PLM Bulk Asbestos Report

SAMM:18436.00-IN; Yonkers PS 16; 759 N Broadway,
Yonkers, NY 10701

Client No. / HGA	Lab No.	Asbestos Present	Total % Asbestos
12 6	219011438-12 **Location:** Fl. LB - Gym - 12 x 12 Floor Tile (Dark Blue Mottled)	***No***	NAD (by NYS ELAP 198.6) by Valeriu Voicu on 01/07/19
Analyst Description: Dark Blue, Homogeneous, Non-Fibrous, Bulk Material **Asbestos Types:** **Other Material:** Non-fibrous 23 %			
13 7	219011438-13 **Location:** Fl. LB - Gym - 12 x 12 Floor Tile (Lt. Blue Mottled)	***No***	NAD (by NYS ELAP 198.6) by Valeriu Voicu on 01/07/19
Analyst Description: Blue, Homogeneous, Non-Fibrous, Bulk Material **Asbestos Types:** **Other Material:** Non-fibrous 15.2 %			
14 7	219011438-14 **Location:** Fl. LB - Gym - 12 x 12 Floor Tile (Lt. Blue Mottled)	***No***	NAD (by NYS ELAP 198.6) by Valeriu Voicu on 01/07/19
Analyst Description: Blue, Homogeneous, Non-Fibrous, Bulk Material **Asbestos Types:** **Other Material:** Non-fibrous 13.2 %			
15 8	219011438-15 **Location:** Fl. LB - Gym - 12 x 12 Floor Tile (Orange Mottled)	***No***	NAD (by NYS ELAP 198.6) by Valeriu Voicu on 01/07/19
Analyst Description: Orange, Homogeneous, Non-Fibrous, Bulk Material **Asbestos Types:** **Other Material:** Non-fibrous 22.3 %			
16 8	219011438-16 **Location:** Fl. LB - Gym - 12 x 12 Floor Tile (Orange Mottled)	***No***	NAD (by NYS ELAP 198.6) by Valeriu Voicu on 01/07/19
Analyst Description: Orange, Homogeneous, Non-Fibrous, Bulk Material **Asbestos Types:** **Other Material:** Non-fibrous 18.7 %			
17 9	219011438-17 **Location:** Fl. LB - Gym - 12 x 12 Floor Tile (Off-White W/ Gray)	***No***	NAD (by NYS ELAP 198.6) by Valeriu Voicu on 01/07/19
Analyst Description: OffWhite, Homogeneous, Non-Fibrous, Bulk Material **Asbestos Types:** **Other Material:** Non-fibrous 18.1 %			

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Client No. / HGA	Lab No.	Asbestos Present	Total % Asbestos
18 9	219011438-18 **Location:** Fl. LB - Gym - 12 x 12 Floor Tile (Off-White W/ Gray)	***No***	NAD (by NYS ELAP 198.6) by Valeriu Voicu on 01/07/19
Analyst Description: OffWhite, Homogeneous, Non-Fibrous, Bulk Material **Asbestos Types:** **Other Material:** Non-fibrous 20.3 %			
19 10	219011438-19 **Location:** Fl. LB - Gym - 12 x 12 Floor Tile (White W/ Gray, Blue & Red)	***No***	NAD (by NYS ELAP 198.6) by Valeriu Voicu on 01/07/19
Analyst Description: Light Grey/Green, Homogeneous, Non-Fibrous, Bulk Material **Asbestos Types:** **Other Material:** Non-fibrous 8.6 %			
20 10	219011438-20 **Location:** Fl. LB - Gym - 12 x 12 Floor Tile (White W/ Gray, Blue & Red)	***No***	NAD (by NYS ELAP 198.6) by Valeriu Voicu on 01/07/19
Analyst Description: Light Grey/Green, Homogeneous, Non-Fibrous, Bulk Material **Asbestos Types:** **Other Material:** Non-fibrous 5.6 %			
21 11	219011438-21 **Location:** Fl. LB - Gym - 12 x 12 Floor Tile (Dark Gray Mottled)	***No***	NAD (by NYS ELAP 198.6) by Valeriu Voicu on 01/07/19
Analyst Description: Dark Grey, Homogeneous, Non-Fibrous, Bulk Material **Asbestos Types:** **Other Material:** Non-fibrous 23.5 %			
22 11	219011438-22 **Location:** Fl. LB - Gym - 12 x 12 Floor Tile (Dark Gray Mottled)	***No***	NAD (by NYS ELAP 198.6) by Valeriu Voicu on 01/07/19
Analyst Description: Dark Grey, Homogeneous, Non-Fibrous, Bulk Material **Asbestos Types:** **Other Material:** Non-fibrous 19.8 %			
23 12	219011438-23 **Location:** Fl. LB - Gym - 12 x 12 Floor Tile (Lt. Gray Mottled)	***No***	NAD (by NYS ELAP 198.6) by Valeriu Voicu on 01/07/19
Analyst Description: Grey, Homogeneous, Non-Fibrous, Bulk Material **Asbestos Types:** **Other Material:** Non-fibrous 20.9 %			

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Client No. / HGA	Lab No.	Asbestos Present	Total % Asbestos
24 12	219011438-24 **Location:** Fl. LB - Gym - 12 x 12 Floor Tile (Lt. Gray Mottled)	***No***	NAD (by NYS ELAP 198.6) by Valeriu Voicu on 01/07/19
Analyst Description: Grey, Homogeneous, Non-Fibrous, Bulk Material **Asbestos Types:** **Other Material:** Non-fibrous 19.6 %			
25 13	219011438-25 **Location:** Fl. LB - Gym - 12 x 12 Floor Tile (Brown W/ Brown Mottled)	***No***	NAD (by NYS ELAP 198.6) by Valeriu Voicu on 01/07/19
Analyst Description: Brown, Homogeneous, Non-Fibrous, Bulk Material **Asbestos Types:** **Other Material:** Non-fibrous 25.6 %			
26 13	219011438-26 **Location:** Fl. LB - Gym - 12 x 12 Floor Tile (Brown W/ Brown Mottled)	***No***	NAD (by NYS ELAP 198.6) by Valeriu Voicu on 01/07/19
Analyst Description: Brown, Homogeneous, Non-Fibrous, Bulk Material **Asbestos Types:** **Other Material:** Non-fibrous 21.9 %			
27 14	219011438-27 **Location:** Fl. LB - Gym - Yellow Adhesive Mastic	***No***	NAD (by NYS ELAP 198.6) by Valeriu Voicu on 01/07/19
Analyst Description: Yellow, Homogeneous, Non-Fibrous, Bulk Material **Asbestos Types:** **Other Material:** Non-fibrous 45.3 %			
28 14	219011438-28 **Location:** Fl. LB - Gym - Yellow Adhesive Mastic	***No***	NAD (by NYS ELAP 198.6) by Valeriu Voicu on 01/07/19
Analyst Description: Yellow, Homogeneous, Non-Fibrous, Bulk Material **Asbestos Types:** **Other Material:** Non-fibrous 40.3 %			
29 15	219011438-29 **Location:** Fl. LB - Gym - Black Mastic	***No***	NAD (by NYS ELAP 198.6) by Valeriu Voicu on 01/07/19
Analyst Description: Black, Homogeneous, Non-Fibrous, Bulk Material **Asbestos Types:** **Other Material:** Non-fibrous 12.5 %			

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Client No. / HGA	Lab No.	Asbestos Present	Total % Asbestos
30 15	219011438-30 **Location:** Fl. LB - Gym - Black Mastic	***No***	NAD (by NYS ELAP 198.6) by Valeriu Voicu on 01/07/19
Analyst Description: Black, Homogeneous, Non-Fibrous, Bulk Material **Asbestos Types:** **Other Material:** Non-fibrous 8.6 %			
31 16	219011438-31 **Location:** Fl. B - Classroom 10 - Bottom Layer On Concrete	***No***	NAD (by NYS ELAP 198.6) by Valeriu Voicu on 01/07/19
Analyst Description: Black, Homogeneous, Non-Fibrous, Bulk Material **Asbestos Types:** **Other Material:** Non-fibrous 17.4 %			
32 16	219011438-32 **Location:** Fl. B - Classroom 10 - Bottom Layer On Concrete	***No***	NAD (by NYS ELAP 198.6) by Valeriu Voicu on 01/07/19
Analyst Description: Black, Homogeneous, Non-Fibrous, Bulk Material **Asbestos Types:** **Other Material:** Non-fibrous 25 %			
33 17	219011438-33 **Location:** Fl. LB - Gym - Ceiling Plaster (Top Coat)	***No***	NAD (by NYS ELAP 198.1) by Valeriu Voicu on 01/07/19
Analyst Description: White, Homogeneous, Non-Fibrous, Bulk Material **Asbestos Types:** **Other Material:** Non-fibrous 100 %			
34 17	219011438-34 **Location:** Fl. LB - Gym - Ceiling Plaster (Top Coat)	***No***	NAD (by NYS ELAP 198.1) by Valeriu Voicu on 01/07/19
Analyst Description: White, Homogeneous, Non-Fibrous, Bulk Material **Asbestos Types:** **Other Material:** Non-fibrous 100 %			
35 17	219011438-35 **Location:** Fl. LB - Gym - Ceiling Plaster (Top Coat)	***No***	NAD (by NYS ELAP 198.1) by Valeriu Voicu on 01/07/19
Analyst Description: White, Homogeneous, Non-Fibrous, Bulk Material **Asbestos Types:** **Other Material:** Non-fibrous 100 %			

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Client No. / HGA	Lab No.	Asbestos Present	Total % Asbestos
36 17	219011438-36 **Location:** Fl. LB - Gym - Ceiling Plaster (Top Coat)	***No***	NAD (by NYS ELAP 198.1) by Valeriu Voicu on 01/07/19
Analyst Description: White, Homogeneous, Non-Fibrous, Bulk Material **Asbestos Types:** **Other Material:** Non-fibrous 100 %			
37 17	219011438-37 **Location:** Fl. B - Classroom 10 - Ceiling Plaster (Top Coat)	***No***	NAD (by NYS ELAP 198.1) by Valeriu Voicu on 01/07/19
Analyst Description: White/Beige, Heterogeneous, Non-Fibrous, Bulk Material **Asbestos Types:** **Other Material:** Cellulose Trace, Non-fibrous 100 %			
38 17	219011438-38 **Location:** Fl. B - Classroom 12 - Ceiling Plaster (Top Coat)	***No***	NAD (by NYS ELAP 198.1) by Valeriu Voicu on 01/07/19
Analyst Description: White, Homogeneous, Non-Fibrous, Bulk Material **Asbestos Types:** **Other Material:** Non-fibrous 100 %			
39 17	219011438-39 **Location:** Fl. 2 - Hallway - Ceiling Plaster (Top Coat)	***No***	NAD (by NYS ELAP 198.1) by Valeriu Voicu on 01/07/19
Analyst Description: White, Homogeneous, Non-Fibrous, Bulk Material **Asbestos Types:** **Other Material:** Non-fibrous 100 %			
40 18	219011438-40 **Location:** Fl. LB - Gym - Ceiling Plaster (Base Coat)	***No***	NAD (by NYS ELAP 198.1) by Valeriu Voicu on 01/07/19
Analyst Description: Brown/Grey, Homogeneous, Non-Fibrous, Cementitious, Bulk Material **Asbestos Types:** **Other Material:** Animal hair Trace, Cellulose Trace, Non-fibrous 100 %			
41 18	219011438-41 **Location:** Fl. LB - Gym - Ceiling Plaster (Base Coat)	***No***	NAD (by NYS ELAP 198.1) by Valeriu Voicu on 01/07/19
Analyst Description: Brown/Grey, Homogeneous, Non-Fibrous, Cementitious, Bulk Material **Asbestos Types:** **Other Material:** Animal hair 1 %, Cellulose Trace, Non-fibrous 99 %			

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Client No. / HGA	Lab No.	Asbestos Present	Total % Asbestos
42	219011438-42	***No***	NAD
18	**Location:** Fl. LB - Gym - Ceiling Plaster (Base Coat)		(by NYS ELAP 198.1) by Valeriu Voicu on 01/07/19
	Analyst Description: Brown/Grey, Homogeneous, Non-Fibrous, Cementitious, Bulk Material		
	Asbestos Types:		
	Other Material: Animal hair 1 %, Cellulose Trace, Non-fibrous 99 %		
43	219011438-43	***Yes***	Trace (<0.25 % pc)
18	**Location:** Fl. LB - Gym - Ceiling Plaster (Base Coat)		(EPA 400 PC) by Valeriu Voicu on 01/07/19
	Analyst Description: Grey, Homogeneous, Non-Fibrous, Cementitious, Bulk Material		
	Asbestos Types: Chrysotile <0.25 % pc		
	Other Material: Cellulose Trace, Non-fibrous 100 %		
44	219011438-44	***Yes***	Trace (<0.25 % pc)
18	**Location:** Fl. B - Classroom 10 - Ceiling Plaster (Base Coat)		(EPA 400 PC) by Valeriu Voicu on 01/07/19
	Analyst Description: Brown, Homogeneous, Non-Fibrous, Cementitious, Bulk Material		
	Asbestos Types: Chrysotile <0.25 % pc		
	Other Material: Animal hair Trace, Cellulose Trace, Non-fibrous 100 %		
45	219011438-45	***Yes***	Trace (<0.25 % pc)
18	**Location:** Fl. B - Classroom 12 - Ceiling Plaster (Base Coat)		(EPA 400 PC) by Valeriu Voicu on 01/07/19
	Analyst Description: Brown, Homogeneous, Non-Fibrous, Cementitious, Bulk Material		
	Asbestos Types: Chrysotile <0.25 % pc		
	Other Material: Animal hair Trace, Cellulose Trace, Non-fibrous 100 %		
46	219011438-46	***No***	NAD
18	**Location:** Fl. 2 - Hallway - Ceiling Plaster (Base Coat)		(by NYS ELAP 198.1) by Valeriu Voicu on 01/07/19
	Analyst Description: Brown/Beige, Homogeneous, Non-Fibrous, Cementitious, Bulk Material		
	Asbestos Types:		
	Other Material: Animal hair Trace, Cellulose Trace, Non-fibrous 100 %		
47	219011438-47	***No***	NAD
19	**Location:** Fl. B - Classroom 14 - 12 x 12 Floor Tile (Gray & Dark Gray Mottled)		(by NYS ELAP 198.6) by Valeriu Voicu on 01/07/19
	Analyst Description: Grey, Homogeneous, Non-Fibrous, Bulk Material		
	Asbestos Types:		
	Other Material: Non-fibrous 10.5 %		

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PLM Bulk Asbestos Report

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Client No. / HGA	Lab No.	Asbestos Present	Total % Asbestos
48	219011438-48	***No***	NAD
19	**Location:** Fl. B - Classroom 14 - 12 x 12 Floor Tile (Gray & Dark Gray Mottled)		(by NYS ELAP 198.6) by Valeriu Voicu on 01/07/19
	Analyst Description: Grey, Homogeneous, Non-Fibrous, Bulk Material		
	Asbestos Types:		
	Other Material: Non-fibrous 14.8 %		
49	219011438-49	***Yes***	4.1 %
20	**Location:** Fl. B - Classroom 14 - Leveler		(by NYS ELAP 198.6) by Tara L. Fisher on 01/07/19
	Analyst Description: Grey, Homogeneous, Non-Fibrous, Bulk Material		
	Asbestos Types: Chrysotile 4.1 %		
	Other Material: Non-fibrous 34.6 %		
	Comment: Sample Submitted Appears to be Vinyl Tile (NOB) Material.		
50	219011438-50		NA/PS
20	**Location:** Fl. B - Classroom 14 - Leveler		
	Analyst Description: Bulk Material		
	Asbestos Types:		
	Other Material:		
	Comment: Sample Submitted Appears to be Vinyl Tile (NOB) Material.		
51	219011438-51	***Yes***	6.9 %
21	**Location:** Fl. B - Classroom 14 / Closet - 9 x 9 Green (Under 12 x 12)		(by NYS ELAP 198.6) by Valeriu Voicu on 01/07/19
	Analyst Description: Green, Homogeneous, Fibrous, Bulk Material		
	Asbestos Types: Chrysotile 6.9 %		
	Other Material: Non-fibrous 38 %		
52	219011438-52		NA/PS
21	**Location:** Fl. B - Classroom 14 / Closet - 9 x 9 Green (Under 12 x 12)		
	Analyst Description: Bulk Material		
	Asbestos Types:		
	Other Material:		

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Client No. / HGA	Lab No.	Asbestos Present	Total % Asbestos
53 22	219011438-53 **Location:** Fl. B - Classroom 14 / Closet - 9 x 9 Grey (Under 12 x 12)	***Yes***	5.7 % (by NYS ELAP 198.6) by Valeriu Voicu on 01/07/19
	Analyst Description: Grey, Homogeneous, Fibrous, Bulk Material **Asbestos Types:** Chrysotile 5.7 % **Other Material:** Non-fibrous 35.8 %		
54 22	219011438-54 **Location:** Fl. B - Classroom 14 / Closet - 9 x 9 Grey (Under 12 x 12)		NA/PS
	Analyst Description: Bulk Material **Asbestos Types:** **Other Material:**		
55 23	219011438-55 **Location:** Fl. B - Classroom 14 / Closet - 9 x 9 Tile Mastic	***No***	NAD (by NYS ELAP 198.6) by Valeriu Voicu on 01/07/19
	Analyst Description: Black, Homogeneous, Non-Fibrous, Bulk Material **Asbestos Types:** **Other Material:** Non-fibrous 9.2 %		
56 23	219011438-56 **Location:** Fl. B - Classroom 14 / Closet - 9 x 9 Tile Mastic	***Yes***	Trace (<0.25 % pc) (EPA 400 PC) by Valeriu Voicu on 01/07/19
	Analyst Description: Black, Homogeneous, Non-Fibrous, Bulk Material **Asbestos Types:** Chrysotile <0.25 % pc **Other Material:** Non-fibrous 15.9 %		
57 24	219011438-57 **Location:** Fl. B - Classroom 14 - Pink Sink Coating	***No***	NAD (by NYS ELAP 198.6) by Valeriu Voicu on 01/07/19
	Analyst Description: Pink, Homogeneous, Non-Fibrous, Bulk Material **Asbestos Types:** **Other Material:** Non-fibrous 35.2 %		
58 24	219011438-58 **Location:** Fl. B - Classroom 14 - Pink Sink Coating	***No***	NAD (by NYS ELAP 198.6) by Valeriu Voicu on 01/07/19
	Analyst Description: Pink, Homogeneous, Non-Fibrous, Bulk Material **Asbestos Types:** **Other Material:** Non-fibrous 37 %		

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Client No. / HGA	Lab No.	Asbestos Present	Total % Asbestos
59 25	219011438-59 **Location:** Fl. B - Classroom 12 - 12 x 12	***No***	NAD (by NYS ELAP 198.6) by Valeriu Voicu on 01/07/19
Analyst Description: OffWhite/Beige, Homogeneous, Non-Fibrous, Bulk Material **Asbestos Types:** **Other Material:** Non-fibrous 16.5 %			
60 25	219011438-60 **Location:** Fl. B - Classroom 12 - 12 x 12	***No***	NAD (by NYS ELAP 198.6) by Valeriu Voicu on 01/07/19
Analyst Description: OffWhite/Beige, Homogeneous, Non-Fibrous, Bulk Material **Asbestos Types:** **Other Material:** Non-fibrous 17.5 %			
61 26	219011438-61 **Location:** Fl. B - Classroom 12 - Fiberglass Pipe Wrap	***No***	NAD (by NYS ELAP 198.1) by Valeriu Voicu on 01/07/19
Analyst Description: Silver/Tan/White, Heterogeneous, Fibrous, Bulk Material **Asbestos Types:** **Other Material:** Cellulose 30 %, Fibrous glass 10 %, Non-fibrous 60 %			
62 26	219011438-62 **Location:** Fl. B - Classroom 12 - Fiberglass Pipe Wrap	***No***	NAD (by NYS ELAP 198.1) by Valeriu Voicu on 01/07/19
Analyst Description: Silver/Tan/White, Heterogeneous, Fibrous, Bulk Material **Asbestos Types:** **Other Material:** Cellulose 35 %, Fibrous glass 10 %, Non-fibrous 55 %			
63 26	219011438-63 **Location:** Fl. B - Classroom 12 - Fiberglass Pipe Wrap	***No***	NAD (by NYS ELAP 198.1) by Valeriu Voicu on 01/07/19
Analyst Description: Silver/Tan/White, Heterogeneous, Fibrous, Bulk Material **Asbestos Types:** **Other Material:** Cellulose 30 %, Fibrous glass 10 %, Non-fibrous 60 %			
64 27	219011438-64 **Location:** Fl. B - Classroom 10 - 12 x 12 Tan & Gray Mottled	***No***	NAD (by NYS ELAP 198.6) by Valeriu Voicu on 01/07/19
Analyst Description: Beige, Homogeneous, Non-Fibrous, Bulk Material **Asbestos Types:** **Other Material:** Non-fibrous 18.5 %			

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Client No. / HGA	Lab No.	Asbestos Present	Total % Asbestos
65 27	219011438-65 **Location:** Fl. B - Classroom 10 - 12 x 12 Tan & Gray Mottled	***No***	NAD (by NYS ELAP 198.6) by Valeriu Voicu on 01/07/19
Analyst Description: Beige, Homogeneous, Non-Fibrous, Bulk Material **Asbestos Types:** **Other Material:** Non-fibrous 14.7 %			
66 28	219011438-66 **Location:** Fl. B - Classroom 10 - 12 x 12 Orange Mottled	***No***	NAD (by NYS ELAP 198.6) by Valeriu Voicu on 01/07/19
Analyst Description: Orange, Homogeneous, Non-Fibrous, Bulk Material **Asbestos Types:** **Other Material:** Non-fibrous 13.7 %			
67 28	219011438-67 **Location:** Fl. B - Classroom 10 - 12 x 12 Orange Mottled	***No***	NAD (by NYS ELAP 198.6) by Valeriu Voicu on 01/07/19
Analyst Description: Orange, Homogeneous, Non-Fibrous, Bulk Material **Asbestos Types:** **Other Material:** Non-fibrous 15.1 %			
68 29	219011438-68 **Location:** Fl. B - Classroom 10 - 12 x 12 Green Mottled	***No***	NAD (by NYS ELAP 198.6) by Valeriu Voicu on 01/07/19
Analyst Description: Green, Homogeneous, Non-Fibrous, Bulk Material **Asbestos Types:** **Other Material:** Non-fibrous 13.3 %			
69 29	219011438-69 **Location:** Fl. B - Classroom 10 - 12 x 12 Green Mottled	***No***	NAD (by NYS ELAP 198.6) by Valeriu Voicu on 01/07/19
Analyst Description: Green, Homogeneous, Non-Fibrous, Bulk Material **Asbestos Types:** **Other Material:** Non-fibrous 13.4 %			
70 30	219011438-70 **Location:** Fl. B - Classroom 10 - 12 x 12 Mauve Mottled	***No***	NAD (by NYS ELAP 198.6) by Valeriu Voicu on 01/07/19
Analyst Description: Purple, Homogeneous, Non-Fibrous, Bulk Material **Asbestos Types:** **Other Material:** Non-fibrous 10.2 %			

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Client No. / HGA	Lab No.	Asbestos Present	Total % Asbestos
71 30	219011438-71 **Location:** Fl. B - Classroom 10 - 12 x 12 Mauve Mottled	***No***	NAD (by NYS ELAP 198.6) by Valeriu Voicu on 01/07/19
Analyst Description: Purple, Homogeneous, Non-Fibrous, Bulk Material **Asbestos Types:** **Other Material:** Non-fibrous 14.9 %			
72 31	219011438-72 **Location:** Fl. B - Classroom 10 - Yellow / Brown Mastic On Wood	***No***	NAD (by NYS ELAP 198.6) by Valeriu Voicu on 01/07/19
Analyst Description: Yellow/Brown, Heterogeneous, Non-Fibrous, Bulk Material **Asbestos Types:** **Other Material:** Non-fibrous 27 %			
73 31	219011438-73 **Location:** Fl. B - Classroom 10 - Yellow / Brown Mastic On Wood	***No***	NAD (by NYS ELAP 198.6) by Valeriu Voicu on 01/07/19
Analyst Description: Yellow/Brown, Heterogeneous, Non-Fibrous, Bulk Material **Asbestos Types:** **Other Material:** Non-fibrous 24.4 %			
74 32	219011438-74L1 **Location:** Fl. B - Classroom 10 - Black Cove Base W/ Adhesive / Cove Base	***No***	NAD (by NYS ELAP 198.6) by Valeriu Voicu on 01/07/19
Analyst Description: Black, Homogeneous, Non-Fibrous, Bulk Material **Asbestos Types:** **Other Material:** Non-fibrous 3.2 %			
74 32	219011438-74L2 **Location:** Fl. B - Classroom 10 - Black Cove Base W/ Adhesive / Adhesive	***No***	NAD (by NYS ELAP 198.6) by Valeriu Voicu on 01/07/19
Analyst Description: Beige, Homogeneous, Non-Fibrous, Bulk Material **Asbestos Types:** **Other Material:** Non-fibrous 4.5 %			
75 32	219011438-75L1 **Location:** Fl. B - Classroom 10 - Black Cove Base W/ Adhesive / Cove Base	***No***	NAD (by NYS ELAP 198.6) by Valeriu Voicu on 01/07/19
Analyst Description: Black, Homogeneous, Non-Fibrous, Bulk Material **Asbestos Types:** **Other Material:** Non-fibrous 2.2 %			

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Client No. / HGA	Lab No.	Asbestos Present	Total % Asbestos
75 32	219011438-75L2 **Location:** Fl. B - Classroom 10 - Black Cove Base W/ Adhesive / Adhesive	***No***	NAD (by NYS ELAP 198.6) by Valeriu Voicu on 01/07/19
Analyst Description: Tan, Homogeneous, Non-Fibrous, Bulk Material **Asbestos Types:** **Other Material:** Non-fibrous 2.7 %			
76 33	219011438-76L1 **Location:** Fl. B - Classroom 12 - 6" Cove Base W/ Adhesive / Cove Base	***No***	NAD (by NYS ELAP 198.6) by Valeriu Voicu on 01/07/19
Analyst Description: Black, Homogeneous, Non-Fibrous, Bulk Material **Asbestos Types:** **Other Material:** Non-fibrous 0.7 %			
76 33	219011438-76L2 **Location:** Fl. B - Classroom 12 - 6" Cove Base W/ Adhesive / Adhesive	***No***	NAD (by NYS ELAP 198.6) by Valeriu Voicu on 01/07/19
Analyst Description: Tan, Homogeneous, Non-Fibrous, Bulk Material **Asbestos Types:** **Other Material:** Non-fibrous 3 %			
77 33	219011438-77L1 **Location:** Fl. B - Classroom 12 - 6" Cove Base W/ Adhesive / Cove Base	***No***	NAD (by NYS ELAP 198.6) by Valeriu Voicu on 01/07/19
Analyst Description: Black, Homogeneous, Non-Fibrous, Bulk Material **Asbestos Types:** **Other Material:** Non-fibrous 3 %			
77 33	219011438-77L2 **Location:** Fl. B - Classroom 12 - 6" Cove Base W/ Adhesive / Adhesive	***No***	NAD (by NYS ELAP 198.6) by Valeriu Voicu on 01/07/19
Analyst Description: Tan, Homogeneous, Non-Fibrous, Bulk Material **Asbestos Types:** **Other Material:** Non-fibrous 1.4 %			
78 34	219011438-78 **Location:** Fl. B - Classroom 10 - Concrete Wall	***No***	NAD (by NYS ELAP 198.1) by Valeriu Voicu on 01/07/19
Analyst Description: Grey, Homogeneous, Non-Fibrous, Cementitious, Bulk Material **Asbestos Types:** **Other Material:** Cellulose Trace, Non-fibrous 100 %			

See Reporting notes on last page

PLM Bulk Asbestos Report

SAMM:18436.00-IN; Yonkers PS 16; 759 N Broadway,
Yonkers, NY 10701

Client No. / HGA	Lab No.	Asbestos Present	Total % Asbestos
79 34	219011438-79 **Location:** Fl. B - Classroom 12 - Concrete Wall	***No***	NAD (by NYS ELAP 198.1) by Valeriu Voicu on 01/07/19
Analyst Description: Grey, Homogeneous, Non-Fibrous, Cementitious, Bulk Material **Asbestos Types:** **Other Material:** Cellulose Trace, Non-fibrous 100 %			
80 35	219011438-80 **Location:** Ext. - Black Tar (Waterproofing) On Stone	***No***	NAD (by NYS ELAP 198.6) by Tara L. Fisher on 01/07/19
Analyst Description: Black, Homogeneous, Non-Fibrous, Bulk Material **Asbestos Types:** **Other Material:** Non-fibrous 14.1 %			
81 35	219011438-81 **Location:** Ext. - Black Tar (Waterproofing) On Stone	***No***	NAD (by NYS ELAP 198.6) by Tara L. Fisher on 01/07/19
Analyst Description: Black, Homogeneous, Non-Fibrous, Bulk Material **Asbestos Types:** **Other Material:** Non-fibrous 25.6 %			
82 36	219011438-82 **Location:** Ext. - Plaster @ Entrance	***No***	NAD (by NYS ELAP 198.1) by Valeriu Voicu on 01/07/19
Analyst Description: Grey, Homogeneous, Non-Fibrous, Cementitious, Bulk Material **Asbestos Types:** **Other Material:** Cellulose Trace, Non-fibrous 100 %			
83 36	219011438-83 **Location:** Ext. - Plaster @ Entrance	***No***	NAD (by NYS ELAP 198.1) by Valeriu Voicu on 01/07/19
Analyst Description: Grey, Homogeneous, Non-Fibrous, Cementitious, Bulk Material **Asbestos Types:** **Other Material:** Cellulose Trace, Non-fibrous 100 %			
84 36	219011438-84 **Location:** Ext. - Plaster @ Entrance	***No***	NAD (by NYS ELAP 198.1) by Valeriu Voicu on 01/07/19
Analyst Description: Grey, Homogeneous, Non-Fibrous, Cementitious, Bulk Material **Asbestos Types:** **Other Material:** Cellulose Trace, Non-fibrous 100 %			

See Reporting notes on last page

PLM Bulk Asbestos Report

SAMM:18436.00-IN; Yonkers PS 16; 759 N Broadway,
Yonkers, NY 10701

Client No. / HGA	Lab No.	Asbestos Present	Total % Asbestos
85 37	219011438-85 **Location:** Fl. 2 - Hallway - Ceiling Tile (Mountains W/ Holes)	***No***	NAD (by NYS ELAP 198.6) by Tara L. Fisher on 01/07/19
Analyst Description: Beige, Homogeneous, Fibrous, Bulk Material **Asbestos Types:** **Other Material:** Non-fibrous 20.2 %			
86 37	219011438-86 **Location:** Fl. 2 - Hallway - Ceiling Tile (Mountains W/ Holes)	***No***	NAD (by NYS ELAP 198.6) by Tara L. Fisher on 01/07/19
Analyst Description: Beige, Homogeneous, Fibrous, Bulk Material **Asbestos Types:** **Other Material:** Non-fibrous 18 %			
87 38	219011438-87 **Location:** Fl. 2 - Hallway - Ceiling Tile (Craters W/ Holes)	***No***	NAD (by NYS ELAP 198.6) by Tara L. Fisher on 01/07/19
Analyst Description: Beige, Homogeneous, Fibrous, Bulk Material **Asbestos Types:** **Other Material:** Non-fibrous 49.6 %			
88 38	219011438-88 **Location:** Fl. 2 - Hallway - Ceiling Tile (Craters W/ Holes)	***No***	NAD (by NYS ELAP 198.6) by Tara L. Fisher on 01/07/19
Analyst Description: Beige, Homogeneous, Fibrous, Bulk Material **Asbestos Types:** **Other Material:** Non-fibrous 42.3 %			
89 39	219011438-89 **Location:** Fl. B - Supply Room - Black Flooring Material On Concrete	***No***	NAD (by NYS ELAP 198.6) by Tara L. Fisher on 01/07/19
Analyst Description: Black, Homogeneous, Non-Fibrous, Bulk Material **Asbestos Types:** **Other Material:** Non-fibrous 39.2 %			
90 39	219011438-90 **Location:** Fl. B - Supply Room - Black Flooring Material On Concrete	***No***	NAD (by NYS ELAP 198.6) by Tara L. Fisher on 01/07/19
Analyst Description: Black, Homogeneous, Non-Fibrous, Bulk Material **Asbestos Types:** **Other Material:** Non-fibrous 39 %			

See Reporting notes on last page

PLM Bulk Asbestos Report

SAMM:18436.00-IN; Yonkers PS 16; 759 N Broadway,
Yonkers, NY 10701

Client No. / HGA	Lab No.	Asbestos Present	Total % Asbestos
91 40	219011438-91 **Location:** Ext. - Brick Mortar	***No***	NAD (by NYS ELAP 198.1) by Valeriu Voicu on 01/07/19
Analyst Description: Grey/Red, Heterogeneous, Non-Fibrous, Cementitious, Bulk Material **Asbestos Types:** **Other Material:** Cellulose Trace, Non-fibrous 100 %			
92 40	219011438-92 **Location:** Ext. - Brick Mortar	***No***	NAD (by NYS ELAP 198.1) by Valeriu Voicu on 01/07/19
Analyst Description: Grey/Red, Heterogeneous, Non-Fibrous, Cementitious, Bulk Material **Asbestos Types:** **Other Material:** Cellulose Trace, Non-fibrous 100 %			
93 41	219011438-93 **Location:** Ext. - Concrete Wall (Foundation)	***No***	NAD (by NYS ELAP 198.1) by Valeriu Voicu on 01/07/19
Analyst Description: Grey/Red, Heterogeneous, Non-Fibrous, Cementitious, Bulk Material **Asbestos Types:** **Other Material:** Cellulose Trace, Non-fibrous 100 %			
94 41	219011438-94 **Location:** Ext. - Concrete Wall (Foundation)	***No***	NAD (by NYS ELAP 198.1) by Valeriu Voicu on 01/07/19
Analyst Description: Grey, Homogeneous, Non-Fibrous, Cementitious, Bulk Material **Asbestos Types:** **Other Material:** Cellulose Trace, Non-fibrous 100 %			
95 42	219011438-95 **Location:** Ext. - Stone Mortar	***No***	NAD (by NYS ELAP 198.1) by Valeriu Voicu on 01/07/19
Analyst Description: Grey, Homogeneous, Non-Fibrous, Cementitious, Bulk Material **Asbestos Types:** **Other Material:** Cellulose Trace, Non-fibrous 100 %			
96 42	219011438-96 **Location:** Ext. - Stone Mortar	***No***	NAD (by NYS ELAP 198.1) by Valeriu Voicu on 01/07/19
Analyst Description: Grey, Homogeneous, Non-Fibrous, Cementitious, Bulk Material **Asbestos Types:** **Other Material:** Non-fibrous 100 %			

See Reporting notes on last page

PLM Bulk Asbestos Report

SAMM:18436.00-IN; Yonkers PS 16; 759 N Broadway,
Yonkers, NY 10701

Client No. / HGA	Lab No.	Asbestos Present	Total % Asbestos
97 43	219011438-97 **Location:** Ext. - Caulking @ Window	***No***	NAD (by NYS ELAP 198.6) by Tara L. Fisher on 01/07/19
Analyst Description: Grey, Homogeneous, Non-Fibrous, Bulk Material **Asbestos Types:** **Other Material:** Non-fibrous 3.5 %			
98 43	219011438-98 **Location:** Ext. - Caulking @ Window	***No***	NAD (by NYS ELAP 198.6) by Tara L. Fisher on 01/07/19
Analyst Description: Grey, Homogeneous, Non-Fibrous, Bulk Material **Asbestos Types:** **Other Material:** Non-fibrous 3.2 %			
99 44	219011438-99 **Location:** Ext. - Red Brick Mortar (Repair)	***No***	NAD (by NYS ELAP 198.1) by Valeriu Voicu on 01/07/19
Analyst Description: Red, Homogeneous, Non-Fibrous, Cementitious, Bulk Material **Asbestos Types:** **Other Material:** Cellulose Trace, Non-fibrous 100 %			
100 44	219011438-100 **Location:** Ext. - Red Brick Mortar (Repair)	***No***	NAD (by NYS ELAP 198.1) by Valeriu Voicu on 01/07/19
Analyst Description: Red, Homogeneous, Non-Fibrous, Cementitious, Bulk Material **Asbestos Types:** **Other Material:** Cellulose Trace, Non-fibrous 100 %			
101 45	219011438-101 **Location:** Ext. - Concrete Curb / Sidewalk	***No***	NAD (by NYS ELAP 198.1) by Valeriu Voicu on 01/07/19
Analyst Description: Grey, Homogeneous, Non-Fibrous, Cementitious, Bulk Material **Asbestos Types:** **Other Material:** Cellulose Trace, Non-fibrous 100 %			
102 45	219011438-102 **Location:** Ext. - Concrete Curb / Sidewalk	***No***	NAD (by NYS ELAP 198.1) by Valeriu Voicu on 01/07/19
Analyst Description: Grey, Homogeneous, Non-Fibrous, Cementitious, Bulk Material **Asbestos Types:** **Other Material:** Cellulose Trace, Non-fibrous 100 %			

See Reporting notes on last page

PLM Bulk Asbestos Report

SAMM:18436.00-IN; Yonkers PS 16; 759 N Broadway,
Yonkers, NY 10701

Client No. / HGA	Lab No.	Asbestos Present	Total % Asbestos
103 46	219011438-103 **Location:** Ext. - Asphalt Driveway / Walkway	***No***	NAD (by NYS ELAP 198.6) by Tara L. Fisher on 01/07/19
Analyst Description: Black, Homogeneous, Non-Fibrous, Bulk Material **Asbestos Types:** **Other Material:** Non-fibrous 16.9 %			
104 46	219011438-104 **Location:** Ext. - Asphalt Driveway / Walkway	***No***	NAD (by NYS ELAP 198.6) by Tara L. Fisher on 01/07/19
Analyst Description: Black, Homogeneous, Non-Fibrous, Bulk Material **Asbestos Types:** **Other Material:** Non-fibrous 47 %			
105 47	219011438-105 **Location:** Fl. B - Classroom 10 - Under 1/2 Plywood (2nd Layer)	***No***	NAD (by NYS ELAP 198.6) by Tara L. Fisher on 01/07/19
Analyst Description: Black, Homogeneous, Non-Fibrous, Bulk Material **Asbestos Types:** **Other Material:** Non-fibrous 7 %			
106 47	219011438-106 **Location:** Fl. B - Classroom 10 - Under 1/2 Plywood (2nd Layer)	***No***	NAD (by NYS ELAP 198.6) by Tara L. Fisher on 01/07/19
Analyst Description: Black, Homogeneous, Non-Fibrous, Bulk Material **Asbestos Types:** **Other Material:** Non-fibrous 8.2 %			
107 48	219011438-107 **Location:** Fl. B - Classroom 10 - Cloth Type Vapor Barrier (3rd Layer)	***No***	NAD (by NYS ELAP 198.1) by Valeriu Voicu on 01/07/19
Analyst Description: Grey, Homogeneous, Fibrous, Bulk Material **Asbestos Types:** **Other Material:** Animal hair 5 %, Cellulose 90 %, Non-fibrous 5 %			
108 48	219011438-108 **Location:** Fl. B - Classroom 10 - Cloth Type Vapor Barrier (3rd Layer)	***No***	NAD (by NYS ELAP 198.1) by Valeriu Voicu on 01/07/19
Analyst Description: Grey, Homogeneous, Fibrous, Bulk Material **Asbestos Types:** **Other Material:** Animal hair 7 %, Cellulose 90 %, Non-fibrous 3 %			

See Reporting notes on last page

PLM Bulk Asbestos Report

SAMM:18436.00-IN; Yonkers PS 16; 759 N Broadway,
Yonkers, NY 10701

Client No. / HGA	Lab No.	Asbestos Present	Total % Asbestos
109 49	219011438-109 **Location:** Fl. B - Classroom 10 - Tar (4th Layer)	***Yes***	Trace (<0.25 % pc) (EPA 400 PC) by Tara L. Fisher on 01/07/19
Analyst Description: Black, Homogeneous, Non-Fibrous, Bulk Material **Asbestos Types:** Chrysotile <0.25 % pc **Other Material:** Non-fibrous 6.9 %			
110 49	219011438-110 **Location:** Fl. B - Classroom 10 - Tar (4th Layer)	***Yes***	Trace (<0.25 % pc) (EPA 400 PC) by Tara L. Fisher on 01/07/19
Analyst Description: Black, Homogeneous, Non-Fibrous, Bulk Material **Asbestos Types:** Chrysotile <0.25 % pc **Other Material:** Non-fibrous 8.8 %			
111 50	219011438-111 **Location:** Fl. B - Classroom 10 - Tar Paper Vapor Barrier (Bottom Layer)	***No***	NAD (by NYS ELAP 198.6) by Tara L. Fisher on 01/07/19
Analyst Description: Black, Homogeneous, Non-Fibrous, Bulk Material **Asbestos Types:** **Other Material:** Non-fibrous 4.3 %			
112 50	219011438-112 **Location:** Fl. B - Classroom 10 - Tar Paper Vapor Barrier (Bottom Layer)	***No***	NAD (by NYS ELAP 198.6) by Tara L. Fisher on 01/07/19
Analyst Description: Black, Homogeneous, Non-Fibrous, Bulk Material **Asbestos Types:** **Other Material:** Non-fibrous 4.2 %			
113 51	219011438-113L1 **Location:** Fl. B - Classroom 12 - Under 1/2 Plywood (2nd Layer)	***No***	NAD (by NYS ELAP 198.6) by Tara L. Fisher on 01/07/19
Analyst Description: Black, Homogeneous, Non-Fibrous, Bulk Material **Asbestos Types:** **Other Material:** Non-fibrous 18.6 %			
113 51	219011438-113L2 **Location:** Fl. B - Classroom 12 - Under 1/2 Plywood (2nd Layer)	***No***	NAD (by NYS ELAP 198.6) by Tara L. Fisher on 01/07/19
Analyst Description: Black, Homogeneous, Non-Fibrous, Bulk Material **Asbestos Types:** **Other Material:** Non-fibrous 8.8 %			

See Reporting notes on last page

PLM Bulk Asbestos Report

SAMM:18436.00-IN; Yonkers PS 16; 759 N Broadway,
Yonkers, NY 10701

Client No. / HGA	Lab No.	Asbestos Present	Total % Asbestos
114 51	219011438-114L1 **Location:** Fl. B - Classroom 12 - Under 1/2 Plywood (2nd Layer)	***No***	NAD (by NYS ELAP 198.6) by Tara L. Fisher on 01/07/19
Analyst Description: Black, Homogeneous, Non-Fibrous, Bulk Material **Asbestos Types:** **Other Material:** Non-fibrous 17.5 %			
114 51	219011438-114L2 **Location:** Fl. B - Classroom 12 - Under 1/2 Plywood (2nd Layer)	***No***	NAD (by NYS ELAP 198.6) by Tara L. Fisher on 01/07/19
Analyst Description: Black, Homogeneous, Non-Fibrous, Bulk Material **Asbestos Types:** **Other Material:** Non-fibrous 8.2 %			
115 52	219011438-115 **Location:** Fl. LB - Gym - Under Wood (Bottom Layer)	***No***	NAD (by NYS ELAP 198.6) by Tara L. Fisher on 01/07/19
Analyst Description: Black, Homogeneous, Non-Fibrous, Bulk Material **Asbestos Types:** **Other Material:** Non-fibrous 47.6 %			
116 52	219011438-116 **Location:** Fl. LB - Gym - Under Wood (Bottom Layer)	***No***	NAD (by NYS ELAP 198.6) by Tara L. Fisher on 01/07/19
Analyst Description: Black, Homogeneous, Non-Fibrous, Bulk Material **Asbestos Types:** **Other Material:** Non-fibrous 42.6 %			
117 53	219011438-117 **Location:** Fl. B - Hallway - Wall Plaster (Top Coat)	***No***	NAD (by NYS ELAP 198.1) by Valeriu Voicu on 01/07/19
Analyst Description: White/Blue, Heterogeneous, Non-Fibrous, Bulk Material **Asbestos Types:** **Other Material:** Cellulose Trace, Non-fibrous 100 %			
118 53	219011438-118 **Location:** Fl. B - Hallway - Wall Plaster (Top Coat)	***No***	NAD (by NYS ELAP 198.1) by Valeriu Voicu on 01/07/19
Analyst Description: White/Blue, Heterogeneous, Non-Fibrous, Bulk Material **Asbestos Types:** **Other Material:** Cellulose Trace, Non-fibrous 100 %			

See Reporting notes on last page

PLM Bulk Asbestos Report

SAMM:18436.00-IN; Yonkers PS 16; 759 N Broadway,
Yonkers, NY 10701

Client No. / HGA	Lab No.	Asbestos Present	Total % Asbestos
119 53	219011438-119 **Location:** Fl. B - Hallway - Wall Plaster (Top Coat)	***No***	NAD (by NYS ELAP 198.1) by Valeriu Voicu on 01/07/19
Analyst Description: White/Blue, Heterogeneous, Non-Fibrous, Bulk Material **Asbestos Types:** **Other Material:** Cellulose Trace, Non-fibrous 100 %			
120 53	219011438-120 **Location:** Fl. 1 - Classroom 22 (CL) - Wall Plaster (Top Coat)	***No***	NAD (by NYS ELAP 198.1) by Valeriu Voicu on 01/07/19
Analyst Description: White/Blue, Heterogeneous, Non-Fibrous, Bulk Material **Asbestos Types:** **Other Material:** Cellulose Trace, Non-fibrous 100 %			
121 53	219011438-121 **Location:** Fl. 1 - Server Area - Wall Plaster (Top Coat)	***No***	NAD (by NYS ELAP 198.1) by Valeriu Voicu on 01/07/19
Analyst Description: White/Brown, Heterogeneous, Non-Fibrous, Bulk Material **Asbestos Types:** **Other Material:** Cellulose Trace, Non-fibrous 100 %			
122 54	219011438-122 **Location:** Fl. B - Hallway - Wall Plaster (Base Coat)	***No***	NAD (by NYS ELAP 198.1) by Valeriu Voicu on 01/07/19
Analyst Description: Grey, Homogeneous, Non-Fibrous, Cementitious, Bulk Material **Asbestos Types:** **Other Material:** Animal hair Trace, Cellulose Trace, Non-fibrous 100 %			
123 54	219011438-123 **Location:** Fl. B - Hallway - Wall Plaster (Base Coat)	***No***	NAD (by NYS ELAP 198.1) by Valeriu Voicu on 01/07/19
Analyst Description: Tan/Brown, Homogeneous, Non-Fibrous, Cementitious, Bulk Material **Asbestos Types:** **Other Material:** Cellulose Trace, Non-fibrous 100 %			
124 54	219011438-124 **Location:** Fl. B - Hallway - Wall Plaster (Base Coat)	***No***	NAD (by NYS ELAP 198.1) by Valeriu Voicu on 01/07/19
Analyst Description: Tan/Brown, Homogeneous, Non-Fibrous, Cementitious, Bulk Material **Asbestos Types:** **Other Material:** Cellulose Trace, Non-fibrous 100 %			

See Reporting notes on last page

PLM Bulk Asbestos Report

SAMM:18436.00-IN; Yonkers PS 16; 759 N Broadway,
Yonkers, NY 10701

Client No. / HGA	Lab No.	Asbestos Present	Total % Asbestos
125 54	219011438-125 **Location:** Fl. 1 - Classroom 22 (CL) - Wall Plaster (Base Coat)	***No***	NAD (by NYS ELAP 198.1) by Valeriu Voicu on 01/07/19
Analyst Description: Tan/Brown, Homogeneous, Non-Fibrous, Cementitious, Bulk Material **Asbestos Types:** **Other Material:** Cellulose Trace, Non-fibrous 100 %			
126 54	219011438-126 **Location:** Fl. 1 - Server Area - Wall Plaster (Base Coat)	***No***	NAD (by NYS ELAP 198.1) by Valeriu Voicu on 01/07/19
Analyst Description: Brown, Homogeneous, Non-Fibrous, Cementitious, Bulk Material **Asbestos Types:** **Other Material:** Cellulose Trace, Non-fibrous 100 %			
127 55	219011438-127 **Location:** Fl. 1 - Server Area - Drywall	***No***	NAD (by NYS ELAP 198.1) by Valeriu Voicu on 01/07/19
Analyst Description: Grey/Brown, Heterogeneous, Fibrous, Bulk Material **Asbestos Types:** **Other Material:** Cellulose 5 %, Fibrous glass Trace, Non-fibrous 95 %			
128 55	219011438-128 **Location:** Fl. 1 - Server Area - Drywall	***No***	NAD (by NYS ELAP 198.1) by Valeriu Voicu on 01/07/19
Analyst Description: Grey, Homogeneous, Fibrous, Bulk Material **Asbestos Types:** **Other Material:** Cellulose 1 %, Fibrous glass Trace, Non-fibrous 99 %			
129 56	219011438-129 **Location:** Fl. 1 - Server Area - Joint Compound	***No***	NAD (by NYS ELAP 198.1) by Valeriu Voicu on 01/07/19
Analyst Description: White, Homogeneous, Non-Fibrous, Bulk Material **Asbestos Types:** **Other Material:** Cellulose Trace, Non-fibrous 100 %			
130 56	219011438-130 **Location:** Fl. 1 - Server Area - Joint Compound	***No***	NAD (by NYS ELAP 198.1) by Valeriu Voicu on 01/07/19
Analyst Description: White, Homogeneous, Non-Fibrous, Bulk Material **Asbestos Types:** **Other Material:** Cellulose Trace, Non-fibrous 100 %			

See Reporting notes on last page

PLM Bulk Asbestos Report

SAMM:18436.00-IN; Yonkers PS 16; 759 N Broadway,
Yonkers, NY 10701

Reporting Notes:

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

(2) Sample prepared for analysis by ELAP 198.6 method

(3) Sample prepared for analysis by ELAP 198.6 method

Analyzed by: Valeriu Voicu Sara Fisher for V.V.

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

Reviewed By:_____ _____END OF REPORT_____

Adelaide Environmental Health Associates, Inc
1454 Rte. 22, Suite B202
Brewster, NY 10509
845-278-7710
845-278-7750 - fax

#2190111438

Site Address: Yonkers PS 16	Date: 12/7/18 12/17/18	Inspector(s) **David Seddon**
759 N Broadway		
Yonkers, NY 10701	Project #: SAMM 18436.00-IN	

Sample ID #	Homogeneous Area	Floor Level	Sample Location/Description	Quantity (In Feet)	Friable NonFriable	Condition g, d, sd
1	1	LB	Cream - 12x12 Floor Tile - Black Border Tile			G
2	1		- - " "			
3	2		- - Brown w/ Mottled (Mastic)			
4	2		- - " "			
5	3		- - Tan Mottled			
6	3		- - "			
7	4		- - Tan w/ Brown Streaks			
8	4		- - " "			
9	5		- - Pink Mottled			
10	5		- - "			
11	6		- - Dark Blue Mottled			
12	6		- - " "			
13	7		- - Lt Blue Mottled			D

Special Instructions/ Turnaround Time:

Stop at 1st Positive per Homogenous Area ***24hr TAT***
Fax Results to 845-278-7750
E-Mail results to AdelaideLabResults@Adelaidellc.com

Relinquished by:
Received by: 1/7/19 1125
Relinquished by:
Received by:

Adelaide Environmental Health Associates, Inc
1454 Rte. 22, Suite B202
Brewster, NY 10509
845-278-7710
845-278-7750 - fax

#21901 1438

Site Address:	Yonkers PS 16	Date:	12/7/18 12/17/18	Inspector(s)	David Seddon
		Project #:	Samm 18436.00-IN		

Sample ID #	Homogeneous Area	Floor Level	Sample Location/Description	Quantity (In Feet)	Friable NonFriable	Condition g, d, sd
14	7	LB	Gym - 12x12 Floor Tile - LT Blue Mottled			G
15	8		- ORANGE Mottled			
16	8		- "			
17	9		- OFF White w/ Gray			
18	9		- " "			
19	10		- White w/ Gray, Blue, Red			
20	10		- " "			
21	11		- Dark Gray Mottled			
22	11		- " "			
23	12		- LT Gray Mottled			
24	12		- " "			
25	13		- Brown w/ Brown Mottled			
26	13	"	- "			"

Special Instructions/ Turnaround Time:

Stop at 1st Positive per Homogenous Area **24hr TAT**
Fax Results to 845-278-7750
E-Mail results to AdelaideLabResults@Adelaidellc.com

Relinquished by:
Received by:
Relinquished by:
Received by: 1/7/19 1125

Adelaide Environmental Health Associates, Inc
1454 Rte. 22, Suite B202
Brewster, NY 10509
845-278-7710
845-278-7750 - fax

#21901438

Site Address: Yonkers PS 16	Date: 12/7/18 12/17/18	Inspector(s) David Seddon
	Project #: GAMM 18436.00-IN	

Sample ID #	Homogeneous Area	Floor Level	Sample Location/Description	Quantity (In Feet)	Friable NonFriable	Condition g, d, sd
27	14	LB	Gym - Yellow Adhesive MASTIC			G
28	14	"	" - " "			"
29	15	"	" - BLACK MASTIC			"
30	15	"	" - "			"
31	16	B	Classroom 10 - Bottom Layer on Concrete			"
32	16	"	" - " " "			"
33	17	LB	Gym - Plaster Ceiling - Top Coat			"
34	17	"	" - " -			"
35	17	"	" - " -			"
36	17	"	" - " -			"
37	17	B	Classroom 10 - " -			"
38	17	B	" 12 - " -			"
39	17	2	Hallway - " -			"

Special Instructions/ Turnaround Time:

Stop at 1st Positive per Homogenous Area **24hr TAT**
Fax Results to 845-278-7750
E-Mail results to AdelaideLabResults@Adelaidellc.com

Relinquished by:
Received by: [signature] 1/7/19 1125
Relinquished by:
Received by:

Adelaide Environmental Health Associates, Inc
1454 Rte. 22, Suite B202
Brewster, NY 10509
845-278-7710
845-278-7750 - fax

#21901438

Site Address:	Yonkers PS 16	Date:	12/7/18 12/17/18	Inspector(s)	David Seddon
		Project #:	SAMM 18436.00-IN		

Sample ID #	Homogeneous Area	Floor Level	Sample Location/Description	Quantity (In Feet)	Friable NonFriable	Condition g, d, sd
40	18	LB	Gym - PLASTER CEILING - BASE COAT			G
41	18		- -			
42	18		- -			
43	18		- -			
44	18	B	Classroom 10 - -			
45	18		12 - -			
46	18	2	Hallway - -			
47	19	B	Classroom 14 - 12x12 Floor Tile - GRAY & DARK GRAY MOTTLED			
48	19		-			
49	20		- LEVELER			
50	20		-			
51	21	B	Classroom 14 Closet - 9x9 GREEN UNDER 12x12			
52	21		-			G

Special Instructions/ Turnaround Time:

Stop at 1st Positive per Homogenous Area **24hr TAT**
Fax Results to 845-278-7750
E-Mail results to AdelaideLabResults@Adelaidellc.com

Relinquished by:
Received by: 1/7/19 1125
Relinquished by:
Received by:

Adelaide Environmental Health Associates, Inc
1454 Rte. 22, Suite B202
Brewster, NY 10509
845-278-7710
845-278-7750 - fax

#2190 1438

Site Address: Yonkers PS 16	Date: 12/7/18 12/17/18	Inspector(s) David Seddon
	Project #: SAMM #8436.00 -IN	

Sample ID #	Homogeneous Area	Floor Level	Sample Location/Description	Quantity (In Feet)	Friable NonFriable	Condition g, d, sd
53	22	B	Classroom 14 Closet - 9x9 Gray Tile under 12x12			G
54	22	↓	- ↓ ↓			↓
55	23	↓	- 9x9 Tile Mastic			↓
56	23	↓	- ↓			↓
57	24	B	Classroom 14 - Pink Sink Coating			↓
58	24	↓	↓ - ↓ ↓			↓
59	25	B	Classroom 12 - 12x12			↓
60	25	↓	- ↓			↓
61	26	↓	- Fiberglass Pipe Wrap			↓
62	26	↓	- ↓ ↓			↓
63	26	↓	↓ - ↓ ↓			↓
64	27	B	Classroom 10 - 12x12 Tan & Gray Mottled			↓
65	27	↓	- ↓ ↓			↓

Special Instructions/ Turnaround Time:

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E-Mail results to AdelaideLabResults@Adelaidellc.com

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845-278-7750 - fax

#2190 1438

Site Address: Yonkers PS 16	Date: 12/7/18 12/17/18	Inspector(s) David Seddon
	Project #: SAUNA 18436.00-IN	

Sample ID #	Homogeneous Area	Floor Level	Sample Location/Description	Quantity (In Feet)	Friable NonFriable	Condition g, d, sd
66	28	B	Classroom 10 - 12x12. Orange Mottles			F
67	28		- " "			
68	29		- 12x12 Green Mottles			
69	29		- " "			
70	30		- 12x12 Mauve Mottles			
71	30		- " "			
72	31		- Yellow/Brown Mastic on Wood			
73	31		- " " "			
74	32		- Black Coveback w/ Adhesive			
75	32		- " " "			
76	33		Classroom 12 - 6" Coveback w/ Adhesive			
77	33		C " - " "			
78	34		Classroom 10 - Concrete Wall			F

Special Instructions/ Turnaround Time:

Stop at 1st Positive per Homogenous Area **24hr TAT**
Fax Results to 845-278-7750
E-Mail results to AdelaideLabResults@Adelaidellc.com

Relinquished by:
Received by:
Relinquished by: 1/7/19 1125
Received by:

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Brewster, NY 10509
845-278-7710
845-278-7750 - fax

#2190 [illegible] 38

Site Address: Yonkers PS 16	Date: 12/7/18 12/17/18	Inspector(s) **David Seddon**
	Project #: SAUM 18436.00 - EN	

Sample ID #	Homogeneous Area	Floor Level	Sample Location/Description	Quantity (In Feet)	Friable NonFriable	Condition g, d, sd
79	34	B	Classroom 12 - Concrete Wall			G
80	35	Ext	Exterior - Black Tar (Waterproofing) on Stone			
81	35	"	"			
82	36	"	- Plaster @ Entrance			
83	36	"	"			
84	36	"	"			
85	37	2	2nd Floor Hallway - Ceiling Tile - Mountains of Holes			
86	37	"	"			
87	38	"	- Craters of Holes			
88	38	"	"			
89	39	B	Supply Room - Black Flooring Material on Concrete			
90	39	"	"			
91	40		Exterior - Brick Mortar			

Special Instructions/ Turnaround Time:

Stop at 1st Positive per Homogenous Area **24hr TAT**
Fax Results to 845-278-7750
E-Mail results to AdelaideLabResults@Adelaidellc.com

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845-278-7750 - fax

#2190 1438

Site Address: Yonkers PS 16	Date: 12/7/18 12/17/18	Inspector(s) **David Seddon**
	Project #: SAMM 18436.00-IN	

Sample ID #	Homogeneous Area	Floor Level	Sample Location/Description	Quantity (In Feet)	Friable NonFriable	Condition g, d, sd
92	40	EXT	Exterior - Brick Mortar			G
93	41		- Concrete wall (Foundation)			
94	41		- " "			"
95	42		- Stone Mortar			D
96	42		- "			"
97	43		- Caulking @ Window			G
98	43		- "			
99	44		- Red Brick Mortar (Repair)			
100	44		- " "			
101	45		- Concrete Curb/sidewalk			
102	45		- " "			
103	46		- Asphalt Driveway/walkway			G
104	46	"	- " " "			

Special Instructions/ Turnaround Time:

Stop at 1st Positive per Homogenous Area **24hr TAT**
Fax Results to 845-278-7750
E-Mail results to AdelaideLabResults@Adelaidellc.com

Relinquished by:
Received by: 1/7/19 1125
Relinquished by:
Received by:

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Brewster, NY 10509
845-278-7710
845-278-7750 - fax

#2190 1438

Site Address: Yonkers PS16	Date: 12/7/18 12/17/18	Inspector(s) **David Seddon**
	Project #: SAMM 18436.W-TW	

Sample ID #	Homogeneous Area	Floor Level	Sample Location/Description	Quantity (In Feet)	Friable NonFriable	Condition g, d, sd
105	47	B	Classroom 10 - 2nd Layer - Under ½ Plywood			G
106	47	↓	↓ - ↓ - ↓			↓
107	48	↓	- 3rd Layer - Cloth Type Vapor Barrier			↓
108	48	↓	↓ - ↓			↓
109	49	↓	- 4th Layer - Tar			↓
110	49	↓	↓ - ↓			↓
111	50	↓	- Bottom Layer - Tar Paper Vapor Barrier			↓
112	50	↓	↓ - ↓ - ↓			↓
113	51	↓	Classroom 12 - 2nd Layer - Under ½ Plywood			↓
114	51	↓	↓ - ↓ - ↓			↓
115	52	LB	Gym - Bottom Layer under wood			↓
116	52	↓	↓ - ↓ - ↓			↓
117	53	B	Hallway - Plaster Wall - Top Coat			↓

Special Instructions/ Turnaround Time:

Stop at 1st Positive per Homogenous Area **24hr TAT**
Fax Results to 845-278-7750
E-Mail results to AdelaideLabResults@Adelaidellc.com

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Received by:
Relinquished by: 1/7/19 1125
Received by:

Adelaide Environmental Health Associates, Inc
1454 Rte. 22, Suite B202
Brewster, NY 10509
845-278-7710
845-278-7750 - fax

#2190 1438

Site Address: YONKERS PS16	Date: 12/7/18 12/17/18	Inspector(s) **David Seddon**
	Project #: SAMM 18436.00-TW	

Sample ID #	Homogeneous Area	Floor Level	Sample Location/Description	Quantity (In Feet)	Friable NonFriable	Condition g, d, sd
118	53	B	Hallway - Plaster Wall - Top Coat			G
119	53	1	" - "			"
120	53	1st	Classroom 22(CL) - "			"
121	53	1	Server Area - "			"
122	54	B	Hallway - Plaster Wall - Base Coat			"
123	54	1	" - "			"
124	54	1	" - "			"
125	54	1st	Classroom 22(CL) - "			"
126	54	1	Server Area - "			"
127	55	1	- Dry Wall			"
128	55	1	- "			"
129	56	1	- Joint Compound			"
130	56	1	- "			"

Special Instructions/ Turnaround Time:

Stop at 1st Positive per Homogenous Area
Fax Results to 845-278-7750
E-Mail results to AdelaideLabResults@Adelaidellc.com

24hr TAT

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Relinquished by:
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APPENDIX D

XRF READINGS

Aelaide Environmental Heath Associates Inc.
1511 Route 22, Suite C24
Brewster, New York 10509

Index	Time	Type	Project Number	Project Name	Space Type	Floor	Room	Component	Side	Color	Substrate	Paint Condition	PbC	PbL	PbK	Units	Results	Inspector
1	2018-12-07 17:34	Paint	18436.00	Yonkers PS16	School		Calibrate						0.80 +/- 0.20	0.80 +/- 0.20	< LOD: 2.10	mg / cm ^2	Negative	David Seddon
2	**2018-12-07 17:35**	**Paint**	**18436.00**	**Yonkers PS16**	**School**		**Calibrate**						**1.10 +/- 0.10**	**1.10 +/- 0.10**	**< LOD: 0.68**	**mg / cm ^2**	**Positive**	**David Seddon**
3	**2018-12-07 17:35**	**Paint**	**18436.00**	**Yonkers PS16**	**School**		**Calibrate**						**1.10 +/- 0.10**	**1.10 +/- 0.10**	**< LOD: 0.75**	**mg / cm ^2**	**Positive**	**David Seddon**
4	2018-12-07 17:36	Paint	18436.00	Yonkers PS16	School	Basement	Gym	Wall	A	Beige	Brick	Intact	< LOD: 0.03	< LOD: 0.03	< LOD: 2.66	mg / cm ^2	Negative	David Seddon
5	2018-12-07 17:37	Paint	18436.00	Yonkers PS16	School	Basement	Gym	Floor Bracket	A	Grey	Metal	Intact	< LOD: 0.45	< LOD: 0.45	< LOD: 4.50	mg / cm ^2	Negative	David Seddon
6	2018-12-07 17:37	Paint	18436.00	Yonkers PS16	School	Basement	Gym	Ceiling	A	White	Plaster	Intact	< LOD: 0.35	< LOD: 0.35	< LOD: 3.15	mg / cm ^2	Negative	David Seddon
7	2018-12-07 17:38	Paint	18436.00	Yonkers PS16	School	Basement	Gym	Ceiling	A	White	Plaster	Intact	< LOD: 0.21	< LOD: 0.21	< LOD: 1.20	mg / cm ^2	Negative	David Seddon
8	**2018-12-07 17:38**	**Paint**	**18436.00**	**Yonkers PS16**	**School**	**Basement**	**Gym**	**Ceiling**	**A**	**White**	**Plaster**	**Intact**	**1.60 +/- 0.60**	**0.60 +/- 0.20**	**1.60 +/- 0.60**	**mg / cm ^2**	**Positive**	**David Seddon**
9	2018-12-07 18:29	Paint	18436.00	Yonkers PS16	School	Basement	Clasrom 10	Ceiling	A	White	Plaster	Intact	< LOD: 0.03	< LOD: 0.03	< LOD: 2.52	mg / cm ^2	Negative	David Seddon
10	2018-12-07 18:29	Paint	18436.00	Yonkers PS16	School	Basement	Clasrom 10	Ceiling	A	White	Plaster	Intact	< LOD: 0.03	< LOD: 0.03	< LOD: 2.35	mg / cm ^2	Negative	David Seddon
11	2018-12-07 18:30	Paint	18436.00	Yonkers PS16	School	Basement	Clasrom 10	Wall Upper	A	White	Plaster	Intact	< LOD: 0.12	< LOD: 0.12	< LOD: 1.05	mg / cm ^2	Negative	David Seddon
12	2018-12-07 18:31	Paint	18436.00	Yonkers PS16	School	Basement	Clasrom 10	Wall Lower	A	Green	Plaster	Intact	< LOD: 1.00	0.30 +/- 0.18	< LOD: 1.00	mg / cm ^2	Negative	David Seddon
13	**2018-12-07 18:48**	**Paint**	**18436.00**	**Yonkers PS16**	**School**	**Basement**	**Clasrom 12**	**Wall Lower**	**A**	**Green**	**Concrete**	**Intact**	**1.90 +/- 0.90**	**1.90 +/- 0.90**	**< LOD: 2.85**	**mg / cm ^2**	**Positive**	**David Seddon**
14	2018-12-07 18:50	Paint	18436.00	Yonkers PS16	School	Basement	Clasrom 12	Wall Upper	A	White	Concrete	Intact	0.17 +/- 0.11	0.17 +/- 0.11	< LOD: 1.65	mg / cm ^2	Negative	David Seddon
15	**2018-12-07 18:50**	**Paint**	**18436.00**	**Yonkers PS16**	**School**	**Basement**	**Clasrom 12**	**Door-Interior**	**A**	**Green**	**Metal**	**Intact**	**2.50 +/- 1.40**	**2.50 +/- 1.40**	**< LOD: 3.60**	**mg / cm ^2**	**Positive**	**David Seddon**
16	2018-12-07 18:52	Paint	18436.00	Yonkers PS16	School	Basement	Clasrom 12	Ceiling	A	White	Plaster	Intact	< LOD: 0.03	< LOD: 0.03	< LOD: 1.04	mg / cm ^2	Negative	David Seddon
17	**2018-12-07 18:56**	**Paint**	**18436.00**	**Yonkers PS16**	**School**	**Basement**	**Storage**	**Floor**	**A**	**Grey**	**Concrete**	**Intact**	**1.30 +/- 0.30**	**1.30 +/- 0.30**	**< LOD: 1.80**	**mg / cm ^2**	**Positive**	**David Seddon**
18	2018-12-07 19:18	Paint	18436.00	Yonkers PS16	School	Basement	Classroom 14	Door-Interior	A	Green	Wood	Intact	< LOD: 0.21	< LOD: 0.21	< LOD: 2.14	mg / cm ^2	Negative	David Seddon
19	2018-12-07 19:18	Paint	18436.00	Yonkers PS16	School	Basement	Classroom 14	Wall Upper	A	White	Concrete	Intact	0.12 +/- 0.08	0.12 +/- 0.08	< LOD: 1.52	mg / cm ^2	Negative	David Seddon
20	2018-12-07 19:19	Paint	18436.00	Yonkers PS16	School	Basement	Classroom 14	Wall Lower	A	Green	Concrete	Intact	0.22 +/- 0.12	0.22 +/- 0.12	< LOD: 1.50	mg / cm ^2	Negative	David Seddon
21	2018-12-07 19:19	Paint	18436.00	Yonkers PS16	School	Basement	Classroom 14	Ceiling	A	White	Plaster	Intact	< LOD: 0.03	< LOD: 0.03	< LOD: 2.40	mg / cm ^2	Negative	David Seddon
22	2018-12-07 19:25	Paint	18436.00	Yonkers PS16	School	Basement	Classroom 15	Ceiling	A	White	Plaster	Intact	< LOD: 0.13	< LOD: 0.13	< LOD: 2.31	mg / cm ^2	Negative	David Seddon
23	2018-12-07 19:25	Paint	18436.00	Yonkers PS16	School	Basement	Classroom 15	Wall	A	Light Blue	Concrete	Intact	0.40 +/- 0.20	0.40 +/- 0.20	< LOD: 1.63	mg / cm ^2	Negative	David Seddon
24	**2018-12-07 19:43**	**Paint**	**18436.00**	**Yonkers PS16**	**School**	**Basement**	**Hallway**	**Wall**	**East**	**Light Blue**	**Plaster**	**Intact**	**< LOD: 6.60**	**< LOD: 4.80**	**< LOD: 6.60**	**mg / cm ^2**	**Positive**	**David Seddon**
25	2018-12-07 19:43	Paint	18436.00	Yonkers PS16	School	Basement	Hallway	Wall	East	Light Blue	Brick	Intact	< LOD: 0.23	< LOD: 0.23	< LOD: 2.65	mg / cm ^2	Negative	David Seddon
26	2018-12-07 19:44	Paint	18436.00	Yonkers PS16	School	Basement	Hallway	Wall	West	Light Blue	Concrete	Intact	< LOD: 1.41	< LOD: 0.29	< LOD: 1.41	mg / cm ^2	Negative	David Seddon
27	**2018-12-07 19:45**	**Paint**	**18436.00**	**Yonkers PS16**	**School**	**Basement**	**Hallway**	**Ceiling**	**Ceiling**	**White**	**Plaster**	**Peeling**	**< LOD: 6.30**	**< LOD: 7.65**	**< LOD: 6.30**	**mg / cm ^2**	**Positive**	**David Seddon**
28	2018-12-07 19:46	Paint	18436.00	Yonkers PS16	School	Basement	Hallway	Ceiling	Ceiling	White	Plaster	Intact	< LOD: 0.15	< LOD: 0.15	< LOD: 2.84	mg / cm ^2	Negative	David Seddon
29	**2018-12-07 20:15**	**Paint**	**18436.00**	**Yonkers PS16**	**School**		**Calibrate**						**1.10 +/- 0.10**	**1.10 +/- 0.10**	**< LOD: 0.75**	**mg / cm ^2**	**Positive**	**David Seddon**
30	**2018-12-07 20:16**	**Paint**	**18436.00**	**Yonkers PS16**	**School**		**Calibrate**						**1.10 +/- 0.10**	**1.10 +/- 0.10**	**< LOD: 0.60**	**mg / cm ^2**	**Positive**	**David Seddon**
31	**2018-12-07 20:17**	**Paint**	**18436.00**	**Yonkers PS16**	**School**		**Calibrate**						**1.00 +/- 0.10**	**1.00 +/- 0.10**	**0.80 +/- 0.30**	**mg / cm ^2**	**Positive**	**David Seddon**

Aelaide Environmental Heath Associates Inc.
1511 Route 22, Suite C24
Brewster, New York 10509

Index	Time	Type	Project Number	Project Name	Space Type	Floor	Room	Component	Side	Color	Substrate	Paint Condition	PbC	PbL	PbK	Units	Results	Inspector
1	**2018-12-17 15:58**	**Paint**	**18436.00**	**Yonkers PS16**	**School**		**Calibrate**						**1.10 +/- 0.10**	**1.10 +/- 0.10**	**< LOD: 0.75**	**mg / cm ^2**	**Positive**	**David Seddon**
2	**2018-12-17 15:59**	**Paint**	**18436.00**	**Yonkers PS16**	**School**		**Calibrate**						**1.00 +/- 0.10**	**1.00 +/- 0.10**	**0.90 +/- 0.30**	**mg / cm ^2**	**Positive**	**David Seddon**
3	**2018-12-17 16:00**	**Paint**	**18436.00**	**Yonkers PS16**	**School**		**Calibrate**						**1.10 +/- 0.10**	**1.10 +/- 0.10**	**< LOD: 0.75**	**mg / cm ^2**	**Positive**	**David Seddon**
4	**2018-12-17 16:03**	**Paint**	**18436.00**	**Yonkers PS16**	**School**	**East Elevation**	**South Enerance**	**Trim**	**A**	**Yellow**	**Wood**	**Intact**	**< LOD: 32.55**	**< LOD: 13.65**	**< LOD: 32.55**	**mg / cm ^2**	**Positive**	**David Seddon**
5	**2018-12-17 16:04**	**Paint**	**18436.00**	**Yonkers PS16**	**School**	**East Elevation**	**South Enerance**	**Rail**	**A**	**Brown**	**Metal**	**Poor**	**2.40 +/- 1.20**	**2.40 +/- 1.20**	**< LOD: 5.40**	**mg / cm ^2**	**Positive**	**David Seddon**
6	2018-12-17 16:12	Paint	18436.00	Yonkers PS16	School	East Elevation	Exterior	Wall	A	Red	Brick	Poor	< LOD: 0.03	< LOD: 0.03	< LOD: 2.47	mg / cm ^2	Negative	David Seddon
7	2018-12-17 16:12	Paint	18436.00	Yonkers PS16	School	East Elevation	Exterior	Vent Grate	A	Red	Metal	Poor	< LOD: 0.03	< LOD: 0.03	< LOD: 3.64	mg / cm ^2	Negative	David Seddon
8	**2018-12-17 16:30**	**Paint**	**18436.00**	**Yonkers PS16**	**School**	**2nd Floor**	**Hallway**	**Ceiling**	**Ceiling**	**White**	**Plaster**	**Intact**	**< LOD: 6.15**	**< LOD: 3.15**	**< LOD: 6.15**	**mg / cm ^2**	**Positive**	**David Seddon**
9	**2018-12-17 16:58**	**Paint**	**18436.00**	**Yonkers PS16**	**School**	**1st Floor**	**Classroom 22 Closet**	**Wall**	**A**	**Mint**	**Plaster**	**Intact**	**< LOD: 8.70**	**< LOD: 8.70**	**< LOD: 9.60**	**mg / cm ^2**	**Positive**	**David Seddon**
10	2018-12-17 16:59	Paint	18436.00	Yonkers PS16	School	1st Floor	Classroom 22 Closet	Wall Lower	B	Mint	Wood	Intact	< LOD: 0.16	< LOD: 0.16	< LOD: 2.52	mg / cm ^2	Negative	David Seddon
11	2018-12-17 17:00	Paint	18436.00	Yonkers PS16	School	1st Floor	Classroom 22 Closet	Wall Upper	B	Mint	Plaster	Intact	< LOD: 0.03	< LOD: 0.03	< LOD: 1.39	mg / cm ^2	Negative	David Seddon
12	**2018-12-17 17:04**	**Paint**	**18436.00**	**Yonkers PS16**	**School**	**1st Floor**	**Hallway**	**Wall Upper**	**B**	**Cream**	**Plaster**	**Intact**	**< LOD: 4.65**	**< LOD: 1.16**	**< LOD: 4.65**	**mg / cm ^2**	**Positive**	**David Seddon**
13	**2018-12-17 17:04**	**Paint**	**18436.00**	**Yonkers PS16**	**School**	**1st Floor**	**Hallway**	**Wall Upper**	**B**	**Brown**	**Plaster**	**Intact**	**< LOD: 3.45**	**< LOD: 0.17**	**< LOD: 3.45**	**mg / cm ^2**	**Positive**	**David Seddon**
14	2018-12-17 17:04	Paint	18436.00	Yonkers PS16	School	1st Floor	Hallway	Wall Lower	B	Beige	Plaster	Intact	< LOD: 0.15	< LOD: 0.15	< LOD: 1.35	mg / cm ^2	Negative	David Seddon
15	2018-12-17 17:05	Paint	18436.00	Yonkers PS16	School	1st Floor	Hallway	Wall Lower	A	Beige	Plaster	Intact	< LOD: 0.10	< LOD: 0.10	< LOD: 2.71	mg / cm ^2	Negative	David Seddon
16	2018-12-17 17:06	Paint	18436.00	Yonkers PS16	School	1st Floor	Server Room	Wall Lower	A	Beige	Wood	Intact	< LOD: 0.17	< LOD: 0.17	< LOD: 2.20	mg / cm ^2	Negative	David Seddon
17	**2018-12-17 17:07**	**Paint**	**18436.00**	**Yonkers PS16**	**School**	**1st Floor**	**Server Room**	**Wall Upper**	**A**	**Beige**	**Plaster**	**Intact**	**3.70 +/- 2.00**	**3.70 +/- 2.00**	**< LOD: 5.70**	**mg / cm ^2**	**Positive**	**David Seddon**
18	**2018-12-17 18:26**	**Paint**	**18436.00**	**Yonkers PS16**	**School**		**Calibrate**						**1.00 +/- 0.10**	**1.00 +/- 0.10**	**1.00 +/- 0.30**	**mg / cm ^2**	**Positive**	**David Seddon**
19	**2018-12-17 18:27**	**Paint**	**18436.00**	**Yonkers PS16**	**School**		**Calibrate**						**1.00 +/- 0.10**	**1.00 +/- 0.10**	**1.00 +/- 0.30**	**mg / cm ^2**	**Positive**	**David Seddon**
20	**2018-12-17 18:28**	**Paint**	**18436.00**	**Yonkers PS16**	**School**		**Calibrate**						**1.10 +/- 0.10**	**1.10 +/- 0.10**	**1.00 +/- 0.40**	**mg / cm ^2**	**Positive**	**David Seddon**

APPENDIX E

PERSONNEL AND LABORATORY CERTIFICATIONS

New York State – Department of Labor
Division of Safety and Health
License and Certificate Unit
State Campus, Building 12
Albany, NY 12240

ASBESTOS HANDLING LICENSE

Adelaide Environmental Health Associates, Inc.
Suite C24
1511 Route 22

Brewster, NY 10509

FILE NUMBER: 99-0656
LICENSE NUMBER: 29305
LICENSE CLASS: RESTRICTED
DATE OF ISSUE: 07/03/2018
EXPIRATION DATE: 07/31/2019

Duly Authorized Representative – John Soter:

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

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

Eileen M. Franko, Director
For the Commissioner of Labor

SH 432 (8/12)

United States Environmental Protection Agency

This is to certify that

Adelaide Environmental Health Associates, Inc

has fulfilled the requirements of the Toxic Substances Control Act (TSCA) Section 402, and has received certification to conduct lead-based paint renovation, repair, and painting activities pursuant to 40 CFR Part 745.89

In the Jurisdiction of:

All EPA Administered States, Tribes, and Territories

This certification is valid from the date of issuance and expires December 05, 2022

NAT-15081-2

Certification #

June 21, 2017

Issued On

Michelle Price, Chief

Lead, Heavy Metals, and Inorganics Branch

STATE OF NEW YORK - DEPARTMENT OF LABOR
ASBESTOS CERTIFICATE

N.Y.S

DAVID SEDDON
CLASS(EXPIRES)
C ATEC(12/19) D INSP(12/19)
E MGPL(12/19) H PM (12/19)

CERT# 09-08546
DMV# 879533539

MUST BE CARRIED ON ASBESTOS PROJECTS

01213 004874201 90

EYES BRO
HAIR BRO
HGT 5' 10"

IF FOUND RETURN TO:
NYSDOL - L&C UNIT
ROOM 161A BUILDING 12
STATE OFFICE CAMPUS
ALBANY NY 12240

United States Environmental Protection Agency

This is to certify that

David W Seddon

has fulfilled the requirements of the Toxic Substances Control Act (TSCA) Section 402, and has received certification to conduct lead-based paint activities pursuant to 40 CFR Part 745.226 as:

Inspector

In the Jurisdiction of:

All EPA Administered Lead-based Paint Activities Program States, Tribes and Territories

This certification is valid from the date of issuance and expires September 19, 2020

LBP-I-101120-1

Certification #

July 05, 2017

Issued On

John Gorman, Chief

Pesticides & Toxic Substances Branch

NEW YORK STATE DEPARTMENT OF HEALTH
WADSWORTH CENTER

Expires 12:01 AM April 01, 2019
Issued April 01, 2018

CERTIFICATE OF APPROVAL FOR LABORATORY SERVICE

Issued in accordance with and pursuant to section 502 Public Health Law of New York State

MR. PAUL J. MUCHA
AMERICA SCIENCE TEAM NEW YORK, INC
117 EAST 30TH ST
NEW YORK, NY 10016

NY Lab Id No: 11480

is hereby APPROVED as an Environmental Laboratory for the category
ENVIRONMENTAL ANALYSES SOLID AND HAZARDOUS WASTE
All approved subcategories and/or analytes are listed below:

Miscellaneous

Asbestos in Friable Material	Item 198.1 of Manual
	EPA 600/M4/82/020
Asbestos in Non-Friable Material-PLM	Item 198.6 of Manual (NOB by PLM)
Asbestos in Non-Friable Material-TEM	Item 198.4 of Manual

Serial No.: 57809

Appendix 'B'

Project Designer Certification

STATE OF NEW YORK - DEPARTMENT OF LABOR
ASBESTOS CERTIFICATE

N.Y.S

PAUL R CHECCO
CLASS(EXPIRES)
I PD (09/20)

CERT# 04-01754
DMV# 748856015

MUST BE CARRIED ON ASBESTOS PROJECTS

01213 005129938 64

EYES GRN
HAIR BRO
HGT 5' 07"

IF FOUND RETURN TO:
NYSDOL - L&C UNIT
ROOM 161A BUILDING 12
STATE OFFICE CAMPUS
ALBANY NY 12240

SECTION 03 30 00 – CAST IN PLACE CONCRETE

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

A. Drawings and Division 01 General Requirements apply to this section.

1.2 SUMMARY

A. This Section includes exterior cement concrete pavement the following:
   1. Curbs.
   2. Walkways.
   3. Slabs-on-grade.
   4. Watermain concrete encasement.

B. Related Sections include other Division 2 Sections.

1.3 DEFINITIONS

A. Cementitious Materials: Portland cement alone or in combination with one or more of blended hydraulic cement, fly ash and other pozzolans, and ground granulated blast-furnace slag.

1.4 SUBMITTALS

A. Product Data: For each type of manufactured material and product indicated.

B. Design Mixtures: For each concrete pavement mixture. Include alternate mixture designs when characteristics of materials, Project conditions, weather, test results, or other circumstances warrant adjustments.

C. Material Certificates: Signed by manufacturers certifying that each of the following materials complies with requirements:

   1. Cementitious materials.
   2. Steel reinforcement and reinforcement accessories.
   3. Fiber reinforcement.
   4. Admixtures.
   5. Curing compounds.
   6. Applied finish materials.
   7. Bonding agent or epoxy adhesive.
   8. Joint fillers.
   9. Detectable warning strips.

D. Field quality-control test reports.

1.5 QUALITY ASSURANCE

A. Manufacturer Qualifications: Manufacturer of ready-mixed concrete products who complies with ASTM C 94/C 94M requirements for production facilities and equipment.

1. Manufacturer certified according to NRMCA's "Certification of Ready Mixed Concrete Production Facilities."

B. Testing Agency Qualifications: An independent agency qualified according to ASTM C 1077 and ASTM E 329 for testing indicated, as documented according to ASTM E 548.

1. Personnel conducting field tests shall be qualified as ACI Concrete Field Testing Technician, Grade 1, according to ACI CP-01 or an equivalent certification program.

C. ACI Publications: Comply with ACI 301, "Specification for Structural Concrete," unless modified by requirements in the Contract Documents.

D. Concrete Testing Service: Engage a qualified independent testing agency to perform material evaluation tests and to design concrete mixtures.

1.6 PROJECT CONDITIONS

A. Traffic Control: Maintain access for vehicular and pedestrian traffic as required for other construction activities.

PART 2 - PRODUCTS

2.1 MANUFACTURERS

A. In other Part 2 articles where titles below introduce lists, the following requirements apply to product selection:

1. Available Products: Subject to compliance with requirements, products that may be incorporated into the Work include, but are not limited to, products specified.

2. Available Manufacturers: Subject to compliance with requirements, manufacturers offering products that may be incorporated into the Work include, but are not limited to, manufacturers specified.

2.2 FORMS

A. Form Materials: Plywood, metal, metal-framed plywood, or other approved panel-type materials to provide full-depth, continuous, straight, smooth exposed surfaces.

1. Use flexible or curved forms for curves with a radius 100 feet (30.5 m) or less.

B. Form-Release Agent: Commercially formulated form-release agent that will not bond with, stain, or adversely affect concrete surfaces and will not impair subsequent treatments of concrete surfaces.

2.3 STEEL REINFORCEMENT

A. Plain-Steel Welded Wire Reinforcement: ASTM A 185, fabricated from as-drawn steel wire into flat sheets.

B. Reinforcing Bars: ASTM A 615/A 615M, Grade 60; deformed.

C. Hook Bolts: ASTM A 307, Grade A (ASTM F 568M, Property Class 4.6), internally and externally threaded. Design hook-bolt joint assembly to hold coupling against pavement form and in position during concreting operations, and to permit removal without damage to concrete or hook bolt.

D. Bar Supports: Bolsters, chairs, spacers, and other devices for spacing, supporting, and fastening reinforcing bars, welded wire reinforcement, and dowels in place. Manufacture bar supports according to CRSI's "Manual of Standard Practice" from steel wire, plastic, or precast concrete of greater compressive strength than concrete, and as follows:

1. Equip wire bar supports with sand plates or horizontal runners where base material will not support chair legs.

2.4 CONCRETE MATERIALS

A. Cementitious Material: Use the following cementitious materials, of the same type, brand, and source throughout the Project:

1. Portland Cement: ASTM C 150, Type I or II gray.

B. Normal-Weight Aggregates: ASTM C 33, Class [4S] [4M] coarse aggregate, uniformly graded. Provide aggregates from a single source with documented service record data of at least 10 years' satisfactory service in similar pavement applications and service conditions using similar aggregates and cementitious materials.

1. Maximum Coarse-Aggregate Size: 1 inch (25 mm) nominal.
2. Fine Aggregate: Free of materials with deleterious reactivity to alkali in cement.

C. Water: ASTM C 94/C 94M.

D. Air-Entraining Admixture: ASTM C 260.

E. Chemical Admixtures: Provide admixtures certified by manufacturer to be compatible with other admixtures and to contain not more than 0.1 percent water-soluble chloride ions by mass of cementitious material.

1. Water-Reducing Admixture: ASTM C 494/C 494M, Type A.

2. Retarding Admixture: ASTM C 494/C 494M, Type B.

2.5 CURING MATERIALS

A. Absorptive Cover: AASHTO M 182, Class 2, burlap cloth made from jute or kenaf, weighing approximately 9 oz./sq. yd. (305 g/sq. m) dry.

B. Moisture-Retaining Cover: ASTM C 171, polyethylene film or white burlap-polyethylene sheet.

C. Water: Potable.

D. Evaporation Retarder: Waterborne, monomolecular film forming; manufactured for application to fresh concrete.

1. Available Products:

a. Axim Concrete Technologies; Cimfilm.
b. Burke by Edeco; BurkeFilm.
c. ChemMasters; Spray-Film.
d. Conspec Marketing & Manufacturing Co., Inc.; Aquafilm.
e. Dayton Superior Corporation; Sure Film.
f. Euclid Chemical Company (The); Eucobar.
g. Kaufman Products, Inc.; Vapor Aid.
h. Lambert Corporation; Lambco Skin.
i. L&M Construction Chemicals, Inc.; E-Con.
j. MBT Protection and Repair, ChemRex Inc.; Confilm.
k. Meadows, W. R., Inc.; Sealtight Evapre.
l. Metalcrete Industries; Waterhold.
m. Nox-Crete Products Group, Kinsman Corporation; Monofilm.
n. Sika Corporation, Inc.; SikaFilm.
o. Symons Corporation; Finishing Aid.
p. Vexcon Chemicals, Inc.; Certi-Vex EnvioAssist.

E. Clear Waterborne Membrane-Forming Curing Compound: ASTM C 309, Type 1, Class B.

1. Available Products:

a. Anti-Hydro International, Inc.; AH Curing Compound #2 DR WB.
b. Burke by Edoko; Aqua Resin Cure.
c. ChemMasters; Safe-Cure Clear.
d. Conspec Marketing & Manufacturing Co., Inc.; W.B. Resin Cure.
e. Dayton Superior Corporation; Day Chem Rez Cure (J-11-W).
f. Euclid Chemical Company (The); Kurez DR VOX.
g. Kaufman Products, Inc.; Thinfilm 420.
h. Lambert Corporation; Aqua Kure-Clear.
i. L&M Construction Chemicals, Inc.; L&M Cure R.
j. Meadows, W. R., Inc.; 1100 Clear.
k. Nox-Crete Products Group, Kinsman Corporation; Resin Cure E.

l. Symons Corporation; Resi-Chem Clear.
m. Tamms Industries Inc.; Horncure WB 30.
n. Unitex; Hydro Cure 309.
o. Vexcon Chemicals, Inc.; Certi-Vex Enviocure 100.
p. Tamms Industries, Inc.; Horncure 200-W.
q. Unitex; Hydro White.
r. Vexcon Chemicals, Inc.; Certi-Vex Enviocure White 100.

2.6 RELATED MATERIALS

A. Expansion- and Isolation-Joint-Filler Strips: ASTM D 1751, asphalt-saturated cellulosic fiber.

B. Bonding Agent: ASTM C 1059, Type II, non-redispersible, acrylic emulsion or styrene butadiene.

C. Epoxy Bonding Adhesive: ASTM C 881, two-component epoxy resin, capable of humid curing and bonding to damp surfaces, of class suitable for application temperature and of grade to requirements, and as follows:

1. Types IV and V, load bearing, for bonding hardened or freshly mixed concrete to hardened concrete.

2.7 CONCRETE MIXTURES

A. Prepare design mixtures, proportioned according to ACI 301, for each type and strength of normal-weight concrete determined by either laboratory trial mixes or field experience.

1. Use a qualified independent testing agency for preparing and reporting proposed concrete mixture designs for the trial batch method.

B. Proportion mixtures to provide normal-weight concrete with the following properties:

1. Compressive Strength (28 Days): 4,000 psi (20.7 MPa).
2. Maximum Water-Cementitious Materials Ratio at Point of Placement: 0.45
3. Slump Limit: 4” (100 mm) plus or minus 1 inch (25 mm).

C. Add air-entraining admixture at manufacturer's prescribed rate to result in normal-weight concrete at point of placement having an air content as follows:

1. Air Content: 6 percent plus or minus 1.5 percent for 3/4-inch (19-mm) nominal maximum aggregate size.

D. Limit water-soluble, chloride-ion content in hardened concrete to 0.15 percent by weight of cement.

E. Chemical Admixtures: Use admixtures according to manufacturer's written instructions.

1. Use plasticizing and retarding admixture in concrete, as required, for placement and workability.
2. Use water-reducing and retarding admixture when required by high temperatures, low humidity, or other adverse placement conditions.

2.8 CONCRETE MIXING

A. Ready-Mixed Concrete: Measure, batch, and mix concrete materials and concrete according to ASTM C 94/C 94M and ASTM C 1116. Furnish batch certificates for each batch discharged and used in the Work.

1. When air temperature is between 85 deg F (30 deg C) and 90 deg F (32 deg C), reduce mixing and delivery time from 1-1/2 hours to 75 minutes; when air temperature is above 90 deg F (32 deg C), reduce mixing and delivery time to 60 minutes.

B. Project-Site Mixing: Measure, batch, and mix concrete materials and concrete according to ASTM C 94/C 94M. Mix concrete materials in appropriate drum-type batch machine mixer.

1. For concrete mixes of 1 cu. yd. (0.76 cu. m) or smaller, continue mixing at least 1-1/2 minutes, but not more than 5 minutes after ingredients are in mixer, before any part of batch is released.
2. For concrete mixes larger than 1 cu. yd. (0.76 cu. m), increase mixing time by 15 seconds for each additional 1 cu. yd. (0.76 cu. m).
3. Provide batch ticket for each batch discharged and used in the Work, indicating Project identification name and number, date, mixture type, mixing time, quantity, and amount of water added.

PART 3 - EXECUTION

3.1 EXAMINATION

A. Examine exposed subgrades and subbase surfaces for compliance with requirements for dimensional, grading, and elevation tolerances.

B. Proof-roll prepared subbase surface below concrete pavements with heavy pneumatic-tired equipment to identify soft pockets and areas of excess yielding.

1. Completely proof-roll subbase in one direction and repeat in perpendicular direction. Limit vehicle speed to 3 mph (5 km/h).
2. Subbase with soft spots and areas of pumping or rutting exceeding depth of 1/2 inch (13 mm) require correction according to requirements in Section 31 20 00 "Earth Moving."

C. Proceed with concrete pavement operations only after nonconforming conditions have been corrected and subgrade is ready to receive pavement.

3.2 PREPARATION

A. Remove loose material from compacted subbase surface immediately before placing concrete.

3.3 EDGE FORMS AND SCREED CONSTRUCTION

A. Set, brace, and secure edge forms, bulkheads, and intermediate screed guides for pavement to required lines, grades, and elevations. Install forms to allow continuous progress of work and so forms can remain in place at least 24 hours after concrete placement.

B. Clean forms after each use and coat with form-release agent to ensure separation from concrete without damage.

3.4 STEEL REINFORCEMENT

A. General: Comply with CRSI's "Manual of Standard Practice" for fabricating, placing, and supporting reinforcement.

B. Clean reinforcement of loose rust and mill scale, earth, ice, or other bond-reducing materials.

C. Arrange, space, and securely tie bars and bar supports to hold reinforcement in position during concrete placement. Maintain minimum cover to reinforcement.

D. Install welded wire reinforcement in lengths as long as practicable. Lap adjoining pieces at least one full mesh, and lace splices with wire. Offset laps of adjoining widths to prevent continuous laps in either direction.

E. Install fabricated bar mats in lengths as long as practicable. Handle units to keep them flat and free of distortions. Straighten bends, kinks, and other irregularities, or replace units as required before placement. Set mats for a minimum 2-inch (50-mm) overlap of adjacent mats.

3.5 JOINTS

A. General: Form construction, isolation, and contraction joints and tool edgings true to line with faces perpendicular to surface plane of concrete. Construct transverse joints at right angles to centerline, unless otherwise indicated.

1. When joining existing pavement, place transverse joints to align with previously placed joints, unless otherwise indicated.

B. Construction Joints: Set construction joints at side and end terminations of pavement and at locations where pavement operations are stopped for more than one-half hour unless pavement terminates at isolation joints.

1. Continue steel reinforcement across construction joints, unless otherwise indicated. Do not continue reinforcement through sides of pavement strips, unless otherwise indicated.
2. Provide tie bars at sides of pavement strips where indicated.
3. Butt Joints: Use bonding agent at joint locations where fresh concrete is placed against hardened or partially hardened concrete surfaces.
4. Keyed Joints: Provide preformed keyway-section forms or bulkhead forms with keys, unless otherwise indicated. Embed keys at least 1-1/2 inches (38 mm) into concrete.
5. Doweled Joints: Install dowel bars and support assemblies at joints where indicated. Lubricate or asphalt-coat one-half of dowel length to prevent concrete bonding to one side of joint.

C. Isolation Joints: Form isolation joints of preformed joint-filler strips abutting concrete curbs, catch basins, manholes, inlets, structures, walks, other fixed objects, and where indicated.

1. Locate expansion joints at intervals of 30 feet, unless otherwise indicated.
2. Extend joint fillers full width and depth of joint.
3. Terminate joint filler not less than 1/2 inch (13 mm) or more than 1 inch (25 mm) below finished surface if joint sealant is indicated.
4. Place top of joint filler flush with finished concrete surface if joint sealant is not indicated.
5. Furnish joint fillers in one-piece lengths. Where more than one length is required, lace or clip joint-filler sections together.
6. Protect top edge of joint filler during concrete placement with metal, plastic, or other temporary preformed cap. Remove protective cap after concrete has been placed on both sides of joint.

D. Contraction Joints: Form weakened-plane contraction joints, sectioning concrete into areas as indicated. Construct contraction joints for a depth equal to at least one-fourth of the concrete thickness, as follows:

1. Grooved Joints: Form contraction joints after initial floating by grooving and finishing each edge of joint with grooving tool to a 1/4-inch (6-mm) radius. Repeat grooving of contraction joints after applying surface finishes. Eliminate groover marks on concrete surfaces.
2. Sawed Joints: Form contraction joints with power saws equipped with shatterproof abrasive or diamond-rimmed blades. Cut 1/8-inch- (3-mm-) wide joints into concrete when cutting action will not tear, abrade, or otherwise damage surface and before developing random contraction cracks.

E. Edging: Tool edges of pavement, gutters, curbs, and joints in concrete after initial floating with an edging tool to a 1/4-inch (6-mm) radius. Repeat tooling of edges after applying surface finishes. Eliminate tool marks on concrete surfaces.

3.6 CONCRETE PLACEMENT

A. Inspection: Before placing concrete, inspect and complete formwork installation, steel reinforcement, and items to be embedded or cast in. Notify other trades to permit installation of their work.

B. Remove snow, ice, or frost from subbase surface and reinforcement before placing concrete. Do not place concrete on frozen surfaces.

C. Moisten subbase to provide a uniform dampened condition at time concrete is placed. Do not place concrete around manholes or other structures until they are at required finish elevation and alignment.

D. Comply with ACI 301 requirements for measuring, mixing, transporting, and placing concrete.

E. Do not add water to concrete during delivery or at Project site.

F. Do not add water to fresh concrete after testing.

G. Deposit and spread concrete in a continuous operation between transverse joints. Do not push or drag concrete into place or use vibrators to move concrete into place.

H. Consolidate concrete according to ACI 301 by mechanical vibrating equipment supplemented by hand spading, rodding, or tamping.

1. Consolidate concrete along face of forms and adjacent to transverse joints with an internal vibrator. Keep vibrator away from joint assemblies, reinforcement, or side forms. Use only square-faced shovels for hand spreading and consolidation. Consolidate with care to prevent dislocating reinforcement, dowels, and joint devices.

I. Place concrete in two operations; strike off initial pour for entire width of placement and to the required depth below finish surface. Lay welded wire fabric or fabricated bar mats immediately in final position. Place top layer of concrete, strike off, and screed.

1. Remove and replace concrete that has been placed for more than 15 minutes without being covered by top layer, or use bonding agent if approved by Engineer.

J. Screed pavement surfaces with a straightedge and strike off.

K. Commence initial floating using bull floats or darbies to impart an open textured and uniform surface plane before excess moisture or bleed water appears on the surface. Do not further disturb concrete surfaces before beginning finishing operations or spreading surface treatments.

L. Curbs and Gutters: When automatic machine placement is used for curb and gutter placement, submit revised mix design and laboratory test results that meet or exceed requirements. Produce curbs and gutters to required cross section, lines, grades, finish, and jointing as specified for formed concrete. If results are not approved, remove and replace with formed concrete.

M. Slip-Form Pavers: When automatic machine placement is used for pavement, submit revised mix design and laboratory test results that meet or exceed requirements. Produce pavement to required thickness, lines, grades, finish, and jointing as required for formed pavement.

1. Compact subbase and prepare subgrade of sufficient width to prevent displacement of paver machine during operations.

N. When adjoining pavement sections are placed in separate pours, do not operate equipment on concrete until pavement has attained 85 percent of its 28-day compressive strength.

O. 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 air temperature has fallen to or is expected to fall below 40 deg F (4.4 deg C), uniformly heat water and aggregates before mixing to obtain a concrete mixture temperature of not less than 50 deg F (10 deg C) and not more than 80 deg F (27 deg C) at point of placement.
2. Do not use frozen materials or materials containing ice or snow.
3. Do not use calcium chloride, salt, or other materials containing antifreeze agents or chemical accelerators unless otherwise specified and approved in mix designs.

P. Hot-Weather Placement: Comply with ACI 301 and as follows when hot-weather conditions exist:

1. Cool ingredients before mixing to maintain concrete temperature below 90 deg F (32 deg C) 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. Cover steel reinforcement with water-soaked burlap so steel temperature will not exceed ambient air temperature immediately before embedding in concrete.
3. Fog-spray forms, steel reinforcement, and subgrade just before placing concrete. Keep subgrade moisture uniform without standing water, soft spots, or dry areas.

3.7 FLOAT FINISHING

A. General: Do not add water to concrete surfaces during finishing operations.

B. Float Finish: Begin the second floating operation when bleed-water sheen has disappeared and concrete surface has stiffened sufficiently to permit operations. Float surface with power-driven floats, or by hand floating if area is small or inaccessible to power units. Finish surfaces to true planes. Cut down high spots and fill low spots. Refloat surface immediately to uniform granular texture.

1. Burlap Finish: Drag a seamless strip of damp burlap across float-finished concrete, perpendicular to line of traffic, to provide a uniform, gritty texture.

2. Medium-to-Fine-Textured Broom Finish: Draw a soft bristle broom across float-finished concrete surface perpendicular to line of traffic to provide a uniform, fine-line texture.

3.8 CONCRETE PROTECTION AND CURING

A. General: Protect freshly placed concrete from premature drying and excessive cold or hot temperatures.

B. Comply with ACI 306.1 for cold-weather protection.

C. 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 (1 kg/sq. m 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.

D. Begin curing after finishing concrete but not before free water has disappeared from concrete surface.

E. Curing Methods: Cure concrete by moisture curing, moisture-retaining-cover curing, curing compound, or a combination of these as follows:

1. Moist 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 (300-mm) 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 (300 mm), and sealed by waterproof tape or adhesive. 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 PAVEMENT TOLERANCES

A. Comply with tolerances of ACI 117 and as follows:

1. Elevation: 1/4 inch (6 mm).
2. Thickness: Plus 3/8 inch (10 mm), minus 1/4 inch (6 mm).
3. Surface: Gap below 10-foot- (3-m-) long, unleveled straightedge not to exceed 1/4 inch (6 mm).
4. Lateral Alignment and Spacing of Tie Bars and Dowels: 1 inch (25 mm).

5. Vertical Alignment of Tie Bars and Dowels: 1/4 inch (6 mm).
6. Alignment of Tie-Bar End Relative to Line Perpendicular to Pavement Edge: 1/2 inch (13 mm).
7. Alignment of Dowel-Bar End Relative to Line Perpendicular to Pavement Edge: Length of dowel 1/4 inch per 12 inches (6 mm per 300 mm).
8. Joint Spacing: 3 inches (75 mm).
9. Contraction Joint Depth: Plus 1/4 inch (6 mm), no minus.
10. Joint Width: Plus 1/8 inch (3 mm), no minus.

3.10 FIELD QUALITY CONTROL

A. Testing Agency: Engage a qualified independent testing and inspecting agency to perform field tests and inspections and prepare test reports at contractor's expense.

B. Testing Services: 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 at least 1 composite sample for each 100 cu. yd. (76 cu. m) or fraction thereof of each concrete mix placed each day.

    a. When frequency of testing will provide 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/C 143M; one test at point of placement for each composite sample, but not less than one test for each day's pour of each concrete mix. Perform additional tests when concrete consistency appears to change.
3. Air Content: ASTM C 231, pressure method; one test for each composite sample, but not less than one test for each day's pour of each concrete mix.
4. Concrete Temperature: ASTM C 1064; one test hourly when air temperature is 40 deg F (4.4 deg C) and below and when 80 deg F (27 deg C) and above, and one test for each composite sample.
5. Compression Test Specimens: ASTM C 31/C 31M; cast and laboratory cure one set of three standard cylinder specimens for each composite sample.
6. Compressive-Strength Tests: ASTM C 39/C 39M; test 1 specimen at 7 days and 2 specimens at 28 days.

    a. A compressive-strength test shall be the average compressive strength from 2 specimens obtained from same composite sample and tested at 28 days.

C. Strength of each concrete mix will be satisfactory if average of any 3 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 (3.4 MPa).

D. Test results shall be reported in writing to 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.

E. 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.

F. 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.

G. Remove and replace concrete pavement where test results indicate that it does not comply with specified requirements.

H. Additional testing and inspecting, at Contractor's expense, will be performed to determine compliance of replaced or additional work with specified requirements.

3.11 REPAIRS AND PROTECTION

A. Remove and replace concrete pavement that is broken, damaged, or defective or that does not comply with requirements in this Section.

B. Drill test cores, where directed by Engineer, when necessary to determine magnitude of cracks or defective areas. Fill drilled core holes in satisfactory pavement areas with portland cement concrete bonded to pavement with epoxy adhesive.

C. Protect concrete from damage. Exclude traffic from pavement for at least 14 days after placement. When construction traffic is permitted, maintain pavement as clean as possible by removing surface stains and spillage of materials as they occur.

D. Maintain concrete pavement free of stains, discoloration, dirt, and other foreign material. Sweep concrete pavement not more than two days before date scheduled for Substantial Completion inspections.

END OF SECTION 03 30 00

SECTION 04 0100
MAINTENANCE OF MASONRY

PART 1 GENERAL

1.01 SECTION INCLUDES

A. Water cleaning of brick masonry surfaces.

B. Replacement of brick and cast stone units.

C. Repointing mortar joints.

D. Repair of damaged masonry.

E. Application of sealants to close and waterproof joints.

1.02 RELATED REQUIREMENTS

A. Section 04 0511 - Mortar and Masonry Grout.

B. Section 04 2000 - Unit Masonry: Brick masonry units.

1.03 REFERENCE STANDARDS

A. TMS 402/602 - Building Code Requirements and Specification for Masonry Structures 2016.

1.04 ADMINISTRATIVE REQUIREMENTS

A. Preinstallation Meeting: Convene one week prior to commencing work of this section.
   1. Require attendance of parties directly affecting work of this section.
   2. No work shall proceed until mock up has been approved by the Architect.

1.05 SUBMITTALS

A. See Section 01 3000 - Administrative Requirements, for submittal procedures.

B. Shop Drawings: Indicate setting details of stone. Detail shoring.

C. Product Data: Provide data on sealants and mortars, cleaning compounds, and sealants and mortars.

D. Provide Manufacturers Safety Data Sheets (MSDS) for all products submitted.

E. Samples: Submit four samples of face brick, cast stone, and cast stone units to illustrate matching color, texture and extremes of color range.

F. Mock Up - Provide 8'x 8' area to demonstrate results of cleaning, repointing, mortar match, cast stone color match, brick match, and sealant match. Approved mock up will demonstrate approved level and quality of work required for entire project.

G. Manufacturer's Instructions: For cleaning materials, indicate special procedures, conditions requiring special attention, and [_____].

H. Certification of Specfication Compliance.

1.06 QUALITY ASSURANCE

A. Comply with provisions of TMS 402/602, except where exceeded by requirements of the contract documents.
   1. Maintain one copy of each document on project site.

B. Restorer: Company specializing in masonry restoration with minimum five years of documented experience.
   1. The contractor shall submit a list of completed projects comparable to the project being bid for, along with the names and addresses of the specific buildings and the Owners, Managers or Architects involved in those projects.

1.07 WARRANTY

A. This Contractor shall, and hereby does warrant; and the General Contractor shall, and hereby does guarantee, that caulking and sealing work will be free from defects of materials and workmanship for two (2) years from the date of final acceptance of this work. The following types of failure will be adjudged dective work; leakage, hardening, chalking, crumbling, melting, chrinking, or running of caulking, or staining of adjacent work by

caulking.

B. Waterproofing execution shall be doen under the supervised control of the manufacturer or his authorized representative so aas to permit the issuance of a ten (10) year written warranty covering labor and material.

C. Repair and replace work which becomes defective during the guarantee term, without cost to the owner.

1.08 MOCK-UP

A. Restore and repoint an existing masonry wall area sized 8 feet long by 8 feet high; include in mock-up area instances of mortar.

B. Clean a 10 ft by 10 ft panel of wall to determine extent of cleaning.

C. Locate where directed.

D. Acceptable panel and procedures employed will become the standard for work of this section.

E. Mock-up may remain as part of the Work.

F. Work can not proceed, and no materials ordered, until the mock up has been approved by the architect.

1.09 DELIVERY, STORAGE, AND HANDLING

A. Deliver masonry neatly stacked and tied on pallets. Store clear of ground with adequate waterproof covering.

1.10 FIELD CONDITIONS

A. No work shall be done if the air temperature is below 40 degrees F.

B. Maintain materials and surrounding air temperature to minimum 40 degrees F prior to, during, and 48 hours after completion of masonry work.

C. Maintain materials and surrounding air temperature to maximum 90 degrees F prior to, during, and 48 hours after completion of masonry work.

D. All surfaces to receive new jointing operations shall be dry and clean of all foriegn matter. Sealant applicator tool shall have nozzle of proper size and shall provide sufficient pressure to completely fill joints as detailed, specified or arise in the actual field conditions.

PART 2 PRODUCTS

2.01 MANUFACTURERS

A. Restoration and Cleaning Chemicals:
   1. PROSOCO; Product Sure-Klean Heavy Duty Restoration Cleaner: www.prosoco.com/#sle.
   2. [_____] ; Product [____].
   3. Substitutions: See Section 01 6000 - Product Requirements.

2.02 CLEANING MATERIALS

A. Cleaning Agent: Detergent type.

B. Cleaning Agent: 0.5 lb of sodium hydrosulphite mixture to one gallon of water.

2.03 MORTAR MATERIALS

A. Conform to requirements of Section 04 0511.

2.04 MASONRY MATERIALS

A. Brick: Section 04 2000.
   1. New brick shall match, as closely as possible, to the satisfaction of the Architect, the existing in color, texture and size for the intended usage and shall meet the requirements of ASTM 216, Grade SW FBS for exterior use.

2.05 2.05 ACCESSORIES

A. Drilled in anchor devices - "Pos-i-Tie" with "Tapcon" screws and loop ties as manufatured by National Wire.

B. Brick/brick ties shall be similat and equal to Hilti "HIT" renovation ties modified to receive a stainless steel wire "wye" shaped brick tie.

C. Brick-backup masonry ties shall be similar and equal to Hilti "HIT-C20" renovation ties with stainless steel loop wire tie for brick anchorage.

D. Weeps - Preformed PVC tubing, rectangular in design.

E. Bonding Agents - Material to be used in building our of spalled and deteriorated masonry shall be similar and equal to "Thorobond" by Standard Drywall Products.

F. Sealants
   1. Sealants shall be Type III as specified in 07 9005 including all primers, backers and other material requirements set forth therein.
   2. Type III backer is required at wide joints as specified in section 04 0511.

PART 3 EXECUTION

3.01 EXAMINATION

A. Verify that surfaces to be cleaned, restored and repointed are ready for work of this section.

3.02 SCAFFOLDING

A. Scaffold work required to accomplish restoration work will be the responsibilty of this Specialty Contractor and will be made available to all required trades without charge and will be adequately and safely maintained. All scaffolding, staging and appurtanences thereto shall comply, in total, to the requirements of the Safety and Health Regualtions for Construction, Chapter XVII of OSHA, 29 CFR Part 1926 and all related ammendments and all other government agencies having jurisdiction. The most stringent requirements shall govern.

3.03 PREPARATION

A. Protect surrounding elements from damage due to restoration procedures.

B. Carefully remove and store removable items located in areas to be restored, including fixtures, fittings, finish hardware, and accessories; reinstall upon completion.

C. Separate areas to be protected from restoration areas using means adequate to prevent damage.

D. Cover existing landscaping with tarpaulins or similar covers.

E. Mask immediately adjacent surfaces with material that will withstand cleaning and restoration procedures.

F. Close off adjacent occupied areas with dust proof and weatherproof partitions.

G. Protect roof membrane and flashings from damage with 1/2 inch plywood laid on roof surfaces over full extent of work area and traffic route.

H. When using cleaning methods that involve water or other liquids, install drainage devices to prevent runoff over adjacent surfaces unless those surfaces are impervious to damage from runoff.

3.04 REBUILDING

A. Cut out damaged and deteriorated masonry with care in a manner to prevent damage to any adjacent remaining materials.

B. Support structure as necessary in advance of cutting out units.

C. Cut away loose or unsound adjoining masonry and mortar to provide firm and solid bearing for new work.

D. Build in new units following procedures for new work specified in other section(s).

E. Mortar Mix: Colored and proportioned to match existing work.

F. Ensure that anchors are correctly located and built in.

G. Install built in masonry work to match and align with existing, with joints and coursing true and level, faces plumb and in line. Build in all openings, accessories and fittings.

3.05 REPOINTING

A. Perform repointing prior to cleaning masonry surfaces.

B. Cut out loose or disintegrated mortar in joints to minimum 3/4 inch depth or until sound mortar is reached.

C. Joints eroded to a depth greater than 1" shall be backpointed prior to cleaning.

D. Joints worn to greater than 1/4" from surface shall be cut to a minimum 1 inch depth and back pointed to within 3/4 inch from surface.

E. Use power tools only after test cuts determine no damage to masonry units will result. Architect must give approval for use of power tools.

F. Hand strip all existing sealants from sealed a/ caulked joints. Work shall be done in cool weather and demostrate means and methods. Dry ice and hard blades may be used as necessary to facilitate removal.

G. Do not damage masonry units. Extreme care shall be exercised in cutting of all joints.

H. When cutting is complete, remove dust and loose material by brushing.

I. Premoisten joint and apply mortar. Pack tightly in maximum 1/4 inch layers. Form a smooth, compact concave joint to match existing.

J. Moist cure for 72 hours.

K. Repair minor structural cracks by saw-cutting and injection of clear Type II sealant.

L. Remove, reflash and reset existing brick sills where indicated on drawings. Scrape, clean and prime all lintels to be reflashed.

M. After pointing, all areas shall be cleaned as required.

3.06 SEALANT APPLICATION

A. Caulking of all joits of sash and other dissimilar surround joints on all faces from grade to top of existing parapet shall be totally cut out, including all backing material and shall be re-caulked and packed.

B. No caulking or sealant work shall be performed until all necessary repairs have been made to all masonry, stone and brick.

C. Install back-up material at proper depth in joint to provide sealant dimensions as specified above. Back-up material shall be suitable size and shape so that that when compressed 20 to 50% of it will fit in all joints as required.

D. Apply masking tape where required in continuous strips in alignment with joint edge. Remove tape immediately after joints have been sealed and tooled.

E. Prime surfaces where required with primer recommended by sealant manufacturer.

F. Apply, tool and finish sealant in accordance with manufacturer's recommendations.

G. Clean adjacent surfaces free or sealant or soiling resulting from this work as work progresses using solvent or cleaning agent recommended by selant manufacturer. All finished work shall be left in neat clean condition.

3.07 CLEANING EXISTING MASONRY

A. Cleaning Detergent: Brush clean masonry surfaces at all locations with cleaning agent in accordance with the manufacturer's instructions. Saturate masonry with clean water and flush loose mortar and dirt.

1. Remove all organic and inorganic contaminants from the surface and pores of the substrate, returning the masonry systems to their natural color. The surfaces shall be evenly cleaned with no evidence or streaking or bleaching.
2. The cleaning process shall not affect the density, porosity, or color or the masonry or any other component thereof. The rinsing cycle shall flush deep into the pores of the substrate, removing all traces of acidity or alkalinity.
3. Cleaning shall be done employing solvent and /or detergent, scrubbing and flushing with water. Repeated scrubbings and flushings shall be done until all residue, dirt and cleaning agents have been removed.

3.08 CLEANING NEW MASONRY

A. Verify mortar is fully set and cured.

B. Clean surfaces and remove large particles with wood scrapers, brass or nylon wire brushes.

C. Scrub walls with cleaning agent solution using stiff brush. Thoroughly rinse and wash off cleaning solution, dirt and mortar crumbs using clean, pressurized water.

3.09 RESTORATION CLEANING

A. Clean surfaces and remove large particles with wood scrapers or non-ferrous wire brush.

B. Spray coat masonry with above specified restoration cleaner, mixed into solution in accordance with manufacturer's instructions.

C. Provide a second application if required to match mock-up area.

D. Allow sufficient time for solution to remain on masonry and agitate with soft fiber brush or sponge.

E. Rinse from the bottom up with potable water applied at 400 psi and at a rate of 4 gal/min.

3.10 CLEANING

A. Immediately remove stains, efflorescence, or other excess resulting from the work of this section.

B. Remove excess mortar, smears, and droppings as work proceeds and upon completion.

C. Clean surrounding surfaces.

END OF SECTION

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SECTION 04 0511
MORTAR AND MASONRY GROUT

PART 1 GENERAL

1.01 SECTION INCLUDES

A. Mortar for masonry.

B. Grout for masonry.

1.02 RELATED REQUIREMENTS

A. Section 04 2000 - Unit Masonry: Installation of mortar and grout.

1.03 REFERENCE STANDARDS

A. TMS 402/602 - Building Code Requirements and Specification for Masonry Structures 2016.

B. ASTM C5 - Standard Specification for Quicklime for Structural Purposes 2018.

C. ASTM C 55 for Concrete Brick

D. ASTM C 90 for Load Bearing Concrete Masonry units

E. ASTM C91/C91M - Standard Specification for Masonry Cement 2018.

F. ASTM C94/C94M - Standard Specification for Ready-Mixed Concrete 2020.

G. ASTM C144 - Standard Specification for Aggregate for Masonry Mortar 2018.

H. ASTM C150/C150M - Standard Specification for Portland Cement 2020.

I. ASTM C207 - Standard Specification for Hydrated Lime for Masonry Purposes 2018.

J. ASTM C270 - Standard Specification for Mortar for Unit Masonry 2019.

K. ASTM C387/C387M - Standard Specification for Packaged, Dry, Combined Materials for Concrete and High Strength Mortar 2017.

L. ASTM C404 - Standard Specification for Aggregates for Masonry Grout 2018.

M. ASTM C476 - Standard Specification for Grout for Masonry 2020.

N. ASTM C780 - Standard Test Method for Preconstruction and Construction Evaluation of Mortars for Plain and Reinforced Unit Masonry 2020.

O. ASTM C979/C979M - Standard Specification for Pigments for Integrally Colored Concrete 2016.

P. ASTM C1019 - Standard Test Method for Sampling and Testing Grout for Masonry 2019.

Q. ASTM C1314 - Standard Test Method for Compressive Strength of Masonry Prisms 2018.

R. Building Code of New York State

1.04 SUBMITTALS

A. See Section 01 3000 - Administrative Requirements, for submittal procedures.

B. Product Data: Include design mix and indicate whether the Proportion or Property specification of ASTM C270 is to be used. Also include required environmental conditions and admixture limitations.

C. Samples: Submit two samples of mortar, illustrating mortar color and color range.

D. Reports: Submit reports on mortar indicating conformance of mortar to property requirements of ASTM C 270 and test and evaluation reports per ASTM C 780.

E. Manufacturer's Certificate: Certify that products meet or exceed specified requirements.

F. Manufacturer's Instructions: Submit packaged dry mortar manufacturer's installation instructions.

G. MSDS Sheets for all products to be used.

1.05 QUALITY ASSURANCE

A. Comply with provisions of TMS 402/602, except where exceeded by requirements of the contract documents.

B. All mortar mixes shall comply with the requirements set forth in ASTM C 270, "Standard Specification for Mortar for Unit Masonry".

1.06 DELIVERY, STORAGE, AND HANDLING

A. Maintain packaged materials clean, dry, and protected against dampness, freezing, and foreign matter.

B. All packaged and loose materials shall be properly protected and stored in weathertight containers, with floor raised not less than 1 foot above adjoining grade or for short intervals, on raised platforms covered with waterproof tarps.

C. Aggregates shall be stored in clean bins, scows or platforms having hard clean surfaces.

D. Aggregates of different kinds and sizes shall be placed in different stockpiles.

E. Cement that has hardened or partially set shall be removed from the site and not used.

F. Washed aggregates and aggregates produced or manipulated by hydraulic methods shall be allowed to drain for at least 12 hours before use.

1.07 FIELD CONDITIONS

A. Maintain materials and surrounding air temperature to minimum 40 degrees F prior to, during, and 48 hours after completion of masonry work. Heat aggregates when air temperature is below 32 degrees F to assure mortar temperatures between 40 degrees F and 120 degrees F until used.

B. Maintain materials and surrounding air temperature to maximum 90 degrees F prior to, during, and 48 hours after completion of masonry work. Do not heat water or sand above 120 degrees F.

C. No air-entraining admixtures or cementitious materials containing air-entraining admixtures shall be used in the mortar.

D. No antifreeze compounds or other substances shall be used in the mortar to lower the freezing point. Calcium chloride or admixture containing same shall not be used in any mortar employed in the work.

PART 2 PRODUCTS

2.01 MORTAR AND GROUT APPLICATIONS

A. Mortar Mix Designs: ASTM C270, Property Specification.

2.02 MATERIALS

A. Mortar Compressive Strengths when tested in accordance with Property Specification Table 2 of the reference standard C 270:
   1. Mortar Type N - 750 psi (5.2 MPa) at 28 days
   2. Mortar Type S - 1,800 psi (12.4 MPa) at 28 days
   3. Mortar Type M - 2,500 psi (17.2 MPa) at 28 days

B. Portland Cement: ASTM C 150 , Type I - Normal; color as required to produce approved color sample. Proportion 1 part per mix volume.

C. Hydrated Lime: ASTM C207, Type S.

D. Quicklime: ASTM C5, non-hydraulic type.

E. Mortar Aggregate: ASTM C144.
   1. Except for joints less than 1/4 inch use aggregate graded with 100% passing the No. 16 sieve.

F. Grout Aggregate: ASTM C404.

G. Pigments for Colored Mortar: Pure, concentrated mineral pigments specifically intended for mixing into mortar and complying with ASTM C979/C979M.
   1. Color(s): As indicated on drawings.
   2. Manufacturers:
      a. Scofield
      b. Flamingo

H. Water: Clean and potable.

I. Mortar Additive for Use with Type "N" Only:
   1. Acrylic polymer and modifier mixture
      a. Acceptable product: "Acryl 60" by Thoro, Division of ChemRex/ Deguassa

J. Accelerating Admixture: Nonchloride type for use in cold weather.
   1. Acceptable product: "Accelguard 80" by Euclid Chemical Co. .

K. Moisture-Resistant Admixture: Water repellent compound designed to reduce capillarity.
   1. Acceptable product: Mortar Tite by Addiment Incorporated.
   2. Substitutions: See Section 01 6000 - Product Requirements.

L. Bonding Agent: Latex type.

M. Colored Mortar: Proportion selected pigments and other ingredients to match Architect desired color, without exceeding manufacturer's recommended pigment-to-cement ratio.
   1. Colors will be established using preweighed, prepackaged proportioned color unit bags selected from the "A", "H", or "X" color series as manufactured by Solomon Grind-Chem Services, or equal by Scofield or Flamingo.
   2. Only premixed colored mortar materials are acceptable. No liquid colorants shall be permitted.

2.03 MORTAR MIXING

A. Thoroughly mix mortar ingredients using mechanical batch mixer, in accordance with ASTM C 270 and in quantities needed for immediate use. Mix in clean mechanical mixer for a minimum of 3 minutes, with a maximum of 5 minutes with the minimum amount of water to produce a workable consistancy.

B. Maintain sand uniformly damp immediately before the mixing process.

C. Do not use anti-freeze compounds to lower the freezing point of mortar.

D. If water is lost by evaporation, mortar may be retempered by adding water as frequently as required to restore the required consistency. Re-temper only within two hours of initial mixing. Mortars not used and placed in final position within two hours shall be discarded.

2.04 GROUT MIXING

A. Mix grout in accordance with ASTM C94/C94M.

B. Thoroughly mix grout ingredients in quantities needed for immediate use in accordance with ASTM C476 for fine and coarse grout.

C. Add admixtures in accordance with manufacturer's instructions; mix uniformly.

D. Do not use anti-freeze compounds to lower the freezing point of grout.

2.05 PRECONSTRUCTION TESTING

A. Testing will be conducted by an independent test agency, in accordance with provisions of Section 01 4000.

B. Mortar Mixes: Test mortars prebatched by weight in accordance with ASTM C780 recommendations for preconstruction testing.
   1. Test results will be used to establish optimum mortar proportions and establish quality control values for construction testing.

C. Grout Mixes: Test grout batches in accordance with ASTM C1019 procedures.
   1. Test results will be used to establish optimum grout proportions and establish quality control values for construction testing.

PART 3 EXECUTION

3.01 PREPARATION

A. Apply bonding agent to existing concrete surfaces.

B. Plug clean-out holes for grouted masonry with brick masonry units. Brace masonry to resist wet grout pressure.

3.02 INSTALLATION

A. Install mortar and grout to requirements of section(s) in which masonry is specified.

B. Work grout into masonry cores and cavities to eliminate voids.

C. Do not install grout in lifts greater than 16 inches without consolidating grout by rodding.

D. Do not displace reinforcement while placing grout.

E. Remove excess mortar from grout spaces.

3.03 GROUTING

A. Use either high-lift or low-lift grouting techniques, at 's option, subject to other limitations of contract documents.

B. Perform all grouting by means of low-lift technique. Do not employ high-lift grouting.

C. Low-Lift Grouting:
   1. Limit height of pours to 12 inches.
   2. Limit height of masonry to 16 inches above each pour.
   3. Pour grout only after vertical reinforcing is in place; place horizontal reinforcing as grout is poured. Prevent displacement of bars as grout is poured.
   4. Place grout for each pour continuously and consolidate immediately; do not interrupt pours for more than 1-1/2 hours.

3.04 FIELD QUALITY CONTROL

A. An independent testing agency will perform field tests, in accordance with provisions of Section 01 4000.

B. Test and evaluate mortar in accordance with ASTM C780 procedures.

C. Test and evaluate grout in accordance with ASTM C1019 procedures.
   1. Test with same frequency as specified for masonry units.

D. Prism Tests: Test masonry and mortar panels for compressive strength in accordance with ASTM C1314, and for flexural bond strength in accordance with ASTM C1072 or ASTM E518; perform tests and evaluate results as specified in individual masonry sections.

3.05 SCHEDULES

A. Exterior Cavity Wall, including brick, block and cast stone: Type S mortar with Type N pointing mortar.

END OF SECTION

SECTION 04 2000
UNIT MASONRY

PART 1 GENERAL

1.01 SECTION INCLUDES

A. Common Brick.

B. Mortar and Grout.

C. Reinforcement and Anchorage.

D. Flashings.

E. Accessories.

1.02 RELATED REQUIREMENTS

A. Section 03 2000 - Concrete Reinforcing: Reinforcing steel for grouted masonry.

B. Section 04 0511 - Mortar and Masonry Grout.

C. Section 07 8400 - Firestopping: Firestopping at penetrations of fire-rated masonry and at top of fire-rated walls.

1.03 REFERENCE STANDARDS

A. TMS 402/602 - Building Code Requirements and Specification for Masonry Structures 2016.

B. ASTM A153/A153M - Standard Specification for Zinc Coating (Hot-Dip) on Iron and Steel Hardware 2016a.

C. ASTM A580/A580M - Standard Specification for Stainless Steel Wire 2018.

D. ASTM C34 - Standard Specification for Structural Clay Load-Bearing Wall Tile 2017.

E. ASTM C56 - Standard Specification for Structural Clay Nonloadbearing Tile 2013 (Reapproved 2017).

F. ASTM C62 - Standard Specification for Building Brick (Solid Masonry Units Made From Clay or Shale) 2017.

G. ASTM C67 - Standard Test Methods for Sampling and Testing Brick and Structural Clay Tile 2017.

H. ASTM C90 - Standard Specification for Loadbearing Concrete Masonry Units 2016a.

I. ASTM C91/C91M - Standard Specification for Masonry Cement 2018.

J. ASTM C126 - Standard Specification for Ceramic Glazed Structural Clay Facing Tile, Facing Brick, and Solid Masonry Units 2019.

K. ASTM C129 - Standard Specification for Nonloadbearing Concrete Masonry Units 2017.

L. ASTM C140/C140M - Standard Test Methods for Sampling and Testing Concrete Masonry Units and Related Units 2020a.

M. ASTM C144 - Standard Specification for Aggregate for Masonry Mortar 2018.

N. ASTM C150/C150M - Standard Specification for Portland Cement 2020.

O. ASTM C207 - Standard Specification for Hydrated Lime for Masonry Purposes 2018.

P. ASTM C216 - Standard Specification for Facing Brick (Solid Masonry Units Made From Clay or Shale) 2019.

Q. ASTM C270 - Standard Specification for Mortar for Unit Masonry 2019.

R. ASTM C404 - Standard Specification for Aggregates for Masonry Grout 2018.

S. ASTM C476 - Standard Specification for Grout for Masonry 2020.

T. ASTM C744 - Standard Specification for Prefaced Concrete and Calcium Silicate Masonry Units 2016.

U. ASTM C780 - Standard Test Method for Preconstruction and Construction Evaluation of Mortars for Plain and Reinforced Unit Masonry 2020.

V. ASTM D226/D226M - Standard Specification for Asphalt-Saturated Organic Felt Used in Roofing and Waterproofing 2017.

W. UL (FRD) - Fire Resistance Directory Current Edition.

1.04 SUBMITTALS

A. See Section 01 3000 - Administrative Requirements, for submittal procedures.

B. Product Data: Provide data for masonry units, fabricated wire reinforcement, mortar, and masonry accessories.

C. Samples: Submit one sample of each type of units to illustrate color, texture, and extremes of color range.
   1. Initial brick and mortar samples msut be provided within three (3) weeks of contract award.
   2. For selection of brick, submit products that manufacturers agents consider to be their closest match. Re-submit until match meets the approval of the Architect.
   3. Colored masonry mortar samples for each color required showing the full range or color which can be expected in the finished work. Label samples to indicate type and amount of colorant used.

D. Certificate of specification compliance. Certifiy that masonry units meet or exceed specified requirements.

E. Material Safety and Data Sheets for all materials submitted.

1.05 QUALITY ASSURANCE

A. Comply with provisions of TMS 402/602, except where exceeded by requirements of the contract documents.

1.06 MOCK-UP

A. Construct a masonry wall as a mock-up panel sized 8 feet long by 6 feet high; include mortar and accessories, structural backup, flashings, and wall insulation in mock-up.

B. Locate where directed.

C. Mock-up may remain as part of the Work.

D. No work shall commence, and no materials shall be ordered, until the mock up has been approved by the Architect.

1.07 DELIVERY, STORAGE, AND HANDLING

A. Deliver, handle, and store masonry units by means that will prevent mechanical damage and contamination by other materials.

B. Store and handle materials to prevent theit deterioration or damage due to moisture, temperature changes, contaminants, corrosion or other causes.

C. Do not use materials in broken containers or in containers showing water marks or other evidence of damage. Remove such containers from site immediately.

D. Limit moisture absorption of concrete masonry units during delivery and unitl time of installation to the maximum percentage specified for Type I units for the average annual relative humidity as reported by the US Weather Bureau Station nearest project site.

E. Store cementitious materials off the ground, under cover and in a dry location.

F. Store and protect aggregates where grading and other required characteristics can ba maintained.

1.08 ENVIRONMENTAL REQUIREMENTS

A. Cold and Hot Weather Requirements: Comply with requirements of ACI 530.1/ASCE 6/TMS 602 or applicable building code, whichever is more stringent.

B. Do not erect any masonry when temperature of surrounding air is below 40 Degrees F unless approved measn are provided for maintaining the masonty at a temperature above this point during and for 72 hours subsequent to erecting the masonry.

C. Protection or work; during erection cover top of walls with waterproof sheeting at end of each day's work. Cover partially completed structures when work is not is progress.

1. Extend cover a minimum of 24" down both sides and hold cover securely in place.

D. Do not apply uniform floor or roof loading for at least 12 hours after building masonry walls or columns.

E. Do not apply concentrated loads for at least three (3) days after building masonry walls or columns.

F. Staining; prevent grout, mortar or soil from staining the face of masonry to be left exposed or painted. remove grout or mortar in conta t with such masonty immediately.

G. Protect base of walls from rain-splashed mud and/or mortar splatter by means of coverings spread on ground and over wall surfaces.

H. Protect sills, ledges and projections from droppings of mortar.

I. Cold Weather Protection
   1. Do not lay units that are forzen or wet.
   2. Remove any ice or snow formed on masonry bed by carefully applying heat until the top surface is dry to the touch.
   3. Remove masonry damaged by freezing conditions.
   4. For clay masonry units with initial rates or absorption which require them to be wetted before laying, comply with the following:
      a. For units with a surface temperature above 32 degrees F, wet with water heated to above 70 degrees F.
      b. For units with surface temperature below 32 degrees F, wet with water heated to above130 degrees F.
   5. Perform the following construction procedures while masonry work is progressing. Temperature ranges indicated below apply to air temperature existing at time of installation, except for grout;
      a. For Grout- temperature ranges apply to anticipated minimum night temperatures. In heating mortar and grout materials, maintain mixing temperature selected within 10 degrees F.
      b. 40 Degrees F to 32 Degrees F:
         1) Mortar: heat mixing water to produce mortar temperature between 40 degrees F and 120 degrees F.
         2) Grout: follow normal masonry procedures
      c. 32 Degrees F to 25 Degrees F:
         1) Mortar: Heat mixing water and snad to produce mortar temperatures between 40 Degrees F and 120 Degrees F. Maintain temperature of mortar on boards above freezing.
         2) Grout: Heat grout materials to 90 Degree F to produce in -place grout temperature of 70 Degree F at end of work day.
      d. 25 Degrees F to 20 Degrees F:
         1) Mortar: Heat mixing water and sand to produce mortar temperatures between 40 degrees F and 120 degrees F. Maintain temperature of mortar on boards above freezing.
         2) Grout: Heat grout materials to 90 Degrees F to produce in-place grout temperature of 70 degrees F at end of work day.
         3) Heat both sides of walls under construction using salamanders or other heat sources.
         4) Use windbreaks or enclosures when wind is in excess of 15 mph.
      e. 20 Degrees F and Below:
         1) Mortar: Heat mixing water and sand to produce mortar temperatures between 40 Degrees F and 120 Degrees F.
         2) Grout: Heat grout materials to 90 F to produce in-place grout temperatures of 70 Degrees F at end of work day.
         3) Masonry Units: Heat masonry units so that they are above 20 degrees F at time of laying.
         4) Provide enclosure and auxiliary heat to maintain an air temperature of at least 40 Degrees F for 24 hours after laying units.
         5) Do not heat mixing water for mortar and grout to above 160 Degrees F.

6. Protect completed masonry and masonry not being worked on in the following manner: (temperature ranges indicated apply to mean daily air temperatures except for grouted masonry, if for grouted masonry temperature ranges apply to anticipated minimum night temperatures.)
   a. 40 Degrees F to 32 Degrees F
      1) Protect masonry from rain or snow for at least 24 hours by covering with a weather resistant membrane.
   b. 32 Degrees F to 25 Degrees F
      1) Completely cover masonry with weather resistant membrane for at least 24 hours.
   c. 25 Degrees F to 20 Degrees F
      1) Completely cover masonry with weather resistant insulating blankets or similar protection for at least 24 hours, 48 hours for grouted masonry.
   d. 20 Degrees F and Below:
      1) Except as otherwise indicated, maintain masonry temperature avobve 32 Degrees F for 24 hours using enclosures and supplementary heat, electric heating blankets, infrared lamps or other methods proven to be satisfactory. For grouted masonry maintain heated enclosures to 40 Degrees F for 48 hours.

J. Shore and brace walls as necessary for proper protection and execution of work in accordance with OSHA requirements setting forth "limited access zone" and "braced wall 8 feet and over in height" which require special attention.

K. Where a masonry bond between parts of adjoining work can not be made, provide a mechanical bond with anchors, dowels and the like to insure proper and stable connections.

L. Lay up masonry exposed to view of the weather in the finished building from the side of wall and/or partition on which it is exposed.

M. Holes will not be permitted in any exposed masonry.

1.09 SCAFFOLDING

A. Furnish, install and maintain safe and adequate scaffolding, centering and other equipment as long as necessary.

B. All scaffolding is to be designed and stamped by an engineer licensed in the jurisdiction. Submit calculations and stamped drawings to the Architect.

C. All scaffold systems shall be erected and maintained in accordance with the total requirements of the Safety and Health Regulations for Construction, Chapter XVII or OSHA, Part 1926 and all realated ammendments and all other government agencies having jurisdiction. The most stringent requirements shall govern.

PART 2 PRODUCTS

2.01 CONCRETE MASONRY UNITS

A. Concrete Block: Comply with referenced standards and as follows:
   1. Size: Standard units with nominal face dimensions of 16 x 8 inches and nominal depth of 8 inches.
   2. Load-Bearing Units: ASTM C90, normal weight.
      a. Hollow block, as indicated.
   3. Non-Loadbearing Units: ASTM C129.
      a. Hollow block, as indicated.

2.02 BRICK UNITS

A. Facing Brick: ASTM C216, Type FBS, Grade SW.
   1. Color and texture: match existing.
   2. Nominal size: As indicated on drawings.
   3. Special shapes: Molded units as required by conditions indicated, unless standard units can be sawn to produce equivalent effect.
   4. Compressive strength: As indicated on drawings, measured in accordance with ASTM C67.

B. Building (Common) Brick: ASTM C62, Grade SW; solid units.

1. Nominal size: match existing.

2.03 MORTAR AND GROUT MATERIALS

A. Masonry Cement: ASTM C91, Type N.
   1. Colored mortar: Premixed cement as required to match sample of the existing

B. Portland Cement: ASTM C150, Type I; color as required to produce approved color sample.
   1. Not more than 0.60 percent alkali.
   2. Hydrated Lime: ASTM C207, Type S.
   3. Mortar Aggregate: ASTM C144.
   4. Grout Aggregate: ASTM C404.

C. Water: Clean and potable.

D. Accelerating Admixture: Nonchloride type for use in cold weather.

E. Moisture-Resistant Admixture: Water repellent compound designed to reduce capillarity.

2.04 REINFORCEMENT AND ANCHORAGE

A. Manufacturers of Joint Reinforcement and Anchors:
   1. WIRE-BOND: www.wirebond.com/#sle.
   2. Substitutions: See Section 01 6000 - Product Requirements.

B. Reinforcing Steel: Type specified in Section 03 2000; size as indicated on drawings; galvanized finish.

C. Single Wythe Joint Reinforcement: Ladder type; ASTM A 82/A 82M steel wire hot dip galvanized after fabrication to ASTM A 153/A 153M Class B; 0.1483 inch side rods with 0.1483 inch cross rods; width as required to provide not more than 1 inch and not less than 1/2 inch of mortar coverage on each exposure.

D. Multiple Wythe Joint Reinforcement: Truss type; fabricated with moisture drip; ASTM A 82/A 82M steel wire hot dip galvanized after fabrication to ASTM A 153/153M Class B; 0.1483 inch side rods with 0.1483 inch cross rods; width as required to provide not more than 1 inch and not less than 1/2 inch of mortar coverage on each exposure.

E. Adjustable Multiple Wythe Joint Reinforcement: Truss type with adjustable ties or tabs spaced at 16 in on center and fabricated with moisture drip; ASTM A 82/A 82M steel wire hot dip galvanized after fabrication to ASTM A 153/153M Class B; 0.1875 inch side rods with 0.1483 inch cross rods and adjustable components of 0.1875 inch wire; width of components as required to provide not more than 1 inch and not less than 1/2 inch of mortar coverage from each masonry face.
   1. Vertical adjustment: Not less than 2 inches.
   2. Seismic Feature: Provide lip, hook, or clip on extended leg of wall ties to engage or enclose not less than one continuous horizontal joint reinforcement wire of 0.1483 inch diameter.
   3. Insulation Clips: Provide clips at tabs or ties designed to secure insulation against outer face of inner wythe of masonry.

F. Strap Anchors: Bent steel shapes configured as required for specific situations, 1-1/4 in width, 0.105 in thick, lengths as required to provide not more than 1 inch and not less than 1/2 inch of mortar coverage from masonry face, corrugated for embedment in masonry joint, hot dip galvanized to ASTM A 153/A 153M Class B.

G. Flexible Anchors: 2-piece anchors that permit differential movement between masonry and building frame, sized to provide not more than 1 inch and not less than 1/2 inch of mortar coverage from masonry face.
   1. Steel frame: Crimped wire anchors for welding to frame, 0.25 inch thick, with trapezoidal wire ties 0.1875 inch thick, hot dip galvanized to ASTM A 153/A 153M Class B.

H. Wall Ties: Corrugated formed sheet metal, 7/8 inch wide by 0.05 inch thick, hot dip galvanized to ASTM A 153/A 153M Class B, sized to provide not more than 1 inch and not less than 1/2 inch of mortar coverage from masonry face.

I. Two-Piece Wall Ties: Formed steel wire, 0.1875 inch thick, adjustable, eye and pintle type, hot dip galvanized to ASTM A 153/A 153M Class B, sized to provide not more than 1 inch

and not less than 1/2 inch of mortar coverage from masonry face and to allow vertical adjustment of up to 1-1/4 in.

J. Masonry Veneer Anchors: 2-piece anchors that permit differential movement between masonry veneer and structural backup, hot dip galvanized to ASTM A 153/A 153M, Class B.
   1. Anchor plates: Not less than 0.075 inch thick, designed for fastening to structural backup through sheathing by two fasteners; provide design with legs that penetrate sheathing and insulation to provide positive anchorage.
   2. Wire ties: Rectangular shape, 0.1875 inch thick. Vee ties are not permitted.
   3. Vertical adjustment: Not less than 3-1/2 inches.
   4. Seismic Feature: Provide lip, hook, or clip on end of wire ties to engage or enclose not less than one continuous horizontal joint reinforcement wire of 0.1483 inch diameter.
   5. Manufacturer:
      a. Hohmann & Barnard #DW-10 Seismiclip Interlock System

K. Anchor Bolts: Steel bolts with hex nuts and flat washers complying with ASTM A-307, Grade A, hot-dipped galvanized to comply with ASTM C-153 Class C in sizes and configurations noted.

2.05 FLASHINGS

A. Flashing material for use where same is fully supported by construction (non bridging material) shal be self adhering design, 40 mil thickness and shall be one of the following:
   1. Perm-A-Flash by W.R. Grace
   2. Bitu-Mem by Nervastral Inc.
   3. Plastiwrap 40 by Progress Unlimited
   4. Hyload System by Hyload (1-800-457-4056)

B. Flashing material for use in general applications for through wall systems other than where same occurs in face masonry / backup masonry shall be either:
   1. Rib-Bond by Atlantic Distributing in 10 oz. copper or 0.010 inch stainless steel.
   2. 3 ounce copper Fabric Flashing as manufactured by York Mfg.
      a. If asphalt coated material is proposed, provide either polymer based material compatible with sealant specified or sealant cap fabricated from 12 ounce copper or stainless steel sheet.

2.06 ACCESSORIES

A. Preformed Control Joints: Rubber material. Provide with corner and tee accessories, fused joints. Conform to ASTM 2240.
   1. Manufacturers:
      a. Hohmann & Barnard, Inc (including Dur-O-Wal brand): www.h-b.com/#sle.
      b. WIRE-BOND: www.wirebond.com/#sle.
      c. Substitutions: See Section 01 6000 - Product Requirements.

B. Soft Joints: Factory extruded closed cell neoprene with adhesive surface similar.
   1. Manufacturers:
      a. Dur-O-Wal: Product Rapid Soft Joint #DA 2010.
      b. Hohmann & Barnard
      c. Masonry Reinforcing Corporation of America

C. Expansion Joints: Factory extruded closed cell neoprene with compressibility exceeding 50%.
   1. Manufacturers:
      a. Dur-O-Wal: Product Rapid Expansion Joint #DA 2015.
      b. Hohmann & Barnard, : www.h-b.com.
      c. Masonry Reinforcing Corporation of America: www.wirebond.com.

D. Cavity Mortar Control: Semi-rigid polyethylene or polyester mesh panels, sized to thickness of wall cavity, and designed to prevent mortar droppings from clogging weeps and cavity vents and allow proper cavity drainage.
   1. Mortar Diverter: Panels designed for installation at flashing locations.
      a. Manufacturers:
         1) Dur-o-wall Mortar Net #DA 1008 www.dur-o-wal.com.

2) Hohmann and Barnard ; Product The mortar Net.www.h-b.com.
3) Substitutions: See Section 01 6000 - Product Requirements.

E. Building Paper: ASTM D226/D226M, Type I ("No.15") asphalt felt.

F. Weeps: Polyethylene tubing.
1. Manufacturers:
a. Hohmann & Barnard, Inc; Product #342 Clear: www.h-b.com/#sle.
b. WIRE-BOND; Product #3603: www.wirebond.com/#sle.
c. Substitutions: See Section 01 6000 - Product Requirements.

G. Cavity Vents: Molded PVC grilles, insect resistant.
1. Manufacturers:
a. CavClear/Archovations, Inc: www.cavclear.com/#sle.
b. Hohmann & Barnard, Inc; Product #QV Quadro Vent: www.h-b.com/#sle.
c. WIRE-BOND; Product #3601 Clear: www.wirebond.com/#sle.
d. Substitutions: See Section 01 6000 - Product Requirements.

H. Cleaning Solution: Non-acidic, not harmful to masonry work or adjacent materials.
1. Manufacturer:
a. Prosoco Inc - Product "600 Detergent"
b. Hydrozzo
c. Cresset

2.07 MORTAR AND GROUT MIXES

A. Mortar for Unit Masonry: ASTM C270, using the Proportion Specification.
1. Exterior, loadbearing masonry: Type N.

B. New Mortar for Old Brick: Proportioned by volume only; not more than 20 percent of the total volume of Portland cement and lime combined shall be Portland cement.
1. Sand: Match original mortar as closely as possible in color, size, and texture, without use of other additives.
2. Repointing Mortar: Use proportions from 1 part lime to 2 parts sand with no Portland cement, up to 2 parts Portland cement to 3 parts lime to 6 parts sand.

C. Grout: ASTM C476. Consistency required to fill completely volumes indicated for grouting; fine grout for spaces with smallest horizontal dimension of 2 inches or less; coarse grout for spaces with smallest horizontal dimension greater than 2 inches.

D. Admixtures: Add to mixture at manufacturer's recommended rate and in accordance with manufacturer's instructions; mix uniformly.

E. Mixing: Use mechanical batch mixer and comply with referenced standards.

PART 3 EXECUTION

3.01 EXAMINATION

A. Verify that field conditions are acceptable and are ready to receive masonry.

B. Verify that related items provided under other sections are properly sized and located.

C. Verify that built-in items are in proper location, and ready for roughing into masonry work.

3.02 PREPARATION

A. Direct and coordinate placement of metal anchors supplied for installation under other sections.

B. Provide temporary bracing during installation of masonry work. Maintain in place until building structure provides permanent bracing.

3.03 COLD AND HOT WEATHER REQUIREMENTS

A. Maintain materials and surrounding air temperature to minimum 40 degrees F prior to, during, and 48 hours after completion of masonry work.

B. Maintain materials and surrounding air temperature to maximum 90 degrees F prior to, during, and 48 hours after completion of masonry work.

C. Examine all surfaces and contiugous elements to receive work of this section, and correct as part of the Work of this Contract, any defects affecting installation.

D. Commencement of work will be construed as complete acceptability of surfaces and contiguous elements.

3.04 COURSING

A. Establish lines, levels, and coursing indicated. Protect from displacement.

B. Contractor shall lay out each course to align with the existing adjacent masonry coursing so that no units smaller than 1/2 brick are used in any one course and joints shall be staggered consistently across wall surface.

C. Maintain masonry courses to uniform dimension. Form vertical and horizontal joints of uniform thickness.

D. Concrete Masonry Units:
   1. Bond: Running.
   2. Coursing: One unit and one mortar joint to equal 8 inches.
   3. Mortar Joints: Concave.

E. Brick Units:
   1. Bond: Running.
   2. Coursing: Three units and three mortar joints to equal 8 inches.
   3. Mortar Joints: Concave.

3.05 PLACING AND BONDING

A. Lay solid masonry units in full bed of mortar, with full head joints, uniformly jointed with other work.

B. Lay hollow masonry units with face shell bedding on head and bed joints.

C. Face joints of masonry sahll be concave tooled back from the general plane of the face of the unit. Tool vertical joints ahead of horizontal joints. Tool joints when mortar is still plastic but somewhat hard to impress under firm thumb pressure. Slightily compress face of raked joints so that mortar is smooth. Clean all mortar from brick surface in open portion of tooled joints.

D. Buttering corners of joints or excessive furrowing of mortar joints is not permitted.

E. Remove excess mortar and mortar smears as work progresses.

F. Interlock intersections and external corners, except for units laid in stack bond.

G. Do not shift or tap masonry units after mortar has achieved initial set. Where adjustment must be made, remove mortar and replace.

H. Perform job site cutting of masonry units with proper tools to provide straight, clean, unchipped edges. Prevent broken masonry unit corners or edges.

I. Cut mortar joints flush where wall tile is scheduled or resilient base is scheduled.

J. Isolate masonry partitions from vertical structural framing members with a control joint as indicated.

K. Isolate top joint of masonry partitions from horizontal structural framing members and slabs or decks with compressible joint filler.

L. Lay out the bond of exposed face masonry in each wall surface as shown on drawings and so that no course shall finish at an external angle, corner, or joint with a piece of brick less that 3-3/4 inches long.

M. Brick at the time of laying shall require wetting if the unit's initial rate of water absorption exceeds 30 grams per 30 sqin. per minute or 0.035 ounce per sqin., as determined by ASTM C 67.

3.06 WEEPS/CAVITY VENTS

A. Install weeps in veneer and cavity walls at 24 inches on center horizontally above through-wall flashing, above shelf angles and lintels, and at bottom of walls.

B. Install cavity vents in veneer and cavity walls at 32 inches on center horizontally below shelf angles and lintels and near top of walls.

3.07 CAVITY MORTAR CONTROL

A. Do not permit mortar to drop or accumulate into cavity air space or to plug weep/cavity vents.

B. For cavity walls, build inner wythe ahead of outer wythe to accommodate accessories.

C. Install cavity mortar control panels continuously throughout full height of exterior masonry cavities during construction of exterior wythe, complying with manufacturer's installation instructions. Verify that airspace width is no more than 3/8 inch greater than panel thickness. Install horizontally between joint reinforcement. Stagger end joints in adjacent rows. Fit to perimeter construction and penetrations without voids.

D. Install cavity mortar diverter at base of cavity and at other flashing locations as recommended by manufacturer to prevent mortar droppings from blocking weep/cavity vents.
   1. Place cavity mortar net in the collar joint or cavity resting on the flashing at the base of the wall positioned with the zig-zag side up.

3.08 REINFORCEMENT AND ANCHORAGE - GENERAL

A. Unless otherwise indicated on drawings or specified under specific wall type, install horizontal joint reinforcement 16 inches on center.

B. Place masonry joint reinforcement in first and second horizontal joints above and below openings. Extend minimum 16 inches each side of opening.

C. Place continuous joint reinforcement in first and second joint below top of walls.

D. Lap joint reinforcement ends minimum 6 inches.

E. Reinforce stack bonded unit joint corners and intersections with strap anchors 16 inches on center.

F. Fasten anchors to structural framing and embed in masonry joints as masonry is laid. Unless otherwise indicated on drawings or closer spacing is indicated under specific wall type, space anchors at maximum of 36 inches horizontally and 24 inches vertically.

3.09 REINFORCEMENT AND ANCHORAGE - SINGLE WYTHE MASONRY

A. Install horizontal joint reinforcement 8 inches on center.

B. Place masonry joint reinforcement in first and second horizontal joints above and below openings. Extend minimum 16 inches each side of opening.

C. Place continuous joint reinforcement in first and second joint below top of walls.

D. Lap joint reinforcement ends minimum 6 inches.

E. Reinforce stack bonded unit joint corners and intersections with strap anchors 16 inches on center.

3.10 REINFORCEMENT AND ANCHORAGE - MASONRY VENEER

A. Install horizontal joint reinforcement 16 inches on center.

B. Place masonry joint reinforcement in first and second horizontal joints above and below openings. Extend minimum 16 inches each side of opening.

C. Place continuous joint reinforcement in first and second joint below top of walls.

D. Lap joint reinforcement ends minimum 6 inches.

E. Masonry Back-Up: Embed anchors to bond veneer at maximum 16 inches on center vertically and 36 inches on center horizontally. Place additional anchors at perimeter of openings and ends of panels, so maximum spacing of anchors is 8 inches on center.

F. Stud Back-Up: Secure veneer anchors to stud framed back-up and embed into masonry veneer at maximum 16 inches on center vertically and 24 inches on center horizontally. Place additional anchors at perimeter of openings and ends of panels, so maximum spacing of anchors is 8 inches on center.

G. Seismic Reinforcement: Connect veneer anchors with continuous horizontal wire reinforcement before embedding anchors in mortar.

H. Reinforce stack bonded unit joint corners and intersections with strap anchors 16 inches on center.

3.11 REINFORCEMENT AND ANCHORAGES - CAVITY WALL MASONRY

A. Install horizontal joint reinforcement 16 inches on center.

B. Place masonry joint reinforcement in first and second horizontal joints above and below openings. Extend minimum 16 inches each side of openings.

C. Place continuous joint reinforcement in first and second joint below top of walls.

D. Lap joint reinforcement ends minimum 6 inches.

E. Fasten anchors to structural framing and embed in masonry joints as masonry is laid. Space anchors at maximum of 24 inches horizontally and 16 inches vertically.

3.12 MASONRY FLASHINGS

A. Whether or not specifically indicated, install masonry flashing to divert water to exterior at all locations where downward flow of water will be interrupted.
   1. Extend flashings full width at such interruptions and at least 4 inches into adjacent masonry or turn up at least 4 inches to form watertight pan at non-masonry construction.
   2. Remove or cover protrusions or sharp edges that could puncture flashings.
   3. Seal lapped ends and penetrations of flashing before covering with mortar.
   4. Pocket at all terminations, including window and door heads and sills with an envelope fold.

B. Extend metal flashings through exterior face of masonry and turn down to form drip. Install joint sealer below drip edge to prevent moisture migration under flashing.

C. Bed flashing on masonry with Type II sealant.

D. Lap end joints of flashings at least 6 inches and seal watertight with mastic or elastic sealant.

E. Where material is fully supported and not bridging any cavity or openings, same can be a self adhering, self sealing material. Where flashing must bridge, form pockets and like conditions, material shall be a distressed rigidized metallic system.

3.13 LINTELS

A. Install loose steel lintels over openings.

B. See lintel schedule on the drawings.

C. Maintain minimum 8 inch bearing on each side of opening.

3.14 CONTROL AND EXPANSION JOINTS

A. Do not continue horizontal joint reinforcement through control and expansion joints.

B. Form control joint with a sheet building paper bond breaker fitted to one side of the hollow contour end of the block unit. Fill the resultant core with grout fill. Rake joint at exposed unit faces for placement of backer rod and sealant.

C. Install preformed control joint device in continuous lengths. Seal butt and corner joints in accordance with manufacturer's instructions.

D. Form expansion joint as detailed.

E. Expansion and control joints in face unit walls form a joint a mximum of 1/2 inch width (+/- 1/8") by means of prefabricated elements specified in this section.

F. Control joints are to be spaced 20 feet +/- on center with final pattern to be issued by the Architect for construction

G. Expansion joints are to be spaced 20 feet +/- on center at all parapets and at junctions of new masonry with existing.

3.15 BUILT-IN WORK

A. As work progresses, install built-in metal door frames, fabricated metal frames, anchor bolts, and plates and other items to be built into the work and furnished under other sections.

B. Install built-in items plumb, level, and true to line.

C. Bed anchors of metal door and glazed frames in adjacent mortar joints. Fill frame voids solid with grout.
   1. Fill adjacent masonry cores with grout minimum 12 inches from framed openings.

D. Do not build into masonry construction organic materials that are subject to deterioration.

E. Install anchor bots for retention of roof and other blockings required to be built into masonry work.

F. Install loose lintels (under 100 pounds) as furnished and specified on the drawings.

3.16 TOLERANCES

A. Maximum Variation from Alignment of Columns: 1/4 inch.

B. Maximum Variation From Unit to Adjacent Unit: 1/16 inch.

C. Maximum Variation from Plane of Wall: 1/4 inch in 10 ft and 1/2 inch in 20 ft or more.

D. Maximum Variation from Plumb: 1/4 inch per story non-cumulative; 1/2 inch in two stories or more.

E. Maximum Variation from Level Coursing: 1/8 inch in 3 ft and 1/4 inch in 10 ft; 1/2 inch in 30 ft.

F. Maximum Variation of Joint Thickness: 1/8 inch in 3 ft.

G. Maximum Variation from Cross Sectional Thickness of Walls: 1/4 inch.

3.17 CUTTING AND FITTING

A. Cut and fit for chases. Coordinate with other sections of work to provide correct size, shape, and location.

B. Obtain approval prior to cutting or fitting masonry work not indicated or where appearance or strength of masonry work may be impaired.

C. Cut holes for outlets, switches and receptacles neatly and where conduits and pipe are run in partitions, cut away webs without interrupting the face of units or patternof wall joints. Strike excess mortar.

D. Note that all exposed interior masonry surfaces including those to receive paint or similar finish must present an attractive, even, regular appearance unbroken except for normal jointing.

3.18 PARGING

A. Dampen masonry walls prior to parging.

B. Scarify each parging coat to ensure full bond to subsequent coat.

C. Parge masonry walls in two uniform coats of mortar to a total thickness of 3/4 inch.

D. Steel trowel surface smooth and flat with a maximum surface variation of 1/8 inch per foot.

E. Strike top edge of parging at 45 degrees.

3.19 FIELD QUALITY CONTROL

A. An independent testing agency will perform field quality control tests, as specified in Section 01 4000.

B. Clay Masonry Unit Tests: Test each variety of clay masonry in accordance with ASTM C67 requirements, sampling 5 randomly chosen units for each 50,000 installed.

C. Concrete Masonry Unit Tests: Test each variety of concrete unit masonry in accordance with ASTM C140/C140M for conformance to requirements of this specification.

D. Mortar Tests: Test each type of mortar in accordance with ASTM C780, testing with same frequency as masonry samples.

3.20 CLEANING

A. Remove excess mortar and mortar droppings.

B. Replace defective mortar. Match adjacent work.

C. Clean soiled surfaces with cleaning solution.

D. Use non-metallic tools in cleaning operations.

E. As cleaning progresses, examine all face joints in exposed masonry to located cracks, holes or other defects, and point up all such defects and fill with mortar.

F. Where necessary in the opinion of the Architect, cut out defective joints and masonry units and replace with new materials, excercising extreme care to match original work.

3.21 PROTECTION

A. Without damaging completed work, provide protective boards at exposed external corners that are subject to damage by construction activities.

B. Provide drop cloths or other suitable protective coverings in all areas of work.

C. Damage caused by the handling, storing, mixing or application of materials or the failure to provide adequate protection shall be repaired or replaced at no additional cost to the Owner.

END OF SECTION

SECTION 04 2020
MASONRY RESTORATION

PART 1 - GENERAL

1.01 DESCRIPTION OF WORK:

A. Provide all masonry restoration Work as indicated on the Drawings and as specified herein.

1.02 RELATED SECTIONS

A. Exterior Paint Removal Section 02085
B. Unit Masonry Section 04200
C. Masonry Cleaning Section 04510
D. Joint Sealers Section 07900

1.03 REFERENCES

A. References and industry standards listed in this Section are applicable to the Work. Unless more restrictive criteria or differing requirements are explicitly stated in the Specifications, or mandated by governing codes or regulations, the recommendations, suggestions, and requirements described in the referenced standards shall be deemed mandatory and applicable to the Work.

B. American Society for Testing and Materials (ASTM)
   1. Standard Specification for Heat-Resisting Chromium and Chromium Nickel Stainless Steel Plate, Sheet, and Strip for Pressure Vessels.
   2. Standard Specification for Stainless and Heat-Resisting Steel Wire.
   3. Standard Methods of Sampling and Testing Brick and Structural Clay Tile.
   4. Standard Test Method for Compressive Strength of Hydraulic Cement Mortars (Using 2-inch or 50 MM Cube Specimens).
   5. Standard Specification for Ceramic Glazed Structural Clay Facing Tile, Facing Brick, and Solid Masonry Units.
   6. Standard Specification for Aggregate for Masonry Mortar.
   7. Standard Specification for Portland Cement.
   8. Standard Specification for Hydrated Lime for Masonry Purposes.
   9. Standard Specification for Mortar for Unit Masonry.
   10. Standard Specification for Aggregates for Masonry Grout.
   11. Standard Specification for Grout for Reinforced and Nonreinforced Masonry.
   12. Standard Test Method for Preconstruction and Construction Evaluation of Mortars for Plain and Reinforced Unit Masonry.
   13. Standard Specification for Pigments for Integrally Colored Concrete.
   14. Brick Industry of America (BIA): BIA Technical Notes

1.04 SUBMITTALS

A. Product Data
   1. Portland Cement: Brand and manufacturer's name.
   2. Lime: Brand and manufacturer's name.
   3. Mortar Pigments: Brand and manufacturer's name.
   4. Packaged Products: Manufacturer's specifications and application instructions.
   5. Sand: Location of pit, name of owner, and previous test data.
   6. Masonry reinforcement, anchors and helical masonry ties.
   7. Shop Drawings

B. If bracing/shoring of the masonry is required, submit stability drawings and calculations prepared, signed and sealed by a New York State Professional Engineer or Registered Architect.

C. Samples
   1. Deliver to the Site for comparison with existing masonry.
   2. Mortar for Exposed Joints and Cracks: Each required type, minimum 12" long by full thickness, showing finish and color.

3. Masonry Units: Each required type, full size, showing finish and full color range. Remove one unit of each existing type in order to allow for full size comparison.
4. Masonry reinforcement, anchors and helical masonry ties.
5. Quality Control Submittals
   a. Schedule of Uses: By mortar type.
   b. Certificates
      1) Furnish notarized Building Department affidavit from masonry manufacturer stating materials delivered to project comply with the Specification requirements.
      2) Furnish notarized Building Department affidavit from masonry supplier stating materials delivered to project comply with the Specification requirements.
      3) Provide a letter signed and sealed by a New York State Professional Engineer or Registered Architect describing the Contractor's “Method of Operation” for removal and installation of masonry, and stating whether bracing/shoring for structural stability is required or not required. Provide calculations, if requested.
6. Tests
   a. Provide test reports on masonry units utilized showing conformance to specification requirements. Reports shall be dated within two years of project.
   b. Provide test results prepared by the helical masonry tie manufacturer's Company Field Representative (CFR) for the helical masonry tie pull out tests with recommendations.

1.05 CONTRACTOR QUALIFICATIONS:

A. Provide proof of manufacturer and installer qualifications specified under "Quality Assuarance".

B. Mock-up: Provide mock-ups as indicated under Quality Assurance.

1.06 QUALITY ASSURANCE

A. Qualifications
   1. Company specializing in the Work of this Section shall have a minimum of three years experience and at least three successful projects with similar quantity of materials.
   2. Technicians performing the work must pass the mock-up test indicated in Paragraph D.3 below.

B. Regulatory Requirements
   1. Building Code: Work of this Section shall conform to all requirements of the NY State Building Code and all applicable regulations of governmental authorities having jurisdiction, including safety, health, noise, and anti-pollution regulations. Where more severe requirements than those contained in the Building Code are given in this Section, the requirements of this Section shall govern.
   2. Mock-ups
      a. Prior to performing the Work of this Section, prepare at the job site sample panels of not less than 12 sq ft for each type of masonry restoration Work required, including cutting of joints prior to and after pointing. Sample panels shall be at locations indicated on the Drawings or where directed by the Authority’s Representative. Inconspicuous locations will be chosen, except where it is necessary to choose other locations to be representative of brick color, joint size, mortar color, and other aspects of masonry appearance.
      b. Clean masonry and mortar of the mock-up area and surrounding area to expose the true color of the masonry prior to preparing sample panels. Cleaning materials shall not damage masonry surface. Do not proceed further with the Work until the sample panel has been approved by the Authority's Representative. Approved samples will be used as quality standards for the Work. Maintain approved samples at the Site until the Work is completed. Once the panel is approved, do not change materials or proportions of mortar mixes unless approved by the Architect or Engineer of Record. Sample panels may be a portion of existing masonry that is to be restored, at a location directed by the Authority's Representative.

c. All technicians performing masonry removal and joint cutting must successfully complete five linear feet of cutting and raking of mortar joints in the presence of the Authority's representative. Unsuccessful performance of this test is grounds for the rejection of the technician for this project.

1.07 DELIVERY, STORAGE, AND HANDLING

A. Packaged Products
1. Deliver materials to the site in manufacturer's original, sealed containers. Do not deliver materials that have exceeded shelf life limitation set forth by the manufacturer. Material containers shall bear the manufacturer's label indicating manufacturer's name, trade name of product, lot number, shelf life of product, and mix ratio (if applicable). This includes individual bags of pre-bagged mortar mixes.
2. Comply with manufacturer's printed instructions for storing and protecting materials.
3. Bulk Aggregate
a. Store in a manner which will keep aggregate clean and protected from the weather elements.

1.08 ENVIRONMENTAL REQUIREMENTS

A. Cold Weather Construction Requirements
1. Cold weather construction provisions of TMS 602/ACI 530.1/ASCE 6 Article 1.8C shall be implemented when either the ambient temperature falls below 40°F or the temperature of masonry units is below 40°F.
2. Salt or other chemicals for lowering the freezing temperature of the mortar shall not be used.

1.09 HOT WEATHER CONSTRUCTION REQUIREMENTS

A. Hot weather construction provisions of TMS 602/ACI 530.1/ASCE 6 Article 1.8D shall be implemented when temperatures exceed 100°F, or 90°F with a wind velocity greater than 8 mph.
1. Wetting of Clay Masonry Units
a. Provide prewetting of masonry for units with initial rates of absorption that require their wetting before laying (21.42 grams per 30 square inches or 0.025 ounce psi).

PART 2 – PRODUCTS

2.01 MANUFACTURERS

A. Reinforcement and Ties
1. Hohmann & Barnard, Inc., Hauppage, N.Y.
2. Dur-O-Wall, Arlington Heights, IL.
3. Helifix North America Corporation (Rep.: Patrick Sweeney, 888 992-9989)
4. Blok-Lok Ltd. (Rep.: Scott Burns, 800 561-3026),

B. Mortar Coloring
1. "SGS" Mortar Colors, Solomon Grind-Chem Services, Inc.
2. "True Tone Mortar Colors", Davis Colors, Rockwood Industries, Inc.
3. "Flamingo Colors ", The Riverton Corporation.

C. Masonry Cleaner
1. ProSoCo, Inc., South Plainfield, N.J.
2. Sure-Kleen

D. Restoration Mortar
1. Cathedral Stone Products
2. Edison Coatings, Inc.

2.02 FACE BRICK MANUFACTURERS/DISTRIBUTORS

A. Belden Tri-State Building Materials, www.btsbm.com, 347-683-2396
1. Match existing brick color and size.
2. Stone Art Inc., 295B California Ave. Church Hill, TN 37642

2.03 MATERIALS

A. Base Materials

1. Portland Cement: Type I ASTM C150
2. Sand for Mortar Mix ASTM C144
   a. Sand shall be natural sand matching the gradation and color of the existing mortar aggregate.
   b. Hydrated Lime ASTM C207
      1) Type "S"
3. Water: Shall be clean potable water free of injurious foreign matter.
4. Mortar Coloring: Provide pure mineral pigments, natural and synthetic iron oxides, and chromium oxides compounded for use in mortar mixes. Material shall conform to ASTM C979. Coloring shall not contain alkalyde salts. No liquid colorants shall be permitted.
   a. Premixed sand and lime for mortar mixes is not permitted. The use of batched material by Spec-Mix and factory-packaged cement-lime-pigment by major mortar manufacturers is permitted. Each individual bag of material shall have the manufacturer's label identifying the mortar type.
   b. No air-entraining admixtures or material containing such shall be permitted in the mortar. Also, no anti-freeze compounds, calcium chloride, or other compounds, unless expressly permitted otherwise, shall be permitted in the mortar.
5. Masonry Units
   a. Match existing units in type, grade, size, appearance, texture, and color unless otherwise indicated. Provide multiple types, sizes, and colors of brick to match existing brick patterns.
   b. In addition to 1. above, brick shall be clay or shale, ASTM C216, grade SW, solid. Brick shall be tested for efflorescence in accordance with ASTM Test Methods C67 and the rating shall be ”Not Effloresced”.
   c. Lip brick are to be factory manufactured only. Do not use field cut lip brick.
6. Use 100% solid brick over exterior relieving angles/lintels or other brick projections on exterior face of building. (Use of solid brick with cores is acceptable if cores are filled solid with mortar and the cores are not visible to view.)
7. Accessories:
   a. Material
      1) Reinforcement and anchors
         (a) Stainless Steel: 18-8, type 304
         (b) Sheet Steel: (No. 2B finish), cold-rolled, annealed, ASTM A240.
         (c) Wire Steel: ASTM A580
      2) Manufactured Units: All manufactured units shall be as follows:
         (a) LOX-ALL #120 Truss-Mesh, 9 gage, of proper width for the wall thickness.
         (b) Veneer Anchor: DW-10HS Manufacturers Hohmann & Barnard or approved equal. Stainless steel Type 304, ASTM A580.
         (c) Vee Tie: Stainless steel, masonry wire ties. Manufacturer - Hohmann & Barnard or approved equal.
         (d) Anchors: Manufacturers - Rawlplug; RKL. 1/4" diameter, 2" long flat head stainless steel Zamac Nailing Fastener by Rawlplug Company Inc. of approved equal.
         (e) Wire: Stainless steel continuous wire by Hohmann & Barnard or approved equal.
         (f) If the actual space between wythes of solid masonry limits the use of a particular anchor, notify the Engineer of Record for an acceptable alternate anchor.
         (g) Seismiclips: #187 by Hohmann & Barnard or approved equal.
      3) Electrode for Welding to Stainless Steel to carbon steel: E309-16. Keep electrode dry. Oven dry electrode after exposing it for more than 6 hours.
      4) Mortar mesh: "Mortar Net" high density polyethylene or nylon, full width of cavity, with stepped top to catch mortar droppings.
8. Helical Masonry Ties for Stabilization of Existing Masonry Walls:
   a. Ties shall be fabricated from round stock stainless steel, Type 304, subject to the requirements specified herein. Tie diameters available: 8mm, 10mm. Sizes, type and length of ties shall be as recommended by the helical tie manufacturer's

Company Field Representative (CFR) based on pull out load tests performed at the site and field conditions. A minimum 10mm diameter ties shall be used for cinder block.

b. Where necessary, as in ties installed through mortar joints into concrete backup, provide asymmetric helical ties.

9. Masonry Repair Mortar:
   a. Material shall be capable of filling the holes created due to the installation of the helical masonry ties in bricks. Material shall match properties of the existing natural material, be freeze-thaw resistant and shall be color to match the existing bricks.
   b. Masonry repair mortar for bricks shall be Jahn Repair Mortar M100 as manufactured by Cathedral Stone Products, Mimic by Conprocco, or Custom Series 45 as manufactured by Edison Coatings, Inc.

2.04 MIXES

A. Mortar Types
   1. All Mortar:
   2. Comply with ASTM C270 and BIA-M1-88.
   3. Provide Type I Portland cement. Masonry cement shall not be used as a substitute.

B. Preconstruction testing with the proportions carefully monitored is to be used to establish the upper end of the strength range of the mortar, which should generally be near the minimum strength of the next higher strength mortar.

C. The maximum strength of each mortar shall generally not exceed the minimum strength of the next higher strength mortar type. The preconstruction testing will determine the general range of strengths to be found and may end up higher than the threshold above.

D. Air content of mortar shall be less than 12%.

E. Rebuilding/Setting Mortar; Type N: 1 part Portland cement, 1 part lime, 6 parts dry sand. Minimum compressive strength shall be 750 psi.

F. Repointing Mortar: Comply with ASTM C 270, X3 Tuck Pointing Mortar.
   1. Brick: (Type O) 1 part Portland cement, 2 parts lime, 7 parts dry sand. Minimum compressive strength shall be 350 psi.
   2. Stone: (Type N) 1 part Portland cement, 1 part lime, 6 parts dry sand. Minimum compressive strength shall be 750 psi.
   3. Mortar Color

G. For exposed mortar, select materials (complying with the requirements) and proportion pigments with other ingredients as necessary to match the color and texture of existing corresponding materials. White Portland cement and colored aggregates similar to the existing may be used as required to accomplish the matching of mortar color desired.

2.05 SOURCE QUALITY CONTROL

A. The Authority will assign a Special Inspector who will inspect the masonry construction under the requirements of Section BC 1704.5.

B. Preconstruction Testing
   1. Preconstruction testing of mortar properties will be done in accordance with ASTM C780. The Contractor shall assist the Authority’s laboratory by any means necessary and shall provide the mock-up prior to beginning the installation work to allow for adjustments of the mix if necessary. Do not proceed with masonry work until the preconstruction testing is completed. Contractor shall mix mortar as it intends for the actual construction.
   2. Compressive strength tests of field mixed mortar and factory batched/prepackaged mortar are to be done during construction of the mock-up, or earlier if desired by the Contractor, to provide a benchmark for the strength based on actual field conditions and proportioning of the mortar. If mortar strengths are too high or too low, proportions and material source may be required to be modified if directed by the Architect or Engineer of Record.

PART 3 – EXECUTION

3.01 EXAMINATION

A. Examine all adjoining Work on which this Work is in anyway dependent for proper installation and workmanship. Report to the Authority any conditions that prevent the performance of this Work.

3.02 PREPARATION AND PROTECTION

A. Protection
   1. Protect adjacent surfaces not being restored. Protect sills, ledges, and projections from material droppings. Also protect any painted surfaces that are not included in the Work from impact or damage.
   2. Cover top of masonry wall with waterproof plastic membrane at the end of the work period and at other times when Work needs to be protected from rain and other precipitation. Extend cover down sides as needed to thoroughly protect the Work.
   3. During cold weather, do not use wet masonry units and frozen masonry units.
   4. Do not use frozen materials or lay masonry on frozen materials; remove frozen materials from wall. Refer to Part 1 of this Section, "Environmental Requirements" for temperature restrictions.
   5. Remove excess mortar from walls as soon after laying units as practicable to prevent staining and to facilitate cleaning of wall.

B. Brace walls as needed until sufficiently set, or until intersecting walls provide lateral support.

C. Scaffolding shall not be supported from a parapet wall on which work is being performed.
   1. Work on the exterior face of a parapet wall shall not be done concurrently with work on the interior face of the parapet wall.
   2. Surface Preparation
      a. Prepare surfaces to be restored in compliance with product manufacturer's printed instructions and as specified.
      b. Remove dirt, dust, and foreign material from surfaces to be restored.
      c. Clean areas to be restored with compressed air or water flushing, except as otherwise recommended by the mortar manufacturer.

D. Material Preparation
   1. Do not further wet concrete masonry units and stone that are already wet.
   2. Wet bricks that have a high initial absorption rate (greater than 20 g/min). Wet bricks until water runs off. Install bricks when surface is slightly damp.
   3. Prepare exposed mortar to match the color and appearance of existing adjoining mortar.

3.03 MIXING PROCEDURE FOR MORTAR

A. Measure material by volume or equivalent weight. In measuring by volume, use a container to measure ingredients. Do not measure by shovel.

B. Rebuilding/Setting Mortar
   1. Mix ingredients in a clean mechanical mixer for a minimum of 3 minutes, maximum of 5, with the minimum amount of water to produce a workable consistency.
   2. Mortar that has stiffened because of evaporation of water from the mortar may be retempered only once, and only during the first hour of placement to restore the required consistency. Use mortar within 21/2 hours of its initial mixing; tempering is permitted only once and during the first hour only. Limit amount of mortar batched at one time to stay within these requirements.

C. Pointing Mortar
   1. Add sufficient water to dry mix to produce a damp mix that will retain it shape when pressed into a ball by hand. Mix from 3 to 7 min. in a mechanical mixer.
   2. Let mortar stand for not less than 1 hour nor more than 1½ hours for prehydration. Add sufficient water to bring mortar to proper consistency for tuck-pointing, somewhat drier than mortar used for laying units.
   3. Use mortar within 2½ hours of its initial mixing; tempering is permitted only once after bringing mortar to proper consistency. Limit amount of mortar batched at one time to stay within these requirements.

4. For prepackaged masonry repair mortar, mix with water or manufacturer's polymer in proportions defined by manufacturer to provide the required consistency.

D. Repointing Joints
1. The Contractor shall take all precautions required to ensure the original appearance of the building is maintained (not changed) and the existing brick is not damaged. The new mortar shall match the original in color & texture and the new joint shall match the existing joint tooling, size and profile. For joints that are set back from the brick face (raked joints), provide a sloping joint starting at the original depth at the top and sloping to the brick face at the bottom that will prevent water sitting on the brick while maintaining the intended shadow line.
2. Rake or cut out joints to a minimum uniform depth of 3/4" and until sound surface is reached. Do not spall edges of masonry units or widen joints. Replace all brick damaged by such operations with new to match color, size, and texture.

E. Mortar Removal
1. Where cutting is required to remove existing mortar and joint filler, use a rotary power masonry saw wherever possible without damaging masonry. Masonry saw shall have a vacuum attachment to reduce dust. Use non-power tools for vertical brick joints or where rotary power masonry saw will damage joint.
2. Cut the mortar and joint filler cleanly from the sides of the joints, leaving square corners. Flush joints clean with water or compressed air.
3. Dampen joints slightly before application of mortar, making sure there is no free water. Pack pointing mortar tightly in joints in thin layers (1/4" max.), with each layer "thumbprint hard" before applying the next layer. Tool joints to match existing adjoining joints.
4. Where joint sealant is required, backpack the joints tightly out to a uniform depth of 1/4", or as indicated on Drawings. Refer to Section 07 9000 for sealants. Apply bondbreaker tape prior to installing sealants.
5. Cure mortar by maintaining in a damp condition for at least 72 hours.

3.04 REPLACING MASONRY UNITS

A. The Contractor is responsible for performing Work in a safe manner. Provide temporary shoring or other supports as required to prevent displacement of existing masonry that is to remain. Perform the removal Work with such care as may be required to prevent failure of the masonry or damage to adjoining masonry that is to remain. Follow method of operation and/or bracing scheme required to be provided in Article 1.04 titled "Submittals".

B. Remove the deteriorated and damaged masonry units to their full depth, including the surrounding joint mortar. Wet masonry to reduce dust. Install helical masonry ties at perimeter of replacement prior to removal as indicated in details on the Drawings. Wherever possible without damaging masonry, use a rotary power masonry saw for cutting Work. Masonry saw shall have a vacuum attachment to reduce dust. For SHPO designated/landmark buildings, removal of perimeter brick in the area designated for removal shall be done by first cutting the joint utilizing methods specified in Art. 3.04,B.,2. Leave square corners at adjoining masonry that is to remain. Clean joints and cavities by flushing with water or compressed air.

C. Dampen contact surfaces slightly before application of mortar, making sure there is no free water. Install matching masonry units with Type N mortar. Install units to match and align with existing masonry. Maintain bonding and coursing pattern of existing masonry. Use presoaked wood wedges where necessary to properly set the units and maintain uniform matching joints. Backpack and fill joints full of mortar. Finish joints to match existing adjoining joints as described in Art. 3.04- Repointing Joints. Fill open joints in backup. In solid masonry construction, ensure that entire collar joint is filled between the backup and the face masonry. Collar joint is likely to vary substantially, up to 3” in locations.

D. Install accessories as indicated on Drawings. In cavity wall construction provide mortar mesh directly on flashing, such as at base of wall, and at relieving angles and lintels, with flashing extending at least 6” above top of mortar mesh.

E. Area Face Brick Replacement
1. Single wythes of brick shall be replaced in 4 foot lengths maximum unless indicated otherwise by the "methods of operation" submitted by the Contractor's Engineer as

required to be submitted in the Article 1.04 titled "Submittals".

2. Install reinforcement every 16" each way and secure it to backup masonry as indicated on Drawings.

F. Replacement by Brick Stitching

1. Remove and replace existing brick to their full depth with new face brick, one brick each on both sides of crack in masonry. Also, remove and replace all existing pushed-out, missing, split or otherwise defective face bricks to match the adjoining existing good sound masonry. If the existing masonry work has a solid masonry common-bond pattern, existing sound header bricks shall remain. However, any cracked, defective or loose header brick shall be replaced. All new brick work shall be toothed into existing good work. At horizontal and diagonal cracks, the replacement of bricks shall be done in 4-foot lengths maximum unless indicated otherwise by the "methods of operation" submitted by the Contractor's Engineer as required to be submitted in Article 1.04 titled "Submittals". Existing mortar bed for replaced brick shall be thoroughly removed and the back parged with a coat of new mortar to fill the collar joint.

G. Stabilization of Existing Masonry Walls

1. The existing face masonry shall be stabilized to the backup material by means of helical masonry ties. The installation and procedure shall be inspected by the Authority's Representative and the Company Field Representative to verify proper installation of the helical ties.
2. Prior to start of the Work, the existing conditions shall be examined by a Company Field Representative (CFR) authorized in writing by the manufacturer of the helical ties (see Art. 2.01, Par. F.) The CFR shall instruct the Contractor in the installation of the ties. The CFR shall recommend the diameter, length, type, and spacing of ties and drill bits to be used at each location and masonry condition, based on tests described in paragraph C., below. The CFR shall submit this information in written or graphic form, through the Contractor, to the Authority for review and approval by the Architect or Engineer of Record.
3. The design spacing of the ties shall typically be 16" vertically and 16" horizontally. Spacing shall be closer where required because of existing conditions, and where pull-out load tests show it to be necessary. Pull-out tests shall be performed at each masonry condition by the CFR prior to the start of the Work, and the results of the tests shall be submitted to the Authority. Separate pull-out tests shall be performed on the face masonry, mortar joints and on the backup material. For tie spacing of 16" x 16" a load of 300 lbs. shall be achieved for the face masonry and for the backup material separately, without failure by loss of resistance or slippage. Where a 500 lbs. test load is achieved for each material separately, it will be permissible to increase spacing of ties to 16" x 24".
4. A pilot hole shall be drilled through the face masonry and into the backup material using a high-speed rotary percussion drill (Bosch model 1194VSR, or equivalent), 3-jaw chuck type. If acceptable pullout results are achieved through the mortar joints, this shall be the preferred method of installation of the ties rather than through the face masonry, particularly for SHPO eligible buildings. At certain conditions, as recommended by the CFR, the drill bit used for the face masonry shall be of different diameter than the bit used in the backup material. The helical tie shall be driven into position using an electric hammer drill with SDS type chuck and specialized insertion tool. The electric hammer drill with SDS type chuck shall not be used for drilling pilot holes in face masonry. The electric hammer drill with SDS type chuck shall only be used for drilling pilot holes in backup material when recommended by the manufacturer such as in concrete.
5. Each wall condition shall be examined by the Architect or Engineer of Record and the CFR to determine specific installation requirements. The following is presented as an example of a 10mm diameter tie in face brick with concrete block backup. The installation shall be performed in the following manner, subject to actual project conditions and modification by the CFR:
6. For use of 10 mm helical ties, drill an 8mm-entryhole through face brick using high speed rotary percussion drill. (Where location is a mortar joint, drill a 6.5mm hole near the approximate center point of the brick, not at T-joints or ends).

7. Change bits and drill a 6.5mm entry hole through the concrete block backup to a minimum of 3 inches, using high-speed rotary percussion drill.
8. Drive helical tie into place, recessed for final patching, using a setting tool mounted on an electric hammer drill with an SDS type chuck.

3.05 FIELD QUALITY CONTROL

A. The Authority will assign a Special Inspector who will inspect the masonry construction. Post installed anchors are subject to Special Inspection. If the masonry work is not designated for Special Inspection, the masonry work will be subject to Quality Control Inspection, with testing and inspection similar to that listed below for Special Inspection. Inspections performed by the Authority do not relieve the Contractor of its obligation to conform to all requirements specified in this Section.

B. The Special Inspector will make inspections and any testing deemed necessary. Mortar suspected or tested to be too strong or too weak will be subject to petrographic analysis or other methods deemed necessary by the Engineer of Record and Special Inspector. The Contractor shall pay for all tests if they verify improper work. Inspections will include, but not be limited to, the following:
   1. Proper installation of reinforcement of brick on angles.
   2. Proper depth of mortar cutting for pointing.
   3. Proper installation of mortar, including proportioning and mixing. Those mortar properties listed in the Appendix of ASTM C780 are to be tested at the discretion of the Special Inspector or the Architect/Engineer of Record Mortar strengths, when tested, will be determined in accordance with ASTM C780 using cylinders.
   4. Proper installation of weeps, flashing, drip edges, mortar mesh, cleaning of cavity (if cavity wall construction), etc.
   5. At solid masonry construction, all bed, head, and collar joints are filled completely For cavity wall construction, all bed and head joints are filled completely.
   6. The Architect or Engineer of Record will analyze any results not found to be in conformance with the applicable ASTM, industry practice, and the Specifications and determine if the masonry in question is to be removed and redone.
   7. Cooperate with the Special Inspector and the Testing Laboratory performing Special Inspection testing.
   8. The Contractor's engineer shall monitor the restoration procedure to ensure compliance with the "methods of operation" and to ensure safety of the structure.

3.06 PROTECTION AND CLEANING

A. Protect face of adjacent walls and surfaces from water, mortar, and grout used for terra cotta installation.

B. Remove excess mortar and mortar smears as work progresses.

C. After mortar has cured (a minimum of 30 days), clean soiled surfaces with detergent and clean water. Use fiber brushes and cloths. Do not use metallic tools or acids. Perform a mock-up of the cleaning procedure.

END OF SECTION

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SECTION 04 2500
TERRA COTTA

PART 1 - GENERAL

1.01 DESCRIPTION OF WORK

A. Provide all terra cotta work as indicated on the Drawings and as specified herein.

B. Match color, shape, and texture of existing terra cotta units. Detail, furnish, and install all support, anchorage, and connection devices and coordinate size and configuration with all other elements of the Work.
   1. Coordinate the work of this Section with Sections 04 2000 and 04 2020.

1.02 RELATED SECTIONS

A.	Demolition	Section 02 4100
B.	Unit Masonry	Section 04 2000
C.	Masonry Restoration	Section 04 2020
D.	Flashing and Sheet Metal	Section 07 6200
E.	Joint Sealers	Section 07 9005

1.03 DESIGN REQUIREMENTS

A. Terra cotta is to consist of hand-pressed or ram-pressed cast structural fired clay pieces attached to structural substrate to form a weather-tight ornamentation and/or structural element. All units are to have web and wall pieces to maintain unit integrity and allow for attachment to anchorage system. At holes and slots, maintain at least 1¼" wall thickness around the perforations. The use of extruded units is not permitted.

B. Anchorage details are shown schematically. Contractor is to engage an Engineer licensed in the state of New York to verify anchorage and modify as required to the Building Code. The method of attachment to each type of substrate shall be designed to adequately resist wind pressure, uplift, and other loads for project location.

C. Method of installation and expansion joints shall accommodate stresses caused by deflection, settlement, wind pressure, and temperature changes without failure of joints, undue stress on fasteners, or other detrimental effects.

D. Setting mortar shall be type S. Pointing mortar shall be Type N. No air-entraining admixtures or material containing such shall be permitted in the mortar. Also, no anti-freeze compounds, calcium chloride, or other compounds, unless expressly permitted otherwise, shall be permitted in the mortar.

E. Units that are cracked in any way or which have been repaired will not be accepted.

1.04 REFERENCES

A. References and industry standards listed in this Section are applicable to the Work. Unless more restrictive criteria or differing requirements are explicitly stated in the Specifications, or mandated by governing codes or regulations, the recommendations, suggestions, and requirements described in the referenced standards shall be deemed mandatory and applicable to the Work.

B. American Society for Testing and Materials (ASTM).
   1. Standard Specification for Chromium and Chromium Nickel Stainless Steel Plate, Sheet and Strip for Pressure Vessels and General Applications.
   2. Standard Methods of Sampling and Testing Brick and Structural Clay Tile.
   3. Standard Specification for Ceramic Glazed Structural Clay Facing Tile, Facing Brick, and Solid Masonry Units.
   4. Standard Specification for Aggregate for Masonry Mortar.
      a. Standard Specification for Portland Cement.
   5. Standard Specification for Hydrated Lime for Masonry Purposes.
   6. Standard Specification for Structural Facing Tile
   7. Standard Specification for Mortar for Unit Masonry.
   8. Standard Specification for Aggregates for Masonry Grout.

9. Standard Specification for Grout for Reinforced and Nonreinforced Masonry.
10. A.I.A. File No. 9 - Public Works Specifications, Ceramic Veneer.

1.05 SUBMITTALS

A. Product Data

B. Submit manufacturer's specifications, including installation instructions and instructions for handling and storage of terra cotta.

C. Shop Drawings
1. Provide Shop, fabrication, and setting Drawings showing sections, dimensions, weeps, supports, anchors, reglets, flashing, installation details, etc. Shop drawings shall indicate all contiguous materials in contact with the terra cotta. Do not fabricate until shop drawings are approved.

D. Samples
1. Submit 3 samples, size 12" x 12", showing color, surface finish and gloss of surface glaze.
2. Submit 3 samples of each type of anchoring devices.
   a. Mortar sample showing color.
3. Full size prototype with ceramic finish of each major terra cotta piece.
4. Quality Control Submittals
5. Certificates
   a. Furnish notarized Building Department affidavit from masonry manufacturer (Form 10H) stating materials delivered to project comply with the Specification requirements.
   b. Furnish notarized Building Department affidavit from masonry supplier (Form 10J) stating materials delivered to project comply with the Specification requirements.

E. Test Reports:
1. Submit test reports of terra cotta material characteristics as specified in Article 2.02 from regularly performed quality control testing. These tests will be acceptable as the means of approving the material for production.
   a. Submit test reports of terra cotta material characteristics as specified in Article 2.02 from production units made for this Project. The freeze-thaw test requirement on production units is waived if regularly performed quality control test results on units made from the same clay and glazes used on this project are no more than two years old. In lieu of the production run test, the quality control test results and a signed certification that the units are made from the same materials will be accepted.

F. Contractor Qualifications: Provide proof of Manufacturer, Installer, Mechanics, Adhesive Anchor Installer and Engineer qualifications specified under “Quality Assurance”.

G. Mock-up: Provide mock-ups as indicated under Quality Assurance.

1.06 QUALITY ASSURANCE

A. Qualifications

B. Manufacturer: Company specializing in the manufacture of architectural terra cotta materials to be used in this Contract shall have a minimum of 10 years experience.

C. Installer: Company specializing in the installation of terra cotta shall have a minimum of five years experience and shall have worked on at least two projects with similar quantities of materials used. Mechanics installing the work shall have a minimum of three years experience installing terra cotta.
1. Engineer: Preparation of details of the terra-cotta anchorage system shall be under the direct supervision of and bear the seal of a Licensed Professional Engineer of the State of New York experienced in the design of such work.
2. Adhesive Anchor Installer: Installer for adhesive anchors installed in a horizontal or upwardly inclined position supporting sustained tension loads shall be certified per ACI Appendix D9.2.2 as per Section BC 1912 of the 2014 NYC Building Code.

D. Laboratory Testing
1. Test reports showing manufacturer’s materials meet the specifications are to be by an independent testing laboratory.

2. In addition to regularly scheduled quality control testing performed on the manufacturer’s clay source and glazing used, the Manufacturer shall have production run samples tested for the performance characteristics specified in Part 2 of this Section by a recognized testing laboratory, approved in advance by the Architect. The samples shall be selected at the manufacturer's plant by the laboratory from the production run of the terra cotta to be used in the Project. A certification report indicating compliance with Specifications requirements shall be submitted to the Architect's Representative before the terra cotta materials are installed in the Project.
3. The Architect reserves the right to have its own lab perform tests and shall be granted access to the manufacturer’s plant to perform such tests if required.

E. Regulatory Requirements
1. Building Code: Work of this Section shall conform to all requirements of the NYC Building Code and all applicable regulations of governmental authorities having jurisdiction, including safety, health, noise, and anti-pollution regulations. Where more severe requirements than those contained in the Building Code are given in this Section, the requirements of this Section shall govern.
2. NYC Board of Standards and Appeals (BSA) approvals, NYC Materials and Equipment Acceptance (MEA) approvals or Office of Technical Certification and Research (OTCR)

F. Certifications
1. Masonry construction shall conform to the material acceptance, certification and inspection requirements of Section BC 1701 of the 2014 NYC Building Code.

G. Mockups
1. General
2. Construct sample panels to conform to appearance and workmanship as indicated in the Drawings and Specifications.
3. Use approved sample panels for a standard of comparison for the Project. All Work shall conform in workmanship and appearance to that of the approved samples.
4. If not approved, remove panel and install new panel (or panels), repeating the process until panel is approved.
   a. Do not proceed with Work until panels are approved in writing by the Project Architect/Engineer. Do not build Sample Panel "B" until Sample Panel "A" has been approved.
   b. Approved Panel "B" may remain in place as part of the Project if accepted.
5. Erect sample panels where directed, for approval by the Project Architect/Engineer.
   a. Provide sample Panel "A", 4'x 4' panel illustrating mortar, bonding, jointing, course heights, and ties to back-up units. Lay up Panel "A" from terracotta furnished for this purpose.
   b. Provide a second sample Panel "B", incorporated into the building, from terra cotta delivered for the job. Sample Panel "B" shall be 3’0” minimum.

1.07 DELIVERY, STORAGE, AND HANDLING

A. Deliver materials to project site in undamaged condition. Store in an enclosed location or off the ground with waterproof covering as needed to protect all materials from moisture, contaminants, corrosion, deleterious temperature changes, and other harmful conditions.

B. The Contractor is to inspect the terra cotta units immediately upon arrival and reject any damaged items.
1. Keep terra cotta units in their storage containers until ready for installation. Protect units from the weather to prevent staining.

C. Packaged Products
1. Deliver materials to the site in manufacturer's original, sealed containers. Do not deliver materials that have exceeded shelf life limitation set forth by the manufacturer. Material containers shall bear the manufacturer's label indicating manufacturer's name, trade name of product, lot number, shelf life of product, and mix ratio (if applicable). This includes individual bags of pre-bagged mortar mixes.
2. Comply with manufacturer's printed instructions for storing and protecting materials.

1.08 ENVIRONMENTAL REQUIREMENTS

A. Cold Weather Construction Requirements
   1. Per Section BC 2104.3, cold weather construction provisions of TMS 602/ACI 530.1/ASCE 6 Article 1.8C shall be implemented when either the ambient temperature falls below 40°F or the temperature of masonry units is below 40°F.
   2. Salt or other chemicals for lowering the freezing temperature of the mortar shall not be used.
   3. Hot Weather Construction Requirements
   4. Per the requirements of Section BC 2104.4, hot weather construction provisions of TMS 602/ACI 530.1/ASCE 6 Article 1.8D shall be implemented when temperatures exceed 100°F, or 90°F with a wind velocity greater than 8 mph.

B. Wetting of Clay Masonry Units
   1. Provide prewetting of masonry for units with initial rates of absorption that require their wetting before laying (21.42 grams per 30 square inches or 0.025 ounce psi).

PART 2 - PRODUCT

2.01 MANUFACTURERS

A. Terra Cotta
   1. Boston Valley Terra Cotta, Orchard Park, N.Y. 14127.
   2. Gladding, McBean Co., Lincoln, CA.

B. Reinforcement and Ties
   1. Hohmann & Barnard, Inc., Hauppage, N.Y.
   2. Dur-O-Wall, Arlington Heights, IL.

C. Adhesive Anchors
   1. Hilti
   2. ITW Red Head
   3. Powers Fasteners

2.02 MATERIAL

A. Terra Cotta
   1. Process: Provide units manufactured only by the hand pressed or ram pressed of forming.
   2. Terra Cotta units shall be tested for listed characteristics and properties in compliance with the following ASTM procedures by an independent laboratory. Test values under criteria are based on an average of 10 samples:
   3. METHOD CRITERIA
   4. Compressive Strength ASTM C67 8000 psi (whole unit) minimum (No indiv. unit less than 5000 psi)
   5. Absorption (5 hour boil) ASTM C67 11.9% max
   6. Absorption (24 hour soak) ASTM C67 7.9% max
   7. Saturation Coefficient ASTM C67 0.69 max
   8. Freeze/Thaw Resistance ASTM C67 300 cycles without degradation (100 for pro-duction run)
   9. Glaze Absorption ASTM C67 0.15% max
   10. Terra Cotta units shall be tested for listed characteristics and properties in compliance with the following tests described in A.I.A. File No. 9 - Public Works Specifications for Ceramic Veneer procedures by an independent laboratory.
       a. Imperviousness: After test, no stain on or beneath surface, visible from a distance of 5 feet, except a slight discoloration of mottled finishes, as judged by the Project Architect/Engineer.
       b. Chemical Resistance: Glaze color shall not change under test.
       c. Crazing: Glaze shall not craze, spall, or crack when subjected to one cycle of autoclaving in the crazing test.
       d. Glaze Adhesion: After test, there shall be no clean separation of finish and body, and the finish shall have portions of the body adhering to it over the complete exposed surface.

11. Finish: Finish faces, exposed when in place, shall be free from chips, blisters, crawling, or other imperfections which, as judged by the Project Architect/Engineer, detract from the appearance of the finished work when viewed from a distance of 15 feet.
12. Tolerances:
    a. Face Dimension Tolerances: To be as per Table II and III of ASTM C1126. Exposed face shall not vary from shop drawing dimensions by more than 1/8" plus or minus per linear foot.
    b. Warpage Tolerances: The exposed face shall not vary from a true plane by more than the original terra cotta units.
13. Defects: Units with cracks, spalls, or show evidence of being patched will not be accepted.

B. Anchors:
1. Strap Anchors for building with back-up wall or welding to existing steel: 1/8" thick minimum stainless steel, Type 304 conforming to ASTM A240. See Drawings for sizes and shapes.
2. Rod Anchors for attaching into masonry are to be Type 304 stainless steel adhesive type with screen. Adhesive anchors in concrete shall have an ICC-ES Evaluation Service report (ESR) issued in accordance with ACI 355.4 or ICC-ES AC 308 for use in cracked concrete, including seismic applicability loading, and pursuant to the Office of Technical Certification and Research (OTCR) Building Bulletin 2014-018. Anchors installed in grouted masonry shall have a report issued in accordance with AC 58:
    a. Hilti HY 70.
    b. ITW Red Head C6+
    c. Powers Fasteners AC100+Gold
3. Eye rods & pins: Type 304 stainless steel
4. Electrode for Welding to Stainless Steel to carbon steel: E309-16. Keep electrode dry. Oven dry electrode after exposing it for more than 6 hours.

C. Mortar Materials:
1. Portland Cement: ASTM C150, Type I
2. Lime: ASTM C207, Type S.
3. Sand: Clean, white, ASTM C144. Mix shall not contain chlorides. If required to provide matching mortar color, provide colored sand meeting the required gradation.
4. Water: Shall be clean potable water free of injurious foreign matter conforming to the requirements of Section BC 1903.4.
5. Mortar Coloring: Provide pure mineral pigments, natural and synthetic iron oxides, and chromium oxides compounded for use in mortar mixes. Material shall conform to ASTM C979. Coloring shall not contain alkalyde salts or chlorides. No liquid colorants shall be permitted.
6. Premixed sand and lime for mortar mixes is not permitted. The use of batched material by Spec-Mix and factory-packaged cement-lime-pigment by major mortar manufacturers is permitted. Each individual bag of material shall have the manufacturer's label identifying the mortar type.
7. Weep tubes
    a. Preformed plastic tube

2.03 MIXES

A. Mortar Types
1. All Mortar:
2. Comply with ASTM C270 and BIA-M1-88.
3. Provide Type I Portland cement. Masonry cement shall not be used as a substitute.
    a. Preconstruction testing with the proportions carefully monitored is to be used to establish the upper end of the strength range of the mortar, which should generally be near the minimum strength of the next higher strength mortar.
    b. The maximum strength of each mortar shall generally not exceed the minimum strength of the next higher strength mortar type.
    c. Air content of mortar shall be less than 12%.
4. Provide the following:

5. Setting Mortar: Type S of the following proportions; 1 part Portland cement, 1/2 part lime, 41/2 parts dry sand. Minimum compressive strength shall be 1800 psi.
    a. Pointing Mortar: Type N of the following proportions; 1 part Portland cement, 1 part lime, 6 parts dry sand. Minimum compressive strength shall be 750 psi.
    b. Mortar grout for grouting behind units with spaces between 5/8” to 3/4": Setting mortar with additional water.
        1) Peas Gravel Grout where space behind unit is greater than 3/4" or for filling large cells: 1 part Portland cement, 3 parts sand, and 2 parts graded gravel passing the 3/8” sieve.
        2) Proportion mortar coloring with other mortar mix ingredients to obtain desired color, as approved by the Project Architect. Provide white cement instead of gray cement where required to meet the desired color. Do not exceed 1 part pigment to 10 parts cement, by weight. If consistent color cannot be obtained, provide as a minimum premixed Portland cement and coloring from major cement manufacturer.

2.04 FABRICATION

A. Field measure existing units and produce molds from existing units to replicate work. Based on these, create shop drawings. Allow for clay shrinkage resulting from drying and firing. Joint widths are to be 1/4" minimum if existing is less than 1/4" and 3/8” maximum if joints are equal to or greater than 3/8”. If existing units are damaged and details are missing, recreate missing details in the pieces or if units are missing, create new design based on similar adjacent pieces or existing photographs.

B. Fabricate terra cotta pieces in accordance with approved shop and setting drawings.

C. Form clay pieces by hand pressing or ram pressing as determined by manufacturer as best method for shapes, sizes, and complexity of terra cotta. Hand finish pieces as required to produce high quality component.

D. Form reglets to receive flashings where reglets are required by the Drawings.

E. Walls of units shall not be less than 11/4” thick and partitions shall be of such thickness and so spaced as to perform their proper function with regard to form and structure. Necessary anchor holes and hand holes shall be provided in accordance with shop drawings so formed as to properly engage the structure. Beds shall generally not be less than 4” deep.

F. All joints shall be straight and true. All units shall be laid out in the factory to test it for uniformity of joint widths and overall dimensions. When necessary to secure accurate dimensions and uniform joint widths, the material shall be sized straight and true.

G. Dry pieces 3 to 14 days using regulated temperature and humidity.

H. Glaze of units shall not overlap edges to provide full bonding of mortar to the sides.

I. Provide weeps in cells that will not be filled with mortar.

2.05 SOURCE QUALITY CONTROL

A. Testing
    1. Perform testing on production runs as specified under “Quality Assurance

B. Preconstruction Testing

C. Preconstruction testing of mortar properties will be done in accordance with ASTM C780. The Contractor shall assist the Architect’s laboratory by any means necessary and shall provide the mock-up prior to beginning the installation work to allow for adjustments of the mix if necessary. Do not proceed with masonry work until the preconstruction testing is completed. Contractor shall mix mortar as it intends for the actual construction.
    1. Compressive strength tests of field mixed mortar are to be done during construction of the mock-up, or earlier if desired by the Contractor, to provide a benchmark for the strength based on actual field conditions and proportioning of the mortar. If mortar strengths are too high, proportions may be required to be modified if directed by the Architect or Engineer of Record.
    2. Inspection

D. The Architect will assign a Special Inspector who will inspect the masonry construction under the requirements of Special Inspections

1. The Architect reserves the right to perform plant inspections of the terra cotta manufacturing process. Afford the Architect's representatives access to the facility.
2. Contractor Plant Inspections
   a. After fabrication and prior to packing for shipment, carefully inspect terra cotta pieces for chips, cracks, and other defects. Verify dimensions comply with shop drawing dimensions and finishes match approved samples.
   b. Verify pieces meet fabrication tolerances:
   c. Shop assembly:
      1) Layout terra cotta pieces in accordance with setting drawings. Verify that joints, when installed, will be straight, true, and uniform in width. Verify that decorative elements continuous from one piece to next are aligned.
      2) Notify Architect 10 days prior to shop assembly.

PART 3 - EXECUTION

3.01 EXAMINATION

A. Examine all adjoining Work on which this Work is in anyway dependent for proper installation and workmanship. Report to the Architect any conditions that prevent the performance of this Work.

3.02 PREPARATION AND PROTECTION

A. Protection

B. Protect adjacent surfaces not being restored. Protect sills, ledges, and projections from material droppings. Also, protect any painted surfaces that are not included in the Work from impact or damage.

C. Cover top of masonry wall with waterproof plastic membrane at the end of the work period and at other times when Work needs to be protected from rain and other precipitation. Extend cover down sides as needed to thoroughly protect the Work.

D. During cold weather, do not use wet masonry units and frozen masonry units.

E. Do not use frozen materials or lay masonry on frozen materials; remove frozen materials from wall. Refer to Part 1 of this Section, "Environmental Requirements" for temperature restrictions.

F. Remove excess mortar from walls as soon after laying units as practicable to prevent staining and to facilitate cleaning of wall.

G. Scaffolding shall not be supported from a parapet wall on which work is being performed.
   1. Work on the exterior face of a parapet wall shall not be done concurrently with work on the interior face of the parapet wall.
   2. Preparation

H. Carefully remove existing units to be replaced, without causing damage to adjacent areas.
   1. Fill in void spaces in back-up masonry and paint existing steel members. Carefully examine substrate construction before installing the work; correct as necessary to provide a plumb and true substrate to accommodate a proper installation of the terra cotta units. Install new back-up masonry as indicated. Perform work in conjunction with Section 04520 and 04200.

I. Surface Preparation
   1. Prepare surfaces in compliance with terra cotta manufacturer's recommendations.
   2. Remove dirt, dust, and foreign material from surfaces.
      a. Where ties are to be welded to existing steel members, grind surface at weld area to shiny metal.

J. Materials Preparation
   1. Clean new units prior to setting, leaving edges and surfaces free of dirt and foreign material.
   2. Soak units in a vat or box of clean water for one hour or more just prior to installation. Units shall be noticeably damp at the time of setting. Units shall be drained sufficiently to eliminate surface water.
      a. Clean and degrease anchors prior to setting in epoxied holes.

3. At the beginning of each setting day, soak surfaces to receive terra cotta with clean water. Soak again with water not more than one (1) hour before setting of unit.

3.03 MIXING PROCEDURE FOR MORTAR

A. Measure material by volume or equivalent weight. In measuring by volume, use a container to measure ingredients. Do not measure by shovel.

B. Setting Mortar

C. Mix ingredients in a clean mechanical mixer for a minimum of 3 minutes, maximum of 5, with the minimum amount of water to produce a workable consistency.

D. Mortar that has stiffened because of evaporation of water from the mortar may be retempered only once, and only during the first hour of placement to restore the required consistency. Mortar shall be used within 21/2 hours after initial mixing. Limit amount of mortar batched at one time to stay within these requirements.
   1. Pointing Mortar
      a. Add sufficient water to dry mix to produce a damp mix that will retain it shape when pressed into a ball by hand. Mix from 3 to 7 min. in a mechanical mixer.
      b. Let mortar stand for not less than 1 hour nor more than 1½ hours for prehydration. Add sufficient water to bring mortar to proper consistency for tuck-pointing, somewhat drier than mortar used for laying units.
      c. Use mortar within 21/2 hours of its initial mixing; tempering is permitted only once after bringing mortar to proper consistency.

3.04 INSTALLATION

A. Install terra cotta pieces in accordance with manufacturers recommended instructions and approved shop drawings.

B. Field cutting: Where cutting is required to accommodate non-standard conditions, use power saw with water-cooled abrasive or diamond blade and rigid cutting templates. Do not reduce strength of terra cotta by cutting webs and partitions.

C. Set terra cotta plumb, true, and aligned. Maintain courses to uniform dimension.

D. Projecting terra cotta shall be aligned and uniform such that shadow cast is true line.

E. Anchor installation:
   1. Attach new terra cotta pieces to substrate with metal anchors as detailed on approved shop drawings.
   2. Securely attach anchors, hangers, bolts, clips, rods, and pins as required for securing terra cotta pieces. Ensure items are properly sized and accurately located.
   3. Where indicated, weld stainless steel anchors to steel members using E309-16 electrodes
   4. Set pieces in solid mortar bed. Fill all spaces between terra cotta and substrate with mortar. Provide teflon shims or wood to set depth of joint, removing shims after mortar has set. Ensure weep holes in units are clear of debris.
   5. Open back terra cotta shapes placed in a wall shall be filled solidly with brick masonry and mortar as units are installed (or prior to installation) to the point that is within the masonry wall to provide bearing (not the portions that overhang the wall, which shall remain open and be weeped). Allow mortar to set enough to permit handling.
   6. Ensure that all rebates in bed and cross-joints on sides and back are filled solid with mortar. Leave no voids.
   7. As work progresses, install built-in flashings and sheet metal as indicated on approved shop and setting drawings. Seal penetrations in flashing using mastic.

F. Fill terra cotta formed cavities containing reinforcement and other locations indicated on approved shop and setting drawings with mortar. Place and consolidate grout without displacing reinforcement. Ensure that steel reinforcement, supports, anchors, and ties are encased with mortar and permanently protected from corrosion.

G. Provide weep holes through mortar joints as indicated on approved shop and setting drawings. Keep weep holes free of mortar and grout.
   1. Mortar joints:
   2. Size 3/8” wide or to match existing, whichever is smaller. Minimum size shall be 1/4". Joint width is to be taken into account in manufacturer of units.

3. Rake joints back 3/4" to allow for installation of pointing mortar, except as noted in 3 below.
4. At transverse joints of flat surfaces (skyward facing joints), rake back mortar 1/4” to allow for installation on sealant. Sealant is to come down vertical face 1”. After curing, install bond breaker tape and sealant.
    a. Pointing of Mortar Joints
    b. Wet joint thoroughly and repeatedly prior to pointing and between lifts. There shall be no free standing water at the time of mortar application.
    c. Point in two lifts. Pack joint to within 3/8” of surface on first lift. Allow first lift to set prior to pointing second lift.
    d. As soon as final lift has set, tool joint to form concave vertical and horizontal joints of uniform thickness. Where units are adjacent to existing units, match joint finish. Point joints as work progresses.
    e. After initial 24 hour set, moisten joints regularly until mortar is fully cured in 28 days.
5. Expansion joints: Provide expansion joints in linear terra cotta runs, at shelf supports, and other locations indicated on approved shop drawings to accommodate deflection, thermal changes, and settlement.
6. Unless noted otherwise, the maximum distance between expansion joints shall be 25 feet
7. Rake out expansion joints to full depth of setting bed at time terra cotta is installed.
8. Install filler sealant, bond breaker tape, and sealant as indicated on approved shop drawings.

3.05 FIELD QUALITY CONTROL

A. Inspection
    1. The Architect will assign a Special Inspector who will inspect the masonry construction. Post installed anchors are subject to Special Inspection as per Section BC 1704.32. Adhesive anchors installed in concrete in a horizontal or upwardly inclined position supporting sustained tension loads shall be installed under continuous Special Inspection as required by paragraph D9.2.4 of ACI 318-11.

B. The Special Inspector will make inspections and any testing deemed necessary. Mortar suspected or tested to be too strong or too weak will be subject to petrographic analysis or other methods deemed necessary by the Engineer of Record and Special Inspector. The Contractor shall pay for all tests if they verify improper work. Inspections are to include, but not be limited to, the following:
    1. Proper installation of reinforcement of terra cotta on angles.
    2. Proper installation of mortar. Those mortar properties listed in the Appendix of ASTM C780 are to be tested at the discretion of the Special Inspector or the Architect/Engineer of Record. Mortar strengths, when tested, will be determined in accordance with ASTM C780 using cylinders.
    3. Proper installation of weeps, flashing, drip edges, etc.
    4. The Architect or Engineer of Record will analyze any results not found to be in conformance with the applicable ASTM, industry practice, and the Specifications and determine if the masonry in question is to be removed and redone.

C. Cooperate with the Special Inspector and the Testing Laboratory performing Special Inspection testing.
    1. Manufacturer’s field representative shall inspect installed terra cotta, identify defects, and submit report to Architect. The Contractor shall correct deficiencies identified by manufacturer’s field representative.
    2. The Architect will inspect the units for acceptance. The Contractor shall remove units that are found to be cracked, chipped, or otherwise damaged and do not conform to specifications.

3.06 PROTECTION AND CLEANING

A. Protect face of adjacent walls and surfaces from water, mortar, and grout used for terra cotta installation.

B. Remove excess mortar and mortar smears as work progresses.

C. After mortar has cured (a minimum of 30 days), clean soiled surfaces with detergent and clean water. Use fiber brushes and cloths. Do not use metallic tools or acids. Perform a mock-up of the cleaning procedure.
   1. Protect terra cotta from subsequent construction operations. If damage occurs, remove and replace damaged components as required to provide terra cotta in original, undamaged condition.

END OF SECTION

SECTION 04 5100
MASONRY CLEANING

PART 1 - GENERAL

1.01 DESCRIPTION OF WORK

A. Provide all masonry cleaning Work as indicated on the Drawings and as specified herein, including, but not limited to the following:
   1. Brick
   2. Architectural Precast Concrete

1.02 REFERENCES

A. References and industry standards listed in this Section are applicable to the Work. Unless more restrictive criteria or differing requirements are explicitly stated in the Specifications, or mandated by governing codes or regulations, the recommendations, suggestions, and requirements described in the referenced standards shall be deemed mandatory and applicable to the Work.
   1. American Society for Testing and Materials (ASTM)
   2. Regulatory Agency;
      a. N.Y. State Office of Parks, Recreation and Historic Preservation (OPRHP)/State Historic Preservation Office(r) (SHPO)

1.03 SUBMITTALS

A. Product Data:
   1. Cleaning materials manufacturers' catalog sheets, specifications, and application instructions.

B. Quality Control Submittals:
   1. Cleaning Subcontractor's Qualifications Data:
      a. Firm name, address, and telephone number.
      b. Period of time firm has performed masonry cleaning work, and names and addresses of the required number of similar projects completed by the firm.
      c. Cleaners Qualifications Data:
         1) Name of each person who will be performing the Work of this Section.
         2) Employer's name, address, and telephone number.
         3) Names and addresses of the required number of similar projects that each person has worked on which meet the experience criteria.
      d. Cleaning Procedure: Proposed cleaning procedure for cleaning masonry including each step in the cleaning process, type of scaffolding, and type, size and location of equipment.
      e. Material Safety Date Sheets (MSDS) for all products to be used.
      f. Tests report of all proposed cleaning methods:

C. Submit a schedule of cleaning activities for each type of masonry to be cleaned. (Include location and a description of the cleaning sequence, all products, equipment and scaffolding, etc. to be used.

D. Submit a description of Protection Procedures for each condition and surface which requires protection.

1.04 QUALITY ASSURANCE

A. Cleaning Contractor's Qualifications:
   1. The firm performing the Work of this Section shall have been regularly engaged in masonry cleaning work for a minimum of five years, and shall have completed 5 similar projects using the cleaning method specified.

B. Cleaners' Qualifications:
   1. The persons cleaning the masonry and their supervisors shall be personally experienced in the required method of masonry cleaning, and shall have worked on 5 similar projects within the last 3 years.

C. Field Examples:

1. Before the building cleaning operations are started, clean a sample panel of approximately 100 square feet of each type of masonry required to be cleaned at a location on the building directed by the Architect's Representative. If the sample panel is not satisfactory, as determined by the Architect's Representative, modify the cleaning procedure and clean another sample panel. Continue cleaning sample panels until satisfactory results are obtained and approved by the Architect's Representative. When a final approval is obtained, go back and re-clean all previously rejected panels.
    a. For cleaning procedures other than specified, but which generally follow the method(s) specified, submit proposed procedure for approval and clean additional sample panels adjacent to the above sample panels for comparison of results.
    b. Coordinate the preparation of sample panels with testing of the low pressure, micro-abrasive powder cleaning process specified herein. Provide additional panels as required to conduct tests.
    c. Approved panels and procedures will become the cleaning standard for the Work of this Section.
    d. Cover the approved sample panels with six mil polyethylene plastic mounted on wood frames of adequate size and strength to protect the panels until the completion of Work. The cover shall be easily removable for comparison with completed Work.

D. If unusual types of soiling agents are encountered, consult with the Authority's Representative before proceeding with the Work.

1.05 DELIVERY, STORAGE, AND HANDLING

A. Deliver cleaning materials in manufacturer's packaging, with instructions for use.

B. Store, protect, and handle cleaning materials in accordance with manufacturer's instructions.

1.06 PROJECT CONDITIONS

A. Environmental Requirements:
1. Make necessary provisions for the diversion and disposal of cleaning water and solutions, including the furnishing of pumps if required. Take precautions as required to prevent damage and contamination resulting from run off of cleaning solution.
2. Do not wet or wash down masonry surfaces when the temperature is below 40 degrees F or may drop below 40 degrees F within 24 hours.

B. Existing Conditions:
1. Take necessary precautions and protective measures to prevent injury to people and damage to property in areas adjacent to the Site, including damage due to wind drift of cleaning materials.
2. Pumping equipment will not be allowed in or on the building.
3. Ensure that painted surfaces (such as exterior doors, windows, window sills, etc.) are not affected by the washing, except for those surfaces designated by the Architect for cleaning.

PART 2 - PRODUCTS

2.01 MATERIALS

A. Cleaning Materials:
1. Liquid detergents and water, and solutions of chemical cleaning agents and additives, that will remove the dirt, grime, carbon, surface residues, stains, graffiti, and other foreign material from the masonry surfaces, but will not damage the masonry.
2. Solvent - similar and equal to "Prosoco Sure Klean Heavy Duty Restoration Cleaner
    a. Note - It is the Contractors sole responsibility to insure compliance with all environmental control requirements as to the use of "acid" bearing type materials in this work as they relate to containment and disposal of contaminated solutions.
3. Stripper - similar and equal to Prosoco "Heavy Duty Paint Stripper"
    a. Test all materials in accordance with applicable section 3 herein for compatibility with existing surfaces. If not suitable, propose substitutes of equal value, with prepared field test patches for Architect's inspection.

B. Do not use abrasive blasting aggregate cleaning method, or low pressure micro-abrasive powder process or any other cleaning method until written permission is given by the Authority.

PART 3 - EXECUTION

3.01 PREPARATION

A. Protection:
1. Protect windows, doors, fixtures, air conditioners, roofing, flashings, painted surfaces and other adjacent surfaces not required to be cleaned, from damage.
2. Protect landscaping, paving, and other improvements near the building from damage. Provide necessary covering, wrappings and presoak all landscaping with water to dilute overspray of cleaners.
3. Construct temporary sidewalk sheds at building entrances and other areas to divert cleaning materials and debris away from entrance ways and to provide sheltered access to the building.

B. Surface Preparation:
1. Remove vines, bird nests, stalactite deposits, and heavy accumulations of dirt, bird droppings and other foreign materials from surfaces required to be cleaned. Remove material from the site.
2. Perform this preliminary cleaning by brushing, sweeping, wiping, scraping, vacuuming, and other approved methods as required by existing conditions. Use tools that will not damage the masonry.

3.02 CLEANING MASONRY

A. Chemical Solutions or Liquid Detergent and Water:
1. Prewet the masonry surfaces with water.
2. Prepare cleaning solutions and operate pressure spray equipment in accordance with cleaning materials manufacturer's recommendations, unless otherwise indicated.
a. Clean areas not accessible to spray equipment with bristle brushes.
b. The use of wire brushes, steel wool or sandblasting for cleaning will not be permitted. Repeated scrubbings and flushings shall be done until all residue dirt and cleaning agents have been removed.

B. Water Cleaning Methods:
1. Low pressure (water soak) for limestone and marble.
2. Medium pressure: Use 200 psi to 600 psi.

C. Clean masonry equal in appearance to the approved sample panels.

D. Clean masonry free of dirt, grime, soot, carbon, efflorescence, moss, stains, graffiti, tendrils, and other foreign materials. Leave masonry uniformly clean and undamaged.

E. Clean all features and appurtenances of the masonry such as sills, arches, lintels, returns, reveals, projecting courses, coping, entablature work, back of parapets and balustrades, balconies, friezes, fascias, cornices, chimneys and other features, except for those building features which are painted and are not included in the scope of work.

F. Thoroughly rinse off the masonry surfaces with water.

3.03 CLEAN-UP

A. Clean and restore sidewalks, paving, and lawns soiled or damaged as a result of the cleaning operations. Remove all protective materials.

END OF SECTION

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SECTION 05 5000
METAL FABRICATIONS

PART 1 GENERAL

1.01 SECTION INCLUDES

A. Shop fabricated steel items.

B. Prefabricated ladders and ship ladders.

1.02 RELATED REQUIREMENTS

A. Section 04 2000 - Unit Masonry: Placement of metal fabrications in masonry.

B. Section 09 9000 - Painting and Coating: Paint finish.

1.03 REFERENCE STANDARDS

A. ASTM A36/A36M - Standard Specification for Carbon Structural Steel 2014.

B. ASTM A53/A53M - Standard Specification for Pipe, Steel, Black and Hot-Dipped, Zinc-Coated, Welded and Seamless 2020.

C. ASTM A123/A123M - Standard Specification for Zinc (Hot-Dip Galvanized) Coatings on Iron and Steel Products 2017.

D. ASTM A283/A283M - Standard Specification for Low and Intermediate Tensile Strength Carbon Steel Plates 2018.

E. ASTM A307 - Standard Specification for Carbon Steel Bolts, Studs, and Threaded Rod 60 000 PSI Tensile Strength 2014, with Editorial Revision (2017).

F. ASTM A500/A500M - Standard Specification for Cold-Formed Welded and Seamless Carbon Steel Structural Tubing in Rounds and Shapes 2020.

G. ASTM A501/A501M - Standard Specification for Hot-Formed Welded and Seamless Carbon Steel Structural Tubing 2014.

H. ASTM B209 - Standard Specification for Aluminum and Aluminum-Alloy Sheet and Plate 2014.

I. ASTM B211 - Standard Specification for Aluminum and Aluminum-Alloy Rolled or Cold Finished Bar, Rod, and Wire 2012.

J. ASTM B221 - Standard Specification for Aluminum and Aluminum-Alloy Extruded Bars, Rods, Wire, Profiles, and Tubes 2014.

K. AWS A2.4 - Standard Symbols for Welding, Brazing, and Nondestructive Examination 2012.

L. AWS D1.1/D1.1M - Structural Welding Code - Steel 2020.

M. OSHA 1910.27 - Fixed Ladders

N. SSPC-Paint 15 - Steel Joist Shop Primer/Metal Building Primer 1999 (Ed. 2004).

O. SSPC-Paint 20 - Zinc-Rich Primers (Type I, "Inorganic," and Type II, "Organic") 2002 (Ed. 2004).

P. SSPC-SP 2 - Hand Tool Cleaning 2018.

1.04 SUBMITTALS

A. See Section 01 3000 - Administrative Requirements, for submittal procedures.

B. Shop Drawings: Indicate profiles, sizes, connection attachments, reinforcing, anchorage, size and type of fasteners, and accessories. Include erection drawings, elevations, and details where applicable.
   1. Indicate welded connections using standard AWS A2.4 welding symbols. Indicate net weld lengths.

C. Product Data
   1. Submit product data sheets for products used in metal fabrications, including anchoring devices. Instructions for installation of anchorage devices built into other work.

2. Product data sheets for painting materials
3. Product dat sheets for grouts and sealants.
4. Manfacturers Safety and Data Sheets (MSDS)

D. Samples
1. Welders' Certificates: Submit certification for welders employed on the project, verifying AWS qualification within the previous 12 months.

1.05 QUALITY ASSURANCE

A. Design under direct supervision of a Professional Structural Engineer experienced in design of this Work and licensed in Yonkers, NY.

PART 2 PRODUCTS

2.01 MATERIALS - STEEL

A. Steel Sections: ASTM A36/A36M.

B. Steel Tubing: ASTM A500, Grade B cold-formed structural tubing.

C. Plates: ASTM A283.

D. Pipe: ASTM A53/A53M, Grade B Schedule 40, black finish.

E. Welding Materials: AWS D1.1/D1.1M; type required for materials being welded.

F. Shop and Touch-Up Primer: SSPC-Paint 15, complying with VOC limitations of authorities having jurisdiction.
1. Shop Primer Interior work
a. Tnmec Co. No. 10-99 Tnmec primer
b. Benjamin Moore Ironclad Retardo Rust Inhibitive Paint No. 163
2. Shop Primer Exterior Work except galvanized items:
a. Primer for epoxy coat system as per section 09 9000.

G. Touch-Up Primer for Galvanized Surfaces: SSPC-Paint 20, Type I - Inorganic, complying with VOC limitations of authorities having jurisdiction. Dry film not less than 94% zinc dust weight.

2.02 FABRICATION

A. Fit and shop assemble items in largest practical sections, for delivery to site. Disassemble units only as necessary for shipping and handling.

B. Fabricate items with joints tightly fitted and secured.

C. Continuously seal joined members by continuous welds.
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 that no roughness shows after finishing and contour of welded surface matches those adjacent.

D. Grind exposed joints flush and smooth with adjacent finish surface. Make exposed joints butt tight, flush, and hairline. Ease exposed edges to small uniform radius.

E. Exposed Mechanical Fastenings: Flush countersunk screws or bolts; unobtrusively located; consistent with design of component, except where specifically noted otherwise.

F. Supply components required for anchorage of fabrications. Fabricate anchors and related components of same material and finish as fabrication, except where specifically noted otherwise.

G. Allow for thermal movement resulting from the following maximum change (range) in ambient tempertature in the design, fabrication, and installation of installed metal assemblies to prevent buckling, opening up of the joints and overstressing of the welds and fasteners. Base design calculations on actual surface temperatures of metals due to both solar heat gain and nighttime sky heat loss.

H. Remove sharp or rough areas on exposed traffic surfaces

2.03 FABRICATED ITEMS

A. Exterior Lintels: As detailed; galvanized finish.
   1. Furnish to mason at the proper time for setting all steel lintels in exterior walls not connected by hangers, clips, bolts or otherwise, to the structural work. Lintels in exterior walls of reinforced concrete framed superstructure of portion thereof, or in the concrete fire proofing of steel spandrel beams, shall be secured in place by means of wedge inserts in concrete beams or steel spandrel fireporoofing.
   2. All exterior lintels in exterior walls shall be hot dipped galvanized in accordance with ASTM A123. Bolts connecting lintels to the galvanized wedge inserts shall be galvanized inaccordance with ASTM A153.

2.04 PREFABRICATED LADDERS

A. Prefabricated Ship Ladder: Welded metal unit complying with ANSI A14.3; factory fabricated to greatest degree practical and in the largest components possible.
   1. Components: Manufacturer's standard rails, rungs, treads, handrails. returns, platforms and safety devices complying with the requirements of the MATERIALS article of this section.
   2. Materials: Aluminum; ASTM B221/B221M alloy 6063-T52.
   3. Incline: 75 degrees.
   4. Finish: Powder coat; color to be selected by Architect from manufacturer's full range.
   5. Products:
      a. O'Keeffe's, Inc; Model 520: www.okeeffes.com/#sle.
      b. Precision Ladders LLC www.precisionladders.com.
      c. Substitutions: See Section 01 6000 - Product Requirements.

2.05 FINISHES - STEEL

A. Prime paint all steel items.
   1. Exceptions: Galvanize items to be embedded in concrete or masonry.

B. Prepare surfaces to be primed in accordance with SSPC-SP2.

C. Clean surfaces of rust, scale, grease, and foreign matter prior to finishing.

D. Prime Painting: One coat.

E. Galvanizing of Non-structural Items: Galvanize after fabrication to ASTM A123/A123M requirements.

2.06 FABRICATION TOLERANCES

A. Squareness: 1/8 inch maximum difference in diagonal measurements.

B. Maximum Offset Between Faces: 1/16 inch.

C. Maximum Misalignment of Adjacent Members: 1/16 inch.

D. Maximum Bow: 1/8 inch in 48 inches.

E. Maximum Deviation From Plane: 1/16 inch in 48 inches.

PART 3 EXECUTION

3.01 EXAMINATION

A. Verify that field conditions are acceptable and are ready to receive work.

3.02 PREPARATION

A. Clean and strip primed steel items to bare metal where site welding is required.

B. Supply setting templates to the appropriate entities for steel items required to be cast into concrete or embedded in masonry.

3.03 INSTALLATION

A. Install items plumb and level, accurately fitted, free from distortion or defects.

B. Provide for erection loads, and for sufficient temporary bracing to maintain true alignment until completion of erection and installation of permanent attachments.

C. Perform field welding in accordance with AWS D1.1/D1.1M.

D. Obtain approval prior to site cutting or making adjustments not scheduled.

E. After erection, prime welds, abrasionsand surfaces not shop primed or galvanized , except surfaces to be in contact with concrete.

3.04 TOLERANCES

A. Maximum Variation From Plumb: 1/4 inch per story, non-cumulative.

B. Maximum Offset From True Alignment: 1/4 inch.

C. Maximum Out-of-Position: 1/4 inch.

END OF SECTION

SECTION 06 1000
ROUGH CARPENTRY

PART 1 GENERAL

1.01 SECTION INCLUDES

A. Structural dimension lumber framing.

B. Rough opening framing for doors, windows, and roof openings.

C. Sheathing.

D. Roof-mounted curbs.

E. Wood nailers and curbs for roofing and items installed on roof.

F. Concealed wood blocking, nailers, and supports.

G. Miscellaneous wood nailers, furring, and grounds.

1.02 RELATED REQUIREMENTS

A. Section 07 6200 - Sheet Metal Flashing and Trim: Sill flashings.

B. Section 09 2116 - Gypsum Board Assemblies: Gypsum-based sheathing.

1.03 REFERENCE STANDARDS

A. ANSI A208.1 - American National Standard for Particleboard 2016.

B. ASTM A153/A153M - Standard Specification for Zinc Coating (Hot-Dip) on Iron and Steel Hardware 2016a.

C. ASTM C578 - Standard Specification for Rigid, Cellular Polystyrene Thermal Insulation 2019.

D. ASTM C1177/C1177M - Standard Specification for Glass Mat Gypsum Substrate for Use as Sheathing 2017.

E. ASTM C1396/C1396M - Standard Specification for Gypsum Board 2017.

F. ASTM D2898 - Standard Test Methods for Accelerated Weathering of Fire-Retardant-Treated Wood for Fire Testing 2010 (Reapproved 2017).

G. ASTM E84 - Standard Test Method for Surface Burning Characteristics of Building Materials 2020.

H. AWPA C2 - Lumber, Timber, Bridge Ties and Mine Ties -- Preservative Treatment by Pressure Processes; American Wood Protection Association; 2003.

I. AWPA C9 - Plywood -- Preservative Treatment by Pressure Processes; American Wood Protection Association; 2003.

J. AWPA C27 - Plywood -- Fire-Retardant Treatment by Pressure Processes; American Wood-Protection Association; 2002.

K. PS 20 - American Softwood Lumber Standard 2020.

L. SPIB (GR) - Grading Rules 2014.

M. WCLIB (GR) - Standard Grading Rules for West Coast Lumber No. 17 2018.

N. WWPA G-5 - Western Lumber Grading Rules 2017.

1.04 SUBMITTALS

A. Product Data: Provide technical data on insulated sheathing, wood preservative materials, and application instructions.

B. Shop Drawings: For site fabricated truss frames, indicate dimensions, wood species and grades, component profiles, drilled holes, fasteners, connectors, details, and sequence of erection.

C. Samples: For rough carpentry members that will be exposed to view, submit two samples, 6x6 inch in size illustrating wood grain, color, and general appearance.

D. Manufacturer's Certificate: Certify that wood products supplied for rough carpentry meet or exceed specified requirements.

1.05 QUALITY ASSURANCE

A. Lumber: Comply with PS 20 and approved grading rules and inspection agencies.
   1. Acceptable Lumber Inspection Agencies: Any agency with rules approved by American Lumber Standards Committee.

1.06 DELIVERY, STORAGE, AND HANDLING

A. General: Cover wood products to protect against moisture. Support stacked products to prevent deformation and to allow air circulation.

PART 2 PRODUCTS

2.01 GENERAL REQUIREMENTS

A. Dimension Lumber: Comply with PS 20 and requirements of specified grading agencies.
   1. If no species is specified, provide any species graded by the agency specified; if no grading agency is specified, provide lumber graded by any grading agency meeting the specified requirements.
   2. Grading Agency: Any grading agency whose rules are approved by the Board of Review, American Lumber Standard Committee (www.alsc.org) and who provides grading service for the species and grade specified; provide lumber stamped with grade mark unless otherwise indicated.

B. Lumber fabricated from old growth timber is not permitted.

2.02 DIMENSION LUMBER

A. Sizes: Nominal sizes as indicated on drawings, S4S.

B. Moisture Content: S-dry or MC19.

C. Joist, Rafter, and Small Beam Framing (2 by 6 through 4 by 16):
   1. Species: Douglas Fir-Larch.
   2. Grade: No. 1 & Btr.

D. Miscellaneous Framing, Blocking, Nailers, Grounds, and Furring:
   1. Lumber: S4S, No. 2 or Standard Grade.
   2. Boards: Standard or No. 3.

2.03 CONSTRUCTION PANELS

A. Roof Sheathing: APA PRP-108, Structural I Rated Sheathing, Exterior Exposure Class, and as follows:
   1. Span Rating: 24/0.
   2. Thickness: 1/2 inch, nominal.

B. Roof Sheathing: Particleboard, ANSI A208.1, Grade M-3 EXTERIOR GLUE; square edges, with panel clips.

C. Communications and Electrical Room Mounting Boards: PS 1 A-D plywood, or medium density fiberboard; 3/4 inch thick; flame spread index of 25 or less, smoke developed index of 450 or less, when tested in accordance with ASTM E84.

2.04 ACCESSORIES

A. Fasteners and Anchors:
   1. Metal and Finish: Hot-dipped galvanized steel per ASTM A 153/A 153M for high humidity and preservative-treated wood locations, unfinished steel elsewhere.
   2. Anchors: Toggle bolt type for anchorage to hollow masonry.

B. Joist Hangers: Hot dipped galvanized steel, sized to suit framing conditions. Provide [_____] manufactured by [_____] .

C. Sill Gasket on Top of Foundation Wall: 1/4 inch thick, plate width, closed cell plastic foam from continuous rolls. Provide [_____] manufactured by [_____] .

D. Sill Flashing: As specified in Section 07 6200.

E. Water-Resistive Barrier: No. Asphalt Felt.

PART 3 EXECUTION

3.01 PREPARATION

A. Where wood framing bears on cementitious foundations, install full width sill flashing continuous over top of foundation, lap ends of flashing minimum of 4 inches and seal.

B. Install sill gasket under sill plate of framed walls bearing on foundations; puncture gasket cleanly to fit tightly around protruding anchor bolts.

C. Coordinate installation of rough carpentry members specified in other sections.

3.02 INSTALLATION - GENERAL

A. Select material sizes to minimize waste.

B. Reuse scrap to the greatest extent possible; clearly separate scrap for use on site as accessory components, including: shims, bracing, and blocking.

3.03 FRAMING INSTALLATION

A. Select material sizes to minimize waste.

B. Set structural members level, plumb, and true to line. Discard pieces with defects that would lower required strength or result in unacceptable appearance of exposed members.

C. Make provisions for temporary construction loads, and provide temporary bracing sufficient to maintain structure in true alignment and safe condition until completion of erection and installation of permanent bracing.

D. Comply with member sizes, spacing, and configurations indicated, and fastener size and spacing indicated, but not less than required by applicable codes and AFPA Wood Frame Construction Manual.

3.04 BLOCKING, NAILERS, AND SUPPORTS

A. Provide framing and blocking members as indicated or as required to support finishes, fixtures, specialty items, and trim.

B. In metal stud walls, provide continuous blocking around door and window openings for anchorage of frames, securely attached to stud framing.

C. In walls, provide blocking attached to studs as backing and support for wall-mounted items, unless item can be securely fastened to two or more studs or other method of support is explicitly indicated.

D. Where ceiling-mounting is indicated, provide blocking and supplementary supports above ceiling, unless other method of support is explicitly indicated.

E. Specifically, provide the following non-structural framing and blocking:
   1. Cabinets and shelf supports.
   2. Wall brackets.
   3. Handrails.
   4. Grab bars.
   5. Towel and bath accessories.
   6. Wall-mounted door stops.
   7. Chalkboards and marker boards.
   8. Wall paneling and trim.
   9. Joints of rigid wall coverings that occur between studs.

3.05 ROOF-RELATED CARPENTRY

A. Coordinate installation of roofing carpentry with deck construction, framing of roof openings, and roofing assembly installation.

B. Provide wood curb at all roof openings except where specifically indicated otherwise. Form corners by alternating lapping side members.

3.06 INSTALLATION OF ACCESSORIES AND MISCELLANEOUS WOOD

A. Coordinate curb installation with installation of decking and support of deck openings.

3.07 INSTALLATION OF CONSTRUCTION PANELS

A. Roof Sheathing: Secure panels with long dimension perpendicular to framing members, with ends staggered and over firm bearing.
   1. Nail panels to framing; staples are not permitted.

B. Communications and Electrical Room Mounting Boards: Secure with screws to studs with edges over firm bearing; space fasteners at maximum 24 inches on center on all edges and into studs in field of board.
   1. At fire-rated walls, install board over wall board indicated as part of the fire-rated assembly.
   2. Where boards are indicated as full floor-to-ceiling height, install with long edge of board parallel to studs.
   3. Install adjacent boards without gaps.

3.08 TOLERANCES

A. Framing Members: 1/4 inch from true position, maximum.

B. Variation from Plane (Other than Floors): 1/4 inch in 10 feet maximum, and 1/4 inch in 30 feet maximum.

3.09 CLEANING

A. Waste Disposal: Comply with the requirements of Section 01 7419.
   1. Comply with applicable regulations.
   2. Do not burn scrap on project site.
   3. Do not burn scraps that have been pressure treated.
   4. Do not send materials treated with pentachlorophenol, CCA, or ACA to co-generation facilities or “waste-to-energy” facilities.

B. Do not leave any wood, shavings, sawdust, etc. on the ground or buried in fill.

C. Prevent sawdust and wood shavings from entering the storm drainage system.

END OF SECTION

SECTION 07 1300
SHEET WATERPROOFING

PART 1 GENERAL

1.01 SECTION INCLUDES

A. Sheet membrane waterproofing.

1.02 RELATED REQUIREMENTS

A. Section 03 3000 - Cast-in-Place Concrete: Concrete substrate.

1.03 SUBMITTALS

A. See Section 01 3000 - Administrative Requirements, for submittal procedures.

B. Product Data: Provide data for membrane.

C. Shop Drawings: Indicate special joint or termination conditions and conditions of interface with other materials.

1.04 QUALITY ASSURANCE

A. Membrane Manufacturer Qualifications: Company specializing in waterproofing sheet membranes with three years experience.

1.05 WARRANTY

A. See Section 01 7800 - Closeout Submittals, for additional warranty requirements.

B. Contractor shall correct defective Work within a five year period after Date of Substantial Completion; remove and replace materials concealing waterproofing at no extra cost to Owner.

C. Provide five year manufacturer warranty for waterproofing failing to resist penetration of water and [_____] , except where such failures are the result of structural failures of building. Hairline cracking of concrete due to temperature change or shrinkage is not considered a structural failure.

PART 2 PRODUCTS

2.01 WATERPROOFING APPLICATIONS

A. Modified Bituminous Membrane Waterproofing: Use at locations as indicated on drawings.
   1. Vertical Surfaces: Adhesive bonded to substrate.
   2. Horizontal Surfaces: Adhesive bonded to substrate.
   3. Cover with protection board.

2.02 MEMBRANE MATERIALS

A. Self-Adhered Modified Bituminous Membrane:
   1. Thickness: 60 mil (0.060 inch).
   2. Sheet Width: 36 inches.
   3. Tensile Strength:
      a. Film: 5000 pounds per square inch, minimum, measured according to ASTM D882 and at grip-separation rate of 2 inches per minute.
      b. Membrane: 325 pounds per square inch, minimum, measured according to ASTM D412 Method A, using die C and at spindle-separation rate of 2 inches per minute.
   4. Elongation at Break: 300 percent, minimum, measured according to ASTM D412.
   5. Water Vapor Permeance: 0.05 perm, maximum, measured in accordance with ASTM E96/E96M.
   6. Low Temperature Flexibility: Unaffected when tested according to ASTM D1970 at minus 20 degrees F, 180 degree bend on 1 inch mandrel.
   7. Peel Strength: 5 pounds per inch, minimum, when tested according to ASTM D903.
   8. Lap Adhesion Strength: 5 pounds per inch, minimum, when tested according to ASTM D1876.
   9. Puncture Resistance: 40 pounds, minimum, measured in accordance with ASTM E154.

10. Water Absorption: 0.1 percent increase in weight, maximum, measured in accordance with ASTM D570, 24 hour immersion.
11. Hydrostatic Resistance: Resists the weight of 200 feet when tested according to ASTM D5385.
12. Adhesives, Sealants, Tapes, and Accessories: As recommended by membrane manufacturer.
13. Manufacturers:
    a. Carlisle Coatings & Waterproofing Incorporated; MiraDRI 860/861: www.carlisle-ccw.com/#sle.
    b. Grace Construction Products; Product Bituthene 4000 by Grace Construction Products: www.na.graceconstruction.com/#sle.

2.03 ACCESSORIES

A. Protection Board: Rigid insulation shall be Owens Corning Foamular 250.

B. Drainage Panel: Drainage layer with geotextile filter fabric on earth side.
   1. Composition: Dimpled polystyrene core; polypropylene filter fabric.
      a. Products:
         1) W.R. Meadows, Inc; Mel-Drain 5012: www.wrmeadows.com/#sle.
         2) Substitutions: See Section 01 6000 - Product Requirements.

PART 3 EXECUTION

3.01 EXAMINATION

A. Verify existing conditions before starting work.

B. Verify substrate surfaces are durable; free of matter detrimental to adhesion or application of waterproofing system.

C. Verify that items that penetrate surfaces to receive waterproofing are securely installed.

3.02 PREPARATION

A. Protect adjacent surfaces not designated to receive waterproofing.

B. Clean and prepare surfaces to receive waterproofing in accordance with manufacturer's instructions. Vacuum substrate clean.

C. Do not apply waterproofing to surfaces unacceptable to membrane manufacturer.

D. Surfaces for Adhesive Bonding: Apply surface conditioner at a rate recommended by manufacturer. Protect conditioner from rain or frost until dry.

E. Concrete Surfaces for Adhesive Bonding: Prepare concrete substrate according to ASTM D5295.

3.03 INSTALLATION - MEMBRANE

A. Install membrane waterproofing in accordance with manufacturer's instructions.

B. Self-Adhering Membrane: Remove release paper layer. Roll out on substrate with a mechanical roller to encourage full contact bond.

C. Overlap edges and ends and seal by method recommended by manufacturer, minimum 3 inches. Seal permanently waterproof. Apply uniform bead of sealant to joint edge.

D. Reinforce membrane with multiple thickness of membrane material over joints, whether joints are static or dynamic.

3.04 INSTALLATION - DRAINAGE PANEL AND PROTECTION BOARD

A. Place drainage panel directly against membrane, butt joints, place to encourage drainage downward. Scribe and cut boards around projections, penetrations, and interruptions.

B. Adhere protection board to substrate with compatible adhesive.

END OF SECTION

SECTION 07 6200
SHEET METAL FLASHING AND TRIM

PART 1 GENERAL

1.01 SECTION INCLUDES

A. Fabricated sheet metal items, including flashings and counterflashings and other items indicated on the drawings.

1.02 RELATED REQUIREMENTS

A. Section 06 1000 (06100) - Rough Carpentry

1.03 REFERENCE STANDARDS

A. AAMA 611 - Voluntary Specification for Anodized Architectural Aluminum 2014 (2015 Errata).

B. ASTM A653/A653M - Standard Specification for Steel Sheet, Zinc-Coated (Galvanized) or Zinc-Iron Alloy-Coated (Galvannealed) by the Hot-Dip Process 2020.

C. ASTM A666 - Standard Specification for Annealed or Cold-Worked Austenitic Stainless Steel Sheet, Strip, Plate, and Flat Bar 2015.

D. ASTM B32 - Standard Specification for Solder Metal 2008 (Reapproved 2014).

E. ASTM B101 - Standard Specification for Lead-Coated Copper Sheet and Strip for Building Construction 2012 (Reapproved 2019).

F. ASTM B209 - Standard Specification for Aluminum and Aluminum-Alloy Sheet and Plate 2014.

G. ASTM B209M - Standard Specification for Aluminum and Aluminum-Alloy Sheet and Plate (Metric) 2014.

H. ASTM B370 - Standard Specification for Copper Sheet and Strip for Building Construction 2012 (Reapproved 2019).

I. ASTM B749 - Standard Specification for Lead and Lead Alloy Strip, Sheet, and Plate Products 2014.

J. ASTM D4586/D4586M - Standard Specification for Asphalt Roof Cement, Asbestos-Free 2007 (Reapproved 2018).

K. CDA A4050 - Copper in Architecture - Handbook current edition.

L. SMACNA (ASMM) - Architectural Sheet Metal Manual 2012.

1.04 SUBMITTALS

A. Shop Drawings: Indicate material profile, jointing pattern, jointing details, fastening methods, flashings, terminations, and installation details.

1.05 QUALITY ASSURANCE

A. Fabricator and Installer Qualifications: Company specializing in sheet metal work with three years of documented experience.

1.06 WARRANTY

A. Contractor shall agree (and does so agree) that all flashings shall be valid as a 5 year endorsement as part of, and inclusive with, the existing guarantee required for roofing. It shall be understood that the flashing provided conforms to materials and workmanship as promulgated by the manufacturer.

1.07 DELIVERY, STORAGE, AND HANDLING

A. Stack material to prevent twisting, bending, and abrasion, and to provide ventilation. Slope metal sheets to ensure drainage.

B. Prevent contact with materials that could cause discoloration or staining.

PART 2 PRODUCTS

2.01 SHEET MATERIALS

A. Stainless Steel: ASTM A666 Type 304, soft temper, 0.015 inch thick; smooth No. 4 finish.

2.02 FABRICATION

A. Form sections true to shape, accurate in size, square, and free from distortion or defects.

B. Form pieces in longest possible lengths.

C. Hem exposed edges on underside 1/2 inch; miter and seam corners.

D. Fabricate corners from one piece with minimum 18 inch long legs; seam for rigidity, seal with sealant.

E. Fabricate vertical faces with bottom edge formed outward 1/4 inch (6 mm) and hemmed to form drip.

F. Fabricate flashings to allow toe to extend 4 inches over roofing . Return and brake edges.

PART 3 EXECUTION

3.01 EXAMINATION

A. Verify roof openings, curbs, pipes, sleeves, ducts, and vents through roof are solidly set, reglets in place, and nailing strips located.

B. Verify roofing termination and base flashings are in place, sealed, and secure.

3.02 PREPARATION

A. Install starter and edge strips, and cleats before starting installation.

B. Install surface mounted reglets true to lines and levels. Seal top of reglets with sealant.

3.03 INSTALLATION

A. Conform to drawing details.

B. Insert flashings into reglets to form tight fit. Secure in place with lead wedges. Pack remaining spaces with lead wool. Seal flashings into reglets with sealant.

C. Apply plastic cement compound between metal flashings and felt flashings.

3.04 FIELD QUALITY CONTROL

A. Inspection will involve surveillance of work during installation to ascertain compliance with specified requirements.

END OF SECTION

SECTION 07 8400
FIRESTOPPING

PART 1 GENERAL

1.01 SECTION INCLUDES

A. Firestopping systems.

B. Firestopping of all joints and penetrations in fire-resistance rated and smoke-resistant assemblies , whether indicated on drawings or not , and other openings indicated.

1.02 RELATED REQUIREMENTS

A. Section 09 2116 - Gypsum Board Assemblies: Gypsum wallboard fireproofing.

1.03 REFERENCE STANDARDS

A. ASTM E119 - Standard Test Methods for Fire Tests of Building Construction and Materials 2020.

B. ASTM E814 - Standard Test Method for Fire Tests of Penetration Firestop Systems 2013a (Reapproved 2017).

C. ASTM E1966 - Standard Test Method for Fire-Resistive Joint Systems 2015 (Reapproved 2019).

D. FM 4991 - Approval Standard for Firestop Contractors 2013.

E. UL (FRD) - Fire Resistance Directory Current Edition.

1.04 SUBMITTALS

A. See Section 01 3000 - Administrative Requirements, for submittal procedures.

B. Product Data: Provide data on product characteristics and performance ratings.

C. Manufacturer's Installation Instructions: Indicate preparation and installation instructions.

D. Manufacturer's Certificate: Certify that products meet or exceed specified requirements.

E. Material Safety and Data Sheets (MSDS) for all products used.

1.05 QUALITY ASSURANCE

A. Fire Testing: Provide firestopping assemblies of designs that provide the specified fire ratings when tested in accordance with ASTM E 814, ASTM E 119, ASTM E 814, ASTM E 119, ASTM E 814, and ASTM E 119.
   1. Listing in the current-year classification or certification books of UL, FM, or ITS (Warnock Hersey) will be considered as constituting an acceptable test report.
   2. Firestopping materials shall be Ul Classified as "Fill, Void or Cavity Material" , for use in through penetration firestop systems.

B. Manufacturer Qualifications: Company specializing in manufacturing the products specified in this section with minimum three years documented experience.

1.06 MOCK-UP

A. Install one firestopping assembly representative of each fire rating design required on project.
   1. Where one design may be used for different penetrating items or in different wall constructions, install one assembly for each different combination.

B. If accepted, mock-up will represent minimum standard for the Work.

C. If accepted, mock-up may remain as part of the Work. Remove and replace mock-ups not accepted.

1.07 FIELD CONDITIONS

A. Comply with firestopping manufacturer's recommendations for temperature and conditions during and after installation. Maintain minimum temperature before, during, and for 3 days after installation of materials.

B. Provide ventilation in areas where solvent-cured materials are being installed.

PART 2 PRODUCTS

2.01 FIRESTOPPING - GENERAL REQUIREMENTS

A. Firestopping: Any material meeting requirements.

B. Firestopping Materials with Volatile Content: Provide only products having lower volatile organic compound (VOC) content than required by South Coast Air Quality Management District Rule No.1168.

C. Mold Resistance: Provide firestoppping materials with mold and mildew resistance rating of 0 as determined by ASTM G21.

D. Primers, Sleeves, Forms, Insulation, Packing, Stuffing, and Accessories: Type required for tested assembly design.

2.02 FIRESTOPPING ASSEMBLY REQUIREMENTS

A. Perimeter Fire Containment Firestopping: Use any system that has been tested according to ASTM E2307 to have fire resistance F Rating equal to required fire rating of the floor assembly.
   1. Movement: In addition, provide systems that have been tested to show movement capability as indicated.
   2. Temperature Rise: In addition, provide systems that have been tested to show T Rating as indicated.
   3. Air Leakage: In addition, provide systems that have been tested to show L Rating as indicated.
   4. Where floor assembly is not required to have a fire rating, provide systems that have been tested to show L Rating as indicated.

B. Head-of-Wall Firestopping at Joints Between Non-Rated Floor and Fire-Rated Wall: Use any system that has been tested according to ASTM E2837 to have fire resistance F Rating equal to required fire rating of floor or wall, whichever is greater.
   1. Movement: In addition, provide systems that have been tested to show movement capability as indicated.

C. Floor-to-Floor, Wall-to-Wall, and Wall-to-Floor Joints, Except Perimeter, Where Both Are Fire-Rated: Use any system that has been tested according to ASTM E1966 or UL 2079 to have fire resistance F Rating equal to required fire rating of the assembly in which the joint occurs.
   1. Movement: In addition, provide systems that have been tested to show movement capability as indicated.
   2. Air Leakage: In addition, provide systems that have been tested to show L Rating as indicated.
   3. Watertightness: In addition, provide systems that have been tested to show W Rating as indicated.
   4. Listing by UL, FM, or Intertek in their certification directory will be considered evidence of successful testing.

D. Through Penetration Firestopping: Use any system that has been tested according to ASTM E814 to have fire resistance F Rating equal to required fire rating of penetrated assembly.
   1. Temperature Rise: In addition, provide systems that have been tested to show T Rating as indicated.
   2. Air Leakage: In addition, provide systems that have been tested to show L Rating as indicated.
   3. Listing by UL, FM, or Intertek in their certification directory will be considered evidence of successful testing.

2.03 FIRESTOPPING PENETRATIONS THROUGH CONCRETE AND CONCRETE MASONRY CONSTRUCTION

A. Blank Openings:
   1. In Floors or Walls:
      a. 2 Hour Construction: UL System C-AJ-0090; Hilti FS-ONE Intumescent Firestop Sealant.

B. Penetrations Through Floors or Walls By:
   1. Multiple Penetrations in Large Openings:
      a. 2 Hour Construction: UL System C-AJ-8143; Hilti FS-ONE Intumescent Firestop Sealant.
   2. Uninsulated Metallic Pipe, Conduit, and Tubing:
      a. 2 Hour Construction: UL System C-AJ-1421; Hilti FS-ONE Intumescent Firestop Sealant or CP 604 Self-Leveling Firestop Sealant.
      b. 2 Hour Construction: UL System C-AJ-1498; Hilti CP 680-P/M Cast-In Device.
   3. Uninsulated Non-Metallic Pipe, Conduit, and Tubing:
      a. 2 Hour Construction: UL System C-AJ-2567; Hilti FS-ONE Intumescent Firestop Sealant.
   4. Electrical Cables Not In Conduit:
      a. 2 Hour Construction: UL System C-AJ-3216; Hilti CP 658 Firestop Plug.

C. Penetrations Through Floors By:
   1. Uninsulated Non-Metallic Pipe, Conduit, and Tubing:
      a. 2 Hour Construction: UL System F-A-2053; Hilti CP 680-P Cast-In Device.
   2. Electrical Cables Not In Conduit:
      a. 2 Hour Construction: UL System F-A-3033; Hilti CP 680-P/M Cast-In Device.

D. Penetrations Through Walls By:
   1. Uninsulated Metallic Pipe, Conduit, and Tubing:
      a. 2 Hour Construction: UL System W-J-1067; Hilti FS-ONE Intumescent Firestop Sealant.
   2. Electrical Cables Not In Conduit:
      a. 2 Hour Construction: UL System W-J-3060; Hilti FS-ONE Intumescent Firestop Sealant, CP 606 Flexible Firestop Sealant, CD 601S Elastomeric Firestop Sealant, or CP 618 Firestop Putty Stick.
      b. 2 Hour Construction: UL System W-J-3143; Hilti CP 658T Firestop Plug.

2.04 FIRESTOPPING PENETRATIONS THROUGH GYPSUM BOARD WALLS

A. Penetrations By:
   1. Uninsulated Metallic Pipe, Conduit, and Tubing:
      a. 2 Hour Construction: UL System W-L-1054; Hilti FS-ONE Intumescent Firestop Sealant.
   2. Electrical Cables Not In Conduit:
      a. 2 Hour Construction: UL System W-L-3065; Hilti FS-ONE Intumescent Firestop Sealant, CP 606 Flexible Firestop Sealant, CD 601S Elastomeric Firestop Sealant, or CP 618 Firestop Putty Stick.
      b. 2 Hour Construction: UL System W-L-3334; Hilti CP 653 Speed Sleeve.
      c. 2 Hour Construction: UL System W-L-3393; Hilti CFS-SL RK Retrofit Sleeve Kit for existing cables.

2.05 FIRESTOPPING SYSTEMS

A. Firestopping: Caulk or putty.
   1. Fire Ratings: Use any system listed by UL or tested in accordance with ASTM E814 that has F Rating equal to fire rating of penetrated assembly and minimum T Rating of 1 hour and that meets all other specified requirements;
      a. Prevent flame pass through.
      b. Restrict temperature to not exceed 325 degrees F over ambient on side of assembly opposite flames.
      c. Provide a positive smoke seal.
      d. Withstand hose stream test.
      e. Firestopping materials must be asbestos free, emit not toxic or combustible fumes and be capable of mainitaining an effective barrier against flame, smoke, gas and water in compliance with the requirements of this section.
      f. On insulated pipe, the fire-rating classfication must not require the removal of the insulation.
      g. Firestopping materials shall be free of solvents and shall not experience shrinking while curing.

2.06 MATERIALS

A. Elastomeric Silicone Firestopping: Single component silicone elastomeric compound and compatible silicone sealant; conforming to the following:
   1. Manufacturers:
      a. A/D Fire Protection Systems Inc: www.adfire.com.
      b. 3M Fire Protection Products: www.3m.com/firestop.
      c. Hilti, Inc: www.us.hilti.com.
      d. Specified Technologies, Inc: www.stifirestop.com.
      e. Substitutions: See Section 01 6000 - Product Requirements.

B. Fibered Compound Firestopping: Formulated compound mixed with incombustible non-asbestos fibers; conforming to the following:
   1. Density: 4 lb/cu ft.
   2. Durability and Longevity: Permanent.
   3. Manufacturers:
      a. A/D Fire Protection Systems Inc: www.adfire.com.
      b. USG; Product Thermafiber: www.usg.com.
      c. Bio Fireshield, Damonmill Square MA .

C. Fiber Firestopping: Mineral fiber insulation used in conjunction with elastomeric surface sealer forming airtight bond to opening; conforming to the following:
   1. Density: 4 lb/cu ft.
   2. Durability and Longevity: Permanent.
   3. Manufacturers:
      a. A/D Fire Protection Systems Inc: www.adfire.com.
      b. Pecora Corporation: www.pecora.com.
      c. Thermafiber, Inc: www.thermafiber.com.
      d. Substitutions: See Section 01 6000 - Product Requirements.

D. Firestop Devices - Wrap Type: Mechanical device with incombustible filler and sheet stainless steel jacket, collar, and flanged stops, intended to be installed after penetrating item has been installed; conforming to the following:
   1. Durability and Longevity: Permanent .
   2. Manufacturers:
      a. Grace Construction Products: www.na.graceconstruction.com.
      b. 3M Fire Protection Products: www.3m.com/firestop.
      c. Hilti, Inc: www.us.hilti.com.
      d. Substitutions: See Section 01 6000 - Product Requirements.

E. Intumescent Putty: Compound that expands on exposure to surface heat gain; conforming to the following:
   1. Potential Expansion: Minimum 1000 percent.
   2. Durability and Longevity: Permanent.
   3. Color: Black, dark gray, or red.
   4. Manufacturers:
      a. Grace Construction Products: www.na.graceconstruction.com.
      b. 3M Fire Protection Products: www.3m.com/firestop.
      c. Hilti, Inc: www.us.hilti.com.
      d. Substitutions: See Section 01 6000 - Product Requirements.

F. Primers, Sleeves, Forms, Insulation, Packing, Stuffing, and Accessories: Type required for tested assembly design.

PART 3 EXECUTION

3.01 EXAMINATION

A. Verify openings are ready to receive the work of this section.

3.02 PREPARATION

A. Clean substrate surfaces of dirt, dust, grease, oil, loose material, or other matter that could adversely affect bond of firestopping material.

B. Remove incompatible materials which may affect bond.

C. Install backing materials to arrest liquid material leakage.

3.03 INSTALLATION

A. Install materials in manner described in fire test report and in accordance with manufacturer's instructions, completely closing openings.

B. Install labeling required by code.

3.04 CLEANING

A. Clean adjacent surfaces of firestopping materials.

3.05 PROTECTION

A. Clean adjacent surfaces of firestopping materials.

B. Protect adjacent surfaces from damage by material installation.

END OF SECTION

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SECTION 07 9200
JOINT SEALANTS

PART 1 GENERAL

1.01 SECTION INCLUDES

A. Nonsag gunnable joint sealants.

B. Self-leveling pourable joint sealants.

C. Joint backings and accessories.

1.02 RELATED REQUIREMENTS

A. Section 01 6116 - Volatile Organic Compound (VOC) Content Restrictions: Additional requirements for sealants and primers.

1.03 REFERENCE STANDARDS

A. ASTM C661 - Standard Test Method for Indentation Hardness of Elastomeric-Type Sealants by Means of a Durometer 2015.

B. ASTM C794 - Standard Test Method for Adhesion-In-Peel of Elastomeric Joint Sealants 2018.

C. ASTM C920 - Standard Specification for Elastomeric Joint Sealants 2018.

D. ASTM C1087 - Standard Test Method for Determining Compatibility of Liquid-Applied Sealants with Accessories Used in Structural Glazing Systems 2016.

E. ASTM C1193 - Standard Guide for Use of Joint Sealants 2016.

F. ASTM C1248 - Standard Test Method for Staining of Porous Substrate by Joint Sealants 2018.

G. ASTM C1330 - Standard Specification for Cylindrical Sealant Backing for Use with Cold Liquid-Applied Sealants 2018.

1.04 SUBMITTALS

A. See Section 01 3000 - Administrative Requirements, for submittal procedures.

B. Product Data for Sealants: Submit manufacturer's technical data sheets for each product to be used, that includes the following.
   1. Physical characteristics, including movement capability, VOC content, hardness, cure time, and color availability.
   2. List of backing materials approved for use with the specific product.
   3. Substrates that product is known to satisfactorily adhere to and with which it is compatible.
   4. Substrates the product should not be used on.
   5. Substrates for which use of primer is required.
   6. Substrates for which laboratory adhesion and/or compatibility testing is required.
   7. Installation instructions, including precautions, limitations, and recommended backing materials and tools.
   8. Sample product warranty.
   9. Certification by manufacturer indicating that product complies with specification requirements.

C. Product Data for Accessory Products: Submit manufacturer's technical data sheet for each product to be used, including physical characteristics, installation instructions, and recommended tools.

D. Color Cards for Selection: Where sealant color is not specified, submit manufacturer's color cards showing standard colors available for selection.

E. Samples for Verification: Where custom sealant color is specified, obtain directions from Architect and submit at least two physical samples for verification of color of each required sealant.

F. Preconstruction Laboratory Test Reports: Submit at least four weeks prior to start of installation.

1.05 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 the work of this section and with at least three years of documented experience.

C. Preconstruction Laboratory Testing: Arrange for sealant manufacturer(s) to test each combination of sealant, substrate, backing, and accessories.
   1. Adhesion Testing: In accordance with ASTM C794.
   2. Compatibility Testing: In accordance with ASTM C1087.
   3. Allow sufficient time for testing to avoid delaying the work.
   4. Deliver to manufacturer sufficient samples for testing.
   5. Report manufacturer's recommended corrective measures, if any, including primers or techniques not indicated in product data submittals.
   6. Testing is not required if sealant manufacturer provides data showing previous testing, not older than 24 months, that shows satisfactory adhesion, lack of staining, and compatibility.

1.06 WARRANTY

A. See Section 01 7800 - Closeout Submittals, for additional warranty requirements.

B. Correct defective work within a five year period after Date of Substantial Completion.

C. Warranty: Include coverage for installed sealants and accessories that fail to achieve watertight seal , exhibit loss of adhesion or cohesion, or do not cure.

PART 2 PRODUCTS

2.01 MANUFACTURERS

A. Non-Sag Sealants: Permits application in joints on vertical surfaces without sagging or slumping.
   1. Sika Corporation; [_____]: www.usa-sika.com/#sle.
   2. Substitutions: See Section 01 6000 - Product Requirements.

B. Self-Leveling Sealants: Pourable or self-leveling sealant that has sufficient flow to form a smooth, level surface when applied in a horizontal joint.
   1. Pecora Corporation; [_____]: www.pecora.com/#sle.
   2. Sika Corporation; [_____]: www.usa-sika.com/#sle.
   3. Tremco Commercial Sealants & Waterproofing; [____]: www.tremcosealants.com/#sle.
   4. Substitutions: See Section 01 6000 - Product Requirements.

2.02 JOINT SEALANT APPLICATIONS

A. Scope:
   1. Exterior Joints: Seal open joints, whether or not the joint is indicated on drawings, unless specifically indicated not to be sealed. Exterior joints to be sealed include, but are not limited to, the following items.
      a. Wall expansion and control joints.
      b. Joints between door, window, and other frames and adjacent construction.
      c. Joints between different exposed materials.
      d. Openings below ledge angles in masonry.
      e. Other joints indicated below.
   2. Interior Joints: Do not seal interior joints unless specifically indicated to be sealed. Interior joints to be sealed include, but are not limited to, the following items.
      a. Joints between door, window, and other frames and adjacent construction.
      b. Other joints indicated below.
   3. Do not seal the following types of joints.
      a. Intentional weepholes in masonry.
      b. Joints indicated to be treated with manufactured expansion joint cover or some other type of sealing device.
      c. Joints where sealant is specified to be provided by manufacturer of product to be sealed.

d. Joints where installation of sealant is specified in another section.
e. Joints between suspended panel ceilings/grid and walls.

B. Type [___] - Exterior Joints: Use non-sag non-staining silicone sealant, unless otherwise indicated.

C. Type [___] - Interior Joints: Use non-sag polyurethane sealant, unless otherwise indicated.

2.03 JOINT SEALANTS - GENERAL

A. Sealants and Primers: Provide products with levels of volatile organic compound (VOC) content as indicated in Section 01 6116.

2.04 NONSAG JOINT SEALANTS

A. Type [___] - Non-Staining Silicone Sealant: ASTM C920, Grade NS, Uses M and A; not expected to withstand continuous water immersion or traffic.
1. Movement Capability: Plus and minus [____] percent, minimum.
2. Non-Staining To Porous Stone: Non-staining to light-colored natural stone when tested in accordance with ASTM C1248.
3. Dirt Pick-Up: Reduced dirt pick-up compared to other silicone sealants.

B. Type [___] - Polyurethane Sealant: ASTM C920, Grade NS, Uses M and A; single or multi-component; not expected to withstand continuous water immersion or traffic.
1. Movement Capability: Plus and minus [____] percent, minimum.

2.05 SELF-LEVELING SEALANTS

A. Type 1 - Self-Leveling Polyurethane Sealant for Continuous Water Immersion: Polyurethane; ASTM C920, Grade P, Uses M and A; single or multi-component; explicitly approved by manufacturer for traffic exposure and continuous water immersion.
1. Movement Capability: Plus and minus 25 percent, minimum.
2. Hardness Range: 35 to 55, Shore A, when tested in accordance with ASTM C661.
3. Color: To be selected by Architect from manufacturer's standard range.
4. Service Temperature Range: Minus 40 to 180 degrees F.
5. Manufacturers:
a. Sika Corporation; Sikaflex-1c SL: www.usa-sika.com/#sle.
b. Substitutions: See Section 01 6000 - Product Requirements.

2.06 ACCESSORIES

A. Backer Rod: Cylindrical cellular foam rod with surface that sealant will not adhere to, compatible with specific sealant used, and recommended by backing and sealant manufacturers for specific application.
1. Type for Joints Not Subject to Pedestrian or Vehicular Traffic: ASTM C1330; Type O - Open Cell Polyurethane.
2. Open Cell: 40 to 50 percent larger in diameter than joint width.

B. Backing Tape: Self-adhesive polyethylene tape with surface that sealant will not adhere to and recommended by tape and sealant manufacturers for specific application.

C. Joint Cleaner: Non-corrosive and non-staining type, type recommended by sealant manufacturer; compatible with joint forming materials.

D. Primers: Type recommended by sealant manufacturer to suit application; non-staining.

PART 3 EXECUTION

3.01 EXAMINATION

A. Verify that joints are ready to receive work.

B. Verify that backing materials are compatible with sealants.

C. Verify that backer rods are of the correct size.

3.02 PREPARATION

A. Remove loose materials and foreign matter that could impair adhesion of sealant.

B. Clean joints, and prime as necessary, in accordance with manufacturer's instructions.

C. Perform preparation in accordance with manufacturer's instructions and ASTM C1193.

D. Mask elements and surfaces adjacent to joints from damage and disfigurement due to sealant work; be aware that sealant drips and smears may not be completely removable.

3.03 INSTALLATION

A. Perform work in accordance with sealant manufacturer's requirements for preparation of surfaces and material installation instructions.

B. Perform installation in accordance with ASTM C1193.

C. Measure joint dimensions and size joint backers to achieve width-to-depth ratio, neck dimension, and surface bond area as recommended by manufacturer, except where specific dimensions are indicated.

D. Install bond breaker backing tape where backer rod cannot be used.

E. Install sealant free of air pockets, foreign embedded matter, ridges, and sags, and without getting sealant on adjacent surfaces.

F. Do not install sealant when ambient temperature is outside manufacturer's recommended temperature range, or will be outside that range during the entire curing period, unless manufacturer's approval is obtained and instructions are followed.

G. Nonsag Sealants: Tool surface concave, unless otherwise indicated; remove masking tape immediately after tooling sealant surface.

3.04 FIELD QUALITY CONTROL

A. Perform field quality control inspection/testing as specified in PART 1 under QUALITY ASSURANCE article.

B. Non-Destructive Adhesion Testing: If there are any failures in first 100 linear feet, notify Architect immediately.

C. Destructive Adhesion Testing: If there are any failures in first 1000 linear feet, notify Architect immediately.

D. Remove and replace failed portions of sealants using same materials and procedures as indicated for original installation.

E. Repair destructive test location damage immediately after evaluation and recording of results.

3.05 POST-OCCUPANCY

A. Post-Occupancy Inspection: Perform visual inspection of entire length of project sealant joints at a time that joints have opened to their greatest width; i.e. at low temperature in thermal cycle. Report failures immediately and repair.

END OF SECTION

SECTION 08 0671
DOOR HARDWARE SETS

PART 1 GENERAL

1.01 RELATED DOCUMENTS

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

1.02 SUMMARY

A. This Section references specification sections relating to commercial door hardware for the following:
   1. Swinging doors.
   2. Sliding Doors.
   3. Other doors to the extent indicated.
   4. Commercial door hardware includes, but is not necessarily limited to, the following:
      a. Mechanical door hardware.
      b. Electromechanical and access control door hardware.
      c. Electromechanical and access control door hardware power supplies, back-ups and surge protection.
      d. Automatic operators.
      e. Cylinders specified for doors in other sections.
   5. Related Sections:
      a. Division 08 Section “Hollow Metal Doors and Frames”.
      b. Division 08 Sections “Flush and Clad Wood Doors”.
      c. Division 08 Section “Stile and Rail Wood Doors”.
      d. Division 08 Section “Door Hardware”.
   6. Codes and References: Comply with the version year adopted by the Authority Having Jurisdiction.
      a. ANSI A117.1 - Accessible and Usable Buildings and Facilities.
      b. ICC/IBC - International Building Code.
      c. NFPA 70 - National Electrical Code.
      d. NFPA 80 - Fire Doors and Windows.
      e. NFPA 101 - Life Safety Code.
      f. NFPA 105 - Installation of Smoke Door Assemblies.
      g. State Building Codes, Local Amendments.
   7. Standards: Reference Related Sections for requirements regarding compliance with applicable industry standards.

1.03 SUBMITTALS

A. Product Data: Manufacturer's product data sheets including installation details, material descriptions, dimensions of individual components and profiles, operational descriptions and finishes.

B. Door Hardware Schedule: Prepared by or under the supervision of supplier, detailing fabrication and assembly of door hardware, as well as procedures and diagrams. Coordinate the final Door Hardware Schedule with doors, frames, and related work to ensure proper size, thickness, hand, function, and finish of door hardware.
   1. Format: Comply with scheduling sequence and vertical format in DHI's "Sequence and Format for the Hardware Schedule."

2. Organization: Organize the Door Hardware Schedule into door hardware sets indicating complete designations of every item required for each door or opening. Organize door hardware sets in same order as in the Door Hardware Sets at the end of Part 3. Submittals that do not follow the same format and order as the Door Hardware Sets will be rejected and subject to resubmission.
3. Content: Include the following information:
    a. Type, style, function, size, label, hand, and finish of each door hardware item.
    b. Manufacturer of each item.
    c. Fastenings and other pertinent information.
    d. Location of door hardware set, cross-referenced to Drawings, both on floor plans and in door and frame schedule.
    e. Explanation of abbreviations, symbols, and codes contained in schedule.
    f. Mounting locations for door hardware.
    g. Door and frame sizes and materials.
    h. Submittal Sequence: Submit the final Door Hardware Schedule at earliest possible date, particularly where approval of the Door Hardware Schedule must precede fabrication of other work that is critical in the Project construction schedule. Include Product Data, Samples, Shop Drawings of other work affected by door hardware, and other information essential to the coordinated review of the Door Hardware Schedule.
4. Keying Schedule: Prepared under the supervision of the Owner, separate schedule detailing final keying instructions for locksets and cylinders in writing. Include keying system explanation, door numbers, key set symbols, hardware set numbers and special instructions. Owner to approve submitted keying schedule prior to the ordering of permanent cylinders.
5. Product Test Reports: Indicating compliance with cycle testing requirements, based on evaluation of comprehensive tests performed by manufacturer and witnessed by a qualified independent testing agency.
6. Operating and Maintenance Manuals: Provide manufacturers operating and maintenance manuals for each item comprising the complete door hardware installation in quantity as required in Division 01, Closeout Submittals. The manual to include the name, address, and contact information of the manufacturers providing the hardware and their nearest service representatives. The final copies delivered after completion of the installation test to include "as built" modifications made during installation, checkout, and acceptance.
7. Warranties and Maintenance: Special warranties and maintenance agreements specified in the Related Sections.

1.04 QUALITY ASSURANCE

A. Manufacturers Qualifications: Engage qualified manufacturers with a minimum [5] years of documented experience in producing hardware and equipment similar to that indicated for this Project and that have a proven record of successful in-service performance.

B. Installer Qualifications: Installers, trained by the primary product manufacturers, with a minimum [3] years documented experience installing both standard and electrified builders hardware 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.

C. Door Hardware Supplier Qualifications: Experienced commercial door hardware distributors with a minimum [5] years documented experience supplying both mechanical and electromechanical hardware installations comparable in material, design, and extent to that indicated for this Project. Supplier recognized as a factory direct distributor in good standing

by the manufacturers of the primary materials with a warehousing facility in Project's vicinity. Supplier to have on staff a certified Architectural Hardware Consultant (AHC) available during the course of the Work to consult with Contractor, Architect, and Owner concerning both standard and electromechanical door hardware and keying.

D. Source Limitations: Obtain each type and variety of Door Hardware specified in the Related Sections from a single source, qualified supplier unless otherwise indicated.

E. Regulatory Requirements: Comply with NFPA 70, NFPA 80, NFPA 101 and ANSI A117.1 requirements and guidelines as directed in the applicable model building code.

F. Pre-Submittal Conference: Conduct coordination conference in compliance with requirements in Division 01 Section "Project Meetings" with attendance by representatives of Supplier(s), Installer(s), and Contractor(s) to review proper methods and the procedures for receiving, handling, and installing door hardware.

1.05 DELIVERY, STORAGE, AND HANDLING

A. Inventory door hardware on receipt and provide secure lock-up and shelving for door hardware delivered to Project site. Do not store electronic access control hardware, software or accessories at Project site without prior authorization.

B. Tag each item or package separately with identification related to the final Door Hardware Schedule, and include basic installation instructions with each item or package.

C. Deliver, as applicable, permanent keys, cylinders, cores, access control credentials, software and related accessories directly to Owner via registered mail or overnight package service. Instructions for delivery to the Owner shall be established at the "Keying Conference".

1.06 COORDINATION

A. Templates: Obtain and distribute to the parties involved templates for doors, frames, and other work specified to be factory prepared for installing standard and electrified hardware. Check Shop Drawings of other work to confirm that adequate provisions are made for locating and installing hardware to comply with indicated requirements.

B. Door and Frame Preparation: Division 08 Sections (Steel, Aluminum and Wood) doors and corresponding frames are to be prepared, reinforced and pre-wired (if applicable) to receive the installation of the specified electrified, monitoring, signaling and access control system hardware without additional in-field modifications.

1.07 WARRANTY

A. General Warranty: Reference Division 01, General Requirements. Special warranties specified in this Article shall not deprive Owner of other rights Owner may have under other provisions of the Contract Documents and shall be in addition to, and run concurrent with, other warranties made by Contractor under requirements of the Contract Documents.

1.08 MAINTENANCE SERVICE

A. 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 door hardware.

PART 2 PRODUCTS

2.01 SCHEDULED DOOR HARDWARE

A. Refer to “PART 3 – EXECUTION” for required specification sections.

PART 3 EXECUTION

3.01 DOOR HARDWARE SETS

A. The door hardware sets represent the design intent and direction of the owner and architect. They are a guideline only and should not be considered a detailed hardware schedule. Discrepancies, conflicting hardware and missing items should 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 and functionality.

B. The supplier is responsible for handing and sizing all products as listed in the door hardware sets. Quantities listed are for each pair of doors, or for each single door.

C. Products listed in the Door Hardware Sets must meet the requirements described in the specification sections noted.
   1. Section 08 71 00 – Door Hardware.

D. Manufacturer's Abbreviations:
   1. 1. MK - McKinney
   2. 2. MR - Markar
   3. 3. ROC - Rockwood
   4. 4. SA - Sargent
   5. 5. CR - Corbin Russwin
   6. 6. MC - Medeco
   7. 7. RF - Rixson
   8. 8. NOR - Norton
   9. 9. PE - Pemko
   10. 10. SU - Securitron

3.02 HARDWARE SCHEDULE

SET 1 - Doors D1, D2, D4, D5, D6, D7 (Classroom, Storeroom from Corridor, Rated)

UNITS	ITEM	DESCRIPTION	FINISH	MFR
1 EACH	CONTINUOUS HINGE	FM300	US26D	MK
1 EACH	CYLINDRICAL LOCKSET	CL3352-PZD x CT6B	626	CR
2 EACH	INTERCHANGEABLE CORE	8000 KEYWAY AS DIRECTED	626	CR
1 EACH	CLOSER	DC6200 A10 M73	689	CR
1 EACH	WALL STOP	405	US26D	ROC
1 EACH	KICK PLATE	K1050 x 4BE xCSK x 8 x 2"LDW	US26D	ROC
1 EACH	MOP PLATE	K1050 x 4BE x CSK x 6 x 1"LDW	US26D	ROC

SET 2 - Door D3 (Mechanical Room, Inswing - Rated)

UNITS	ITEM	DESCRIPTION	FINISH	MFR
1 EACH	CONTINUOUS HINGE	FM300	US26D	MK
1 EACH	STOREROOM LOCK	CL3357-PZD M21 x CT6D	626	CR
2 EACH	INTERCHANGEABLE CORE	8000 KEYWAY AS DIRECTED	626	CR
1 EACH	CLOSER	DC6200 A10 M73	689	CR
1 EACH	WALL STOP	405	US26D	ROC
1 EACH	KICK PLATE	K1050 x 4BE xCSK x 8 x 2"LDW	US26D	ROC
1 EACH	MOP PLATE	K1050 x 4BE x CSK x 6 x 1"LDW	US26D	ROC

SET 3 - Door D8 (Single Door, non-latching, with EMH-Remove, clean and re-install existing)

UNITS	ITEM	DESCRIPTION	FINISH	MFR
1 EACH	CONTINUOUS HINGE	FM300	US26D	MK
1 EACH	CLOSER	DC6200 A10 M73	689	CR
1 EACH	PULL	ROCKWOOD 102X70B 3-1/2”x15”	US32D	ROC
1 EACH	PUSH	ROCKWOOD 73B 3-1/2”x15”	US32D	ROC
1 EACH	WALL STOP	405	US26D	ROC
1 EACH	KICK PLATE	K1050 x 4BE xCSK x 8 x2"LDW	US26D	ROC
1 EACH	MOP PLATE	K1050 x 4BE x CSK x 6 x 1"LDW	US26D	ROC

SET 4 - Door D9 (Double Door, non-latching, with EMH-Remove, clean and re-install existing)

UNITS	ITEM	DESCRIPTION	FINISH	MFR
2 EACH	CONTINUOUS HINGE	FM300	US26D	MK
2 EACH	CLOSER	DC6200 A10 M73	689	CR
2 EACH	PULL	ROCKWOOD 102X70B 3-1/2”x15”	US32D	ROC
2 EACH	PUSH	ROCKWOOD 73B 3-1/2”x15”	US32D	ROC
2 EACH	WALL STOP	405	US26D	ROC
2 EACH	KICK PLATE	K1050 x 4BE xCSK x 8 x2"LDW	US26D	ROC
2 EACH	MOP PLATE	K1050 x 4BE x CSK x 6 x 1"LDW	US26D	ROC

SET 5 - Door D10 (Door to IT Closet, compatible with latch retraction)

UNITS	ITEM	DESCRIPTION	FINISH	MFR
1 EACH	CONTINUOUS HINGE	FM300	US26D	MK
1 EACH	ACCESS CONTROL LOCKSET	ML20606 x SELP 10 x SEC ASB	626	CR
1 EACH	CLOSER	DC6200 A10 M73	689	CR
1 EACH	WALL STOP	405	US26D	ROC
1 EACH	KICK PLATE	K1050 x 4BE xCSK x 8 x2"LDW	US26D	ROC
1 EACH	MOP PLATE	K1050 x 4BE x CSK x 6 x 1"LDW	US26D	ROC

END OF SECTION

SECTION 08 1113
HOLLOW METAL DOORS AND FRAMES

PART 1 GENERAL

1.01 SECTION INCLUDES

A. Non-fire-rated steel doors and frames.

B. Steel frames for wood doors.

C. Fire-rated steel doors and frames.

D. Thermally insulated steel doors.

E. Steel glazing frames.

F. Accessories, including glazing and matching panels.

1.02 RELATED REQUIREMENTS

A. Section 08 7100 - Door Hardware.

B. Section 08 8000 - Glazing: Glass for doors and borrowed lites.

C. Section 09 9000 - Painting and Coating: Field painting.

1.03 REFERENCE STANDARDS

A. ANSI/SDI A250.3 - Test Procedure and Acceptance Criteria for Factory Applied Finish Coatings for Steel Doors and Frames 2007 (Reaffirmed 2011).

B. ANSI/SDI A250.8 - Specifications for Standard Steel Doors and Frames (SDI-100) 2017.

C. ANSI/SDI A250.10 - Test Procedure and Acceptance Criteria for Prime Painted Steel Surfaces for Steel Doors and Frames 2011.

D. ASTM A653/A653M - Standard Specification for Steel Sheet, Zinc-Coated (Galvanized) or Zinc-Iron Alloy-Coated (Galvannealed) by the Hot-Dip Process 2020.

E. ASTM E413 - Classification for Rating Sound Insulation 2016.

F. ASTM E1408 - Standard Test Method for Laboratory Measurement of the Sound Transmission Loss of Door Panels and Door Systems; 1991 (Reapproved 2000).

G. BHMA A156.115 - American National Standard for Hardware Preparation in Steel Doors and Steel Frames 2016.

H. DHI A115 Series - Specifications for Steel Doors and Frame Preparation for Hardware; Door and Hardware Institute; 2000 (ANSI/DHI A115 Series).

I. NAAMM HMMA 840 - Guide Specifications For Receipt, Storage and Installation of Hollow Metal Doors and Frames 2007.

J. NAAMM HMMA 865 - Guide Specifications for Sound Control Hollow Metal Doors and Frames 2013.

K. NFPA 80 - Standard for Fire Doors and Other Opening Protectives 2019.

L. NFPA 252 - Standard Methods of Fire Tests of Door Assemblies 2017.

M. UBC Std 7-2, Part II - Test Standard for Smoke- and Draft-control Assemblies; International Conference of Building Officials; 1997.

N. UL 10B - Standard for Fire Tests of Door Assemblies Current Edition, Including All Revisions.

O. UL 10C - Standard for Positive Pressure Fire Tests of Door Assemblies Current Edition, Including All Revisions.

P. UL 1784 - Standard for Air Leakage Tests of Door Assemblies Current Edition, Including All Revisions.

1.04 SUBMITTALS

A. Product Data: Materials and details of design and construction, hardware locations, reinforcement type and locations, anchorage and fastening methods, and finishes; and one copy of referenced grade standard.

B. Shop Drawings: Details of each opening, showing elevations, glazing, frame profiles, and identifying location of different finishes, if any.

C. Samples: Submit two samples of metal, 2 x 2 inches in size showing factory finishes, colors, and surface texture.
   1. 12" x 12" door corner showing typical construction with mortises and reinforcements.
   2. Louver panel

D. Installation Instructions: Manufacturer's published instructions, including any special installation instructions relating to this project.

E. Manufacturer's Certificate: Certification that products meet or exceed specified requirements.

F. Material Safety and Data Sheets for all products (MSDS)

1.05 QUALITY ASSURANCE

A. Manufacturer Qualifications: Company specializing in manufacturing the products specified in this section with minimum three years documented experience.

B. Maintain at the project site a copy of all reference standards dealing with installation.

C. Warranty - 1 year from substantial completion

1.06 DELIVERY, STORAGE, AND HANDLING

A. Store in accordance with NAAMM HMMA 840.

B. Protect with resilient packaging; avoid humidity build-up under coverings; prevent corrosion.

PART 2 PRODUCTS

2.01 MANUFACTURERS

A. Steel Doors and Frames:
   1. Curries, Product -707 series, 747 series:
   2. Steelcraft; Product L & M Series: www.steelcraft.com.
   3. Ceco ; Product Legion & Medallion Series.

2.02 DOORS AND FRAMES

A. Requirements for All Doors and Frames:
   1. Accessibility: Comply with ANSI/ICC A117.1.
   2. Door Top Closures: Flush with top of faces and edges.
   3. Door Edge Profile: seamless, tack weld, grind smooth, fill and touch up paint.
   4. Door Texture: Smooth faces.
   5. Sound deadening (ASTM E 90) minimum Sound Transmission Class (STC) of 30.
   6. Glazed Lights: Non-removable stops on non-secure side; sizes and configurations as indicated on drawings. On the outside of exterior doors and on the secure side of the interior doors. Coordinate width of rabbet between fixed stop and removable bead and depth of rabbet with type of glass and glazing required.
   7. Hardware Preparation: In accordance with DHI A115 Series, with reinforcement welded in place, in addition to other requirements specified in door grade standard. All doors to be internally reinforced for surface mounted hardware and cut out drilled and tapped to receive mortised hardware. See approved hardware schedule for mortised hardware requirements.
   8. Galvanizing for exterior doors: All components hot-dipped zinc-iron alloy-coated (galvannealed), A60/ZF180.
   9. Fire Labeling; Fire rated doors require meal applied label indicating rating designation.

B. Combined Requirements: If a particular door and frame unit is indicated to comply with more than one type of requirement, comply with all the specified requirements for each type; for instance, an exterior door that is also indicated as being sound-rated must comply with the requirements specified for exterior doors and for sound-rated doors; where two requirements conflict, comply with the most stringent.

2.03 STEEL DOORS

A. Exterior Doors Curries Series 747:

1. Grade: ANSI A250.8 Fabricate exterior doors with two (2) outer stretcher-leveled galvanized steel sheets of 16 gauge unless indicated otherwise on drawings.
2. Core: Vertical steel stiffeners.
3. Insulating Value: U-value of 0.50, when tested in accordance with ASTM C1363 .
4. Weatherstripping: Separate, see Section 08 7100.

B. Interior Doors , Non-Fire-Rated: Curries series 707
1. Grade: ANSI A250.8 Fabricate interior doors with 2 outer stretcher leveled steel sheets of 16 gage unless indicated otherwise on the drawings.
   a. Construct doors with smooth, flush surfaces without visible joints or seams on exposed faces and stile edges, except around glass and louver panels. On mortise face of door, vertical joints shall be continuously MIG or ARC welded and ground smooth and coated with zinc-rich primer.
   b. Provide reinforcement of surface sheet, edge, hardware, stops and other provisions of size and gage.
   c. Provide top and bottom channels and closers.
2. Core: Polystyrene foam.
   a. Bond cores with adhesive to inside of both face sheets compressive strength of 8,00 psi., bond strength shall exceed strength of fiberboard so that delamination shall not occur under any operating conditions.
3. Thickness: 1-3/4 inches.

C. Interior Doors , Fire-Rated: Curries Series 707
1. Grade: ANSI A250.8 fabricate interior doors with 2 outer stretcher leveled steel sheets of 14 gage unless indicated otherwise on the drawings.
2. Fire Rating: As indicated on Door and Frame Schedule, tested in accordance with UL 10C ("positive pressure").
   a. Provide units listed and labeled by UL.
   b. Attach fire rating label to each fire rated unit.
3. Core: Mineral fiberboard.

2.04 STEEL FRAMES

   a. ANSI A250.8 Level 1 Doors: 14 gage frames.
2. Emulsion Coating; Apply emulsion coating over shop primer approx. 1/8" thick to inside face of door frame.

B. Exterior Door Frames: 14 gage. Fully welded. Corners mitered and continuously welded full depth and width of frame. Frames shall be back welded.
1. Galvanizing: All components hot-dipped zinc-iron alloy-coated (galvannealed) in accordance with ASTM A653/A653M, with manufacturer's standard coating thickness.
2. Weatherstripping: Separate, see Section 08 7100.

C. Interior Door Frames; 14 gage Non Fire Rated: Fully welded type.

D. Interior Door Frames , Fire-Rated: Fully welded type.
1. Fire Rating: Same as door, labeled.

E. Frames for Interior Glazing or Borrowed Lights: Construction and face dimensions to match door frames, and as indicated on drawings.

2.05 ACCESSORY MATERIALS

A. Insulated Panels - Provide panels in locations indicated on drawings.
1. All panels shall match in gage and construction, the standard hollow metal door requirements and/or doors over which same are to be installed.
2. Screw into stop, countersink and finish.

B. Glazing: As specified in Section 08 8000 .

C. Removable Stops: Formed sheet steel, shape as indicated on drawings, mitered or butted corners ; prepared for countersink style tamper proof screws.

D. Astragals for Double Doors: Specified in Section 08 7100.
1. Fire-Rated Doors: Steel, shape as required to accomplish fire rating.

E. Grout for Frames: Portland cement grout of maximum 4-inch slump for hand troweling; thinner pumpable grout is prohibited.

F. Silencers: Resilient rubber, fitted into drilled hole; 3 on strike side of single door, 3 on center mullion of pairs, and 2 on head of pairs without center mullions.

G. Temporary Frame Spreaders: Provide for all factory- or shop-assembled frames.
   1. Product similar to Paint 12 by Steel Structures Paint Council.

PART 3 EXECUTION

3.01 EXAMINATION

A. Verify existing conditions before starting work.

B. Verify that opening sizes and tolerances are acceptable.

3.02 PREPARATION

A. Coat inside of frames to be installed in masonry or to be grouted, with bituminous coating, prior to installation.

3.03 INSTALLATION

A. Install in accordance with the requirements of the specified door grade standard and NAAMM HMMA 840 and SDI-100.

B. In addition, install fire rated units in accordance with NFPA 80.

C. Coordinate frame anchor placement with wall construction.

D. Grout frames in masonry construction, using hand trowel methods; brace frames so that pressure of grout before setting will not deform frames.

E. Coordinate installation of hardware.

F. Coordinate installation of glazing.

G. Coordinate installation of electrical connections to electrical hardware items.

H. Touch up damaged factory finishes. Sand smooth any rust or damaged areas of prime coat and apply touch up paint of compatible air-drying primer.

3.04 TOLERANCES

A. Clearances Between Door and Frame: As specified in ANSI A250.8.

B. Maximum Diagonal Distortion: 1/16 in measured with straight edge, corner to corner.

3.05 ADJUSTING

A. Adjust for smooth and balanced door movement.

B. Leave work complete and in proper operating condition. Remove and replace defective work, including door or frames that are warped, bowed or otherwise damaged.

3.06 SCHEDULE

A. Refer to Door and Frame Schedule on the drawings.

END OF SECTION

SECTION 08 1416
FLUSH WOOD DOORS

PART 1 GENERAL

1.01 SECTION INCLUDES

A. Flush wood doors; flush and flush glazed configuration; fire rated and non-rated.

1.02 RELATED REQUIREMENTS

A. Section 08 1113 - Hollow Metal Doors and Frames.

B. Section 08 7100 - Door Hardware.

C. Section 08 8000 - Glazing.

D. Section 09 9000 - Painting and Coating: Site finishing of doors.

1.03 REFERENCE STANDARDS

A. ASTM E413 - Classification for Rating Sound Insulation 2016.

B. AWI/AWMAC (QSI) - Architectural Woodwork Quality Standards Illustrated; Architectural Woodwork Institute and Architectural Woodwork Manufacturers Association of Canada; 2005, 8th Ed., Version 2.0.

C. NFPA 80 - Standard for Fire Doors and Other Opening Protectives 2019.

D. NFPA 252 - Standard Methods of Fire Tests of Door Assemblies 2017.

E. UL 10B - Standard for Fire Tests of Door Assemblies Current Edition, Including All Revisions.

F. UL 10C - Standard for Positive Pressure Fire Tests of Door Assemblies Current Edition, Including All Revisions.

G. UL 1784 - Standard for Air Leakage Tests of Door Assemblies Current Edition, Including All Revisions.

H. WDMA I.S. 1A - Interior Architectural Wood Flush Doors 2013.

1.04 SUBMITTALS

A. Product Data: Indicate door core materials and construction; veneer species, type and characteristics.

B. Test Reports: Show compliance with specified requirements for the following:

C. Shop Drawings: Illustrate door opening criteria, elevations, sizes, types, swings, undercuts required , special beveling , special blocking for hardware , factory machining criteria , factory finishing criteria , identify cutouts for glazing and electrified hardware prep.

D. Manufacturer's Installation Instructions: Indicate special installation instructions.

E. Warranty, executed in Owner's name.

1.05 QUALITY ASSURANCE

A. Maintain one copy of the specified door quality standard on site for review during installation and finishing.

B. Manufacturer Qualifications: Company specializing in manufacturing the products specified in this section with minimum three years of documented experience.

1.06 DELIVERY, STORAGE, AND HANDLING

A. Package, deliver and store doors in accordance with specified quality standard.

B. Accept doors on site in manufacturer's packaging. Inspect for damage.

C. Protect doors with resilient packaging sealed with heat shrunk plastic. Do not store in damp or wet areas; or in areas where sunlight might bleach veneer. Seal top and bottom edges with tinted sealer if stored more than one week. Break seal on site to permit ventilation.

1.07 WARRANTY

A. Interior Doors: Provide manufacturer's warranty for the life of the installation.

B. Include coverage for delamination of veneer, warping beyond specified installation tolerances, defective materials, and telegraphing core construction.

C. Warranted doors found to be defective are to be replaced, which includes removal, new prefinished doors provided and hardware reinstalled, and rehung at no cost to the Owner.

PART 2 PRODUCTS

2.01 MANUFACTURERS

A. Wood Veneer Faced Doors:
1. Graham Wood Doors: Product: GPD PC Series, GPD 45, 60, 90, www.grahamdoors.com.
2. Marshfield DoorSystems, Inc; Product DPC-1 DFP-20 DFM45 60 90: www.marshfielddoors.com/#sle.

2.02 DOORS AND PANELS

A. All Doors: See drawings for locations and additional requirements.
1. Quality Level: Premium Grade, Heavy Duty performance, in accordance with WDMA I.S.1-A.
2. Wood Veneer Faced Doors: 5-ply unless otherwise indicated.

B. Interior Doors: 1-3/4 inches thick unless otherwise indicated; flush construction.
1. Fire Rated Doors: Tested to ratings indicated on drawings in accordance with International Building Code ("positive pressure"); UL or WH (ITS) labeled without any visible seals when door is open.
2. Smoke and Draft Control Doors (Indicated as "S" on Drawings): In addition to required fire rating, provide door assemblies tested in accordance with UBC Standard 7-2, Part II; with "S" label; if necessary, provide additional gasketing or edge sealing.
3. Wood veneer facing with factory transparent finish at [_____].

2.03 DOOR AND PANEL CORES

A. Non-Rated Solid Core and 20 Minute Rated Doors: Type particleboard core (PC), plies and faces as indicated above.
1.

B. Fire Rated Doors: Mineral core, Type FD, plies and faces as indicated above; with core blocking as required to provide adequate anchorage of hardware without through-bolting.

2.04 DOOR FACINGS

A. Wood Veneer Facing for Transparent Finish: Red oak, veneer grade as specified above, plain sliced, book veneer match, balance assembly match; unless otherwise indicated.
1. Vertical Edges: Same species as face veneer.
2. Pairs: Pair match each pair; set match pairs within 10 feet of each other when doors are closed.

B. Facing Adhesive: Type I - waterproof.

2.05 DOOR CONSTRUCTION

A. Fabricate doors in accordance with door quality standard specified.

B. Cores Constructed with stiles and rails:

C. Provide solid blocks at lock edge and top of door for closer, for hardware reinforcement.
1. Provide 5" top and bottom rails, 5" 18" lock blocks, 3/4" stile latch side and 1" stile hinge side for label doors.

D. 1 All doors to be internally reinforced for attachment of hardware without the use of through bolts.

E. Factory machine doors for hardware other than surface-mounted hardware, in accordance with hardware requirements and dimensions.

F. Electrified Openings: Doors to be pre-wired with sufficient number of concealed wires to accomodate electric function of specified hardware. Provide Molex type standardized plug in connectors to accommodate up to twelve wires.

G. Factory fit doors for frame opening dimensions identified on shop drawings, with edge clearances in accordance with specified quality standard.

H. Fire rated doors require metal applied label indicating rating designation.

I. Provide edge clearances in accordance with the quality standard specified.

2.06 FACTORY FINISHING - WOOD VENEER DOORS

A. Factory finish doors in accordance with specified quality standard:
   1. Transparent Finish: Transparent catalyzed polyurethane, Premium quality, satin sheen.
      a. TR-6 finish, color from manufacturers full line of standard colors

B. Factory finish doors in accordance with approved sample.

C. Seal door top edge with color sealer to match door facing.

PART 3 EXECUTION

3.01 EXAMINATION

A. Verify existing conditions before starting work.

B. Verify that opening sizes and tolerances are acceptable.

C. Do not install doors in frame openings that are not plumb or are out-of-tolerance for size or alignment.

3.02 INSTALLATION

A. Install doors in accordance with manufacturer's instructions and specified quality standard.
   1. Install fire-rated doors in accordance with NFPA 80 requirements.

B. Factory-Finished Doors: Do not field cut or trim; if fit or clearance is not correct, replace door.

C. Adjust width of non-rated doors by cutting equally on both jamb edges.
   1. Trim maximum of 3/4 inch off bottom edges.
   2. Trim fire-rated doors in strict compliance with fire rating limitations. Trim height by cutting at bottom edge only.

D. Use machine tools to cut or drill for hardware.

E. Coordinate installation of doors with installation of frames and hardware.

F. Coordinate installation of glazing.

G. Install door louvers plumb and level.

3.03 TOLERANCES

A. Conform to specified quality standard for fit and clearance tolerances:
   1. 1/8" at jamb and head
   2. 1/4" at thresholds.
   3. 1/2" over finish floor

B. Conform to specified quality standard for maximum diagonal distortion- AWI Section 1300 requirements.

C. Maximum Vertical Distortion (Bow): 1/8 inch measured with straight edge or taut string, top to bottom, over an imaginary 36 by 84 inches surface area.

D. Maximum Width Distortion (Cup): 1/8 inch measured with straight edge or taut string, edge to edge, over an imaginary 36 by 84 inches surface area.

3.04 ADJUSTING

A. Adjust doors for smooth and balanced door movement.

B. Adjust closers for full closure.

3.05 SCHEDULE - SEE DRAWINGS

END OF SECTION

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SECTION 08 5113
ALUMINUM WINDOWS

PART 1 GENERAL

1.01 SECTION INCLUDES

A. Extruded aluminum windows with fixed sash, operating sash, and infill panels.

B. Factory glazing.

C. Operating hardware.

D. Insect screens.

1.02 RELATED REQUIREMENTS

A. Section 06 1000 - Rough Carpentry: Rough opening framing.

B. Section 06 1000 - Rough Carpentry: Wood perimeter shims.

1.03 REFERENCE STANDARDS

A. AAMA/WDMA/CSA 101/I.S.2/A440 - North American Fenestration Standard/Specification for Windows, Doors, and Skylights 2017.

B. AAMA 611 - Voluntary Specification for Anodized Architectural Aluminum 2014 (2015 Errata).

C. AAMA 1503 - Voluntary Test Method for Thermal Transmittance and Condensation Resistance of Windows, Doors and Glazed Wall Sections 2009.

D. AAMA 2603 - Voluntary Specification, Performance Requirements and Test Procedures for Pigmented Organic Coatings on Aluminum Extrusions and Panels (with Coil Coating Appendix) 2017a.

E. ASCE 7 - Minimum Design Loads and Associated Criteria for Buildings and Other Structures Most Recent Edition Cited by Referring Code or Reference Standard.

F. ASTM A123/A123M - Standard Specification for Zinc (Hot-Dip Galvanized) Coatings on Iron and Steel Products 2017.

G. ASTM B209 - Standard Specification for Aluminum and Aluminum-Alloy Sheet and Plate 2014.

H. ASTM B209M - Standard Specification for Aluminum and Aluminum-Alloy Sheet and Plate (Metric) 2014.

I. ASTM B221 - Standard Specification for Aluminum and Aluminum-Alloy Extruded Bars, Rods, Wire, Profiles, and Tubes 2014.

J. ASTM B221M - Standard Specification for Aluminum and Aluminum-Alloy Extruded Bars, Rods, Wire, Profiles, and Tubes (Metric) 2013.

K. ASTM E283 - Standard Test Method for Determining the Rate of Air Leakage Through Exterior Windows, Curtain Walls, and Doors Under Specified Pressure Differences Across the Specimen 2004 (Reapproved 2012).

L. ASTM E331 - Standard Test Method for Water Penetration of Exterior Windows, Skylights, Doors, and Curtain Walls by Uniform Static Air Pressure Difference 2000 (Reapproved 2016).

M. ASTM E1105 - Standard Test Method for Field Determination of Water Penetration of Installed Exterior Windows, Skylights, Doors, and Curtain Walls, by Uniform or Cyclic Static Air Pressure Difference 2015.

N. ASTM F588 - Standard Test Methods for Measuring the Forced Entry Resistance of Window Assemblies, Excluding Glazing Impact 2017.

O. SSPC-Paint 20 - Zinc-Rich Primers (Type I, "Inorganic," and Type II, "Organic") 2002 (Ed. 2004).

P. SGCC - Safety Glazing Certification Council - www.sgcc.org
   1. ANSI Z97.1-04 “American National Standard for Safety Glazing Materials used in Buildings - Safety Performance Specifications and Methods of Test”

2. 16 CFR 1201 “Consumer Product Safety Commission Safety Standard for Architectural Glazing Materials - codified at Title 16, Part 1201 of the Code of Federal Regulations”

1.04 PERFORMANCE REQUIREMENTS

A. Performance Requirements: As specified in PART 2, with the following additional requirements: AAMA Designation: AW-PG75-AP for projected windows and C-AW80 for casement windows.

B. Design and size windows to withstand the following load requirements, when tested in accordance with ASTM E 330 using test loads equal to 1.5 times the design wind loads with 10 second duration of maximum load:
   1. Design Wind Loads: Comply with requirements of New York State Building code. 2010
   2. Positive Design Wind Load: 30 lbf/sq ft.
   3. Negative Design Wind Load: 30 lbf/sq ft.
   4. Member Deflection: Limit member deflection to 1/175 in any direction, with full recovery of glazing materials, when tested per ASTM E 330-02 at a static air pressure difference of 50 psf.

C. Movement: Accommodate movement between window and perimeter framing and deflection of lintel, without damage to components or deterioration of seals.

D. Air Infiltration: Limit air infiltration through assembly to 0.1 cu ft/min/sq ft of wall area, measured at a reference differential pressure across assembly of 6.24 psf as measured in accordance with ASTM E 283.

E. Condensation Resistance Factor: 51 frame and 53 glass when measured in accordance with AAMA 1503.1.
   1. Condensation Resistance Factor: minimum 51 frame and 3 glass CRF for sliders/ fixed.
   2. Condensation Resistance Factor: minimum 55 frame and 64 glass CRF for double hung

F. Thermal testing per AAMA 1503.1-98 at the prescribed 6'-0" x 4'-0" test size glazed with 1" insulating glass made with 1/8" clear, Heat Mirror (tm) SC75, argon gas and 1/8" clear lites with the following result:
   1. Thermal Transmittance: Maximum .55 BTU/HR/ swft/F U value for projected

G. Thermal computer simulation testing per NFRC 100-04 at the prescribed 72" x 48" non-residential size, glazed with 1" insulating glass made with 1/8" clear and 1/8" soft coat low E lites and argon gas:
   1. Thermal Transmittance to be maximum of .55 BTU/HR/sqft/F U value for sliders/ fixed.
   2. Thermal Transmittance: maximum .48 BTU/HR/SQ.FT/°F U value for double hung.

H. Water Penetration: after the AAMA 910-93 life cycle test, no uncontrolled water leakage when tested per ASTM E 331-00 and ASTM E 547-00 at a static air pressure difference of :
   1. 15 lb/sf for projected windows
   2. 12 lb/sf for casement windows

I. Air and Vapor Seal: Maintain continuous air barrier and vapor retarder throughout assembly.

J. System Internal Drainage: Drain to the exterior by means of a weep drainage network any water entering joints, condensation occurring in glazing channel, or migrating moisture occurring within system.

K. Forced Entry Resistance: Conform to ASTM F 588 requirements for performance level 10 for all specified window types.

L. Uniform Load Structural Test: With window sash closed and locked, test unit in accordance with ASTM E 330 at a static air pressure difference of 120 psf. Both positive and negative. At conclusion of the test there shall be no glass breakage, permanent damage to fasteners, hardware parts, support arms or actuating mechanisms, nor any other damage that would cause the window to be inoperable.

1.05 SUBMITTALS

A. Product Data: Provide component dimensions, information on glass and glazing, internal drainage details, and descriptions of hardware and accessories.

B. Shop Drawings: Indicate opening dimensions, elevations of different types, framed opening tolerances, method for achieving air and vapor barrier seal to adjacent construction, anchorage locations, sill and soffit replacement details, and installation requirements.

C. Samples: Submit one samples, 12 x 12 inch in size illustrating typical corner construction, accessories, and finishes.

D. Submit two samples of operating hardware.

E. Certificates: Certify that windows meet or exceed specified requirements.

F. Manufacturer's Installation Instructions: Include complete preparation, installation, and cleaning requirements.

1.06 QUALITY ASSURANCE

A. Comply with requirements of AAMA 101 Designation C-AW70.

B. Manufacturer and Installer Qualifications: Company specializing in fabrication of commercial aluminum windows of types required, with not fewer than five years of experience.

1.07 PRE-INSTALLATION MEETING

A. Convene one week before starting work of this section.

1.08 DELIVERY, STORAGE, AND HANDLING

A. Comply with requirements of AAMA CW-10.

B. Protect finished surfaces with wrapping paper or strippable coating during installation. Do not use adhesive papers or sprayed coatings that bond to substrate when exposed to sunlight or weather.

1.09 FIELD CONDITIONS

A. Do not install sealants when ambient temperature is less than 40 degrees F.

B. Maintain this minimum temperature during and 24 hours after installation of sealants.

1.10 WARRANTY

A. Correct defective Work within a five year period after Date of Substantial Completion.

B. Provide five year manufacturer warranty against failure of glass seal on insulating glass units, including interpane dusting or misting. Include provision for replacement of failed units.

C. Provide fifteen year manufacturer warranty against excessive degradation of exterior finish. Include provision for replacement of units with excessive fading, chalking, or flaking.

PART 2 PRODUCTS

2.01 MANUFACTURERS

A. EFCO ; Product Series 2900 and 2901 Thermal.

B. Aluminum Windows:
   1. TRACO
   2. Graham
   3. Kawneer

2.02 WINDOWS

A. Aluminum Windows: Extruded aluminum frame and sash, factory fabricated, factory finished, with operating hardware, related flashings, and anchorage and attachment devices.
   1. Frame Depth: 4-1/2".
   2. Fabrication: Joints and corners flush, hairline, and weatherproof, accurately fitted and secured; prepared to receive anchors; fasteners and attachments concealed from view; reinforced as required for operating hardware and imposed loads.

3. Perimeter Clearance: Minimize space between framing members and adjacent construction while allowing expected movement.
4. Movement: Accommodate movement between window and perimeter framing and deflection of lintel, without damage to components or deterioration of seals.
5. System Internal Drainage: Drain to the exterior by means of a weep drainage network any water entering joints, condensation occurring in glazing channel, and migrating moisture occurring within system.
6. Configuration: Projected, casement and fixed.
7. Air Infiltration: Limit air infiltration through assembly to 0.1 cu ft/min/sq ft of wall area, measured at a specified differential pressure across assembly in accordance with ASTM E283.
8. Water Infiltration Test Pressure Differential: 15 pounds per square foot. for projected .
9. Condensation Resistance Factor: 59 minimum.
10. Overall U-value, Including Glazing: 0.55, maximum.
11. Life Cycle Requirements: No damage to fasteners, hardware parts or other components that would render operable windows in operable and not reduction in air and water infiltration resistance when tested according to AAMA 910.

B. Fixed, Non-Operable Type:
1. Construction: Thermally broken.
2. Glazing: Double; clear; low-e.
   a. Exterior glass lite: thickness: 1/8", tint: clear, tempered or laminated as shown on the drawings.
   b. Interior glass lite: thickness: 1/8", tint: clear, tempered.
   c. Spacer: extruded thermoplastic butyl with integrated desiccant, black,Secondary seal: silicone. Airspace fill: plain air
   d. Dual-seal durability: conformance to ASTM E 2190-02; visible, permanent IGCC certification label.

C. Outswinging Casement Type:
1. Construction: Thermally broken.
2. Glazing: Double; clear; low-e.
3. Exterior Finish: Class I color anodized.

D. Inswinging Hopper Type:
1. Construction: Thermally broken.
2. Provide screens.
3. Glazing: Double; clear; low-e.

2.03 COMPONENTS

A. Frames: 4-1/2" inch wide deep profile; thermally broken with interior portion of frame insulated from exterior portion; flush glass stops of screw fastened.

B. Reinforced Mullion: 2 inch profile of extruded aluminum with integral reinforcement of shaped steel structural section.

C. Sills: 0.125" thick, extruded aluminum; sloped for positive wash; fit under sash leg to 1/2 inch beyond wall face; one piece full width of opening jamb angles to terminate sill end.

D. Insulated Infill Panel:
1. Insulated Panels to be composed thus - 2-1/2" total thickness with an R value of +12. Outer Face and Inner Faces- .032" Smooth Aluminum Skins with kynar finish. Architect to choose from manufacturer's standard colors. Inner and outer face colors may vary. Core- ¾" smooth surface plywood with Polyisocyanurate Insulation Core with .125" Tempered Hardboard Backer.
2. Outer Face: 0.032 inch thick aluminum.
3. Core at AC unit installation: 3/4" exterior plywood plus 1/2" of polystyrene, aluminum facing both sides.

E. Louver - Provide louver similar to Airolite T5833 with insect screen. 45% free air minimum. Louver to be glazed into frame system. Match window finish.

F. Insect Screen Frame: Rolled aluminum frame of rectangular sections; fit with adjustable hardware; nominal size similar to operable glazed unit.

1. NOTE: No screens are to be installed at locations designated as Rescue Windows on the plan.

G. Insect Screens: 18x16 mesh, aluminum strands.

H. Operable Sash Weatherstripping: Wool pile; permanently resilient, profiled to achieve effective weather seal.

I. Fasteners: Stainless steel.

J. Installation Accessories
1. Extruded Aluminum - .062 wall with exposed surfaces finished in clear annodized. Finish performance to match windows. Concealed fasteners and required weatherseals all designed for unrestricted expansion and contraction.
2. Subsills with thermal breaks and end dams.
3. Jamb and Head Receptors
4. Three piece vertical reinforcement mullions

K. Glazing Materials: As specified in Section 08 8000.

L.

2.04 MATERIALS

A. Extruded Aluminum: ASTM B221 (ASTM B221M), 6063 alloy, T6 temper.

B. Sheet Aluminum: ASTM B209 (ASTM B209M), 5005 alloy, H12 or H14 temper.

C. Concealed Steel Items: Profiled to suit mullion sections; galvanized in accordance with ASTM A123/A123M.

2.05 HARDWARE

A. Sash lock: Lever handle with cam lock ; provide pole handle [____] feet long.

B. Operator: Lever action handle fitted to projecting sash arms with limit stops.

C. Projecting Sash Arms: Cadmium plated steel, friction pivot joints with nylon bearings, removable pivot clips for cleaning.

D. Pulls: Manufacturer's standard type. On rescue windows, provide finger pull on bottom rail 6" from hinge side.

E. Bottom Rollers: Stainless steel, adjustable.

F. Limit Stops: Resilient stainless steel bars.

G. Hinges: Continuous hinges on casement windows.

H. Stock and Spare Parts - Provide 10% of total window count number for the following accessories: Plungers, plunger housing, keeper, plunger spring, Wheel & housing, and screen spring.

2.06 FABRICATION

A. Fabricate components with smallest possible clearances and shim spacing around perimeter of assembly that will enable window installation and dynamic movement of perimeter seal.

B. Accurately fit and secure joints and corners. Make joints flush, hairline, and weatherproof.

C. Prepare components to receive anchor devices.

D. Arrange fasteners and attachments to ensure concealment from view.

E. Prepare components with internal reinforcement for operating hardware.

F. Provide steel internal reinforcement in mullions as required to meet loading requirements.

G. Provide internal drainage of glazing spaces to exterior through weep holes.

H. Assemble insect screen frames with mitered and reinforced corners. Secure wire mesh tautly in frame. Fit frame with four, spring loaded steel pin retainers.

I. Double weatherstrip operable units.

J. Factory glaze window units.

2.07 FINISHES

A. Class I Color Anodized Finish: AAMA 611 AA-M12C22A44 Electrolytically deposited colored anodic coating not less than 0.7 mils thick; medium bronze.

B. Apply 1 coat of bituminous coating to concealed aluminum and steel surfaces in contact with dissimilar materials.

C. Touch-Up Primer for Galvanized Steel Surfaces: SSPC-Paint 20, zinc rich.

PART 3 EXECUTION

3.01 EXAMINATION

A. Verify that wall openings and adjoining air and vapor seal materials are ready to receive aluminum windows.

B. The Contractor shall field verify all opening dimensions.

3.02 INSTALLATION

A. Install windows in accordance with manufacturer's instructions.

B. Install window assembly in accordance with AAMA/WDMA/CSA 101/I.S.2/A440.

C. Attach window frame and shims to perimeter opening to accommodate construction tolerances and other irregularities.

D. Align window plumb and level, free of warp or twist. Maintain dimensional tolerances and alignment with adjacent work.

E. Install sill and sill end angles.

F. Provide thermal isolation where components penetrate or disrupt building insulation. Pack fibrous insulation in shim spaces at perimeter of assembly to maintain continuity of thermal barrier.

G. Install operating hardware not pre-installed by manufacturer.

H. Install glass and infill panels in accordance with requirements specified in Section 08 8000.

3.03 TOLERANCES

A. Maximum Variation from Level or Plumb: 1/16 inches every 3 ft non-cumulative or 1/8 inches per 10 ft, whichever is less.

3.04 FIELD QUALITY CONTROL

A. Test installed windows for compliance with performance requirements for water penetration, in accordance with ASTM E1105 using uniform pressure and the same pressure difference as specified for laboratory testing.
   1. Test one window of each type, as directed by Architect.
   2. Cost for all successful tests, both original and retest shall be paid by the Owner. All unsuccessful tests, both original and retest, shall be paid by the responsible Contractor.
   3. If any window fails, test additional windows at contractor's expense.

B. Replace windows that have failed field testing and retest until performance is satisfactory.

3.05 ADJUSTING

A. Adjust hardware for smooth operation and secure weathertight closure.

3.06 CLEANING

A. Adjust hardware for smooth operation and secure weathertight closure.

B. Remove protective material from factory finished aluminum surfaces.

C. Wash surfaces by method recommended and acceptable to sealant and window manufacturer; rinse and wipe surfaces clean.

D. Remove excess sealant by moderate use of mineral spirits or other solvent acceptable to sealant and window manufacturer.

3.07 SCHEDULE

A. School 16.

1. Project In Windows/ Fixed - 4-1/2" AW-PG75-AP
   a. 1" Insulated glass - 1/8" thickness interior tempered or laminated lites and exterior tempered lites.
   b. Exterior finish: Medium bronze anodized.
2. Casement Windows - 4-1/2" C-AW80 similar to Model 2900 by EFCO.
   a. 1" Insulated tempered glass - 1/8" thickness interior tempered or laminated lites and exterior tempered.
   b. Exterior finish: Medium bronze annodized.
   c. Hinges: Continuous
   d. Provide limit arms to prevent window from opening more than 90 degrees.
   e. Provide finger pull on bottom rail of window 6" from hinge side.

END OF SECTION

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SECTION 08 7100
DOOR HARDWARE

PART 1 GENERAL

1.01 SECTION INCLUDES

A. Hardware for wood and hollow metal doors.

B. Hardware for fire-rated doors.

C. Electrically operated and controlled hardware.

D. Thresholds.

1.02 RELATED REQUIREMENTS

A. Section 06 2000 - Finish Carpentry: Wood door frames.

B. Section 08 0671 - Door Hardware Schedule: Schedule of door hardware sets.

C. Section 08 1113 - Hollow Metal Doors and Frames.

D. Section 08 1416 - Flush Wood Doors.

1.03 ADMINISTRATIVE REQUIREMENTS

A. Coordinate the manufacture, fabrication, and installation of products that door hardware is installed on.

B. Preinstallation Meeting: Convene a preinstallation meeting one week prior to commencing work of this section; attendance is required by affected installers and the following:
   1. Architect.
   2. Installer's Architectural Hardware Consultant (AHC).
   3. Hardware Installer.
   4. Owner's Security Consultant.

C. Furnish templates for door and frame preparation to manufacturers and fabricators of products requiring internal reinforcement for door hardware.

1.04 SUBMITTALS

A. See Section 01 3000 - Administrative Requirements, for submittal procedures.

B. Product Data: Manufacturer's catalog literature for each type of hardware, marked to clearly show products to be furnished for this project, and includes construction details, material descriptions, finishes, and dimensions and profiles of individual components.

C. Shop Drawings - Door Hardware Schedule: Submit detailed listing that includes each item of hardware to be installed on each door. Use door numbering scheme as included in Contract Documents.
   1. Prepared by or under supervision of Architectural Hardware Consultant (AHC).
   2. Provide complete description for each door listed.

D. Shop Drawings - Electrified Door Hardware: Submit diagrams for power, signal, and control wiring for electrified door hardware that include details of interface with building safety and security systems. Provide elevations and diagrams for each electrified door opening as follows:
   1. Prepared by or under supervision of Architectural Hardware Consultant (AHC) and Electrified Hardware Consultant (EHC).
   2. Elevations: Submit front and back elevations of each door opening showing electrified devices with connections installed and an operations narrative describing how opening operates from either side at any given time.
   3. Diagrams: Submit point-to-point wiring diagram that shows each device in door opening system with related colored wire connections to each device.

1.05 QUALITY ASSURANCE

A. Standards for Fire-Rated Doors: Maintain one copy of each referenced standard on site, for use by Architect and .

B. Manufacturer Qualifications: Company specializing in manufacturing products specified in this section with minimum three years of documented experience.

C. Installer Qualifications: Company specializing in performing work of the type specified for commercial door hardware with at least three years of documented experience.

D. Supplier Qualifications: Company with certified Architectural Hardware Consultant (AHC) and Electrified Hardware Consultant (EHC) to assist in work of this section.

1.06 DELIVERY, STORAGE, AND HANDLING

A. Package hardware items individually; label and identify each package with door opening code to match door hardware schedule.

1.07 WARRANTY

A. See Section 01 7800 - Closeout Submittals, for additional warranty requirements.

B. Warranty against defects in material and workmanship for period indicated, from Date of Substantial Completion.
   1. Locksets and Cylinders: Three years, minimum.
   2. Other Hardware: Two years, minimum.

PART 2 PRODUCTS

2.01 DESIGN AND PERFORMANCE CRITERIA

A. Provide specified door hardware as required to make doors fully functional, compliant with applicable codes, and secure to extent indicated.

B. Provide individual items of single type, of same model, and by same manufacturer.

C. Provide door hardware products that comply with the following requirements:
   1. Applicable provisions of federal, state, and local codes.
   2. Fire-Rated Doors: NFPA 80, listed and labeled by qualified testing agency for fire protection ratings indicated, based on testing at positive pressure in accordance with NFPA 252 or UL 10C.
   3. Hardware on Fire-Rated Doors: Listed and classified by UL (DIR), ITS (DIR), testing firm acceptable to authorities having jurisdiction, or [_____] as suitable for application indicated.

2.02 FINISHES

PART 3 EXECUTION

3.01 INSTALLATION

A. Install hardware in accordance with manufacturer's instructions and applicable codes.

B. Install hardware on fire-rated doors and frames in accordance with applicable codes and NFPA 80.

C. Use templates provided by hardware item manufacturer.

D. Door Hardware Mounting Heights: Distance from finished floor to center line of hardware item. As indicated in following list; unless noted otherwise in Door Hardware Schedule or on drawings.

E. Set exterior door thresholds with full-width bead of elastomeric sealant at each point of contact with floor providing a continuous weather seal; anchor thresholds with stainless steel countersunk screws.

3.02 FIELD QUALITY CONTROL

A. Perform field inspection and testing under provisions of Section 01 4000 - Quality Requirements.

3.03 ADJUSTING

A. Adjust work under provisions of Section 01 7000 - Execution and Closeout Requirements.

B. Adjust hardware for smooth operation.

C. Adjust gasketing for complete, continuous seal; replace if unable to make complete seal.

3.04 CLEANING

A. Clean finished hardware in accordance with manufacturer's written instructions after final adjustments have been made.

B. Clean adjacent surfaces soiled by hardware installation.

END OF SECTION

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SECTION 08 8000
GLAZING

PART 1 GENERAL

1.01 SECTION INCLUDES

A. Glazing units.

B. Glazing compounds and accessories.

1.02 RELATED REQUIREMENTS

A. Section 07 9200 - Joint Sealants: Sealants for other than glazing purposes.

B. Section 08 1416 - Flush Wood Doors: Glazed lites in doors.

1.03 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 C864 - Standard Specification for Dense Elastomeric Compression Seal Gaskets, Setting Blocks, and Spacers 2005 (Reapproved 2015).

D. ASTM C920 - Standard Specification for Elastomeric Joint Sealants 2018.

E. ASTM C1036 - Standard Specification for Flat Glass 2016.

F. ASTM C1048 - Standard Specification for Heat-Strengthened and Fully Tempered Flat Glass 2018.

G. ASTM C1172 - Standard Specification for Laminated Architectural Flat Glass 2014.

H. ASTM C1193 - Standard Guide for Use of Joint Sealants 2016.

I. GANA (GM) - GANA Glazing Manual 2008.

J. GANA (SM) - GANA Sealant Manual 2008.

K. GANA (LGRM) - Laminated Glazing Reference Manual 2009.

L. IGMA TM-3000 - North American Glazing Guidelines for Sealed Insulating Glass Units for Commercial & Residential Use 1990 (2016).

1.04 ADMINISTRATIVE REQUIREMENTS

A. Preinstallation Meeting: Convene a preinstallation meeting one week before starting work of this section; require attendance by each of the affected installers.

1.05 SUBMITTALS

A. See Section 01 3000 - Administrative Requirements, for submittal procedures.

B. Product Data on Insulating Glass Unit, Glazing Unit, Plastic Sheet Glazing Unit, Plastic Film, and [_____] Glazing Types: Provide structural, physical and environmental characteristics, size limitations, special handling and installation requirements.

C. Product Data on Glazing Compounds and Accessories: Provide chemical, functional, and environmental characteristics, limitations, special application requirements, and identify available colors.

D. Samples: Submit two samples 6 by 6 inch in size of glass units.

E. Samples: Submit 6 inch long bead of glazing sealant, color as selected.

F. Certificate: Certify that products of this section meet or exceed specified requirements.

G. Warranty Documentation: Submit manufacturer warranty and ensure that forms have been completed in Owner's name and registered with manufacturer.

H. Maintenance Materials: Furnish the following for Owner's use in maintenance of project.
   1. See Section 01 6000 - Product Requirements, for additional provisions.
   2. Extra Insulating Glass Units: One of each glass size and each glass type.

1.06 QUALITY ASSURANCE

A. Perform Work in accordance with GANA (GM), GANA (SM), GANA (LGRM), IGMA TM-3000, and [_____] for glazing installation methods. Maintain one copy on site.

B. Installer Qualifications: Company specializing in performing work of the type specified and with at least three years documented experience.

1.07 FIELD CONDITIONS

A. Do not install glazing when ambient temperature is less than 40 degrees F.

B. Maintain minimum ambient temperature before, during and 24 hours after installation of glazing compounds.

1.08 WARRANTY

A. See Section 01 7800 - Closeout Submittals, for additional warranty requirements.

B. Laminated Glass: Provide a five (5) year manufacturer warranty to include coverage for delamination, including providing products to replace failed units.

PART 2 PRODUCTS

2.01 MANUFACTURERS

A. Laminated Glass Manufacturers:
   1. Cardinal Glass Industries; [_____]: www.cardinalcorp.com/#sle.
   2. Viracon, Architectural Glass segment of Apogee Enterprises, Inc; [_____]: www.viracon.com/#sle.
   3. Substitutions: See Section 01 6000 - Product Requirements.

2.02 GLASS MATERIALS

A. Float Glass: Provide float glass based glazing unless otherwise indicated.
   1. Annealed Type: ASTM C1036, Type I - Transparent Flat, Class 1 - Clear, Quality - Q3.
   2. Kind HS - Heat-Strengthened Type: Complies with ASTM C1048.
   3. Fully Tempered Safety Glass: Complies with ANSI Z97.1 or 16 CFR 1201 criteria for safety glazing used in hazardous locations.
   4. Impact Resistant Safety Glass: Complies with ANSI Z97.1 - Class B, or 16 CFR 1201 - Category I criteria.

B. Laminated Glass: Float glass laminated in accordance with ASTM C1172.
   1. Laminated Safety Glass: Complies with ANSI Z97.1 - Class B or 16 CFR 1201 - Category I impact test requirements.
   2. Polyvinyl Butyral (PVB) Interlayer: 0.030 inch thick, minimum.

2.03 GLAZING UNITS

A. Type G-2 - Monolithic Interior Vision Glazing:
   1. Applications: Interior glazing unless otherwise indicated.
   2. Glass Type: Annealed float glass.
   3. Tint: Clear.
   4. Thickness: 1/4 inch, nominal.

2.04 GLAZING COMPOUNDS

A. Type GC-2 - Butyl Sealant: Single component; ASTM C920 Grade NS, Class 12-1/2, Uses M and A, Shore A hardness of 10 to 20; black color.

B. Type GC-3 - Polysulfide Sealant: Two component; chemical curing, non-sagging type; ASTM C920 Type M, Grade NS, Class 25, Uses M, A, and G; with cured Shore A hardness range of 15 to 25; color as selected.

C. Type GC-5 - Silicone Sealant: Single component; neutral curing; capable of water immersion without loss of properties; non-bleeding, non-staining; ASTM C920 Type S, Grade NS, Class 25, Uses M, A, and G; with cured Shore A hardness range of 15 to 25; [_____] color.

2.05 ACCESSORIES

A. Setting Blocks: Silicone, with 80 to 90 Shore A durometer hardness; ASTM C864 Option II. Length of 0.1 inch for each square foot of glazing or minimum 4 inch by width of glazing rabbet space minus 1/16 inch by height to suit glazing method and pane weight and area.

B. Spacer Shims: Neoprene, 50 to 60 Shore A durometer hardness; ASTM C864 Option II. Minimum 3 inch long by one half the height of the glazing stop by thickness to suit application, self adhesive on one face.

C. Glazing Splines: Resilient silicone extruded shape to suit glazing channel retaining slot; ASTM C864 Option II; color black.

PART 3 EXECUTION

3.01 VERIFICATION OF CONDITIONS

A. Verify that openings for glazing are correctly sized and within tolerances, including those for size, squareness, and offsets at corners.

B. Verify that surfaces of glazing channels or recesses are clean, free of obstructions that may impede moisture movement, weeps are clear, and support framing is ready to receive glazing system.

3.02 PREPARATION

A. Clean contact surfaces with appropriate solvent and wipe dry within maximum of 24 hours before glazing. Remove coatings that are not tightly bonded to substrates.

B. Seal porous glazing channels or recesses with substrate compatible primer or sealer.

C. Prime surfaces scheduled to receive sealant where required for proper sealant adhesion.

3.03 INSTALLATION, GENERAL

A. Install glazing in compliance with written instructions of glass, gaskets, and other glazing material manufacturers, unless more stringent requirements are indicated, including those in glazing referenced standards.

B. Install glazing sealants in accordance with ASTM C1193, GANA (SM), and manufacturer's instructions.

C. Do not exceed edge pressures around perimeter of glass lites as stipulated by glass manufacturer.

D. Prevent glass from contact with any contaminating substances that may be the result of construction operations such as, and not limited to the following; weld splatter, fire-safing, plastering, mortar droppings, etc.

3.04 INSTALLATION - DRY GLAZING METHOD (GASKET GLAZING)

A. Application - Exterior and/or Interior Glazed: Set glazing infills from either the exterior or the interior of the building.

B. Place setting blocks at 1/4 points with edge block no more than 6 inch from corners.

C. Rest glazing on setting blocks and push against fixed stop with sufficient pressure on gasket to attain full contact.

D. Install removable stops without displacing glazing gasket; exert pressure for full continuous contact.

3.05 FIELD QUALITY CONTROL

A. Glass and Glazing product manufacturers to provide field surveillance of the installation of their products.

B. Monitor and report installation procedures and unacceptable conditions.

3.06 CLEANING

A. Remove excess glazing materials from finish surfaces immediately after application using solvents or cleaners recommended by manufacturers.

B. Remove non-permanent labels immediately after glazing installation is complete.

C. Clean glass and adjacent surfaces after sealants are fully cured.

D. Clean glass on both exposed surfaces not more than 4 days prior to Date of Substantial Completion in accordance with glass manufacturer's written recommendations.

3.07 PROTECTION

A. After installation, mark pane with an 'X' by using removable plastic tape or paste; do not mark heat absorbing or reflective glass units.

B. Remove and replace glass that is damaged during construction period prior to Date of Substantial Completion.

END OF SECTION

SECTION 08 9100
LOUVERS

PART 1 GENERAL

1.01 SECTION INCLUDES

A. Louvers, frames, and accessories.

1.02 REFERENCE STANDARDS

A. AMCA 500-L - Laboratory Methods of Testing Louvers for Rating 2015.

1.03 SUBMITTALS

A. See Section 01 3000 - Administrative Requirements, for submittal procedures.

B. Product Data: Provide data describing design characteristics, maximum recommended air velocity, design free area, materials and finishes.

C. Shop Drawings: Indicate louver layout plan and elevations, opening and clearance dimensions, tolerances; head, jamb and sill details; blade configuration, screens, blankout areas required, and frames.

D. Samples: Submit two samples 2 by 2 inches in size illustrating finish and color of exterior and interior surfaces.

E. Test Reports: Independent agency reports showing compliance with specified performance criteria.

PART 2 PRODUCTS

2.01 MANUFACTURERS

A. Wall Louvers:
   1. Construction Specialties, Inc; Product A4097: www.c-sgroup.com/#sle.

2.02 LOUVERS

A. Stationary Louvers : Horizontal blade, extruded aluminum construction, with intermediate mullions matching frame.
   1. Free Area: 53%, minimum.
   2. Static Pressure Loss: 0.13 inch wg maximum per square foot of free area at velocity of 1040 fpm, when tested in accordance with AMCA 500-L.
   3. Blades: Straight.
   4. Frame: 4 inches deep, channel profile; corner joints mitered and , with continuous recessed caulking channel each side.
   5. Metal Thickness: Frame 0.060 inch; blades 0.060 inch.
   6. Finish: Fluoropolymer coating, finished after fabrication.

2.03 MATERIALS

A. Extruded Aluminum: ASTM B221 (ASTM B221M), .

2.04 ACCESSORIES

A. Screens: Frame of same material as louver, with reinforced corners; removable, screw attached; installed on inside face of louver frame.

B. Fasteners and Anchors: Galvanized steel.

C. Flashings: Of same material as louver frame, formed to required shape, single length in one piece per location.

PART 3 EXECUTION

3.01 EXAMINATION

A. Verify that prepared openings and flashings are ready to receive work and opening dimensions are as indicated on shop drawings.

B. Verify that field measurements are as indicated.

3.02 INSTALLATION

A. Install louver assembly in accordance with manufacturer's instructions.

B. Install louvers level and plumb.

C. Secure louver frames in openings with concealed fasteners.

END OF SECTION

SECTION 09 2116
GYPSUM BOARD ASSEMBLIES

PART 1 GENERAL

1.01 SECTION INCLUDES

A. Metal stud wall framing.
B. Metal channel ceiling framing.
C. Shaft wall system.
D. Acoustic insulation.
E. Gypsum sheathing.
F. Cementitious backing board.
G. Gypsum wallboard.
H. Joint treatment and accessories.

1.02 RELATED REQUIREMENTS

A. Section 06 1000 - Rough Carpentry: Building framing and sheathing.
B. Section 07 8400 - Firestopping: Top-of-wall assemblies at fire rated walls.

1.03 REFERENCE STANDARDS

A. ASTM C475/C475M - Standard Specification for Joint Compound and Joint Tape for Finishing Gypsum Board 2017.
B. ASTM C645 - Standard Specification for Nonstructural Steel Framing Members 2018.
C. ASTM C665 - Standard Specification for Mineral-Fiber Blanket Thermal Insulation for Light Frame Construction and Manufactured Housing 2017.
D. ASTM C754 - Standard Specification for Installation of Steel Framing Members to Receive Screw-Attached Gypsum Panel Products 2020.
E. ASTM C840 - Standard Specification for Application and Finishing of Gypsum Board 2020.
F. ASTM C1002 - Standard Specification for Steel Self-Piercing Tapping Screws for Application of Gypsum Panel Products or Metal Plaster Bases to Wood Studs or Steel Studs 2018.
G. ASTM C1047 - Standard Specification for Accessories For Gypsum Wallboard and Gypsum Veneer Base 2019.
H. ASTM E84 - Standard Test Method for Surface Burning Characteristics of Building Materials 2020.
I. ASTM E90 - Standard Test Method for Laboratory Measurement of Airborne Sound Transmission Loss of Building Partitions and Elements 2009 (Reapproved 2016).
J. ASTM E413 - Classification for Rating Sound Insulation 2016.
K. GA-600 - Fire Resistance Design Manual 2015.
L. UL (FRD) - Fire Resistance Directory Current Edition.

1.04 SUBMITTALS

A. Shop Drawings: Indicate special details associated with fireproofing.
B. Product Data: Provide data on metal framing, gypsum board, accessories, and joint finishing system.
C. Product Data: Provide manufacturer's data on partition head to structure connectors, showing compliance with requirements.
D. Test Reports: For all stud framing products that do not comply with ASTM C645 or C 754, provide independent laboratory reports showing maximum stud heights at required spacings and deflections.
E. Manufacturers Safety and Data Sheets (MSDS) for all products used.

1.05 QUALITY ASSURANCE

A. Perform in accordance with ASTM C 840. Comply with requirements of GA-600 for fire-rated assemblies.
   1. Maintain one copy of standards at project site.

B. Installer Qualifications: Company specializing in performing gypsum board application and finishingwith minimum 5 years of documented experience.

1.06 REGULATORY REQUIREMENTS

A. Conform to applicable code for fire rated assemblies as indicated on drawings.

B. Industry Standards
   1. Comply with applicable requirements of ASTM C 840, except where more detailed or more stringent requirements are indicated, including the recommendations of the manufacturer.
   2. Acoustical Ratings: Comply with acoustical ratings as required and based on type of construction indicated on the Drawings. Provide materials, accessories, including fasteners, seals, sealants and application procedures which have been listed as manufacturer or tested in accordance with ASTM E90 for the type of construction shown.

PART 2 PRODUCTS

2.01 METAL FRAMING MATERIALS

A. Manufacturers - Metal Framing, Connectors, and Accessories:

B. Obtain all steel studs and other metal framing components and accessories from a single manufacturer.
   1. Clarkwestern Dietrich Building Systems LLC: www.clarkdietrich.com/#sle.
   2. Dietrich Metal Framing: www.dietrichindustries.com.
   3. Marino: www.marinoware.com/#sle.

C. Non-Loadbearing Framing System Components: ASTM C645; galvanized sheet steel, of size and properties necessary to comply with ASTM C754 for the spacing indicated, with maximum deflection of wall framing of L/240 at 5 psf.
   1. Stud thickness: 0.0312 inch minimum thickness of base metal or 20 gage min. unless otherwise indicated for all wall framing members.
   2. Stud thickness: 0.0454 inch. min. thickness of base metal or 18 gage min., unless otherwise indicated, for use at all framed openings, with double studs at each door jamb and as wall framing members in areas where tile backer board is specified.
   3. Stud thickness: 0.0710 inch min. thickness of base metal or 14 gage min., unless otherwise indicated, for use behind wall hung toilet partitions.
   4. Runners: in compliance with ASTM C645 provide galvanized steel runners to match applicable assembly specified, to match wall framing members, typically 0.0312 inch min. thickness of base metal or 20 gage min., unless otherwise indicated.
   5. Furring Members: In compliance with ASTM C645 provide galvanized, cold rolled steel 0.0312 inch min., thickness of base metal or 20 gage min., 7/8" depth, screw type hat channels.
   6. Steel Grounds: Provide steel grounds 20 gage min. thickness min. 8" wide by min. 24" long, for installation directly to steel studs to provide support for wall mounted equipment, fixtures, furnishings, accessories, panels and all other items of work to be attached to walls. Provide grounds for each room name sign and other signs indicated to be located on drywall partitions. Provide grounds of greater size and thickness as required for secure installation of grab bars and other weight bearing and heavy items.
   7. Horizontal Bracing: In compliance with ASTM C645, provide 3/4" galv. cold rolled steel channels, or steel studs, fastened to inside of webs in horizontal position.
   8. Fasteners for Metal Framing: Provide fasteners of type, size, style, grade, holding power, class and other properties required for secure installation of framing and furring. Galvanize all fasteners and accessories. Power actuated fasteners shall not be used during school hours and shall not be used in occupied areas of the buildings.
   9. Exception: The minimum metal thickness and section properties requirements of ASTM C 645 are waived provided steel of 40 ksi minimum yield strength is used, the

metal is continuously dimpled, the effective thickness is at least twice the base metal thickness, and maximum stud heights are determined by testing in accordance with ASTM E 72 using assemblies specified by ASTM C 754.
   a. Acceptable Products:
      1) Dietrich Metal Framing ; UltraSteel (tm): www.dietrichindustries.com.
   b. Studs: "C" shaped with flat or formed webs with knurled faces.
   c. Runners: U shaped, sized to match studs.
   d. Ceiling Channels: C shaped.
   e. Furring: Hat-shaped sections, minimum depth of 1-1/2 inch.
10. Resilient Furring Channels: 1-1/2" inch depth, for attachment to substrate . [_____].
   a. Manufacturers - Resilient Furring Channels:

D. Shaft Wall Studs and Accessories: ASTM C645; galvanized sheet steel, of size and properties necessary to comply with ASTM C754 and specified performance requirements.
   1. Acceptable Product: Cavity Shaft Wall—1" gypsum liner panels set between 4" steel C-H studs 24" o.c. one side—3/4" gypsum panels, fire rated core, other side—3" mineral fiber sound attenuation panels, screw att 8" o.c. perimeter, 12" o.c. field. All joints to be staggered finished, and perimeter caulked. System to conform to UL Des U415 or U492

E. Ceiling Hangers: Type and size as specified in ASTM C754 for spacing required.

F. Partition Head to Structure Connections: Provide mechanical anchorage devices that accommodate deflection using slotted holes, screws and anti-friction bushings, preventing rotation of studs while maintaining structural performance of partition.

2.02 BOARD MATERIALS

A. Manufacturers - Gypsum-Based Board:
   1. Georgia-Pacific Gypsum: www.gpgypsum.com/#sle.
   2. National Gypsum Company: www.nationalgypsum.com/#sle.
   3. USG Corporation: www.usg.com/#sle.

B. Impact-Rated Wallboard: Tested to Level 3 soft-body and hard-body impact in accordance with ASTM C1629.
   1. Products:

C. Gypsum Wallboard: ASTM C 1396/C 1396M. Sizes to minimize joints in place; ends square cut.
   1. Gypsum Board shall be mold and moisture resistant, meeting a minimum average panel score of "8" in accordance with ASTM D3273:
      a. Application: Use for vertical surfaces, unless otherwise indicated.
      b. Thickness: 5/8 inch, or as indicated.
      c. Edges: Square.
   2. Products:
      a. Sheetrock Brand Humitek Gypsum Panels; USG Corp.
      b. DensArmor Plus Interior Guard Panels; G-P Gypsum Corp.
      c. Gold Bond Brand XP Fire-shield Wallboard; National Gypsum Corp.

D. Fire Resistant Type: Complying with Type X requirements; UL or WH rated.
   1. At Assemblies Indicated with Fire-Rating: Use type required by indicated tested assembly; if no tested assembly is indicated, use Type X.
   2. Other Applications: Use at all vertical surfaces, unless otherwise indicated.
   3. Thickness: 1/2 inch and 5/8 inch, as indicated.
   4. Edges: Tapered.

E. Abuse-Resistant Type: Gypsum wallboard especially formulated for increased impact resistance, with enhanced gypsum core and heavy duty face and back paper. Meets or exceeds criteria when tested in accordance with ASTM C36/ ASTM C473, or ASTM C630/ ASTM C1396,
   1. Application: High-traffic areas indicated.
   2. Core Type: Regular and Type X, as indicated.
   3. Thickness: 5/8 inch, as indicated.
   4. Edges: Tapered.

5. Flame Spread (face) max. - 15
6. Smoke Developed max. -5
7. Products:
   a. Fiberock brand panels VHI Abuse Resistant: USG Corp.
   b. Toughrock Brand Gypsum Board: G-P Gypsum Corp.
   c. Fireshield Hi-Impact brand XP Wallboard panels: National Gypsum Corp.

F. Shaftwall and Coreboard: Type X; 1 inch thick by 24 inches wide, beveled long edges, ends square cut. Provide rating and STC performance as shown on the drawings. System to conform to UL Des U415 or U492.
   1. Paper Faced Type: Gypsum shaftliner board or gypsum coreboard as defined ASTM C 1396/C 1396M; water-resistant faces.
   2. Products:
      a. CertainTeed Corporation; ProRoc Brand Shaftliner Type X.
      b. National Gypsum Company; Gold Bond Brand 1" Fire-Shield Shaftliner.
      c. USG Corporation; Sheetrock Gypsum Liner Panels.

2.03 FIBERGLASS REINFORCED BOARD MATERIALS

A. Cementitious Backer Board: ANSI A118.9, aggregated Portland cement panels with glass fiber mesh embedded in front and back surfaces, 5/8 inch thick. Fire tested in accordance with ASTM E119. ASTM E136. Panels shall not contain asbestos.
   1. Meet or exceed the following criteria:
      a. a.Flexural strength: Min. 750 lb./ sq in. in accordance with ASTM C947
      b. Water Absorption: Max. 10% by weight in 24 hrs. in accordance with ASTM C473
      c. Indentation strength: 2250 psi. min. in accordance with SATM D2394.
      d. Nail Pull Resistance: 125 lb. min. in accordance with ASTM C473 or D1037.
      e. Surface Burning Characteristics: Flame spread - 5. Smoke Density - 0 . in accordance with ASTM E84.

2.04 ACCESSORIES

1. Concealed acoustic sealant: comply with ASTM C 919, nonstaining, nonbleeding, gunnable sealant.
2. Exposed acoustic sealant: Comply with ASTM C834, non oxidizing, skinnable, paintable, gunnable, sealant for exposed applications, either latex or acrylic based type.

B. Flexible Closures: For non fire rated work, for filling gaps between steel deck flutes and tops of partitions. Closures shall be fabricated to conform to the profile of the deck. Closed cell EPDM rubber, with adhesive. Houston Foam Plastics, Houston TX 800-231-1752.

C. Waterproof membrane: For tile backer board work, 4-mil fire retardant polyethylene film.

D. Finishing Accessories: ASTM C1047, galvanized steel or rolled zinc, unless otherwise indicated.
   1. Types: As detailed or required for finished appearance, provide level 5 finish. Metal trim shall be formed of galvanized or zinc coated steel. Provide paper faced metal trim where recommended by manufacturer.
   2. Special Shapes: In addition to conventional cornerbead and control joints, provide U-bead at exposed panel edges.
   3. Provide corner reinforcement for all outside corners.
      a. Sheetrock Brand paper faced metal outside corner, tape-on-bead, model B1W USG
      b. Where covered by thinset ceramic tile, provide B1W-NB
   4. No-coat Ultracorner Brand Structural Drywall Corner.

E. Joint Materials: ASTM C 475 and as recommended by gypsum board manufacturer for project conditions, and to meet fire resistance requirements where applicable.
   1. Tape: 2 inch wide, coated glass fiber tape for joints and corners, except as otherwise indicated. For use with mold and moisture resistant paper faced and glass mat faced gypsum board panels.
   2. Ready-mixed vinyl-based joint compound.
   3. For tile backer board, provide manufacturers recommended fillers, tapes and other materials.

F. Screws: ASTM C 1002; self-piercing tapping type.
   1. For fastening the gypsum board in place, specifically designed for use with power driven tools, of length recommended for application in board manufacturers printed instructions, but not less than 1-1/4" long, with self tapping threads and self drilling points. Screws shall be steel with rust inhibitive coating.

G. Anchorage to Substrate: Tie wire, nails, screws, and other metal supports, of type and size to suit application; to rigidly secure materials in place.

H. Adhesive for Attachment to Wood: ASTM C557.

I. Insulation: Comply with ASTM C665, Mineral Fiber Blanket.
   1. Sound Attenuation blankets, Type I, Class A Density 2.5 lbs./ cubic foot minimum. Thermafiber Inc. Wabash, IN 888-834-2371
   2. Foil backed insulation blankets, Type III class A by Thermafiber Inc., Density 3 lbs./cft. min. R-value 3.7 min. per inch of thickness. Foil backing shall be omitted from blankets in exterior partitions indicated to have other vapor retarding materials as part of the wall assembly, such as tile backer board with polyethylene membrane.

PART 3 EXECUTION

3.01 EXAMINATION

A. Verify that project conditions are appropriate for work of this section to commence.

3.02 SHAFT WALL INSTALLATION

A. Shaft Wall Framing: Install in accordance with manufacturer's installation instructions.
   1. Attach J-Runners plumb with one another with short leg to finished side, long leg on shaft side, at floor and structure overhead using power-driven fasteners located 2 in. from each end and 24 in. oc between. Cut jamb J-Runners or E-Studs not less than 3/8 in. nor more than 1/2 in. less than distance from floor to structure above. Position J-Runners or E-Studs at wall structural jambs. Do not attach to floor or overhead J-Runners.Cut C-H Studs not less than 3/8 in. nor more than 1/2 in. less than distance from floor to structure above. Fit first C-H Stud over leading edge of first liner board. Install remaining liner boards and C-H Studs. Do not attach C-H Studs to J-Runners.
   2. Install studs at spacing required to meet performance requirements.
   3. Do not splice C-H Studs or E-Studs. For wall heights exceeding 16 ft attach C-H studs, E-Studs, or jamb J-runners to floor and overhead J-Runners with two (2) 1/2 in. Type S-12 screws on shaft side and one (1) on floor side. Always fit liner boards tightly into studs or jamb runners. Always fit studs or jamb runners tightly over liner boards.

B. Shaft Wall Liner: Cut liner boards 1 in. less than distance from floor to structure above; erect vertically into floor and overhead J-Runners, and into jamb J-Runner or E-Stud. Where wall height exceeds maximum length of liner board, position board end joints within upper and lower 1/3 of height from floor to structure above; stagger joints in adjacent boards. Achieve tight fit at mating board ends. Cut panels to accurate dimension and install sequentially between special friction studs.
   1. On walls over sixteen feet high, screw-attach studs to runners top and bottom.
   2. Seal perimeter of shaft wall and penetrations with acoustical sealant.

C. Small openings: Frame openings with E-Studs or J-Runners at jambs; frame heads and sills with J-Runners. Attach head and sill J-Runners to jambs with two (2) 3/8 in. Type S-12 screws on shaft side and one (1) on floor side.

3.03 FRAMING INSTALLATION

A. Metal Framing: Install in accordance with ASTM C754 and manufacturer's instructions.

B. Suspended Ceilings and Soffits: Space framing and furring members at 16 inches on center.
   1. Level ceiling system to a tolerance of 1/1200.
   2. Laterally brace entire suspension system.

C. Studs: Space studs at 16 inches on center, unless otherwise noted.
   1. Extend partition framing to structure where indicated and to ceiling in other locations.

2. Partitions Terminating at Ceiling: Attach ceiling runner securely to ceiling track in accordance with manufacturer's instructions.
3. Partitions Terminating at Structure: Attach extended leg top runner to structure, maintain clearance between top of studs and structure, and brace both flanges of studs with continuous bridging.
4. Partitions Terminating at Structure: Attach top runner to structure, maintain clearance between top of studs and structure, and connect studs to track using specified mechanical devices in accordance with manufacturer's instructions; verify free movement of top of stud connections; do not leave studs unattached to track.

D. Openings: Reinforce openings as required for weight of doors or operable panels, using not less than double studs at jambs.

E. In kitchen areas, toilet rooms, shower rooms, gymnasium locker rooms, janitorial closets and other such areas subject to water on the floors, provide a heavy coating of bituminous paint on all surfaces of bottom runner tracks and the lower 3" of studs.

F. Where framing is in contact with an exterior masonry wall, install asphalt felt protection strip between metal and masonry.

G. Standard Wall Furring: Install at concrete and masonry walls scheduled to receive gypsum board, not more than 4 inches from floor and ceiling lines and abutting walls. Secure in place on alternate channel flanges at maximum 16 inches on center.
1. Orientation: Horizontal.
2. Spacing: As indicated.
3. Where furring channel is installed directly to a masonry exterior wall, install asphalt felt protection strip between furring channel and wall.

H. Acoustic Furring: Install resilient channels at maximum 24 inches on center. Locate joints over framing members.

I. Furring for Fire Ratings: Install as required for fire resistance ratings indicated and to GA-600 requirements.

J. Blocking: Install wood blocking for support of:
1. Framed openings.
2. Wall mounted cabinets.
3. Plumbing fixtures.
4. Wall mounted door hardware.

K. Blocking: Install blocking for support of plumbing fixtures, toilet partitions, toilet accessories, and hardware. Comply with Section 06 1054 for wood blocking.

L. Horizontal Bracing or Stiffener Installations: Install metal stud bracing fastened to inside of stud with webs in a horizontal position. Space bridging 4 feet on center maximum unless otherwise indicated. Provide additional bracing as recommended by manufacturer.

M. Chase Wall Erection: Align two parallel rows of floor and top runners spaced apart as detailed. Attach to concrete floor slab with concrete stub nails or power driven anchors at 24" o.c. max., and to structure above in a similar fashion. NOTE: It is the responsibility of the Contractor anchoring the runners to ensure that the concrete below the runner will hold the fasteners. Crumbling or deteriorated concrete must be removed and replaced prior to installation of the fasteners.
1. Position steel studs vertically in runners, 16" o.c. max. with flanges in the same direction, and with studs on opposite sides of chase directly across from each other. Anchor all studs to floor and ceiling runners with fastener tool.

3.04 ACOUSTIC ACCESSORIES INSTALLATION

A. Acoustic Insulation: Place tightly within spaces, around cut openings, behind and around electrical and mechanical items within partitions, and tight to items passing through partitions.

B. Acoustic Sealant: Install in accordance with manufacturer's instructions.
1. Place one bead continuously on substrate before installation of perimeter framing members.
2. Place continuous bead at perimeter of each layer of gypsum board.

3. In non-fire-rated construction, seal around all penetrations by conduit, pipe, ducts, and rough-in boxes.

3.05 BOARD & ABUSE RESISTANT BOARD INSTALLATION

A. Double-Layer Non-Rated: Use gypsum board for first layer, placed parallel to framing or furring members, with ends and edges occurring over firm bearing. Place second layer perpendicular to framing or furring members. Offset joints of second layer from joints of first layer.

B. Fire-Rated Construction: Install gypsum board in strict compliance with requirements of assembly listing.

C. Cementitious Backing Board: Install over steel framing members and plywood substrate where indicated, in accordance with ANSI A108.11> ANSI A108/A118/A136.1 and manufacturer's instructions.

D. Moisture Protection: Treat cut edges and holes in moisture resistant gypsum board and exterior gypsum soffit board with sealant.

3.06 INSTALLATION OF TRIM AND ACCESSORIES

A. Control Joints: Place control joints consistent with lines of building spaces and as indicated.
   1. Not more than 30 feet apart on walls and ceilings over 50 feet long.
   2. At exterior soffits, not more than 30 feet apart in both directions.

B. Corner Beads: Install at external corners, using longest practical lengths.

C. Edge Trim: Install at locations where gypsum board abuts dissimilar materials and as indicated.

3.07 JOINT TREATMENT

A. Paper Faced Gypsum Board: Use paper joint tape, bedded with ready-mixed vinyl-based joint compound and finished with ready-mixed vinyl-based joint compound.

B. Finish all gypsum board in accordance with ASTM C 840 Level 4.

C. Tape, fill, and sand exposed joints, edges, and corners to produce smooth surface ready to receive finishes.
   1. Feather coats of joint compound so that camber is maximum 1/32 inch.
   2. Taping, filling, and sanding is not required at surfaces behind adhesive applied ceramic tile and fixed cabinetry.
   3. Taping, filling and sanding is not required at base layer of double layer applications.

D. Fill and finish joints and corners of cementitious backing board as recommended by manufacturer.

3.08 TOLERANCES

A. Maximum Variation of Finished Gypsum Board Surface from True Flatness: 1/8 inch in 10 feet in any direction. Do not exceed 1/16" variation between planes or abutting edges or ends. Shim as required to comply with specified tolerances.

B. For soffits and ceilings, verify that direct suspension system has been installed properly, that main runners are space evenly and have been leveled to a tolerance of 1/8" in 12 feet measured both lengthwise on each runner and transversely between parallel runners so that furring member installation may proceed accurately.

END OF SECTION

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SECTION 09 2300
GYPSUM PLASTERING

PART 1 GENERAL

1.01 SECTION INCLUDES

A. Gypsum lath.

1.02 RELATED REQUIREMENTS

A. Section 06 1000 - Rough Carpentry: Wood stud framing for plaster.

B. Section 08 3100 - Access Doors and Panels: Access panels.

1.03 REFERENCE STANDARDS

A. ASTM C28/C28M - Standard Specification for Gypsum Plasters 2010 (Reapproved 2015).

B. ASTM C35 - Standard Specification for Inorganic Aggregates for Use in Gypsum Plaster 2001 (Reapproved 2019).

C. ASTM C206 - Standard Specification for Finishing Hydrated Lime 2014.

D. ASTM C631 - Standard Specification for Bonding Compounds for Interior Gypsum Plastering 2009 (Reapproved 2020).

E. ASTM C841 - Standard Specification for Installation of Interior Lathing and Furring 2003 (Reapproved 2018).

F. ASTM C842 - Standard Specification for Application of Interior Gypsum Plaster 2005 (Reapproved 2015).

G. ASTM C1396/C1396M - Standard Specification for Gypsum Board 2017.

H. ICC (IBC) - International Building Code Most Recent Edition Adopted by Authority Having Jurisdiction, Including All Applicable Amendments and Supplements.

I. UL (FRD) - Fire Resistance Directory Current Edition.

1.04 SUBMITTALS

A. See Section 01 3000 - Administrative Requirements, for submittals procedures.

B. Product Data: Provide data on plaster materials, characteristics, and limitations of products specified.

1.05 QUALITY ASSURANCE

A. Fire Rated Ceiling and Soffits: Listed assembly by UL, No. P404 ; 1 hour rating minimum.

1.06 FIELD CONDITIONS

A. Do not apply plaster when substrate or ambient air temperature is under 50 degrees F or over 80 degrees F.

B. Maintain minimum ambient temperature of 50 degrees F during and after installation of plaster.

PART 2 PRODUCTS

2.01 MANUFACTURERS

A. Gypsum Plaster:
   1. National Gypsum Company; Product Red Top Gypsum Plaster: www.nationalgypsum.com/#sle.
   2. USG: www.usg.com/#sle.
   3. Substitutions: See Section 01 6000 - Product Requirements.

2.02 PLASTER MATERIALS

A. Ready-Mixed Gypsum Plaster: ASTM C28; mill-mixed type, requiring only the addition of water. For application to monolithic concrete, provide bonding type.

B. Lime: ASTM C206, Type S; special finishing hydrated lime.

2.03 GYPSUM LATH AND ACCESSORIES

A. Gypsum Lath: ASTM C1396/C1396M, standard type.
   1. Thickness: 3/8 inch.

B. Beads, Screeds, Joint Accessories, and Other Trim: Depth governed by plaster thickness, maximum possible lengths.
   1. Material: Formed sheet steel with rust inhibitive primer, expanded metal flanges.

C. Corner Mesh: Formed sheet steel, minimum 0.018 inch thick, perforated flanges shaped to permit complete embedding in plaster, minimum 2 inch size; galvanized.

D. Fasteners: Nails, staples, or other approved metal supports, of type and size to suit application, to rigidly secure accessories in place.

2.04 PLASTER MIXES

A. Over Gypsum Lath: Two-coat application, ready-mixed plaster, mixed and proportioned in accordance with ASTM C842 and manufacturer's instructions.

B. Over Metal Lath: Three-coat application, ready-mixed plaster, mixed and proportioned in accordance with ASTM C842 and manufacturer's instructions.

C. Ready-Mixed Plaster Materials: Mix in accordance with manufacturer's instructions.

D. Finish Coat for Troweled Finish: Lime putty with gypsum gauging plaster, mixed and proportioned in accordance with ASTM C842.

E. Finish Coat for Floated Finish: Lime putty with gypsum gauging plaster, mixed and proportioned in accordance with ASTM C842.

PART 3 EXECUTION

3.01 EXAMINATION

A. Verify that existing conditions are satisfactory before starting work.

B. Grounds and Blocking: Verify items within walls for other sections of work have been installed.

C. Gypsum Lath and Accessories: Verify substrate is flat and surface is ready to receive work of this section. Verify joint and surface perimeter accessories are in place.

D. Metal Lath and Accessories: Verify lath is flat, secured to substrate, and joint and surface perimeter accessories are in place.

3.02 PREPARATION

A. Dampen masonry surfaces to reduce excessive suction.

B. Clean concrete surfaces of foreign matter. Thoroughly dampen surfaces before using acid solutions, solvent, or detergents to perform cleaning. Wash surface with clean water.

C. Apply bonding agent in accordance with manufacturer's instructions.

3.03 INSTALLATION - GYPSUM LATH AND ACCESSORIES

A. Install gypsum lath in accordance with ASTM C841.

B. Install gypsum lath perpendicular to framing members, with lath face exposed. Stagger end joint of alternate courses. Butt joints tight. Maximum gap allowed: 1/8 inch.

C. Place corner reinforcement diagonally over gypsum lath and across corner immediately above and below openings. Secure to gypsum lath only.

D. Continuously reinforce internal angles with corner mesh, return 3 inches from corner to form the angle reinforcement; fasten at perimeter edges only.

E. Place corner bead at external wall corners; fasten at outer edges of lath only.

F. Place strip mesh diagonally at corners of lathed openings. Secure rigidly in place.

G. Place 4 inch wide strips of strip mesh centered over junctions of dissimilar backing materials. Secure rigidly in place.

H. Place casing beads at terminations of plaster finish. Butt and align ends. Secure rigidly in place.

I. Control and Expansion Joints:
   1. Locate at 20 feet on center.
   2. Use two casing beads butted tight to form joint.

J. Coordinate installation of frames plumb and level in opening.

K. Place acoustic sealant at gypsum lath perimeter in accordance with manufacturer's instructions. Seal penetrations of conduit, pipe, duct work, rough-in boxes, and other components.

3.04 PLASTERING

A. Apply gypsum plaster in accordance with ASTM C842 and manufacturer's instructions.

B. Thickness of Plaster including Finish Coat:
   1. Over metal lath: 5/8 inch.
   2. Over gypsum lath: 1/2 inch.

C. Finish Texture: Float to a consistent and smooth finish.

3.05 TOLERANCES

A. Maximum Variation from True Flatness: 1/8 inch in 10 feet.

END OF SECTION

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SECTION 09 3000
TILING

PART 1 GENERAL

1.01 SECTION INCLUDES

A. Tile for floor applications.

B. Tile for wall applications.

C. Cementitious backer board as tile substrate.

D. Stone thresholds.

E. Ceramic accessories.

F. Ceramic trim.

1.02 RELATED REQUIREMENTS

A. Section 09 2116 - Gypsum Board Assemblies: Installation of tile backer board.

1.03 REFERENCE STANDARDS

A. ANSI A108/A118/A136.1 - American National Standard Specifications for the Installation of Ceramic Tile (Compendium). 2017.
   1. ANSI A108.1a - American National Standard Specifications for Installation of Ceramic Tile in the Wet-Set Method, with Portland Cement Mortar 2017.
   2. ANSI A108.1b - American National Standard Specifications for Installation of Ceramic Tile on a Cured Portland Cement Mortar Setting Bed with Dry-Set or Latex-Portland Cement Mortar 2017.
   3. ANSI A108.1c - Specifications for Contractors Option: Installation of Ceramic Tile in the Wet-Set Method with Portland Cement Mortar or Installation of Ceramic Tile on a Cured Portland Cement Mortar Bed with Dry-Set or Latex-Portland Cement 1999 (Reaffirmed 2016).
   4. ANSI A108.4 - American National Standard Specifications for Installation of Ceramic Tile with Organic Adhesives or Water Cleanable Tile-Setting Epoxy Adhesive 2009 (Revised).
   5. ANSI A108.5 - American National Standard Specifications for Installation of Ceramic Tile with Dry-Set Portland Cement Mortar or Latex-Portland Cement Mortar 1999 (Reaffirmed 2010).
   6. ANSI A108.6 - American National Standard Specifications for Installation of Ceramic Tile with Chemical Resistant, Water Cleanable Tile-Setting and -Grouting Epoxy 1999 (Reaffirmed 2010).
   7. ANSI A108.10 - American National Standard Specifications for Installation of Grout in Tilework 2017.
   8. ANSI A118.4 - American National Standard Specifications for Modified Dry-Set Cement Mortar 2012 (Revised).
   9. ANSI A118.6 - American National Standard Specifications for Standard Cement Grouts for Tile Installation 2010 (Reaffirmed 2016).

B. ASTM C847 - Standard Specification for Metal Lath 2018.

1.04 SUBMITTALS

A. Product Data: Provide manufacturers' data sheets on tile, mortar, grout, and accessories. Include instructions for using grouts and adhesives.

B. Shop Drawings: Indicate tile layout, patterns, color arrangement, perimeter conditions, junctions with dissimilar materials, control and expansion joints, thresholds, ceramic accessories, and setting details.

C. Samples: Mount tile and apply grout on two plywood panels, minimum 18 x 18 inches in size illustrating pattern, color variations, and grout joint size variations.

D. Manufacturer's Certificate: Certify that products meet or exceed specified requirements.

E. Material Safety and Data Sheets (MSDS) for all products used.

F. Maintenance Data: Include recommended cleaning methods, cleaning materials, stain removal methods, and polishes and waxes.

G. Maintenance Materials: Furnish the following for Owner's use in maintenance of project.
   1. Extra Tile: 8 square feet of each size, color, and surface finish combination.

1.05 MOCK-UP

1.06 DELIVERY, STORAGE, AND HANDLING

A. Protect adhesives from freezing or overheating in accordance with manufacturer's instructions.

1.07 FIELD CONDITIONS

A. Do not install solvent-based products in an unventilated environment.

B. Maintain ambient and substrate temperature of 50 degrees F during installation of mortar materials.

PART 2 PRODUCTS

2.01 TILE

A. Manufacturers: All products by the same manufacturer.
   1. American Olean: www.americanolean.com.
   2. Dal-Tile Corporation: www.daltile.com/#sle.
   3. Substitutions: See Section 01 6000 - Product Requirements.
   4. Size and Shape: 2 inch square, 1 inch by 2 inches or as selected by the Architect.
   5. Surface Finish: Unglazed. and slip resistant.
   6. Colors: To be selected from manufacturer's standard range.
   7. Colors: As scheduled.

2.02 SETTING MATERIALS

2.03 ADHESIVE MATERIALS

A. Manufacturers:
   1. Bonsal American, Inc: www.sakrete.com
   2. Bostik Inc: www.bostik-us.com.
   3. Mapei Corporation: www.mapei.com.

B. Organic Adhesive: ANSI A136.1, thinset bond type; use Type I in areas subject to prolonged moisture exposure.

C. Epoxy Adhesive: ANSI A118.3, thinset bond type.

2.04 MORTAR MATERIALS

A. Manufacturers:
   1. Bonsal American, Inc: www.sakrete.com
   2. Bostik Inc: www.bostik-us.com.
   3. Custom Building Products: www.custombuildingproducts.com.
   4. Substitutions: See Section 01 6000 - Product Requirements.

B. Mortar Bed Materials: Portland cement, sand, latex additive , Hydrated Lime ASTM C 206 or ASTM C 207 Type S and water.

C. Mortar Bond Coat Materials:
   1. Dry-Set Portland Cement type: ANSI A118.1.
   2. Latex-Portland Cement type: ANSI A118.4.

2.05 GROUTS

A. Manufacturers:
   1. Bonsal American, Inc: www.sakrete.com
   2. Bostik Inc: www.bostik-us.com/#sle.
   3. Custom Building Products: www.custombuildingproducts.com.

B. Standard Grout: Polymer modified cement grout, sanded or unsanded, as specified in ANSI A118.7.

2.06 THIN-SET ACCESSORY MATERIALS

A. Cleavage Membrane: No. 15 asphalt saturated felt.

B. Waterproofing Membrane at Floors: PVC sheet membrane, 40 mils thick, minimum; specifically designed for bonding to cementitious substrate under thick mortar bed or thin-set tile; complying with ANSI A118.10.

C. Membrane at Walls: No. 15 asphalt saturated felt.

D. Membrane at Walls: 4 mil thick polyethylene film.

E. Cementitious Backer Board: ANSI A118.9; High density, cementitious, glass fiber reinforced, 1/2 inch thick; 2 inch wide coated glass fiber tape for joints and corners.

F. Mesh Tape: 2-inch wide self-adhesive fiberglass mesh tape.

PART 3 EXECUTION

3.01 EXAMINATION

A. Verify that sub-floor surfaces are smooth and flat within the tolerances specified for that type of work and are ready to receive tile.

B. Verify that wall surfaces are smooth and flat within the tolerances specified for that type of work, are dust-free, and are ready to receive tile.

C. Verify that sub-floor surfaces are dust-free and free of substances that could impair bonding of setting materials to sub-floor surfaces.

D. Verify that concrete sub-floor surfaces are ready for tile installation by testing for moisture emission rate and alkalinity; obtain instructions if test results are not within limits recommended by tile manufacturer and setting materials manufacturer.

E. Verify that required floor-mounted utilities are in correct location.

3.02 PREPARATION

A. Protect surrounding work from damage.

B. Vacuum clean surfaces and damp clean.

C. Seal substrate surface cracks with filler. Level existing substrate surfaces to acceptable flatness tolerances.

D. Install cementitious backer board in accordance with ANSI A108.11 and board manufacturer's instructions. Tape joints and corners, cover with skim coat of dry-set mortar to a feather edge.

E. Install tile backer board in strict accordance with manufacturer's instructions, using galvanized roofing nails or corrosion-resistant bugle head drywall screws. Bed fiberglass self-adhesive tape at all joints and corners with material used to set tiles.

F. Prepare substrate surfaces for adhesive installation in accordance with adhesive manufacturer's instructions.

3.03 INSTALLATION - GENERAL

A. Install tile and thresholds and grout in accordance with applicable requirements of ANSI A108.1 through A108.13, manufacturer's instructions, and The Tile Council of North America Handbook recommendations.

B. Lay tile to pattern indicated. Do not interrupt tile pattern through openings.

C. Tile work shall be laid out so that no tiles less than one-half of full size shall occur.

D. Cut and fit tile to penetrations through tile, leaving sealant joint space. Form corners and bases neatly. Align floor joints.

E. Align all wall joints to give straight uniform grout lines, plumb and level.

F. Align all floor joints to give straight uniform grout lines, parallel with walls.

G. Place tile joints uniform in width, subject to variance in tolerance allowed in tile size. Make grout joints without voids, cracks, excess mortar or excess grout, or too little grout.

H. Intersections and returns shall be accurately formed. Cutting and drilling of tile shall be neatly done without marring the surface. The cut edges of tile against trim, finish or built-in

items shall be carefully ground and jointed. Tile shall fit closely around electrical outlets, piping, fixtures and fittings so that plates, collars or coverings shall overlap the tile. Recesses of proper size for built-in accessories shall be provided. Only sufficient clearance shall be allowed for leveling and plumbing to permit the metal trim to overlap the tile.

I. Form internal angles square and external angles bullnosed.

J. Install thresholds where indicated.

K. Sound tile after setting. Replace hollow sounding units.

L. Prior to grouting, allow installation to completely cure; minimum of 48 hours.

M. Grout tile joints. Use standard grout unless otherwise indicated.

N. Floor shall not be grouted before 72 hours after setting, and walls before 24 hours. Before grouting, tile work shall be wet with clean water.

O. Order of tile setting shall be first- base, second- walls, third - floors.

P. Provide all trimmers as necessary for a complete installation. Shapes shall be integral with wall tile (combinations) unless otherwise shown or noted. Tile plinths shall be provided where trim is shown for door openings in connection with tile base or wall finish. Wall finish shall extend into reveals of openings and shall be overlapped by trim unless otherwise shown.

Q. All tile shall have standard combinations at external and internal corners and at intersections with wall and floor finish.

3.04 INSTALLATION - FLOORS - THIN-SET METHODS

A. Over exterior concrete substrates, install in accordance with The Tile Council of North America Handbook Method F102, with standard grout.

B. Over interior concrete substrates, install in accordance with TCA Handbook Method F113, dry-set or latex-portland cement bond coat, with standard grout, unless otherwise indicated.
   1. Use uncoupling membrane under all tile unless other underlayment is indicated.
   2. Where waterproofing membrane is indicated, install in accordance with TCA Handbook Method F122, with latex-portland cement grout.

C. Over wood substrates, install in accordance with The Tile Council of North America Handbook Method F142, with standard grout, unless otherwise indicated.

D. Over wood substrate with backer board underlayment, install in accordance with The Tile Council of North America Handbook Method F144, for cementitious backer boards, with standard grout.

3.05 INSTALLATION - WALL TILE

A. On exterior walls install in accordance with TCA Handbook Method W244, thin-set over cementitious backer units, with waterproofing membrane.

B. Over cementitious backer units on studs, install in accordance with The Tile Council of North America Handbook Method W244, using membrane at toilet rooms.
   1. Maximum variation in the Backing surface 1/8" in 8'-0" from the required plane.
   2. Horizontal and vertical joints ad corners, 1/8" spacing filled solid with druy-set or latex p.c. mortar.
   3. 2" Glass fiber mesh tape - embed in a skim coat of the mortar over joints and corners.

C. Over gypsum wallboard on wood or metal studs install in accordance with TCA Handbook Method W243, thin-set with dry-set or latex-portland cement bond coat, unless otherwise indicated.

D. Over interior concrete and masonry install in accordance with TCA Handbook Method W202, thin-set with dry-set or latex-portland cement bond coat.

E. Tile shall be firmly bonded in place with finish surfaces in true planes. Joints shall be straight, true and uniform in width and solidly filled. The completed work shall be free from hollow sounding areas, loose, cracked or defective tile.

F. Make joints between tile sheets same width as joints within sheets so extent of each sheet is not apparent in finish work.

G. Joints shall be grouted full and flush for square edge tile and to depth of cushion and concave for cushion edge tile.

3.06 CLEANING

A. Clean tile and grout surfaces.

B. Remove all grout haze, observing both tile and grout manufacturer's recommendations as to use of acid and chemical cleaners.

C. Polish surface of tile work with soft cloth.

3.07 PROTECTION

A. Do not permit traffic over finished floor surface for 4 days after installation.

B. As soom as the tile work in each space has been grouted and cleaned, it shall be covered with either reinforced Kraft paper (Sisalkraft). Floor coverings shall be kept and maintained unitl completion of the work of all trades or as otherwise directed by the Architect, when it shall be removed without damage to tile or adjoining work.

C. All tiles which are cracked, broken, chipped or otherwise damaged shall be promptly removed and replaced.

3.08 SCHEDULE

A. Floors, Bases and Walls in Toilet 14a:
   1. Tile: Ceramic mosaic.
      a. Size: 2 x 2 inch for floors.
      b. Size 4 x 4 inch for walls.
      c. Size 2 x 6 inch for bullnose top edge .
   2. Base: Coved, 4 inches high, bullnosed top edge.
   3. Installation method: Thinset bed.
   4. Grout: Epoxy Cement for all tile surfaces unless otherwise required by conditions - ANSI A118.4.

END OF SECTION

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SECTION 09 6519
RESILIENT TILE FLOORING - METROFLOR

PART 1 GENERAL

1.01 SECTION INCLUDES

A. Resilient tile flooring.

B. Installation accessories:
   1. Adhesives.

1.02 RELATED REQUIREMENTS

A. Section 01 7419 - Construction Waste Management and Disposal.

B. Section 07 9200 - Joint Sealants.

C. Section 07 9513 - Expansion Joint Cover Assemblies.

1.03 REFERENCE STANDARDS

A. ASTM E648 - Standard Test Method for Critical Radiant Flux of Floor-Covering Systems Using a Radiant Heat Energy Source 2019a, with Editorial Revision (2020).

B. ASTM F710 - Standard Practice for Preparing Concrete Floors to Receive Resilient Flooring 2019, with Editorial Revision (2020).

1.04 SUBMITTALS

A. See Section 01 3000 - Administrative Requirements, for submittal procedures.

B. Manufacturer's documentation for flooring and accessories:
   1. Technical Data.
   2. Installation and Maintenance.
   3. Warranty.
   4. Reclamation Program.
   5. Safety Data Sheets (SDS) for accessories.

C. Selection Samples: Submit manufacturer's complete set of color samples for Architect's initial selection.

1.05 DELIVERY, STORAGE, AND HANDLING

A. Upon receipt, immediately remove any shrink-wrap and check materials for damage and that the material is of the correct style, color, quantity and run number(s).

B. Store all materials flat and off of the floor in an acclimatized, weather-tight space between 65 to 85 degrees F.

1.06 FIELD CONDITIONS

A. Acclimate material at jobsite between 65 to 85 degrees F and 35 percent to 85 percent relative humidity for 48 hours prior to installation. Temperature and relative humidity should also be maintained at the same levels during installation, and after installation.

PART 2 PRODUCTS

2.01 MANUFACTURERS

A. Basis of Design: Mohawk Group; Secoya: www.aspectaflooring.com/#sle.

B. Substitutions: See Section 01 6000 - Product Requirements.

2.02 RESILIENT TILE FLOORING

A. Luxury Vinyl Plank and Tile:

2.03 ACCESSORIES

A. Adhesives:

PART 3 EXECUTION

3.01 EXAMINATION - SEE ALSO SECTION 01 7000.

A. Install flooring and accessories after other operations (including painting) have been completed.

B. Acceptance of Conditions: Carefully examine all installation areas with installer/applicator present, for compliance with requirements affecting work performance.
   1. Verify that field measurements, product, adhesives, substrates, surfaces, structural support, tolerances, levelness, temperature, humidity, moisture content level, pH, cleanliness and other conditions are as required by the manufacturer, and ready to receive work.

C. Verify that substrate is contaminant-free, including old adhesives and abatement chemicals.

D. Test substrates as required by manufacturer to verify proper conditions exist.

E. Verify that required floor-mounted utilities are in correct location.

3.02 PREPARATION

A. Flooring installation should not begin until all site conditions have been assessed, testing has been completed and subfloor conditions have been approved.

B. Prepare per manufacturer's written instructions, Section 01 7000, and as follows:
   1. Prepare substrates to ensure proper adhesion of Luxury Vinyl Plank & Tile.

3.03 INSTALLATION

A. Installation per manufacturer's written instructions, Section 01 7000, and as follows:
   1. Layout shall be specified by Architect, Designer or End User.
   2. Follow layout and ensure installation reference lines are square.
   3. Field tiles shall be installed with directional arrows on back aligned in the same direction, or may be installed in quarter-turned fashion.
   4. Check cartons for and do not mix dye lots.
   5. Expansion Joints: Locate expansion, isolation, and other moving joints prior to installation.
      a. Do not fill expansion, isolation, and other moving joints with patching compound nor cover with resilient flooring.
      b. Install movement joint systems per manufacturer's instructions and per Section 07 9200 and Section 07 9513.
   6. Adhesives: Adhere flooring to substrate using the full spread method resulting in a completed installation without gaps, voids, raised edges, bubbles or any other surface imperfections.
      a. Select appropriate adhesive, trowel and follow manufacturer's instructions.
      b. Periodically spot-check transfer of adhesive to back of tile during installation.
      c. Roll floor with a 100 pound roller to ensure proper transfer of adhesive and bonding.
      d. Protect floor from traffic per manufacturer's instructions.
      e. Do not wet mop floor until the adhesive has properly set per written instructions.

3.04 CLEANING

A. Waste Management per Section 01 7000 and Section 01 7419, and as follows:
   1. Coordinate material reclamation program with manufacturer, if applicable.
      a. Store and return cartons and pallets to manufacturer or recycler for reuse or recycling.

B. Provide progress cleaning per manufacturer's written instructions, Section 01 7000, and as follows:
   1. Work Areas: Clean areas where work is in progress to the level of cleanliness necessary for proper execution of the work.
      a. Clean and protect completed construction until Date of Substantial Completion.
      b. During installation, remove wet adhesive from surface of flooring per manufacturer's instructions.
   2. Site: Maintain project site free of waste materials and debris.

C. Provide final cleaning immediately prior to Date of Substantial Completion inspection per manufacturer's written instructions and Section 01 7000.
   1. Protection: Remove manufacturer's and other installed protection immediately prior to Date of Substantial Completion inspection, unless required otherwise.
   2. Clean floor with a neutral 6-8 pH cleaner.

3.05 PROTECTION

A. Protect materials from construction operations until Date of Substantial Completion or Owner occupancy, whichever occurs first.
   1. Protect finished floor from abuse and damage by using heavy non-staining kraft paper, drop cloths or equivalent. Use additional, non-damaging protective materials as needed.
   2. Light foot traffic on a newly installed floor can be permitted after 24 hours.
   3. Keep heavy traffic and rolling loads off the newly installed LVT flooring for 48 hours.
   4. Protect the floor from rolling loads by covering with protective boards.

END OF SECTION

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SECTION 09 9113
EXTERIOR PAINTING

PART 1 GENERAL

1.01 SECTION INCLUDES

A. Surface preparation.

B. Field application of paints.

C. Scope: Finish exterior surfaces exposed to view, unless fully factory-finished and unless otherwise indicated, including the following:

D. Do Not Paint or Finish the Following Items:
   1. Items factory-finished unless otherwise indicated; materials and products having factory-applied primers are not considered factory finished.
   2. Items indicated to receive other finishes.
   3. Items indicated to remain unfinished.
   4. Fire rating labels, equipment serial number and capacity labels, and operating parts of equipment.
   5. Marble, granite, slate, and other natural stones.
   6. Floors, unless specifically indicated.
   7. Ceramic and other types of tiles.
   8. Brick, glass unit masonry, architectural concrete, cast stone, integrally colored plaster and stucco.
   9. Glass.
   10. Concealed pipes, ducts, and conduits.

1.02 SUBMITTALS

A. See Section 01 3000 - Administrative Requirements, for submittal procedures.

B. Product Data: Provide complete list of products to be used, with the following information for each:
   1. Manufacturer's name, product name and/or catalog number, and general product category (e.g. "alkyd enamel").
   2. MPI product number (e.g. MPI #47).
   3. Cross-reference to specified paint system(s) product is to be used in; include description of each system.
   4. Manufacturer's installation instructions.

C. Samples: Submit three paper "draw down" samples, 8-1/2 by 11 inches in size, illustrating range of colors available for each finishing product specified.
   1. Where sheen is specified, submit samples in only that sheen.

D. Certification: By manufacturer that paints and finishes comply with VOC limits specified.

E. Manufacturer's Instructions: Indicate special surface preparation procedures.

F. Maintenance Data: Submit data including finish schedule showing where each product/color/finish was used, product technical data sheets, material safety data sheets (MSDS), care and cleaning instructions, touch-up procedures, repair of painted and finished surfaces, and color samples of each color and finish used.

1.03 QUALITY ASSURANCE

A. Manufacturer Qualifications: Company specializing in manufacturing the products specified, with minimum three years documented experience.

B. Applicator Qualifications: Company specializing in performing the type of work specified with minimum three years experience and approved by manufacturer.

1.04 DELIVERY, STORAGE, AND HANDLING

A. Deliver products to site in sealed and labeled containers; inspect to verify acceptability.

B. Container Label: Include manufacturer's name, type of paint, brand name, lot number, brand code, coverage, surface preparation, drying time, cleanup requirements, color designation, and instructions for mixing and reducing.

C. Paint Materials: Store at minimum ambient temperature of 45 degrees F and a maximum of 90 degrees F, in ventilated area, and as required by manufacturer's instructions.

1.05 FIELD CONDITIONS

A. Do not apply materials when surface and ambient temperatures are outside the temperature ranges required by the paint product manufacturer.

B. Follow manufacturer's recommended procedures for producing best results, including testing of substrates, moisture in substrates, and humidity and temperature limitations.

C. Do not apply exterior paint and finishes during rain or snow, or when relative humidity is outside the humidity ranges required by the paint product manufacturer.

D. Minimum Application Temperatures for Latex Paints: 50 degrees F for exterior; unless required otherwise by manufacturer's instructions.

E. Provide lighting level of 80 ft candles measured mid-height at substrate surface.

PART 2 PRODUCTS

2.01 MANUFACTURERS

A. Provide paints and finishes from the same manufacturer to the greatest extent possible.
   1. In the event that a single manufacturer cannot provide specified products, minor exceptions will be permitted provided approval by Architect is obtained using the specified procedures for substitutions.
   2. Substitution of MPI-approved products by a different manufacturer is preferred over substitution of unapproved products by the same manufacturer.

B. Substitutions: See Section 01 6000 - Product Requirements.

2.02 PAINTS AND FINISHES - GENERAL

A. Paints and Finishes: Ready mixed, unless required to be a field-catalyzed paint.
   1. Provide paints and finishes of a soft paste consistency, capable of being readily and uniformly dispersed to a homogeneous coating, with good flow and brushing properties, and capable of drying or curing free of streaks or sags.
   2. Supply each paint material in quantity required to complete entire project's work from a single production run.
   3. Do not reduce, thin, or dilute paint or finishes or add materials unless such procedure is specifically described in manufacturer's product instructions.

2.03 PAINT SYSTEMS - EXTERIOR

A. Paint E-OP - Exterior Surfaces to be Painted, Unless Otherwise Indicated: Including concrete, concrete masonry units, brick, fiber cement siding, primed wood, and primed metal.
   1. Two top coats and one coat primer.
   2. Top Coat(s): Exterior Light Industrial Coating, Water Based; MPI #161, 163, or 164.
      a. Products:
         1) Behr Premium Interior/Exterior Direct-To-Metal Paint Semi-Gloss [No. 3200]. (MPI #163)
         2) PPG Paints Pitt-Tech Plus DTM Industrial Enamel, 90-1110 Series, Satin. (MPI #161)
         3) Rodda Multi Master DTM Acrylic Satin Enamel, 528901. (MPI #161)
         4) Substitutions: Section 01 6000 - Product Requirements.
   3. Top Coat(s): Exterior Alkyd Enamel; MPI #94 or 96.
      a. Products:
         1) Behr Alkyd Interior/Exterior Semi-Gloss Enamel [No. 3900].
         2) PPG Paints Fast Dry 35 Quick Drying Enamel, Gloss, 95-9000 Series, Gloss. (MPI #96)
         3) Rodda Porsalite, Semi-Gloss, 745001. (MPI #94)
         4) Substitutions: Section 01 6000 - Product Requirements.

2.04 PRIMERS

A. Primers: Provide the following unless other primer is required or recommended by manufacturer of top coats.

1. Anti-Corrosive Alkyd Primer for Metal; MPI #79.
   a. Products:
      1) PPG Paints 7-Line Interior/Exterior Rust Inhibitive Steel Primer, 7-852 Series. (MPI #79)
      2) PPG Paints Multiprime Multi-Purpose Primer, 4160 Series. (MPI #79)
      3) Rodda Barrier III HS Metal Primer, 708295. (MPI #79)
      4) Substitutions: Section 01 6000 - Product Requirements.
2. Latex Primer for Exterior Wood; MPI #6.
   a. Products:
      1) Behr Premium Plus Interior/Exterior Multi-Surface Primer and Sealer [No. 436]. (MPI #6)
      2) Sherwin-Williams Exterior Latex Primer, B42W8041. (MPI #6)
      3) Substitutions: Section 01 6000 - Product Requirements.

2.05 ACCESSORY MATERIALS

A. Accessory Materials: Provide primers, sealers, cleaning agents, cleaning cloths, sanding materials, and clean-up materials as required for final completion of painted surfaces.

B. Patching Material: Latex filler.

C. Fastener Head Cover Material: Latex filler.

PART 3 EXECUTION

3.01 EXAMINATION

A. Verify that surfaces are ready to receive work as instructed by the product manufacturer.

B. Examine surfaces scheduled to be finished prior to commencement of work. Report any condition that may potentially effect proper application.

C. Test shop-applied primer for compatibility with subsequent cover materials.

D. Measure moisture content of surfaces using an electronic moisture meter. Do not apply finishes unless moisture content of surfaces are below the following maximums:
   1. Fiber Cement Siding: 12 percent.
   2. Masonry, Concrete, and Concrete Masonry Units: 12 percent.
   3. Exterior Wood: 15 percent, measured in accordance with ASTM D4442.

3.02 PREPARATION

A. Clean surfaces thoroughly and correct defects prior to application.

B. Prepare surfaces using the methods recommended by the manufacturer for achieving the best result for the substrate under the project conditions.

C. Remove or mask surface appurtenances, including electrical plates, hardware, light fixture trim, escutcheons, and fittings, prior to preparing surfaces for finishing.

D. Seal surfaces that might cause bleed through or staining of topcoat.

E. Remove mildew from impervious surfaces by scrubbing with solution of tetra-sodium phosphate and bleach. Rinse with clean water and allow surface to dry.

F. Concrete:

G. Masonry:

H. Fiber Cement Siding: Remove dirt, dust and other foreign matter with a stiff fiber brush. Do not coat surfaces if moisture content or alkalinity of surfaces to be coated exceeds that permitted in manufacturer's written instructions.

I. Exterior Wood Surfaces to Receive Opaque Finish: Remove dust, grit, and foreign matter. Seal knots, pitch streaks, and sappy sections. Fill nail holes with tinted exterior calking compound after prime coat has been applied. Back prime concealed surfaces before installation.

3.03 APPLICATION

A. Exterior Wood to Receive Opaque Finish: If final painting must be delayed more than 2 weeks after installation of woodwork, apply primer within 2 weeks and final coating within 4 weeks.

B. Apply products in accordance with manufacturer's written instructions and recommendations in "MPI Architectural Painting Specification Manual".

C. Do not apply finishes to surfaces that are not dry. Allow applied coats to dry before next coat is applied.

D. Apply each coat to uniform appearance.

E. Vacuum clean surfaces of loose particles. Use tack cloth to remove dust and particles just prior to applying next coat.

F. Reinstall electrical cover plates, hardware, light fixture trim, escutcheons, and fittings removed prior to finishing.

3.04 FIELD QUALITY CONTROL

A. See Section 01 4000 - Quality Requirements, for general requirements for field inspection.

3.05 CLEANING

A. Collect waste material that could constitute a fire hazard, place in closed metal containers, and remove daily from site.

3.06 PROTECTION

A. Protect finishes until completion of project.

B. Touch-up damaged finishes after Substantial Completion.

END OF SECTION

SECTION 09 9123
INTERIOR PAINTING

PART 1 GENERAL

1.01 SECTION INCLUDES

A. Surface preparation.

B. Field application of paints.

C. Scope: Finish interior surfaces exposed to view, unless fully factory-finished and unless otherwise indicated.
   1. Surfaces inside cabinets.
   2. Mechanical and Electrical:
      a. In finished areas, paint insulated and exposed pipes, conduit, boxes, insulated and exposed ducts, hangers, brackets, collars and supports, mechanical equipment, and electrical equipment, unless otherwise indicated.

D. Do Not Paint or Finish the Following Items:
   1. Items factory-finished unless otherwise indicated; materials and products having factory-applied primers are not considered factory finished.
   2. Items indicated to receive other finishes.
   3. Items indicated to remain unfinished.
   4. Fire rating labels, equipment serial number and capacity labels, bar code labels, and operating parts of equipment.
   5. Floors, unless specifically indicated.
   6. Glass.
   7. Concealed pipes, ducts, and conduits.

1.02 REFERENCE STANDARDS

A. 40 CFR 59, Subpart D - National Volatile Organic Compound Emission Standards for Architectural Coatings; U.S. Environmental Protection Agency current edition.

B. ASTM D16 - Standard Terminology for Paint, Related Coatings, Materials, and Applications 2016.

C. ASTM D4258 - Standard Practice for Surface Cleaning Concrete for Coating 2005 (Reapproved 2017).

D. ASTM D4442 - Standard Test Methods for Direct Moisture Content Measurement of Wood and Wood-Based Materials 2020.

E. MPI (APSM) - Master Painters Institute Architectural Painting Specification Manual Current Edition.

F. SSPC-SP 1 - Solvent Cleaning 2015, with Editorial Revision (2016).

G. SSPC-SP 2 - Hand Tool Cleaning 2018.

H. SSPC-SP 6 - Commercial Blast Cleaning 2007.

I. SSPC-SP 13 - Surface Preparation of Concrete 1997 (Reaffirmed 2003).

1.03 SUBMITTALS

A. See Section 01 3000 - Administrative Requirements, for submittal procedures.

B. Product Data: Provide complete list of products to be used, with the following information for each:
   1. Manufacturer's name, product name and/or catalog number, and general product category (e.g. "alkyd enamel").
   2. MPI product number (e.g. MPI #47).
   3. Cross-reference to specified paint system(s) product is to be used in; include description of each system.

C. Samples: Submit three paper "draw down" samples, 8-1/2 by 11 inches in size, illustrating range of colors available for each finishing product specified.
   1. Where sheen is specified, submit samples in only that sheen.

2. Allow 21 for approval process, after receipt of complete samples by Architect.
3. Paint color submittals will not be considered until color submittals for major materials not to be painted, such as masonry, have been approved.

D. Samples: Submit two paper chip samples, ____x____ inch in size illustrating range of colors and textures available for each surface finishing product scheduled.

E. Certification: By manufacturer that paints and finishes comply with VOC limits specified.

F. Manufacturer's Instructions: Indicate special surface preparation procedures.

G. Maintenance Data: Submit data including finish schedule showing where each product/color/finish was used, product technical data sheets, material safety data sheets (MSDS), care and cleaning instructions, touch-up procedures, repair of painted and finished surfaces, and color samples of each color and finish used.

H. Maintenance Materials: Furnish the following for Owner's use in maintenance of project.
1. See Section 01 6000 - Product Requirements, for additional provisions.
2. Extra Paint and Finish Materials: 1 gallon of each color; from the same product run, store where directed.
3. Label each container with color in addition to the manufacturer's label.

1.04 QUALITY ASSURANCE

A. Manufacturer Qualifications: Company specializing in manufacturing the products specified, with minimum three years documented experience.

B. Applicator Qualifications: Company specializing in performing the type of work specified with minimum 5 years experience and approved by manufacturer.

1.05 MOCK-UP

A. See Section 01 4000 - Quality Requirements, for general requirements for mock-up.

B. Provide panel, 6 feet long by 6 feet wide, illustrating paint color, texture, and finish.

C. Locate where directed by Architect.

D. Mock-up may remain as part of the work.

1.06 DELIVERY, STORAGE, AND HANDLING

A. Deliver products to site in sealed and labeled containers; inspect to verify acceptability.

B. Container Label: Include manufacturer's name, type of paint, brand name, lot number, brand code, coverage, surface preparation, drying time, cleanup requirements, color designation, and instructions for mixing and reducing.

C. Paint Materials: Store at minimum ambient temperature of 45 degrees F and a maximum of 90 degrees F, in ventilated area, and as required by manufacturer's instructions.

1.07 FIELD CONDITIONS

A. Do not apply materials when surface and ambient temperatures are outside the temperature ranges required by the paint product manufacturer.

B. Follow manufacturer's recommended procedures for producing best results, including testing of substrates, moisture in substrates, and humidity and temperature limitations.

C. Provide lighting level of 80 ft candles measured mid-height at substrate surface.

PART 2 PRODUCTS

2.01 MANUFACTURERS

A. Provide paints and finishes from the same manufacturer to the greatest extent possible.
1. In the event that a single manufacturer cannot provide specified products, minor exceptions will be permitted provided approval by Architect is obtained using the specified procedures for substitutions.
2. Substitution of MPI-approved products by a different manufacturer is preferred over substitution of unapproved products by the same manufacturer.
3. Substitution of a different paint system using MPI-approved products by the same manufacturer will be considered.

B. Paints:

1. PPG Paints: www.ppgpaints.com/#sle.
2. Sherwin-Williams Company: www.sherwin-williams.com/#sle.

C. Substitutions: See Section 01 6000 - Product Requirements.

2.02 PAINTS AND FINISHES - GENERAL

A. Paints and Finishes: Ready mixed, unless intended to be a field-catalyzed paint.
1. Provide paints and finishes of a soft paste consistency, capable of being readily and uniformly dispersed to a homogeneous coating, with good flow and brushing properties, and capable of drying or curing free of streaks or sags.
2. Supply each paint material in quantity required to complete entire project's work from a single production run.
3. Do not reduce, thin, or dilute paint or finishes or add materials unless such procedure is specifically described in manufacturer's product instructions.

B. Volatile Organic Compound (VOC) Content:
1. Provide paints and finishes that comply with the most stringent requirements specified in the following:
a. 40 CFR 59, Subpart D--National Volatile Organic Compound Emission Standards for Architectural Coatings.
b. Ozone Transport Commission (OTC) Model Rule, Architectural, Industrial, and Maintenance Coatings; www.otcair.org; specifically:
1) Opaque, Flat: 50 g/L, maximum.
2) Opaque, Nonflat: 150 g/L, maximum.
3) Opaque, High Gloss: 250 g/L, maximum.
2. Determination of VOC Content: Testing and calculation in accordance with 40 CFR 59, Subpart D (EPA Method 24), exclusive of colorants added to a tint base and water added at project site; or other method acceptable to authorities having jurisdiction.

C. Sheens: Provide the sheens specified; where sheen is not specified, sheen will be selected later by Architect from the manufacturer's full line.

D. Colors: To be selected from manufacturer's full range of available colors.
1. Selection to be made by Architect after award of contract.
2. Allow for minimum of three colors for each system, unless otherwise indicated, without additional cost to Owner.
3. Extend colors to surface edges; colors may change at any edge as directed by Architect.
4. In finished areas, finish pipes, ducts, conduit, and equipment the same color as the wall/ceiling they are mounted on/under.
5. In utility areas, finish equipment, piping, conduit, and exposed duct work in colors according to the color coding scheme indicated.

2.03 PAINT SYSTEMS - INTERIOR

A. Paint I-OP - Interior Surfaces to be Painted, Unless Otherwise Indicated: Including gypsum board, concrete, concrete masonry units, brick, wood, plaster, uncoated steel, shop primed steel, galvanized steel, aluminum, and acoustical ceilings.
1. Two top coats and one coat primer.
2. Top Coat(s): Institutional Low Odor/VOC Interior Latex; MPI #143, 144, 145, 146, 147, or 148.
a. Products:
1) PPG Paints Speedhide Zero Interior Latex, 6-4110XI Series, Flat. (MPI #143)
2) PPG Paints Speedhide Zero Interior Latex, 6-4310XI Series, Eggshell.
3) PPG Paints Speedhide Zero Interior Latex, 6-4510XI Series, Semi-Gloss. (MPI #147)
4) PPG Paints Pure Performance Interior Latex, 9-110XI Series, Flat. (MPI #143)
5) Sherwin-Williams ProMar 200 Zero VOC Interior Latex, Flat.
6) Sherwin-Williams ProMar 200 Zero VOC Interior Latex, Low Sheen. (MPI #144)
7) Sherwin-Williams ProMar 200 Zero VOC Interior Latex, Semi-Gloss.

B. Paint I-OP-MD-DT - Medium Duty Door/Trim: For surfaces subject to frequent contact by occupants, including metals and wood:
   1. Two top coats and one coat primer.
   2. Top Coat(s): Interior Epoxy-Modified Latex; MPI #115 or 215.
      a. Products:
         1) PPG Paints Aquapon WB EP Two-Component Waterborne Epoxy Coating, 98E-1/98E-100 Series, Semi-Gloss. (MPI #215)
         2) PPG Paints Aquapon WB EP Two-Component Waterborne Epoxy Coating, 98E-1/98E-98 Series, Gloss. (MPI #115)
         3) Sherwin-Williams Pro Industrial Waterbased Catalyzed Epoxy, Gloss. (MPI #115)
         4) Sherwin-Williams Waterbased Catalyzed Epoxy, Semi-Gloss.
         5) Sherwin-Williams Waterbased Catalyzed Epoxy, Gloss.
         6) Substitutions: Section 01 6000 - Product Requirements.

C. Paint I-OP-MD-WC - Medium Duty Vertical and Overhead: Including gypsum board, plaster, concrete, concrete masonry units, uncoated steel, shop primed steel, galvanized steel, and aluminum.
   1. Two top coats and one coat primer.
   2. Top Coat(s): Institutional Low Odor/VOC Interior Latex; MPI #143, 144, 145, 146, 147, or 148.
      a. Products:
         1) PPG Paints Speedhide Zero Interior Latex, 6-4110XI Series, Flat. (MPI #143)
         2) PPG Paints Pure Performance Interior Latex, 9-110XI Series, Flat. (MPI #143)
         3) Sherwin-Williams ProMar 200 Zero VOC Interior Latex, Flat.
         4) Sherwin-Williams ProMar 200 Zero VOC Interior Latex, Semi-Gloss.
         5) Substitutions: Section 01 6000 - Product Requirements.

D. Paint GI-OP-3L - Gypsum Board/Plaster, Latex, 3 Coat:
   1. One coat of alkyd primer sealer.
   2. Eggshell: Two coats of latex enamel; [_____].

2.04 PRIMERS

A. Primers: Provide the following unless other primer is required or recommended by manufacturer of top coats.
   1. Interior Institutional Low Odor/VOC Primer Sealer; MPI #149.
      a. Products:
         1) PPG Paints Speedhide Zero Interior Latex Sealer, 6-4900XI. (MPI #149)
         2) PPG Paints Pure Performance Interior Latex Primer, 9-900. (MPI #149)
         3) Sherwin Williams ProMar 200 Zero VOC Latex Primer.
         4) Substitutions: Section 01 6000 - Product Requirements.
   2. Interior/Exterior Latex Block Filler; MPI #4.
      a. Products:
         1) Kilz Pro-X p50 Block Filler Primer.
         2) PPG Paints Speedhide Masonry Hi Fill Latex Block Filler, 6-15XI . (MPI #4)
         3) Sherwin-Williams ConFlex Block Filler. (MPI #4)
         4) Substitutions: Section 01 6000 - Product Requirements.

2.05 ACCESSORY MATERIALS

A. Accessory Materials: Provide primers, sealers, cleaning agents, cleaning cloths, sanding materials, and clean-up materials as required for final completion of painted surfaces.

B. Patching Material: Latex filler.

C. Fastener Head Cover Material: Latex filler.

PART 3 EXECUTION

3.01 EXAMINATION

A. Verify that surfaces are ready to receive work as instructed by the product manufacturer.

B. Examine surfaces scheduled to be finished prior to commencement of work. Report any condition that may potentially effect proper application.

C. Test shop-applied primer for compatibility with subsequent cover materials.

D. Measure moisture content of surfaces using an electronic moisture meter. Do not apply finishes unless moisture content of surfaces are below the following maximums:
   1. Gypsum Wallboard: 12 percent.
   2. Plaster and Stucco: 12 percent.
   3. Masonry, Concrete, and Concrete Masonry Units: 12 percent.
   4. Interior Wood: 15 percent, measured in accordance with ASTM D4442.

3.02 PREPARATION

A. Clean surfaces thoroughly and correct defects prior to application.

B. Prepare surfaces using the methods recommended by the manufacturer for achieving the best result for the substrate under the project conditions.

C. Remove or mask surface appurtenances, including electrical plates, hardware, light fixture trim, escutcheons, and fittings, prior to preparing surfaces or finishing.

D. Seal surfaces that might cause bleed through or staining of topcoat.

E. Concrete:

F. Masonry:

G. Gypsum Board: Fill minor defects with filler compound. Spot prime defects after repair.

H. Plaster: Fill hairline cracks, small holes, and imperfections with latex patching plaster. Make smooth and flush with adjacent surfaces. Wash and neutralize high alkali surfaces.

I. Aluminum: Remove surface contamination and oils and wash with solvent according to SSPC-SP 1.

J. Galvanized Surfaces:

K. Ferrous Metal:
   1. Solvent clean according to SSPC-SP 1.
   2. Shop-Primed Surfaces: Sand and scrape to remove loose primer and rust. Feather edges to make touch-up patches inconspicuous. Clean surfaces with solvent. Prime bare steel surfaces. Re-prime entire shop-primed item.
   3. Remove rust, loose mill scale, and other foreign substances using using methods recommended in writing by paint manufacturer and blast cleaning according to SSPC-SP 6 "Commercial Blast Cleaning". Protect from corrosion until coated.

L. Wood Surfaces to Receive Opaque Finish: Wipe off dust and grit prior to priming. Seal knots, pitch streaks, and sappy sections with sealer. Fill nail holes and cracks after primer has dried; sand between coats. Back prime concealed surfaces before installation.

3.03 APPLICATION

A. Remove unfinished louvers, grilles, covers, and access panels on mechanical and electrical components and paint separately.

B. Apply products in accordance with manufacturer's written instructions and recommendations in "MPI Architectural Painting Specification Manual".

C. Do not apply finishes to surfaces that are not dry. Allow applied coats to dry before next coat is applied.

D. Apply each coat to uniform appearance in thicknesses specified by manufacturer.

E. Sand wood and metal surfaces lightly between coats to achieve required finish.

F. Vacuum clean surfaces of loose particles. Use tack cloth to remove dust and particles just prior to applying next coat.

G. Reinstall electrical cover plates, hardware, light fixture trim, escutcheons, and fittings removed prior to finishing.

3.04 CLEANING

A. Collect waste material that could constitute a fire hazard, place in closed metal containers, and remove daily from site.

3.05 PROTECTION

A. Protect finishes until completion of project.

B. Touch-up damaged finishes after Substantial Completion.

END OF SECTION

SECTION 11 6623
GYMNASIUM EQUIPMENT

PART 1 GENERAL

1.01 SECTION INCLUDES

A. Wall mounted protection pads.

1.02 REFERENCE STANDARDS

A. ASTM E84 - Standard Test Method for Surface Burning Characteristics of Building Materials 2020.

1.03 SUBMITTALS

A. See Section 01 3000 - Administrative Requirements, for submittal procedures.

B. Product Data: Provide manufacturer's data showing configuration, sizes, materials, finishes, hardware, and accessories; include:
   1. Fire rating certifications.
   2. Manufacturer's installation instructions.

C. Shop Drawings: For custom fabricated equipment indicate, in large scale detail, construction methods; method of attachment or installation; type and gauge of metal, hardware, and fittings; plan front elevation; elevations and dimensions; minimum one cross section; utility requirements as to types, sizes, and locations.

D. Samples: Submit samples of wall pad coverings in manufacturer's available range of colors.

E. Warranty: Submit manufacturer warranty and ensure that forms have been completed in Owner's name and registered with manufacturer.

1.04 QUALITY ASSURANCE

A. Manufacturer Qualifications: Company specializing in manufacturing products specified in this section, with not less than three years of documented experience.

1.05 DELIVERY, STORAGE, AND HANDLING

A. Deliver products to project site in manufacturer's original packaging with factory original labels attached.

B. Store products indoors and elevated above floor; prevent warping, twisting, or sagging.

C. Store products in accordance with manufacturer's instructions; protect from extremes of weather, temperature, moisture, and other damage.

1.06 WARRANTY

A. See Section 01 7800 - Closeout Submittals, for additional warranty requirements.

PART 2 PRODUCTS

2.01 MANUFACTURERS

A. Gymnasium Equipment:
   1. Draper, Inc; [_____]: www.draperinc.com/#sle.
   2. IPI by Bison, Inc; [_____]: www.ipibybison.com/#sle.
   3. Performance Sports Systems; Model No. 4120: www.perfsports.com/#sle.
   4. Porter Athletic Equipment Company; [_____]: www.porterathletic.com/#sle.
   5. Substitutions: See Section 01 6000 - Product Requirements.

2.02 GENERAL REQUIREMENTS

A. See drawings for sizes and locations, unless noted otherwise.

B. Provide mounting plates, brackets, and anchors of sufficient size and strength to securely attach equipment to building structure; comply with requirements of Contract Documents.

C. Hardware: Heavy duty steel hardware, as recommended by manufacturer.

2.03 WALL PADDING

A. Wall Padding: Foam filling bonded to backing board, wrapped in covering; each panel fabricated in one piece.
   1. Surface Burning Characteristics: Flame spread index (FSI) of 25 or less, smoke developed index (SDI) of 450 or less, Class A, when tested in accordance with ASTM E84 as a complete panel.
   2. Covering: Vinyl-coated polyester fabric, mildew and rot resistant; stapled to back of board.
      a. Color: As selected from manufacturer's standard range.
      b. Texture: Embossed leather-look.
      c. Fabric Weight: 14 oz/sq yd, minimum.
   3. Foam, Fire-Rated: Open cell polychloroprene (Neoprene), with 5.5 pcf nominal density.
   4. Foam Thickness: 2 inches.
   5. Backing Board: Oriented strand board.
   6. Mounting: Removable; Z-clips fixed to wall and to padding.

PART 3 EXECUTION

3.01 INSTALLATION

A. Install in accordance with Contract Documents and manufacturer's instructions.

B. Install equipment rigid, straight, plumb, and level.

C. Secure equipment with manufacturer's recommended anchoring devices.

D. Install wall padding securely, with edges tight to wall and without wrinkles in fabric covering.

E. Provide cut-outs in wall padding for all items that need access to, including but not limited to door hardware, wall mounted conduits, receptacles and gym equipment.

F. Separate dissimilar metals to prevent electrolytic corrosion.

END OF SECTION

SECTION 220100

GENERAL CONDITIONS

PART 1 - GENERAL

Applicable Provisions of the Conditions of the Contract and Division 1 General Requirements govern the work in this section.

1.1 GENERAL CONDITIONS

A. Before submitting a proposal, Bidders shall examine all Drawings related to this work and shall become fully informed as to the extent and character of the work required and its relation to the other work in the building.

B. Before commencing work, the Contractor will examine all conditions of the project upon which his work is in any way dependent for perfect workmanship according to the intent of this Specification. No "waiver of responsibility" for incomplete, inadequate or defective adjoining work will be considered unless notice has been filed by this Contractor and acceded to by the Owner's representative in writing before the Contractor begins any part of the work.

C. The Contractor will pay for all licenses, permits and inspection fees required by civil authorities having jurisdiction. Comply with all laws, ordinances, regulations, fire underwriters requirements applicable to work herein specified without additional expense to the Owner. (Also, local building code requirements.).

D. It is specifically intended that anything (whether material or labor) which is usually furnished as a part of such equipment as is hereinafter called for (and which is necessary for the completion and proper operation) shall be furnished as part of this Contract without additional cost the Owner, whether or not shown in detail on the Drawings or described in the Specifications.

E. When Drawings and Specifications conflict or there is a question as to the proper intent of this Contract, the Contractor shall assume the more expensive method in his pricing. All questions shall be directed to the Architect/Engineer in writing only and only up to ten (10) days prior to bidding.

F. The Drawings indicate the general runs of the piping, ductwork, etc. systems and the location of equipment and apparatus, but is shall be understood that the right is reserved by the Architect/Engineer to change the location of piping work, ductwork, equipment and apparatus to a reasonable extent as building conditions may dictate, prior to their installation without extra cost to the Owner.

G. Small scale drilling through walls and floors which may contain asbestos shall be performed by a person with a “restricted asbestos handler allied trades certificate” and shall have a copy of it in his possession at all times while working on the project.

H. Any changes from the Drawings and Specifications and any interpretation thereof shall have the prior approval of the Architect/Engineer. The Contractor shall submit in writing, at the time of signing the Contract, any items of necessary labor and materials, which, in his opinion, are lacking in requirements of the Drawings and Specifications to insure a complete job in all respects. No consideration will be granted to alleged misunderstanding of materials to be furnished, work to be done, or conditions to be complied with, it being understood that the tender of a proposal carries with it the agreement to all items and conditions referred to herein, or indicated on the accompanying Drawings.

END OF SECTION

SECTION 220125

SCOPE OF WORK

PART 1 - GENERAL

Applicable Provisions of the Conditions of the Contract and Division 1 General Requirements govern the work in this section.

1.1 SCOPE OF WORK

A. The work under this section includes all labor, materials, equipment, tools, transportation, cutting and patching, excavation and backfill and the performance of all work necessary and required for the furnishing and installation complete of all Plumbing and Drainage work as shown on Contract Drawings, as specified herein and as otherwise required by job conditions or reasonably implied, including but not necessarily limited to the following:

1. Provide complete new and altered sanitary and vent piping from all new plumbing fixtures connecting to existing sanitary and vent system.

2. Provide complete new and altered hot and cold water piping to all new plumbing fixtures, equipment, etc. as indicated.

3. Provide transformer and wire to auto-faucets and flush valves for complete installation. Junction box by Electrical Contractor. Select proper transformer based on number of fixtures.

4. Provide all new plumbing fixtures where indicated, complete including traps, stops, drains, strainers, tailpieces, faucets, escutcheons, etc.

5. Provide complete new piping and final connections to equipment furnished under other Divisions.

6. Provide all demolition, removal disconnecting, capping, sealing of all existing plumbing piping, apparatus, equipment, fixtures, specialties, accessories, etc. which are not included or incorporated in the new layout.

7. Provide all required temporary connections to maintain all plumbing services without interruption.

8. Pipe insulation.

9. Tests and adjustments.

10. This Contractor shall obtain all permits, bonds, approvals, etc. at no additional cost to the Owner.

11. This Contractor shall provide shop drawings for all plumbing fixtures, piping, valves, insulation, equipment, etc.

12. For Cutting and Patching refer to Division 1.

13. For Excavation and Backfill refer to Division 2.

14. Furnish minimum 18" x 18" access doors for all valves, cleanouts, etc. in all inaccessible walls, ceilings, etc. Installation by General Contractor.

15. Fire stopping per FM/UL and NFPA. Refer to Division 1.

B. Coordination Drawings (if applicable): Attention is directed to Division 1 for coordination drawing requirements for this project. These drawings are critical to the proper execution of the work and failure to honor these requirements may become the basis for denial of any and all claims for either or both "time" and "money".

1.2 ALTERATION WORK

A. All equipment, piping, plumbing, fixtures, etc. to be removed, shall be disposed of or salvaged as directed by the Owner. They shall not be removed from the premises without Owners approval.

B. All piping to be removed shall be properly plugged or capped so that upon completion of all new work, all abandoned piping shall be concealed in finished areas.

C. No dead ends shall be left on any piping upon completion of job.

D. The existing systems shall be left in perfect working order upon completion of all new work.

E. Location and sizes of existing piping are approximate. Exact sizes and locations of all existing piping shall be verified on the job.

F. All removals shall be removed from the site.

END OF SECTION

SECTION 22 0130

WATER SUPPLY SYSTEM

PART 1 - GENERAL

Applicable Provisions of the Conditions of the Contract and Division 1 General Requirements govern the work in this section. Submit shop drawings for checking and approval.

1.1 DESCRIPTION OF WORK

A. Furnish and install a complete cold-water distribution system to supply water to all new fixtures, water consuming equipment, and valved outlets for the use of other trades and connect to existing piping.

B. The water supply system shall be complete with all pipe, fittings, valves, mains, risers, branches, shock absorbers, air chambers, hangers, anchors, expansion loops, connections to existing piping, covering, tests, etc. all as shown on the Drawings, as hereinafter specified.

C. Furnish and install a complete hot water distribution system to supply water to all new fixtures and equipment requiring heated water.

PART 2 - PRODUCTS

2.1 PIPING, FITTINGS AND MATERIALS

A. All components of water supply system shall conform to all “No Lead” requirements including NSF/ANSI-372.

B. The domestic water systems shall be of the following material and shall be in accordance with the latest ASTM and ASME Standards.

C. Domestic water piping within the buildings shall be seamless drawn or extruded tubing type "L" copper. Both shall be of Chase, Anaconda, Revere, and approved equal, hard temper ASTM B88 with solder joint sweat end fittings. Fittings for use with copper tubing shall be cast brass of Muellers "Streamlin" pattern or approved equal.

D. Joints for copper tubing shall be made with 95-5 (tin and antimony) solder. Flanges where required shall be cast brass. Provide dielectric adapters between ferrous and non-ferrous pipe joints.

2.2 VALVES

A. All shut-off valves 2” and smaller shall be ball valves equal to Apollo 70 Series or Milwaukee BA100 Series Valve. Bronze body with chrome plated trim.

B. This Contractor shall furnish all valves as indicated on the Drawings, or as may be required for the proper control of the pipe lines installed under this Specification, so that any fixture, line or piece of apparatus may be cut out for repair without interference or interruption of the service to the rest of the Facility.

C. All domestic water valves shall have a minimum working pressure of 125 psig, steam rated unless otherwise noted on the Drawings or specified herein. All valves shall be of one manufacture as manufactured by Milwaukee Valve or Hammond.

D. All gate valves within the buildings shall be wedge gauge valves with painted iron wheel handles, shall have gland followers in stuffing boxes, and shall be so constructed that they may be repacked while open and under pressure. All valves shall have the name of the manufacturer and working pressure cast or stamped thereon.

E. All gate valves shall be all bronze with sweat or screwed joint ends as required by the piping system in which they are installed.

F. Globe valves shall be of all bronze with composition disc, threaded or sweat joint ends as required by piping system in which they are installed.

G. Check valves shall be all bronze swing check type with threaded or sweat joint ends. Check valves 4 inch and larger shall be iron body bronze mountings and shall be provided with screwed or flanged joint ends as required by piping system in which they are installed.

H. Drain valves, at risers and at low points, shall be 3/4 inch heavy cast brass with composition washers with male thread for hose connections.

2.3 SHOCK ABSORBERS

A. Shock absorbers shall be similar and equal to J.R. Smith 5000 series or Zurn Z1700 series with stainless steel pressurized shell sized in accordance with P.D.I. Bulletin WH-201.

B. Provide shock absorbers on all fixtures and equipment having quick closing valves whether or not indicated on the Drawings.

C. Provide access doors where shock absorbers are concealed.

2.4 VACUUM BREAKERS

A. Provide vacuum breakers on water supply piping to each fixture and equipment with submerged inlets, and on faucets and outlets, within the facility to which hose can be, or is attached forming a submerged inlet.

B. Set vacuum breakers in exposed readily accessible locations at least four inches above floor rim level of fixture, or high point of equipment.

C. Vacuum breakers shall be chrome-plated brass. "Watts" or other approved.

D. Vacuum breakers under constant pressure shall be of the continuous pressure type No. 9 "Watts" or Wilkins BFP-8CH or approved equal.

2.5 EXPANSION JOINTS, ANCHORS AND GUIDES

A. The entire piping installation shall be installed with adequate provision for expansion. No rigid connections will be permitted. Refer to Drawings for locations of expansion joints and related guides and anchors. The joints, guides and anchors shall be as manufactured by Flexonics Products, Metraflex or Flex-weld.

B. Branches shall be of sufficient length and have three elbow swings to allow for pipe expansion.

C. Any breaks in the piping within the guarantee period due to improper provision for expansion must be replaced at the expense of this Contractor, and the conditions corrected to prevent future recurrence.

D. Any damages to surrounding areas and equipment due to this failure shall also be repaired and paid for at the expense of this Contractor.

E. Joints to have 150 psi rating, ANSI-B16.5 with liner and cover.

2.6 STERILIZATION

A. The entire domestic water piping system shall be thoroughly sterilized with chlorine before acceptance for domestic operation.

B. The amount of chlorine applied shall be such as to provide a dosage of not less than 50 parts per million for 24 hours or 200 p.p.m. for one hour. The chlorinating material shall be either liquid chlorine or sodium hypochlorite solution and shall be introduced into the system and drawn to all points of the system. If possible to do so, the lines shall be thoroughly flushed before introduction of the chlorinating material. After a contact period of not less than 24 hours, the system shall be flushed with clean water until the residual content is not greater than 0.2 parts per million. All valves in the lines being sterilized shall be opened and closed several times during the contact period.

C. Sterilization and tests for purity of water in the entire piping system shall be performed by the Contractor through an approved independent testing laboratory and a certificate shall be furnished to the Architect certifying the quality of purity.

D. Per ANSI/AWWA Standard C651-14.

PART 3 - EXECUTION

3.1 INSTALLATION

A. It is the intent that each part of the plumbing system shall be complete in all details and water lines provided with all control valves as indicated on Drawings, or as may be required for the proper control of the pipe lines under this Specification so that any fixture, line or piece of apparatus may be cut out for repair without interference or interruption of the service to the rest of the facility.

B. This Contractor shall examine carefully the Architectural Drawings in detail and familiarize himself with all conditions relative to the installation of piping, particularly where same is concealed behind furring or in hung ceilings.

C. In no case shall this Contractor permit his pipes to be exposed beyond finished walls or ceilings unless specifically shown on Drawings. He shall consult with the Contractors of other trades in the building and install his piping in such a way as to least interfere with the installation of other trades.

D. The water piping shall all be installed so as to drain to a valve provided by this Contractor and branches shall not be trapped but shall have continuous pitch. Where necessary to raise or lower mains, the same shall be provided with a drip and shall be properly valved.

E. Piping shall be installed, whether indicated or not, so as to rise and/or drop to clear any and all conduits, lighting fixtures, ductwork and heating mains to maintain the desired clear heights. This Contractor shall consult with the Contractors of other trades and facilitate the erection of the equipment and piping.

F. Run piping straight and as direct as possible, in general forming right angles with or parallel to walls or other piping. Risers shall be erected plumb and true.

G. After cutting, all pipes shall be reamed out to full bore and before erection the inside of all pipes shall be thoroughly cleaned.

H. No piping or work shall be concealed or covered until all required tests have been satisfactorily completed and work has been approved by the Architect.

I. All materials shall be new and installed in a first class manner.

J. In erecting pipe, friction wrenches and vises shall be used exclusively, and any pipe cut, dented or otherwise damaged shall be replaced by this Contractor.

K. All ferrous to non-ferrous pipe connections shall be made with approved dielectric pipe or flange unions isolating joints to prevent any electrolytic action between dissimilar materials.

L. Any piece of pipe 6 inches in length or less shall be considered a nipple. All nipples with unthreaded portion 1-1/2 inch and less shall be of weight corresponding to fitting connected. Only shoulder nipples shall be used, close nipples will not be accepted.

M. Revised water service shall be in accordance with the local water supply department requirements. All water lines are to be protected from freezing. Install new piping for water service below frost line and provide concrete separations when crossing other utilities. Provide concrete thrust mass at changes of pipe direction conforming to authorities having jurisdiction.

END OF SECTION

SECTION 220160

SANITARY DRAINAGE SYSTEMS

PART 1 - GENERAL

Applicable Provisions of the Conditions of the Contract and Division 1 General Requirements govern the work in this section. Submit shop drawings for checking and approval.

1.1 DESCRIPTION OF WORK

A. The work under this section includes all labor, materials, equipment and appliances necessary and required to completely install all drainage systems as required by the Drawings; code and as specified herein, including but not limited to the following:

B. Complete sanitary drainage and venting systems including connections to the existing sanitary drainage and venting systems.

C. Piping and final connections for equipment furnished under other Divisions.

D. Alterations and removals to existing sanitary and vent systems.

E. Tests.

PART 2 - PRODUCTS

2.1 PIPING AND FITTING MATERIALS

A. All indoor underground soil, waste and vent piping shall be service weight cast iron with fittings of bell and spigot type. All exterior underground soil and waste piping shall be extra heavy cast iron. Each length shall have the size, weight per foot and the manufacturer's name clearly cast or stamped thereon. Weight shall be as defined by the Plumbing Code. Fittings and traps shall be similarly marked and of corresponding weights.

B. All aboveground soil, waste and vent piping and fittings 3" and larger shall be service weight and fittings of bell and spigot type as specified in paragraph above. Above ground waste and vent piping 2" and smaller shall be galvanized steel, fittings on waste piping shall be galvanized cast iron, recessed drainage pattern, fitting on vent piping shall be galvanized cast iron, beaded pattern, screwed joints shall be made up to be perfectly tight without the use of lead or filler of any kind, except oil or graphite. Nipples for galvanized pipe shall be shoulder type. No close nipples shall be permitted.

C. Joints shall be made with gasket or hemp or picked oakum and lead, at least 12 oz. of fine soft pig lead shall be used for each inch of diameter pipe used. Lead shall be run in one (1) pouring. All lead shall be pure and soft and of the best quality and shall be sufficiently heated to run joint full at one pouring without hardening. Dross shall not be allowed to accumulate in the melting pot. See 2.1, E. for joint options where permitted.

D. All galvanized pipe and fittings shall be galvanized with prime western spelter by hot drip process.

E. The Contractor has the option of using the following types of joints with hubless cast iron pipe only if approved by the governing agencies. These joints shall be used throughout the project. No mixing of joints shall be permitted.

1. Neoprene gasketed joints similar to Ty-Seal (for above and underground application).

2. Hubless cast iron pipe with neoprene gaskets and stainless steel clamps (by Clamp-All or equal) above ground only. All in accordance with Cast Iron Soil and Pipe Institute Standard 301 latest edition. Hangers and supports shall be in accordance with manufacturer's recommendations.

3. Copper DWV system with 50-50 tin antimony solder, DWV with solvent welded or screwed joints meeting CS-270-65.

2.2 CLEANOUTS

A. Provide easily accessible cleanouts where indicated at base of vertical stacks at ends of horizontal drainage lines and at intervals not exceeding 50 ft.; at each change of direction; on handholes of running traps, and where necessary to make entire drainage system accessible for rodding. Provide at least 18" clearance to permit access to cleanout plugs.

B. Cleanouts for cast iron pipe shall consist of tarpped extra heavy cast iron ferrule caulked into cast iron fittings and extra heavy brass tapered screw plug with solid hexagonal unit. Cleanouts for wrought iron pipe shall consist of extra heavy brass screw plug in drainage fitting.

C. Cleanouts turning out through walls and up through floors shall be made by long sweep ells or "Y" and 1/8 bends with plugs and face or deck plates to conform to Architectural finish in the room. Where no definite finish is indicated on the Architectural and/or Mechanical Drawings, wall plates shall be chrome plated cast brass and floor plates shall be nickel bronze.

D. Cleanouts shall be full size at the pipe up to 6" inclusive. On larger size piping 6" size plugs shall be used.

E. Cleanout fittings in vertical stacks shall consist of tapped tees capable of receiving a rough brass raised head cleanout plug, J.R. Smith S-4730, Zurn Z1445-A-BP or approved equal.

F. All cleanout plugs shall be brass lubricated with graphite before installation.

G. Cleanouts occurring in cast iron soil pipe above floor at change of direction of pipe run and at ends of horizontal runs shall be J.R. Smith S-4425, Zurn Z1441-A-BP or approved equal with cast iron ferrule for caulk connection and fitted with a straight threaded tapered bronze plug with raised hex head.

H. Cleanout deck plates for finished areas shall be similar and equal to J.R. Smith 4020 series, Zurn ZB1400-X or approved equal with cast iron ferrule, scoriated cutoff sections, brass cleanout plus collar with brass bolts for waterproofed slabs. In tile floor areas the cleanout deck plates shall be recessed to tile.

2.3 FLASHING

A. Provide 6 lb. lead flashing extending at least 10" beyond edge of all floor drains and vents through roof and all floor sleeves in floors with waterproofing or vapor barriers. Flashing shall be held securely in by clamping devices.

B. All floor drains shall be provided with flashing rings and 24" square 6 lb. sheet lead flashing, properly flashed into flashing ring of the drain.

2.4 SANITARY DRAINAGE

A. A complete system of drainage shall be provided as shown on the Drawings. The system shall include all drains, leaders, branches, house drains with all pipe fittings, hangers, anchors, etc. to make a complete sanitary drainage system. The systems shall extend through house drains and terminate as indicated on the Drawings.

B. Piping shall be sizes as indicated on the Drawings. The sanitary drains shall have a pitch of 1/8" per ft. minimum unless otherwise noted. Branch connections to stacks and house drains shall pitch a minimum of 1/8" per ft.

2.5 PIPING AND FITTINGS

A. Provide piping of one of the following materials, of weight/class indicated. Provide pipe fittings and accessories of same material and weight/class as pipes, with joining method as indicated.

PART 3 - EXECUTION

3.1 INSTALLATION OF PIPING

A. The size of soil, waste and vent piping shall be as determined by the State codes, rules and regulations for plumbing and drainage, except where specifically noted to be larger by the Specifications or Drawings and all fixed rules of installation, as set forth in the codes, rules and regulations, shall be followed as part of the Specifications.

B. This Contractor shall examine carefully the Architectural plans in detail and familiarize himself with all conditions relative to the installation of piping, particularly where same is concealed behind furring or in hung ceilings.

C. In no case shall this Contractor permit his pipes to be exposed beyond finished plaster lines unless specifically shown on Drawings. He shall consult with the Contractors of other trades in the building and install his piping in such a way as to least interfere with the installation of other trades.

D. Piping shall be installed, whether indicated or not, so to rise and/or drop to clear any and all conduits, lighting fixtures, ductwork and heating mains to maintain the desired cleat heights. This Contractor shall consult with the Contractors of other trades and facilitate the erection of the equipment and piping.

E. Run piping straight and as direct as possible in general forming right angles with or parallel to walls or other piping. Risers and stacks shall be erected plumb and true. After cutting, all pipes shall be reamed out to full bore and before erection the inside of all pipes shall be thoroughly cleaned.

F. No piping or work shall be concealed or covered until all required tests have been satisfactorily completed and work had been approved by the Architect and all other authorities having jurisdiction.

G. Branch connections shall be made with "Wye" and long "Tee-Wye" fittings, short 1/4 bends, common offsets and double hubs will not be permitted. Short "Tee-Wye" fittings are to be used in vertical piping only. All fittings shall conform to code requirements.

H. Cleanouts shall be provided at foot of all stacks, at changes of directions, at the ends of branch runs where shown and as required by code and shall be terminated as described under cleanouts.

I. The house drains must be run at a minimum grade of 1/8" per ft. downward in the direction of flow. Wherever possible, a 1/4" per ft. pitch shall be maintained. Branch connections to stacks from fixtures shall pitch 1/4" per ft. where possible. Attention is again called to the necessity of maintaining the ceiling heights established.

J. Furnish and install complete systems of vent pipes from the various plumbing fixtures and other equipment to which drainage connections are made. Vent pipes shall be connected to the discharge of each trap and shall be carried to a point above the ultimate overflow level of the fixture before connecting with any other vent pipe; in general, this will be approximately 3'-6" above the finished floor. Branches shall be arranged to pitch back to fixtures.

K. The individual vent pipes shall be collected together in branch vent lines and connected to existing vent connections through roof.

L. Any existing vents through roof, damaged, or if flashing on roof comes loose while connecting new vent to them shall be repaired and re-flashed to the roof as required to maintain waterproofing the satisfaction of the Architect.

END OF SECTION

SECTION 220300

PLUMBING FIXTURES AND EQUIPMENT

PART 1 - GENERAL

Applicable Provisions of the Conditions of the Contract and Division 1 General Requirements govern the work in this section. Submit shop drawings for checking and approval.

1.1 DESCRIPTION OF WORK

A. The work under this section shall consist of furnishing all labor, materials, equipment and appliances necessary and required to completely do all plumbing fixture work, as required by the Drawings and as specified herein, including but not limited to the following: plumbing fixtures, traps, fittings, trimmings, brackets, plates, anchor, chair carriers and supports.

B. Just before the Owner's taking over the work in the building, this Contractor shall thoroughly clean all fixtures furnished and set under this Contract, leaving every fixture in perfect condition and ready for use.

C. Submit shop drawings and roughing sheets for all equipment for checking and approval.

PART 2 - PRODUCTS

2.1 PLUMBING FIXTURES AND EQUIPMENT

A. All fixtures shall be free from imperfections, true as to line angles, curves and color, smooth, watertight, complete in every respect and practically noiseless in operation, Fixtures specified are given as the typical standard required as manufactured by American Standard and they or other similar approved fixtures as made by Kohler of Eljer Companies shall be furnished, set and connected in good substantial, neat workmanlike manner.

B. The letter designations hereinafter correspond with the schedule on the Drawings.

1. Floor Mounted Child’s Water Closet - Type A
   Sloan Model ST-2309 vitreous china, siphon jet action, elongated bowl, 1-1/2" top spud, Sloan Royal Optima 111 ESS hardwired low consumption auto flush valve, open front seat cover.

2. Countertop Lavatory - Type B (Handicapped)
   0476.028 “Rondalyn” white vitreous china lavatory with 8” centers, 7723.018 offset grid drain, adjustable trap, loose key stops and all required trim. Sloan model ETF-600 hardwired auto faucet with vandal-proof aerator. Coordinate with General Contractor.

3. Classroom Countertop Sink with Drinking Fountain - Type C
   Equal to Elkay model no. DRKAD-3717-R-C, 18 gauge, type 302 self-rimming, two bowls 6” apart, LK-1141-A, no lead Flexi-Guard Bubbler, LK-35 strainer in sink, LK-8 grid strainer n fountain, LK-2439 concealed mounting mixing faucet, 45 degree restricted swing faucet with aerator.

4. Single Bowl Stainless Steel Sink - Type D (Handicapped)
   Elkay model no. DRKAD282255LC, 18 gauge stainless steel type 304, self-rimming single bowl, LKF413945RS faucet assembly, 5-inch spout, aerator (no bubbler).

PART 3 - EXECUTION

3.1 INSTALLATION

A. All fixtures shown on Drawings shall be set, connected and tested by the Contractor. He shall also make all water; soil, waste, vent and other service connections to fixtures as shown on Drawings or as directed and shall set, furnish, connect and test all necessary fittings.

B. All pipes at fixtures passing into walls, floors or partitions shall be provided with heavy cast brass escutcheons and security (tamperproof) set screws finished to match the pipe. No "waiving" of this section will be permitted.

C. All fittings escutcheons, faucets, traps, exposed piping etc. shall be brass, chrome plated over nickel plate with polished finish. Any visible hanger nuts shall be security (tamperproof) type and shall likewise be chrome plated over nickel plate.

D. This Contractor shall be responsible for protecting all plumbing fixtures including in these Specifications against injury from the building materials, tools and equipment. Any fixtures damaged during the construction period shall be replaced new. After all fixtures are set, this Contractor shall carefully grout all around fixtures.

END OF SECTION

SECTION 220420

SUPPORTS, SLEEVES AND PLATES

PART 1 - GENERAL

Applicable Provisions of the Conditions of the Contract and Division 1 General Requirements govern the work in this section. Submit shop drawings for checking and approval.

1.1 DESCRIPTION OF WORK

A. This Contractor shall furnish and install all plates, hangers and supports for his piping.

B. All piping shall be hung or supported from structural members only.

PART 2 - PRODUCTS

2.1 PIPING

A. All piping shall be supported from building structure in a neat and workmanlike manner wherever possible, parallel runs of horizontal piping shall be grouped together on trapeze hangers. Vertical risers shall be supported at each floor line with steel pipe clamps. Use of wire perforated metal to support pipes will not be permitted. Hanging pipes from other pipes will not be permitted.

B. Necessary structural members, hangers and supports of approved design to keep piping in proper alignment and prevent transmission of injurious thrusts and vibrations shall be furnished and installed. In all cases where hangers, brackets, etc., are supported from concrete construction, care shall be taken not to weaken concrete or penetrate waterproofing.

C. All hangers and supports shall be capable of screw adjustment after piping is erected. Hangers supporting piping expanding into loops, bends and offsets shall be secured to the building structure in such a manner that horizontal adjustment perpendicular to the run of piping supported may be made to accommodate displacement due to expansion. All such hangers shall be finally adjusted, both in the vertical and horizontal direction, when the supported piping is hot.

D. Pipe hangers shall be as manufactured by Grinnell, whose catalog numbers are given herein, or equivalent Carpenter and Paterson, or F&S Mfg. Co.

E. Piping shall be supported as follows unless otherwise indicated on the Drawings:

1. Piping: 1-1/2 inch and smaller Fig. #260 adjustable clevis hanger. 2 inch and larger Fig. #174 one-rod swivel roll hanger.

2. Two-rod hangers shall be used for piping close to the ceiling slab or where conditions prohibit use of other hanger types.

3. Anchors for hanger rods shall be Phillips "Red Head" self-drilling type. Anchors shall be placed only in vertical surfaces.

4. Spacing of pipe supports shall not exceed 6 feet for pipes up to 1-1/2 inch and 10 feet on all other piping.

5. Hangers shall pass around insulation and a 16 gauge steel protective band; 12 inch long shall be inserted between hangers and insulation.

6. All piping shall be supported to allow free movement where expanding or contracting. Pipe shall be anchored as required or directed.

7. All lateral runs of piping shall be securely supported on hangers, rolls, brackets, etc. and in a manner to allow for proper expansion and elimination of vibration.

8. 2 inch and smaller pipe, where run on walls, shall be supported on wrought iron "J" hook brackets with anchor bolts.

9. All horizontal pipe, where run overhead or on walls, shall be supported as follows unless otherwise indicated: On adjustable steel clevis type hangers suspended on hanger rods, pipe sizes up to and including 4 inch.

F. Space limitations in hung ceilings spaces and conditions in other locations may require use of other type of hangers than those specified above. Suitable and approved pipe hangers shall be provided for such job conditions.

G. All supports shall be fastened to structural members or additional steel supports furnished by this Contractor.

H. Hanger rods shall be steel, threaded with nuts and lock nuts, sizes in accordance with following schedule:

Pipe Size	Rod Size
3/4" to 2" inclusive	3/8”
2-1/2" and 3" inclusive	1/2”
4" and 5" inclusive	5/8”
6”	3/4”
8" to 12" inclusive	7/8”

I. Cast iron piping shall be supported at intervals of not more than (5) feet (at each hub) on straight runs.

PART 3 - EXECUTION

3.1 PIPING

A. Where pipes pass through masonry, concrete walls, foundations, or floors, this Contractor shall set sleeves as are necessary for passage of pipes. These sleeves shall be of sufficient size to permit insulation where required to be provided around pipe passing through. This Contractor shall be responsible for exact location of these sleeves.

B. Sleeves shall not be used in any portion of building where use of same would impair strength or construction features of the building. Inserts for supporting lateral pipes and equipment shall be placed and secured to form work, and all sleeves inserts locations shall be thoroughly checked with Architect so as not to conflict with other trades.

C. Where pipes pass through floor or walls, they shall be provided with chromium plated escutcheons.

D. Anchor horizontal piping where indicated and wherever necessary to localize expansion or prevent undue strain on branches. Anchors shall be heavy forged construction entirely separate from supports.

E. Anchor vertical piping wherever indicated and wherever necessary to prevent undue strains on offsets and branches. Anchors, unless otherwise noted shall be heavy steel clamps securely bolted and welded to pipes. Extension ends shall bear on building construction.

F. Auxiliary steel supports that may be required for all mechanical equipment shall be furnished and installed by this Contractor.

G. All operating equipment including pumps, piping, etc. shall be supported so as to produce minimum amount of noise transmission.

END OF SECTION

SECTION 220430

INSULATION

PART 1 - GENERAL

Applicable Provisions of the Conditions of the Contract and Division 1 General Requirements govern the work in this section. Submit shop drawings for checking and approval.

1.1 DESCRIPTION OF WORK

A. The work under this section shall consist of furnishing all labor, materials, equipment and appliances necessary and required to completely do all insulation work as required by the Drawings and as specified herein including but not limited to the following: Insulation, covering, bands, tie wire.

PART 2 - PRODUCTS

2.1 INSULATION

A. The materials as specified have been selected from the catalogs of Owens-Corning Fiberglass Corp. and Johns-Manville Sales Corporation and are representative of the quality, design and finish desired. Insulation as manufactured by Gustin Bacon Co., or other approved manufacturer may be submitted for approval provided the product meets fully in all respects (such as density, moisture absorption, alkalinity, thermal-conductivity, jackets) to the materials as delineated below.

B. All insulation shall be UL rated non-combustible type classified flame spread-25, smoke-developed-50.

2.2 PIPING, FITTINGS AND VALVES

A. All insulation thickness shall be in accordance with the latest edition of the New York State Energy Conservation Construction Code.

B. Minimum pipe insulation shall be:

1. Hot water piping up to 2”-1” insulation and piping 2-1/2” and larger - 1-1/2” insulation.

2. Cold water piping up to 2” – 3/4” insulation and piping 2-1/2” and larger - 1” insulation.

C. Domestic cold, hot water, hot water return, indirect waste and piping aboveground. All piping shall be insulated with l inch thick sectional glass fiber insulation, Owens-Corning 2 piece ASJ/SSL. Joints between sections shall be sealed with factory supplied 3 inch wide sealing strips. Sealing by means of Owens Corning self-sealing lap will also be acceptable. Install (anti-sweat) vapor barriers on all cold water piping.

D. Domestic hot and cold water valves and fittings - Fittings, valves, etc. shall be insulated with 1 inch (1 lb. per cubic foot density) flexible blanket insulation compressed to 1/2 its thickness, tied on with jute twine over which shall be applied a flood coat of Insul-Coustic IC-102 and 10-20 open weave glass cloth. Glass cloth to be finished within additional coat of IC-102. Insulation blanket shall be Owens-Corning 1 inch (1 lb.) ductwrap.

PART 3 - EXECUTION

3.1 INSTALLATION

A. All insulation on pipes running through walls, floors, partitions and beams shall be continuous through sleeves and openings.

B. Insulation shall be installed only after all tests of the piping system have been completed.

C. All insulation shall fit snugly.

D. All surfaces shall be clean and dry when insulation is applied.

E. Longitudinal joints shall be on least conspicuous side off the pipe.

F. Valves shall be insulated up to the packing unit.

G. As specified hereinbefore, all horizontal runs of piping will be supported on adjustable clevis or group trapeze type hangers. Pipe hangers will be installed outside of the insulation. Where hangers occur, prefabricated insulation protective saddles shall be "Insul-Shield-Multi-Purpose-Saddle" as manufactured by Insul-Coustic Corp. or approved equal.

H. Hot and cold water branch piping extending through slab or knockout panels to serve equipment shall be insulated to a point 4 inch above the top of sleeve provided for pipe.

I. The use of staples shall not be permitted.

J. It is the intent of this Specification that all vapor barriers be continuous throughout. Reinstate existing piping at point of new pipe connections.

K. All insulation thickness shall be in accordance with latest New York State Energy Conservation Construction Code.

END OF SECTION

SECTION 220470

TESTS AND ADJUSTMENTS

PART 1 - GENERAL

Applicable Provisions of the Conditions of the Contract and Division 1 General Requirements govern the work in this section.

1.1 TESTS AND ADJUSTMENTS

A. The Contractor shall, at his own expense, during the progress of the work or upon its completion as ordered make such tests as are specified or as required by and in the presence of the Architects, Building Inspectors, etc. At least 48 hours' notice shall be given in advance of all tests.

B. The Contractors shall provide all apparatus, temporary work or other requirements necessary for all tests. He shall take all due precautions to prevent damage to the building, its contents or the work of the other Contractors, that may be incurred by all tests. This Contractors shall also be responsible for the work of other Contractors that may be damaged or disturbed by the tests or the repair or replacement of his work, and he shall without extra charges, restore to its original condition, any work of other Contractors to do the work of restoration.

C. Tests on the various systems may be conducted in sections as the work progresses or when the systems are completed.

D. No caulking of pipe joints to remedy leaks will be permitted except where joints are made with lead and oakum.

E. Each section of the sanitary and vent piping tested shall have all openings tightly closed with screw plugs, or equal device. The drainage and vent systems shall be filled with water and proven tight under a 10'-0" head for a minimum of four (4) hours. Water level must remain constant through test without adding water.

F. Upon final completion of the sanitary systems and when all fixtures and appurtenances have been set and the systems are in complete working order, all traps in the systems shall be filled with water and a thick penetrating smoke shall be introduced into the entire system.

G. As smoke appears at the stack openings on the roof, such openings on the roof shall be tightly closed and a pressure equivalent to 1-1/2 inch of water shall be maintained during the test. Oils of peppermint shall be added at the smoke making machines so that any leakage is readily discernible.

H. Before any covering is applied to the domestic water piping systems, the entire domestic water piping systems shall be hydrostatically tested for eight (8) hours to a hydraulic pressure of 125 psig.

I. At the completion of the test, Contractor shall furnish the Owner with one (1) copy of test certificates as issued by the insurance company.

J. Adjustments: Tests and adjustments shall be repeated as often as necessary until the systems are tight and are to the entire satisfaction of the Plumbing Inspector, Engineers and any other authorities having jurisdiction.

1. Contractor is to thoroughly instruct the building custodian in the proper care and operation of the entire system. Contractor shall prepare for use by custodian, detailed brochures of instructions in non-technical terms, describing the maintenance and operation of all fixtures, apparatus, valves, controls etc. furnished by him.

2. Should any part of the work performed under this Contract fail to function because of cracked piping, obstructions, debris in piping, leaks in piping or any other cause, this Contractor shall disconnect, clean and reconstruct the work at his own expense and pay for any damages to adjoining work.

3. Water flow is to be balanced and adjusted to all flush valves, faucets, etc.

4. All parts of the plumbing system are to be thoroughly flushed until cleared of all grease and sediment and all dirt pockets cleaned. Repeat as often as necessary, open all cleanouts and reset in graphite.

5. All new motors shall be oiled as required.

6. All new valves are to have stuffing boxes packed and adjusted.

END OF SECTION

SECTION 220480

TAGS, CHARTS AND IDENTIFICATION

PART 1 - GENERAL

Applicable Provisions of the Conditions of the Contract and Division 1 General Requirements govern the work in this section. Submit shop drawings for checking and approval.

1.1 TAGS, CHARTS AND IDENTIFICATION

A. Every valve installed under this Contract shall be tagged or labeled as follows: Tag shall be etched brass securely fastened to valve handwheels with heavy brass "S" hooks, soldered closed. At lock shield and similar type valves, tags for same shall be securely wired to valve body.

B. Charts shall be provided for each piping system, as approved and shall consist of schematic diagrams of piping layouts showing and identifying each valve and piece of equipment etc., and its use. Upon completion one (1) copy of diagrams and valve charts suitably framed under glass, shall be furnished and mounted where directed. One (1) copy of diagrams and valve charts shall be delivered to Owner.

C. This Contractor shall provide on all piping, semi-rigid, wrap around plastic identification markers equal to Seton Snap-Around and/or Seton Strap-On pipe markers.

D. Each marker background is to be appropriately color coded with a clearly printed legend to identify the contents of the pipe. Directions of flow arrows are to be included on each marker.

E. Identification of all piping shall be adjacent to each valve, at each pipe passage through wall, floor and ceiling construction and at each branch and riser take-off.

F. Identification shall be on all horizontal pipe runs, marked every 15 ft. as well as at each inlet outlet of equipment at changes in direction.

END OF SECTION

SECTION 220490

GUARANTEE

PART 1 - GENERAL

Applicable Provisions of the Conditions of the Contract and Division 1 General Requirements govern the work in this section.

1.1 GUARANTEE

A. The Contractor shall remove, replace and/or repair at his own expense and at the convenience of the Owner, any defects in workmanship, materials, ratings, capacities and/or characteristics occurring in the work within one (1) year or within such longer period as may be provided in the Drawings and/or Section of the Specifications, which guarantee period shall commence with the final acceptance of the entire Contract in accordance with provisions stated in the General Conditions, and the Contractor shall pay for all damage to the system resulting from defects in the work and all expenses necessary to remove, replace and/or repair and any other work which may be damaged in removing, replacing and/or repairing the work.

END OF SECTION

SECTION 230100

GENERAL CONDITIONS

PART 1 - GENERAL

Applicable Provisions of the Conditions of the Contract and Division 1 General Requirements govern work in this section.

1.1 GENERAL CONDITIONS

A. Before submitting a proposal, Bidders shall examine all related to this work and shall become fully informed as to the extent and character of the work required and its relation to the other work in the building.

B. Before commencing work, the Contractor will examine all conditions of the project upon which his work is in any way dependent for perfect workmanship according to the intent of this Specification. No "waiver of responsibility" for incomplete, inadequate or defective adjoining work will be considered unless notice has been filed by this Contractor and acceded to by the Owner's representative in writing before the Contractor begins any part of the work.

C. The Contractor will pay for all licenses, permits and inspection fees required by civil authorities having jurisdiction. Comply with all laws, ordinances, regulations, and fire underwriter's requirements applicable to work herein specified without additional expense to the Owner. (Also, local building code requirements.).

D. It is specifically intended that anything (whether material or labor), which is usually furnished as a part of such equipment, as is hereinafter called for (and which is necessary for the completion and proper operation) shall be furnished as part of this Contract without additional cost the Owner, whether or not shown in detail or described in the Specifications.

E. When Drawings and Specifications conflict or there is a question as to the proper intent of this Contract, the Contractor shall assume the greater quantity, the higher quality and/or the more expensive method in his pricing. All questions shall be directed to the Architect/Engineer in writing only and only up to ten (10) days prior to bidding.

F. The Drawings indicate the general runs of the piping, ductwork, etc. systems and the location of equipment and apparatus, however it shall be understood that the right is reserved by the Architect/Engineer to change the location of piping work, ductwork, equipment and apparatus to a reasonable extent as building conditions may dictate, prior to their installation without extra cost to the Owner.

G. Small scale drilling through walls and floors or cutting of piping insulation which may contain asbestos shall be performed by a person with a "restricted asbestos handler allied trades certificate" and shall have a copy of it in his possession at all times while working of the project. This shall also apply to removal of piping, ductwork or equipment insulation.

H. Any changes from the Drawings and Specifications and any interpretation thereof shall have the prior approval of the Architect/Engineer. The Contractor shall submit in writing, at the time of signing the Contract, any items of necessary labor and materials, which, in his opinion, are lacking in requirements of the Drawings and Specifications to insure a complete job in all respects. No consideration will be granted to alleged misunderstanding of materials to be furnished, work to be done, or conditions to be complied with, it being understood that the tender of a proposal carries with it the agreement to all items and conditions referred to herein or indicated on the accompanying Drawings.

END OF SECTION

SECTION 230110

SCOPE OF WORK

PART 1 - GENERAL

Applicable Provisions of the Conditions of the Contract and Division 1 General Requirements govern work in this section.

1.1 SCOPE OF WORK

A. The work under this section includes all labor, materials, equipment, tools, transportation, and the performance of all work necessary and required for the furnishing and installation complete of all work as shown on the Contract Documents, including but not necessarily limited to the following:

1. Indoor energy recovery unit and related appurtenances.

2. Ductless split system heat-pump unit, indoor wall fan coil and related appurtenances.

3. Unit heaters and related appurtenances.

4. All required piping, valves and related specialties.

5. Duct mounted coils and related specialties.

6. Sheet metal ductwork and related accessories.

7. Duct and pipe insulation.

8. Registers, diffusers and dampers.

9. Rigging of equipment.

10. Furnish all combination motor starter/disconnects for equipment (with the exception of starters and electric items already mounted on equipment or equipment not requiring same). Fan motor starter/disconnects shall have contacts for ATC connection and a terminal block connection for Fire Alarm fan shutdown. Starters per manufacturer's recommendations. Underwriter's inspection and certificate required. Coordinate with Electrical Contractor.

11. Automatic temperature controls with complete wiring (regardless of voltage).

12. Testing, adjusting and start-up of equipment.

13. Air Balancing.

14. Fire-stopping per NFPA requirements (UL approved systems).

15. Operating and maintenance instructions.

16. As-Built Drawings - Refer to Division 1.

17. Cutting and Patching - Refer to Division 1.

1.2 WORK UNDER OTHER CONTRACTS

A. Power wiring of motors and equipment.

1.3 REMOVALS

A. Removals should be coordinated with other trades affected.

B. Piping which penetrates the construction may be cut and capped provided capping is done beneath the finished surfaces so that construction over it can be achieved.

C. All removals shall be removed from the site.

1.4 ALTERATION WORK

A. All equipment, piping, control components, etc. to be removed, shall be disposed of or salvaged as directed by the Owner. They shall not be removed from the premises without the Owner's approval.

B. All piping to be removed shall be properly plugged or capped so that upon completion of all new work, all abandoned piping shall be concealed in finished areas.

C. No dead ends shall be left on any piping upon completion of job. The existing system shall be left in perfect working order upon completion of new work.

D. Location and sizes of existing piping, ductwork, equipment, etc. are approximate. Exact sizes and locations of all existing work shall be verified on the job.

END OF SECTION

SECTION 230200

STEAM AND STEAM CONDENSATE SPECIALTIES

PART 1 - GENERAL

Applicable provisions of the Conditions of the Contract and Division 1 General Requirements govern the work in this section. Submit shop drawings for checking and approval.

1.1 SECTION INCLUDES

A. Steam traps.

B. Steam air vents.

1.2 REFERENCES

A. ASME - Boiler and Pressure Vessel Codes, SEC 8-D - Rules for Construction of Pressure Vessels.

B. ASME B31.9 - Building Services Piping.

C. ASTM A105 - Forgings, Carbon Steel, for Piping Components.

D. ASTM A126 - Grey Iron Castings for Valves, Flanges and Pipe Fittings.

E. ASTM A216 - Steel Castings, Carbon, Suitable for Fusion Welding for High Temperature Service.

F. ASTM A395 - Ferric Ductile Iron Pressure-Retaining Castings for Use at Elevated Temperatures.

G. NEMA 250 - Enclosures for Electrical Equipment (1000 Volt Maximum).

H. NFPA 70 - National Electrical Code.

1.3 SYSTEM DESCRIPTION

A. Use Float and Thermostatic Traps for: Low pressure drips, medium and low pressure condensate drainage of modulating type equipment.

B. Use thermostatic steam traps for various radiation types.

1.4 PERFORMANCE REQUIREMENTS

A. Steam Traps

1. Select to handle minimum of two times maximum condensate load of apparatus served.

2. Pressure Differentials: Low Pressure Systems (15 psi maximum): 2 psi.

1.5 SUBMITTALS

A. Submit under provisions of Contract requirements.

B. Product Data: Submit Product Data for manufactured products and assemblies required for this project.

1. Provide for manufactured products and assemblies required for this project.

2. Include product description, model, dimensions, component sizes, rough-in requirements, service sizes and finishes.

3. Submit schedule indicating manufacturer, model number, size, location rated capacity, load served and features for each specialty.

4. Include electrical characteristics and connection requirements.

C. Manufacturer's Installation Instructions: Indicate application, selection and hookup configuration. Include pipe and necessary elevations.

1.6 OPERATION AND MAINTENANCE DATA

A. Submit under provisions of Contract.

B. Operation and Maintenance Data: Include installation instructions, servicing requirements and recommended spare parts lists.

1.7 QUALITY ASSURANCE

A. Perform Work in accordance with New York State standards for installation of boilers and pressure vessels.

B. Maintain one copy document on site.

1.8 QUALIFICATIONS

A. Manufacturer: Company specializing in manufacturing the Products specified in this section with minimum three years documented experience.

1.9 REGULATORY REQUIREMENTS

A. Conform to ASME B31.9 code for installation of steam and steam condensate piping and specialties.

B. Product Requiring Electrical Connection: Listed and classified by UL as suitable for the purpose intended.

1.10 DELIVERY, STORAGE AND HANDLING

A. Deliver, store, protect and handle products to site under provisions of Contract.

B. Accept valves on site in shipping containers with labeling in place. Inspect for damage.

C. Provide temporary protective coating on cast iron and steel valves.

D. Provide temporary end caps and closures on piping and fittings. Maintain in place until installation.

E. Protect piping systems from entry of foreign materials by temporary covers, completing section of the work, and isolating parts of completed system.

1.11 EXTRA MATERIALS

A. Provide two service kits for each size and type of steam trap.

PART 2 - PRODUCTS

2.1 INVERTED BUCKET TRAPS

A. Manufacturers

1. Armstrong

2. Other acceptable manufactures offering equivalent products.
   a. Spirax/Sarco, Inc.
   b. Dunham

B. Trap

1. Construction: ASTM A126, cast iron body with bolted cover, stainless steel bucket, stainless steel bucket, stainless steel seats and plungers and stainless steel lever mechanism with knife edge operating surfaces.

2. Rating: 250-psig WSP.

3. Features: Access to internal parts without disturbing piping, top test plug, bottom drain plugs.

4. Accessories: Integral inlet strainer of stainless steel, integral inlet check valve, integral bimetal air vent.

2.2 FLOAT AND THERMOSTATIC TRAPS

A. Manufacturers

1. Spirax/Sarco, Inc.
2. Other acceptable manufactures offering equivalent products.
   a. Mueller
   b. Dunham

B. Trap

1. Construction: ASTM A126, cast iron body with bolted cover, stainless steel or bronze bellows type air vent, stainless steel or copper float, stainless steel lever and valve assembly.

2. Rating: 125-psig 150-psig 300-psig WSP.

3. Features: Access to internal parts without disturbing piping bottom drain plug.

4. Accessories: Gauge glass with shut-off cocks.

2.3 THERMODYNAMIC TRAPS

A. Manufacturers

1. Armstrong
2. Other acceptable manufactures offering equivalent products.

   a. Spirax/Sarco, Inc.
   b. Dunham

B. Trap

1. Construction: Stainless steel body, disc and cap.
2. Rating: 300-psig.
3. Features: Stainless steel insulating cap 1/4” steel blow down valve, integral strainer.

2.4 THERMOSTATIC TRAPS

A. Pressure Balanced

1. Manufacturers

   a. Spirax/Sarco, Inc.
   b. Mueller
   c. Armstrong

2. Trap: ASTM A395 cast iron body and bolted or screwed cover for 125-psig or 300-psig WSP; as required to suit pressures, stainless steel bellows, stainless steel valve and seat; integral stainless steel strainer.

2.5 STEAM AIR VENTS

A. 125-psig WSP

1. Manufacturers

   a. Spirax/Sarco, Inc.
   b. Mueller
   c. Armstrong

2. Balanced Pressure Type: Cast brass body and cover; access to internal parts without disturbing piping; stainless steel bellows, stainless steel valve and seat.

B. 225-psig WSP

1. Manufacturers

   a. Spirax/Sarco, Inc.
   b. Mueller
   c. Armstrong

2. Balanced Pressure Type: ASTM A126 cast iron body and cover; access to internal parts without disturbing piping; stainless steel bellows, stainless steel valve and seat.

PART 3 - EXECUTION

3.1 INSTALLATION OPERATION

A. Install specialties in accordance with manufacturer's instructions.

B. Steam Traps

1. Provide minimum 3/4" size on steam mains and branches.

2. Install with union or flanged connections at both ends.

3. Provide gate valve and strainer at inlet and gate valve, check valve at discharge.

4. Provide minimum 10" long, line size dirt pocket between apparatus and trap.

C. Remove thermostatic elements from steam traps during temporary and trial usage, until system has been operated and dirt pockets cleaned of sediment and scale.

D. Remove and recondition pressure reducing valve, pressure controllers, air filter regulators and transfer valve as noted on Drawings. Reconditioned equipment shall have new full warranty.

END OF SECTION

SECTION 230235

ENERGY RECOVERY UNITS (ERU-1)

PART 1 - GENERAL

Applicable provisions of the Conditions of the Contract and Division 1 General Requirements govern the work in this section. Submit shop drawings for checking and approval.

1.1 SUMMARY

A. This section includes Energy Wheel Ventilators for indoor installation.

1.2 SUBMITTALS

A. Product Data: For each type or model include the following:

1. Complete fan performance curves for both Supply Air and Exhaust Air, with system operating conditions indicated, as tested in an AMCA Certified Chamber.
2. Energy core performance data for both summer and winter operation.
3. Motor ratings, electrical characteristics and motor and fan accessories.
4. Material types and gauges of all component pieces and assemblies.
5. Dimensioned drawings for each type of installation, showing isometric and plan views, to include location of attached ductwork and service clearance requirements.
6. Estimated gross weight of each installed unit.
7. Installation, Operating and Maintenance manual (IOM) for each model.
8. Remote Control Panel description to include all functions.
9. Color chart including a palette of available standard paint finishes.

1.3 QUALITY ASSURANCE

A. Source Limitations: Obtain unit with all appurtenant components or accessories from a single manufacturer.

B. For the actual fabrication, installation and testing of work under this section use only thoroughly trained and experienced workers completely familiar with the items required and with the manufacturer's current recommended methods of installation.

C. Product Options: Drawings must indicate size, profiles and dimensional requirements of Energy Recovery Units and are to be based on the specific system indicated. Refer to Division 1 Section “Product Requirements”.

D. Certifications

1. Entire unit shall be ETL Certified per U.L. 1812 and bear an ETL sticker.
2. Energy Core shall be AHRI Certified, per Standard 1060.

1.4 COORDINATION

A. Coordinate size and location of all building penetrations required for installation of each unit and associated plumbing and electrical systems.

B. Coordinate sequencing of construction of associated HVAC and Electrical supply.

1.5 EXTRA MATERIALS

A. Furnish extra materials described below that match products installed and that are packaged with protective covering for storage and identified with labels describing contents.

1. Filters: Provide 2 sets of MERV 13 disposable filters for each unit.
2. One set of fan belts.

PART 2 - PRODUCTS

2.1 MANUFACTURERS

A. Available Manufacturers: Subject to compliance with specifications contained within this document, manufacturers offering products that may be incorporated into the work include, but are not limited to: Energy Wall or approved equal

2.2 MANUFACTURED UNITS

A. Unit shall be shipped in multiple section for field assembly in mechanical room. Sections shall be fully assembled at the factory and consist of an insulated metal cabinet, energy wheel, motorized dampers, speed control, motion detector, frost control, filter assembly for intake and exhaust air, VFD's for fan speed controls, supply air blower assembly, exhaust air blower assembly, dirty filter contacts, programmable timer, economizer cycle, recirculation contacts, BACnet compatible controller with remote keypad/touch screen, an electrical control center and remote steam heating coil. All specified components and internal accessories factory installed and tested and prepared for single-point high voltage connection.

2.3 CABINET

A. Materials: Formed single wall insulated metal cabinet, fabricated to permit access to internal components for maintenance.

1. The casing shall be double wall 22-gauge galvanized steel with minimum 2" insulation between interior and exterior panels.
2. Maximum height shall not exceed 47 inches (1,194mm).
3. The exterior casing shall be coated with a satin enamel paint finish to prevent corrosion.
4. All interior surfaces of the casing shall be minimum 22-gauge galvanized steel with no screw penetrations from the exterior of the unit. All surfaces shall be smooth to ensure easy cleaning.

B. Access doors shall be hinged.

C. Shall have factory-installed duct flanges on all duct openings.

D. Supply Air and Exhaust Air blower assemblies: Blower assemblies consist of an electric motor as specified by A/E and a direct driven blower. Assembly shall be mounted on heavy gauge galvanized rails and further mounted on 1.125 inch thick neoprene vibration isolators.

E. Control panel / connections: Energy Core Ventilator shall have an electrical control center where all high and low voltage connections are made. Control center shall be constructed to permit single-point high voltage power supply connections.

F. Frost Control: Timed.

G. Economizer Control: None

H. Motorized Dampers / Exhaust Air, Intake Air: Dampers of low leakage type shall be factory installed.

I. Variable speed control are considered to be part of various optional operational modes or device controllers and are to be factory supplied and installed as specified by the A/E.

2.4 BLOWER

A. Blower section construction, Supply Air and Exhaust Air: Motor and blower shall be assembled onto a 14 gauge galvanized steel platform and must have neoprene vibration isolation.

B. Blower assemblies: Shall be statically and dynamically balanced and designed for continuous operation at maximum rated fan speed and horsepower.

C. Centrifugal blower housing: Formed and reinforced steel panels to make curved scroll housing with shaped cutoff.

D. Forward curved blower (fan) wheels: Galvanized or aluminum construction with inlet flange and shallow blades curved forward in direction of airflow. Mechanically attached to shaft with set screws.

E. Blower performance shall be factory tested for flow rate, pressure, power, air density, rotation speed and efficiency. Ratings are to be established in accordance with AMCA 210, “Laboratory Methods of Testing Fans for Rating”.

2.5 MOTORS

A. General

1. The motor and blower must be designed and certified for continuous duty operation.
2. The blower motors shall be ODP or TEFC, EPAct inverter duty 10:1 ratio.
3. The exhaust and supply air shall be delivered independently with its own motor and blower.
4. Provide two speed motors controlled by variable speed control (where applicable).
5. Provide variable speed motor controlled by 0-10VDC signal from control to variable frequency drive (where applicable).

2.6 UNIT CONTROLS

A. The unit shall be constructed so that it can be controlled by field installed stand-alone controllers, thermostats and sensors. Provide a remote control panel with control switches in the remote panel to run the unit based on an occupied / un-occupied schedule.

B. Accessories

1. A low voltage 24VAC transformer shall be supplied to provide power for external control component contacts.
2. Dry contacts for occupancy control, ventilation control, start/stop wheel control, fan interlock, fresh air damper power, exhaust air damper power, and general alarm shall be provided.
3. Access door shall include a fused or non-fused NEMA 4 disconnect switch.
4. Defrost cycle shall be provided using a wheel speed variation controlled by integral variable frequency drive mechanism.
5. Low temperature limit to control fresh air stop if required.
6. Dirty filter contact if required.
7. Low airflow alarm switch if required.
8. Phase loss detection if required.
9. Wheel rotation alarm if required.

2.7 FILTERS

A. Exhaust airflows shall be filtered before they pass through the energy recovery wheel. The exhaust air shall be filtered through a unit integral MERV 13 rated filter.

B. Supply airflows shall be filtered before they pass through the energy recovery wheel. The supply air shall be filtered through a unit integral MERV 13 rated filter.

2.8 SERVICEABILITY

A. The equipment shall have one side access to all working components. This access shall be provided by a hinged, fully insulated and gasketed door per project details. Doors shall include ¼ turn handle access.

B. Energy recovery wheel, filters, and blowers shall be fully removable without disassembling internal partitions or attached duct.

C. The wheel and wheel segments shall be fully removable without the use of tools and shall be cleanable with mild soap and water.

PART 3 - EXECUTION

3.1 EXAMINATION

A. Prior to start of installation, examine area and conditions to verify correct location for compliance with installation tolerances and other conditions affecting unit performance. See unit IOM.

B. Examine roughing-in of electrical and HVAC services to verify actual location and compliance with unit requirements. See unit IOM.

C. Proceed with installation only after all unsatisfactory conditions have been corrected.

3.2 INSTALLATION

A. Installation shall be accomplished in accordance with these written specifications, project drawings, manufacturer's installation instructions as documented in manufacturer's IOM, Best Practices and all applicable building codes.

3.3 CONNECTIONS

A. In all cases, industry Best Practices shall be incorporated. Connections are to be made subject to the installation requirements shown above.

1. Duct installation and connection requirements are specified in Division 23 of this document.

2. Electrical installation requirements are specified in Division 26 of this document.

3.4 FIELD QUALITY CONTROL

A. Manufacturer's Field Service: Engage a factory authorized service representative to inspect field assembled components and equipment installation, to include electrical and piping connections. Report results to A/E in writing. Inspection must include a complete startup checklist to include (as a minimum) the following: Completed Start-Up Checklists as found in manufacturer's IOM.

3.5 START-UP SERVICE

A. Engage a factory authorized service representative to perform startup service. Clean entire unit and install clean filters. Measure and record electrical values for voltage and amperage. Refer to Division 23 "Testing, Adjusting and Balancing" and comply with provisions therein.

3.6 DEMONSTRATION AND TRAINING

A. Engage a factory authorized service representative to train owner's maintenance personnel to adjust, operate and maintain the entire unit. Refer to Division 1 Section Closeout Procedures and Demonstration and Training.

END OF SECTION

SECTION 230260

DUCTLESS SPLIT SYSTEM (HP-1, CU-1)

PART 1 - GENERAL

Applicable Provisions of the Conditions of the Contract and Division 1 General Requirements govern the work in this section. Submit shop drawings for checking and approval.

1.1 SYSTEM DESCRIPTION

A. Outdoor-mounted, air-cooled split system outdoor section suitable for on-the-ground, rooftop, wall hung, balcony, or under-deck installation. Unit shall consist of a hermetic reciprocating, scroll, or rotary compressor, an air-cooled coil, propeller-type blow-thru out-door fans, reversing valve, accumulator, holding refrigerant charge, heating mode metering device, and control box. Unit shall discharge air horizontally as shown on the contract drawings. Units shall function as the outdoor component of an air-to-air cooling and heating system.

B. Indoor, wall-mounted, direct-expansion fan coil to be matched with the associated commercial outdoor heat pump unit.

1.2 QUALITY ASSURANCE

A. Unit construction shall comply with ANSI/ASHRAE 15, latest revision, and with the NEC.

B. Unit shall be rated (when matched with appropriate outdoor unit) per ARI Standard 210/240. Units shall be certified by UL and CSA.

C. Units shall be constructed in accordance with UL standards.

D. Units shall be listed in the CEC directory.

E. Unit cabinet shall be capable of withstanding Federal Test Standard No. 141 (method 6061) 500-hour salt spray test.

F. Air-cooled condenser coils shall be leak tested at 350 psig air pressure with the coil submerged in water.

1.3 DELIVERY, STORAGE AND HANDLING

A. Units shall be shipped in one piece and shall be stored and handled per unit manufacturer’s recommendations.

PART 2 - PRODUCTS

2.1 OUTDOOR EQUIPMENT

A. Factory assembled, single piece, air-cooled outdoor unit. Contained within the unit enclosure shall be all factory wiring, piping, controls, compressor, charge of R-410 refrigerant and special features required prior to field start-up.

B. Unit Cabinet

1. Unit cabinet shall be constructed of galvanized-steel, bonderized and coated with a baked-enamel finish.

2. Unit access panels shall be removable with minimal screws and shall provide full access to the compressor, fan, and control components.

3. Outdoor compartment shall be isolated and have an acoustic lining to assure quiet operation.

C. Fans

1. Outdoor fans shall be direct-drive propeller type and shall discharge air horizontally. Fans shall blow air through the outdoor coil.

2. Outdoor fan motors shall be totally enclosed, single-phase motors with class B insulation and permanently lubricated sleeve bearings. Motor shall be protected by internal thermal overload protection.

3. Shaft shall have inherent corrosion resistance.

4. Fan blades shall be corrosion resistant and shall be statically and dynamically balanced.

5. Outdoor fan openings shall be equipped with PVC coated protection grille over fan and coil.

D. Compressor

1. Compressor shall be fully hermetic reciprocating or scroll type.

2. Compressor shall be equipped with oil system, operating oil charge, and motor. Internal overloads shall protect the compressor from over temperature and over current. Scroll compressors shall also have high discharge gas temperature protection if required.

3. Motor shall be NEMA rated class F, suitable for operation in a refrigerant atmosphere.

4. Reciprocating compressors shall be equipped with crankcase heaters to minimize liquid refrigerant accumulation in compressor during shutdown and to prevent refrigerant dilution of oil.

5. Compressor assembly shall be installed on rubber vibration isolators and shall have internal spring isolation.

6. Compressors shall be single phase or 3-phase as specified on the Contract Drawings.

E. Outdoor Coil: Coil shall be constructed of aluminum fins mechanically bonded to internally enhanced, seamless copper tubes that are cleaned, dehydrated, and sealed.

F. Refrigeration Components: Refrigerant circuit components shall include brass external liquid line service valve with service gage port connections, suction line service valve with service gauge connection port, service gage port connections on compressor suction and discharge lines with Schrader-type fittings with brass caps, accumulator, bi-flow filter drier, pressure relief, reversing valve, and heating mode metering device.

G. Controls and Safeties: Operating controls and safeties shall be factory selected, assembled, and tested. The minimum control functions shall include the following:

1. Controls

    a. Time delay restart to prevent compressor reverse rotation on single-phase scroll compressors.
    b. Automatic restart on power failure.
    c. Safety lockout if any outdoor unit safety is open.
    d. A time delay control sequence is also provided standard through the fan coil board, thermostat, or controller.
    e. High-pressure and liquid line low-pressure switches.
    f. Automatic outdoor-fan motor protection.
    g. Start capacitor and relay (single-phase units without scroll compressors).

2. Safeties

    a. System diagnostics.
    b. Compressor motor current and temperature overload protection.
    c. High pressure relief.
    d. Outdoor fan failure protection.

H. Electrical Requirements

1. Unit shall operate on a 208-v or 230-v, 60 Hz power supply as specified on the equipment schedule.
2. Unit electrical power shall be a single point connection.
3. Unit control voltage to the indoor-fan coil shall be supply line voltage.
4. All power and control wiring must be installed per NEC and all local building codes.
5. Unit shall have high- and low-voltage terminal block connections.

I. Special Features (Field Installed)

1. Low-Ambient Kit: Control shall regulate fan-motor cycles in response to saturated condensing pressure of the unit. The control shall be capable of maintaining a condensing temperature of 100 F ±10 F with outdoor temperatures to –20 F. Installation of kit shall not require changing the outdoor-fan motor.

2. Liquid Solenoid Valve: This electronically operated shutoff valve shall close and open in response to compressor operation. The valve should be used with all long-lines applications (over 100 ft).

3. Crankcase Heater (units with scroll compressors only): Unit shall be shipped with a clamp-on compressor oil sump heater.

2.2 INDOOR EQUIPMENT

A. Indoor, direct-expansion, wall mounted fan coil. Unit shall come complete with cooling/heating coil, fan, fan motor, piping connectors, electrical controls, condensate pump, and hanging brackets.

B. Unit cabinet shall be constructed of zinc-coated steel. Fully insulated discharge and inlet grilles shall be attractively styled, high-impact polystyrene. Cabinet shall have filter tracks and cleanable filters which shall be accessible from below with a 1/4 -turn fastener.

C. Fan shall be a centrifugal, direct-drive blower type with air intake in center of the unit and discharge on the perimeter. Air louvers shall be adjustable discharge.

D. Coil: Coil shall be copper tube with aluminum fins and galvanized steel tube sheets. Fins will be bonded to the tubes by mechanical expansion. A drip pan under the coil shall have a factory-installed condensate pump and drain connection for hose attachment to remove condensate.

E. Motors: Motor shall be totally enclosed and permanently lubricated with inherent protection. Fan motor shall be 3-speed.

F. Controls: Controls shall be 24 v and shall be easily operated by the user from a wall-mounted control unit. Float control shall be in the condensate sump to shut unit down in case of pump malfunction. A wall-mounted electromechanical thermostat with 3 fan-speed selections and an auto/manual switch shall be supplied for field installation. Automatic changeover from cooling to heating modes and selectable 2- or 4-minute start-up delay shall be included. The R-410 refrigerant shall be controlled with a piston-type refrigerant metering device, and evaporator coil freeze protection shall be provided.

G. Filters: Unit shall have filter track with factory-supplied cleanable filters.

H. Electrical Requirements: Unit shall operate on a 208-v, 60 Hz power supply as specified on the equipment schedule.

I. Special Features (Field Installed)

1. Wall Mounted Electronic Programmable Thermostat: Thermostat shall be commercial grade and shall provide 7-day, 4-event scheduling. Integral sub base shall be included. Thermostat shall also provide 3-speed fan switchover capability, air sweep auto changeover, and shall not require a battery to retain memory.

2.3 AIR CONDITIONING CONDENSATE PUMP
(Provide In All Cases Where Condensate Cannot Drain By Gravity)

A. Pump shall be equal to “Little Giant” model no. VCMA-15ULS–554401. Automatic, 15 ft. shut-off, 1/2 gallon tank, safety switch check valve, 6 ft. power cord power cord with plug.

B. Provide 3/8” copper tubing discharge piping installed per manufacturer’s recommendations.

C. For roof discharge applications provide pitch pocket, rigid 3/8” copper discharge piping and gooseneck turned down 12 inches above roof. Provide splash block and remove pump check valve before installation.

PART 3 - EXECUTION

3.1 INSPECTION

A. Inspect equipment space locations before beginning installation. Verify that the space is correct for entry and access. Do not proceed with installation of the equipment until unsatisfactory conditions have been corrected.

3.2 INSTALLATION

A. Comply with manufacturer's instructions and recommendations for installation of equipment, accessories and components.

B. All heating, ventilating and air conditioning equipment shall be carefully designed, constructed and installed so as to prevent any objectionable noise or vibration reaching any part of the building outside of the mechanical equipment room. Care shall also be taken to prevent transmission of noise or odor through ductwork into other spaces. The Contractor shall be required to rectify or replace at his own expense, any equipment not complying with the foregoing requirements.

3.3 CLEANING

A. Clean interior and exterior surfaces promptly after installation of equipment and components. Take care to avoid damage to protective coatings and finishes. Remove excess sealants, lubrication, dirt and other foreign substances.

END OF SECTION

SECTION 230280

VARIABLE FREQUENCY DRIVES

PART 1 - GENERAL

Applicable provisions of the Conditions of the Contract and Division 1 General Requirements govern the work in this section. Submit shop drawings for checking and approval.

1.1 DESCRIPTION

A. This specification is to cover a complete Variable Frequency motor Drive (VFD) consisting of a pulse width modulated (PWM) inverter designed for use with a standard NEMA Design B induction motor.

B. The drive manufacturer shall supply the drive and all necessary options as herein specified. The manufacturer shall have been engaged in the production of this type of equipment for a minimum of twenty years. VFD's that are manufactured by a third party and "brand labeled" shall not be acceptable. All VFD's installed on this project shall be from the same manufacturer.

1.2 QUALITY ASSURANCE

A. Referenced Standards:

1. Institute of Electrical and Electronic Engineers (IEEE)

    a. Standard 519-1992, IEEE Guide for Harmonic Content and Control.

2. Underwriters laboratories

    a. UL508C

3. National Electrical Manufacturer's Association (NEMA)

    a. ICS 7.0, AC Adjustable Speed Drives

4. IEC 16800 Parts 1 and 2

5. National Electric Code (NEC)

    a. NEC 430.120, Adjustable-Speed Drive Systems

6. International Building Code (IBC)

    a. IBC 2006 Seismic – referencing ASC 7-05 and ICC AC-156

B. Qualifications

1. VFD's and options shall be UL listed as a complete assembly. VFD's that require the customer to supply external fuses for the VFD to be UL listed are not acceptable. VFD's with red label UL stickers, requiring additional branch circuit protection are not acceptable. The base VFD shall be UL listed for 100 KAIC without the need for input fuses.

2. CE Mark – The VFD shall conform to the European Union ElectroMagnetic Compatibility directive, a requirement for CE marking. The VFD shall meet product standard EN 61800-3 for the First Environment restricted level.

3. The entire VFD enclosure, including the bypass shall be seismically certified and labeled as such in accordance with the 2006 International Building Code (IBC):

   a. VFD manufacturer shall provide Seismic Certification and Installation requirements at time of submittal.

   b. Seismic importance factor of 1.5 rating is required and shall be based upon actual shake test data as defined by ICC AC-156.

   c. Seismic ratings based upon calculations alone are not acceptable. Certification of Seismic rating must be based on testing done in all three axis of motion.

4. Acceptable Manufactures

   a. ABB ACH Series.

   b. Alternate manufacturer's requests must be submitted in writing to the Engineer for approval at least 20 working days prior to bid. Approval does not relieve the supplier of specification requirements.

5. The VFD manufacturer shall have available a comprehensive, HVAC Drive Computer Based Training (CBT) product. The CBT product shall include detailed, interactive sections covering VFD unpacking, proper mechanical and electrical installation, and programming. The CBT product shall allow the user to provide just-in-time training to new personnel or refresher training for maintenance and repair personnel on the user's site. The CBT product shall be repeatable, precise and shall include record keeping capability. The CBT product shall record answers to simulations and tests by student ID number. The CBT product must be professionally produced and have interactive sections, student tests, and include video clips of proper wiring and installation.

1.3 SUBMITTALS

A. Submittals shall include the following information:

1. Outline dimensions, conduit entry locations and weight.

2. Customer connection and power wiring diagrams.

3. Complete technical product description include a complete list of options provided. **Any portions of this specification not met must be clearly indicated or the supplier and contractor shall be liable to provide all additional components required to meet this specification.**

4. Compliance to IEEE 519 – harmonic analysis for particular jobsite including total harmonic voltage distortion and total harmonic current distortion (TDD).
   a. The VFD manufacturer shall provide calculations; specific to this installation, showing total harmonic voltage distortion is less than 5%. Input filters shall be sized and provided as required by the VFD manufacturer to ensure compliance with IEEE standard 519. All VFD's shall include a minimum of 5% impedance reactors, **no exceptions**.

PART 2 - PRODUCTS

2.1 VARIABLE FREQUENCY DRIVES

A. The VFD package as specified herein shall be enclosed in a UL Listed Type enclosure, exceeding NEMA enclosure design criteria (enclosures with only NEMA ratings are not acceptable), completely assembled and tested by the manufacturer in an ISO9001 facility. The VFD tolerated voltage window shall allow the VFD to operate from a line of +30% nominal, and -35% nominal voltage as a minimum.

1. Environmental operating conditions: VFD's shall be capable of continuous operation at 0 to 50ºC (32 to 122ºF) ambient temperature as per VFD manufacturers documented/submittal data or VFD must be oversized to meet these temperature requirements. Not acceptable are VFD's that can only operate at 40° C intermittently (average during a 24 hour period) and therefore must be oversized. Altitude 0 to 3300 feet above sea level, less than 95% humidity, non-condensing. All circuit boards shall have conformal coating.

2. Enclosure shall be rated UL Type 1 and shall be UL listed as a plenum rated VFD. VFD's without these ratings are not acceptable. NEMA only type 1 enclosures are not acceptable (must be UL Type 1).

3. Provide NEMA 3R enclosures where exposed to outside weather or wet conditions.

B. All VFD's shall have the following standard features:

1. All VFD's shall have the same customer interface, including digital display, and keypad, regardless of horsepower rating. The keypad shall be removable, capable of remote mounting and allow for uploading and downloading of parameter settings as an aid for start-up of multiple VFD's.

2. The keypad shall include Hand-Off-Auto selections and manual speed control. The drive shall incorporate "bumpless transfer" of speed reference when switching between "Hand" and "Auto" modes. There shall be fault reset and "Help" buttons on the keypad. The Help button shall include "on-line" assistance for programming and troubleshooting.

3. There shall be a built-in time clock in the VFD keypad. The clock shall have a battery backup with 10 years minimum life span. The clock shall be used to date and time stamp faults and record operating parameters at the time of fault. If the battery fails, the VFD shall automatically revert to hours of operation since initial power up. Capacitor back-up is not acceptable. The clock shall also be programmable to control start/stop functions, constant speeds, PID parameter sets and output Form-C relays. The VFD shall have a digital input that allows an override to the time clock (when in the off mode) for a programmable time frame. There shall be four (4) separate, independent timer functions that have both weekday and weekend settings.

4. The VFD's shall utilize pre-programmed application macro's specifically designed to facilitate start-up. The Application Macros shall provide one command to reprogram all parameters and customer interfaces for a particular application to reduce programming time. The VFD shall have two user macros to allow the end-user to create and save custom settings.

5. The VFD shall have cooling fans that are designed for easy replacement. The fans shall be designed for replacement without requiring removing the VFD from the wall or removal of circuit boards. The VFD cooling fans shall operate only when required. To extend the fan and bearing operating life, the VFD shall cycle the cooling fans on and off as required.

6. The VFD shall be capable of starting into a coasting load (forward or reverse) up to full speed and accelerate or decelerate to set point without tripping or component damage (flying start).

7. The VFD shall have the ability to automatically restart after an over-current, over-voltage, under-voltage, or loss of input signal protective trip. The number of restart attempts, trial time, and time between attempts shall be programmable.

8. The overload rating of the drive shall be 110% of its normal duty current rating for 1 minute every 10 minutes, 130% overload for 2 seconds. The minimum FLA rating shall meet or exceed the values in the NEC/UL table 430.250 for 4-pole motors.

9. The VFD shall have internal 5% impedance reactors to reduce the harmonics to the power line and to add protection from AC line transients. The 5% impedance may be from dual (positive and negative DC bus) reactors, or 5% AC line reactors. VFD's with only one DC reactor shall add an AC line reactor.

10. The input current rating of the VFD shall be no more than 3% greater than the output current rating. VFD's with higher input current ratings require the upstream wiring, protection devices, and source transformers to be oversized per NEC 430.120. Input and output current ratings must be shown on the VFD nameplate.

11. The VFD shall include a coordinated AC transient surge protection system consisting of 4-120 joule rated MOV's (phase to phase and phase to ground), a capacitor clamp, and 5% impedance reactors.

12. The VFD shall provide a programmable loss-of-load (broken belt / broken coupling) Form-C relay output. The drive shall be programmable to signal the loss-of-load condition via a keypad warning, Form-C relay output, and / or over the serial communications bus. The loss-of-load condition sensing algorithm shall include a programmable time delay that will allow for motor acceleration from zero speed without signaling a false loss-of-load condition.

13. The VFD shall have user programmable underload and overload curve functions to allow user defined indications of broken belt or mechanical failure / jam condition causing motor overload

14. The VFD shall include multiple "two zone" PID algorithms that allow the VFD to maintain PID control from two separate feedback signals (4-20mA, 0-10V, and / or serial communications). The two zone control PID algorithm will control motor speed based on a minimum, maximum, or average of the two feedback signals. All of the VFD PID controllers shall include the ability for "two zone" control.

15. If the input reference (4-20mA or 2-10V) is lost, the VFD shall give the user the option of either (1) stopping and displaying a fault, (2) running at a programmable preset speed, (3) hold the VFD speed based on the last good reference received, or (4) cause a warning to be issued, as selected by the user. The drive shall be programmable to signal this condition via a keypad warning, Form-C relay output and / or over the serial communication bus.
16. The VFD shall have programmable "Sleep" and "Wake up" functions to allow the drive to be started and stopped from the level of a process feedback signal.

17. Provide drive with circuit breaker option and remote panel mounting kit.

C. All VFD's to have the following adjustments:

1. Three (3) programmable critical frequency lockout ranges to prevent the VFD from operating the load continuously at an unstable speed. The lockout range must be fully adjustable, from 0 to full speed.

2. Two (2) PID Set point controllers shall be standard in the drive, allowing pressure or flow signals to be connected to the VFD, using the microprocessor in the VFD for the closed-loop control. The VFD shall have 250 ma of 24 VDC auxiliary power and be capable of loop powering a transmitter supplied by others. The PID set point shall be adjustable from the VFD keypad, analog inputs, or over the communications bus. There shall be two independent parameter sets for the PID controller and the capability to switch between the parameter sets via a digital input, serial communications or from the keypad. The independent parameter sets are typically used for night setback, switching between summer and winter set points, etc.

3. There shall be an independent, second PID loop that can utilize the second analog input and modulate one of the analog outputs to maintain the set point of an independent process (i.e. valves, dampers, etc.). All set points, process variables, etc. to be accessible from the serial communication network.

4. Two (2) programmable analog inputs shall accept current or voltage signals.

5. Two (2) programmable analog outputs (0-20ma or 4-20 ma). The outputs may be programmed to output proportional to Frequency, Motor Speed, Output Voltage, Output Current, Motor Torque, Motor Power (kW), DC Bus voltage, Active Reference, Active Feedback, and other data.

6. Six (6) programmable digital inputs for maximum flexibility in interfacing with external devices. All digital inputs shall be programmable to initiate upon an application or removal of 24VDC or 24VAC.

7. Three (3) programmable, digital Form-C relay outputs. The relay outputs shall include programmable on and off delay times and adjustable hysteresis. The relays shall be rated for maximum switching current 8 amps at 24 VDC and 0.4 A at 250 VAC; Maximum voltage 300 VDC and 250 VAC; continuous current rating of 2 amps RMS. Outputs shall be true Form-C type contacts; open collector outputs are not acceptable.

8. Run permissive circuit - There shall be a run permissive circuit for damper or valve control. Regardless of the source of a run command (keypad, input contact closure, time-clock control, or serial communications), the VFD shall provide a dry contact closure that will signal the damper to open (VFD motor does not operate). When the damper is fully open, a normally open dry contact (end-switch) shall close. The closed end-switch is wired to a VFD digital input and allows VFD motor operation. Two separate safety interlock inputs shall be provided. When either safety is opened, the motor shall be commanded to coast to stop and the damper shall be commanded to close. The keypad shall display “start enable 1 (or 2) missing”. The safety input status shall also be transmitted over the serial communications bus.

9. The VFD control shall include a programmable time delay for VFD start and a keypad indication that this time delay is active. A Form C relay output provides a contact closure to signal the VAV boxes open. This will allow VAV boxes to be driven open before the motor operates. The time delay shall be field programmable from 0 – 120 seconds. Start delay shall be active regardless of the start command source (keypad command, input contact closure, time-clock control, or serial communications), and when switching from drive to bypass.

10. Seven (7) programmable preset speeds.

11. Two independently adjustable accel and decel ramps with 1 – 1800 seconds adjustable time ramps.

12. The VFD shall include a motor flux optimization circuit that will automatically reduce applied motor voltage to the motor to optimize energy consumption and reduce audible motor noise. The VFD shall have selectable software for optimization of motor noise, energy consumption, and motor speed control.

13. The VFD shall include a carrier frequency control circuit that reduces the carrier frequency based on actual VFD temperature that allows higher carrier frequency settings without derating the VFD.

14. The VFD shall include password protection against parameter changes.

D. The Keypad shall include a backlit LCD display. The display shall be in complete English words for programming and fault diagnostics (alpha-numeric codes are not acceptable). All VFD faults shall be displayed in English words. The keypad shall include a minimum of 14 assistants including:

1. Start-up assistant
2. Parameter assistants
    a. PID assistant
    b. Reference assistant
    c. I/O assistant
    d. Serial communications assistant
    e. Option module assistant
    f. Panel display assistant
    g. Low noise set-up assistant
3. Maintenance assistant
4. Troubleshooting assistant
5. Drive optimizer assistants

E. All applicable operating values shall be capable of being displayed in engineering (user) units. A minimum of three operating values from the list below shall be capable of being displayed at all times. The display shall be in complete English words (alpha-numeric codes are not acceptable):

1. Output Frequency
2. Motor Speed (RPM, %, or Engineering units)
3. Motor Current
4. Motor Torque
5. Motor Power (kW)
6. DC Bus Voltage
7. Output Voltage

F. The VFD shall include a fireman's override input. Upon receipt of a contact closure from the fire / smoke control station, the VFD shall operate in one of two modes: 1) Operate at a programmed predetermined fixed speed ranging from -500Hz (reverse) to 500Hz (forward). 2) Operate in a specific fireman's override PID algorithm that automatically adjusts motor speed based on override set point and feedback. The mode shall override all other inputs (analog/digital, serial communication, and all keypad commands), except customer defined safety run interlocks, and force the motor to run in one of the two modes above. "Override Mode" shall be displayed on the keypad. Upon removal of the override signal, the VFD shall resume normal operation, without the need to cycle the normal digital input run command.

G. Serial Communications

1. The VFD shall have an EIA-485 port as standard. The standard protocols shall be Modbus, Johnson Controls N2, Siemens Building Technologies FLN, and BACnet. Optional protocols for LonWorks, Profibus, EtherNet, BACnet IP, and DeviceNet shall be available. Protocol provided shall match ATC system in Building. Each individual drive shall have the protocol in the base VFD. The use of third party gateways and multiplexers is not acceptable. All protocols shall be "certified" by the governing authority (i.e. BTL Listing for BACnet). Use of non-certified protocols is not allowed.

2. The BACnet connection shall be an EIA-485, MS/TP interface operating at 9.6, 19.2, 38.4, or 76.8 Kbps. The connection shall be tested by the BACnet Testing Labs (BTL) and be BTL Listed. The BACnet interface shall conform to the BACnet standard device type of an Applications Specific Controller (B-ASC). The interface shall support all BIBBs defined by the BACnet standard profile for a B-ASC including, but not limited to:
   a. Data Sharing – Read Property – B.
   b. Data Sharing – Write Property – B.
   c. Device Management – Dynamic Device Binding (Who-Is; I-Am).
   d. Device Management – Dynamic Object Binding (Who-Has; I-Have).
   e. Device Management – Communication Control – B.

3. If additional hardware is required to obtain the BACnet interface, the VFD manufacturer shall supply one BACnet gateway per drive. Multiple VFD's sharing one gateway shall not be acceptable.

4. Serial communication capabilities shall include, but not be limited to; run-stop control, speed set adjustment, proportional/integral/derivative PID control adjustments, current limit, accel/decel time adjustments, and lock and unlock the keypad. The drive shall have the capability of allowing the DDC to monitor feedback such as process variable feedback, output speed / frequency, current (in amps), % torque, power (kW), kilowatt hours (resettable), operating hours (resettable), and drive temperature. The DDC shall also be capable of monitoring the VFD relay output status, digital input status, and all analog input and analog output values. All diagnostic warning and fault information shall be transmitted over the serial communications bus. Remote VFD fault reset shall be possible.

5. Serial communication in bypass shall include, but not be limited to; bypass run-stop control, the ability to force the unit to bypass, and the ability to lock and unlock the keypad. The bypass shall have the capability of allowing the DDC to monitor feedback such as, current (in amps), kilowatt hours (resettable), operating hours (resettable), and bypass logic board temperature. The DDC shall also be capable of monitoring the bypass relay output status, and all digital input status. All bypass diagnostic warning and fault information shall be transmitted over the serial communications bus. Remote bypass fault reset shall be possible.

6. The VFD / bypass shall allow the DDC to control the drive and bypass digital and analog outputs via the serial interface. This control shall be independent of any VFD function. The analog outputs may be used for modulating chilled water valves or cooling tower bypass valves. The drive and bypass' digital (Form-C relay) outputs may be used to actuate a damper, open a valve or control any other device that requires a maintained contact for operation. In addition, all of the drive and bypass' digital inputs shall be capable of being monitored by the DDC system. This allows for remote monitoring of which (of up to 4) safeties are open.

7. The VFD shall include an independent PID loop for customer use. The independent PID loop may be used for cooling tower bypass value control, chilled water value / hot water valve control, etc. Both the VFD PID control loop and the independent PID control loop shall continue functioning even if the serial communications connection is lost. As default, the VFD shall keep the last good set point command and last good DO & AO commands in memory in the event the serial communications connection is lost and continue controlling the process.

H. EMI / RFI filters. All VFD's shall include EMI/RFI filters. The onboard filters shall allow the VFD assembly to be CE Marked and the VFD shall meet product standard EN 61800-3 for the First Environment restricted level with up to 100 feet of motor cable. No Exceptions. Certified test reports shall be provided with the submittals confirming compliance to EN 61800-3, First Environment.

I. All VFD's through 75HP at 480 V shall be protected from input and output power mis-wiring. The VFD shall sense this condition and display an alarm on the keypad. The VFD shall not sustain damage from this power mis-wiring condition.

J. Optional Features – Optional features shall be furnished and mounted by the drive manufacturer. All optional features shall be UL Listed by the drive manufacturer as a complete assembly and carry a UL508 label.

1. Door interlocked, pad-lockable disconnect switch that will disconnect all input power from the drive and all internally mounted options. Disconnect option shall be available with or without systems requiring bypass.
2. Field-bus adapters - Protocols such as BACnet IP shall be a plug in modules.

K. Bypass

1. A complete factory wired and tested bypass system consisting of a door interlocked, pad-lockable circuit breaker, output contactor, bypass contactor, and fast acting VFD input fuses. UL Listed motor overload protection shall be provided in both drive and bypass modes.

2. The bypass enclosure door and VFD enclosure must be mechanically interlocked such that the disconnecting device must be in the "Off" position before either enclosure may be accessed.

3. The VFD and bypass package shall have a UL listed short circuit current rating (SCCR) of 100,000 Amps and this rating shall be indicated on the UL data label.

4. The drive and bypass package shall be seismic certified and labeled to the IBC:
   a. Seismic importance factor of 1.5 rating is required and shall be based upon actual shake table test data as defined by ICC AC-156.

5. Drive Isolation Fuses - To ensure maximum possible bypass operation, fast acting fuses, exclusive to the VFD, shall be provided to allow the VFD to disconnect from the line prior to clearing upstream branch circuit protection. This maintains bypass operation capability in the event of a VFD failure. Bypass designs which have no such fuses, or that incorporate fuses common to both the VFD and the bypass, will not be accepted. Third contactor "isolation contactors" are not an acceptable alternative to fuses, as contactors could weld closed and are not an NEC recognized disconnecting device.

6. The bypass shall maintain positive contactor control through the voltage tolerance window of nominal voltage +30%, -35%. This feature is designed to avoid contactor coil failure during brown out / low line conditions and allow for input single phase operation when in the VFD mode. Designs that will not allow input single phase operation in the VFD mode are not acceptable.

7. Motor protection from single phase power conditions - the bypass system must be able to detect a single phase input power condition while running in bypass, disengage the motor in a controlled fashion, and give a single phase input power indication. Bypass systems not incorporating single phase protection in bypass mode are not acceptable.

8. The bypass system shall be designed for stand-alone operation and shall be completely functional in both Hand and Automatic modes even if the VFD has been removed from the system for repair / replacement. Serial communications shall remain functional even with the VFD removed. Bypass systems that do not maintain full functionality with the drive removed are not acceptable.

9. Serial communications – the bypass shall be capable of being monitored and / or controlled via serial communications. On-board communications protocols shall include ModBus RTU; Johnson Controls N2; Siemens Building Technologies FLN (P1); and BACnet MS/TP.

    a. Serial communication capabilities shall include, but not be limited to: bypass run-stop control, the ability to force the unit to bypass, and the ability to lock and unlock the keypad. The bypass shall have the capability of allowing the BAS to monitor feedback such as, current (in amps), kilowatt hours (resettable), operating hours (resettable), and bypass logic board temperature. The BAS shall also be capable of monitoring the bypass relay output status, and all digital input status. All bypass diagnostic warning and fault information shall be transmitted over the serial communications bus. Remote bypass fault reset shall be possible. The following additional status indications and settings shall be transmitted over the serial communications bus and / or via a Form-C relay output – keypad "Hand" or "Auto" selected, bypass selected, and broken belt indication. The BAS system shall also be able to monitor if the motor is running in the VFD mode or bypass mode over serial communications. A minimum of 50 field serial communications points shall be capable of being monitored in the bypass mode.

    b. The bypass serial communications shall allow control of the drive/bypass (system) digital outputs via the serial interface. This control shall be independent of any bypass function or operating state. The system digital (relay) outputs may be used to actuate a damper, open a valve or control any other device that requires a maintained contact for operation. All system analog and digital I/O shall be capable of being monitored by the BAS system.

10. There shall be an adjustable motor current sensing circuit for the bypass and VFD modes to provide proof of flow (broken belt) indication. The condition shall be indicated on the keypad display, transmitted over the BAS and / or via a Form-C relay output contact closure. The broken belt indication shall be programmable to be a system (drive and bypass) indication. The broken belt condition sensing algorithm shall be programmable to cause a warning or system shutdown.

11. The digital inputs for the system shall accept 24VAC or 24VDC. The bypass shall incorporate an internally sourced power supply and not require an external control power source. The bypass power board shall supply 250 mA of 24 VDC for use by others to power external devices.

12. There shall be a run permissive circuit for damper or valve control. Regardless of the source of a run command (keypad command, time-clock control, digital input, or serial communications) the bypass shall provide a dry contact closure that will signal the damper to open before the motor can run. When the damper is fully open, a normally open dry contact (end-switch) shall close. The closed end-switch is wired to a bypass system input and allows motor operation. Up to four separate safety interlock inputs shall be provided. When any safety is opened, the motor shall be commanded to coast to stop, and the damper shall be commanded to close. This feature will also operate in Fireman's override / smoke control mode.

13. The bypass control shall monitor the status of the VFD and bypass contactors and indicate when there is a welded contactor contact or open contactor coil. This failed contactor condition shall be indicated on the bypass LCD display, programmed to activate a Form-C relay output, and / or over the serial communications protocol.

14. The bypass control shall include a programmable time delay bypass start including keypad indication of the time delay. A Form C relay output commands the VAV boxes open. This will allow VAV boxes to be driven open before the motor operates at full speed in the bypass mode. The time delay shall be field programmable from 0 – 120 seconds.

15. There shall be a keypad adjustment to select manual or automatic transfer to bypass. The user shall be able to select via keypad programming which drive faults will result in an automatic transfer to bypass mode and which faults require a manual transfer to bypass. The user may select whether the system shall automatically transfer from drive to bypass mode on the following drive fault conditions:
    a. Over current
    b. Over voltage
    c. Under voltage
    d. Loss of analog input

16. The following operators shall be provided:
    a. Bypass Hand-Off-Auto
    b. Drive mode selector
    c. Bypass mode selector
    d. Bypass fault reset

17. The bypass shall include a two line, 20 character LCD displays. The display shall allow the user to access and view:
    a. Energy savings – in US dollars
    b. Bypass motor amps
    c. Bypass input voltage– average and individual phase voltage
    d. Bypass power (kW)
    e. Bypass faults and fault logs
    f. Bypass warnings
    g. Bypass operating time (resettable)
    h. Bypass energy (kilowatt hours – resettable)
    i. I/O status

j. Parameter settings / programming
k. Printed circuit board temperature

18. The following indicating lights (LED type) or keypad display indications shall be provided. A test mode or push to test feature shall be provided.

    a. Power-on (Ready)
    b. Run enable
    c. Drive mode selected
    d. Bypass mode selected
    e. Drive running
    f. Bypass running
    g. Drive fault
    h. Bypass fault
    i. Bypass H-O-A mode
    j. Automatic transfer to bypass selected
    k. Safety open
    l. Damper opening
    m. Damper end-switch made

19. The Bypass controller shall have six programmable digital inputs, and five programmable Form-C relay outputs. This I/O allows for a total System (VFD and Bypass) I/O count of 24 points as standard. The bypass I/O shall be available to the BAS system even with the VFD removed.

20. The on-board Form-C relay outputs in the bypass shall programmable for any of the following indications.

    a. System started
    b. System running
    c. Bypass override enabled
    d. Drive fault
    e. Bypass fault
    f. Bypass H-O-A position
    g. Motor proof-of-flow (broken belt)
    h. Overload
    i. Bypass selected
    j. Bypass run
    k. System started (damper opening)
    l. Bypass alarm
    m. Over temperature

21. The bypass shall provide a separate terminal strip for connection of freeze, fire, smoke contacts, and external start command. All external safety interlocks shall remain fully functional whether the system is in VFD or Bypass mode. The remote start/stop contact shall operate in VFD and bypass modes. The terminal strip shall allow for independent connection of up to four (4) unique safety inputs.

22. The bypass shall include a supervisory control mode. In this bypass mode, the bypass shall monitor the value of the VFD's analog input (feedback). This feedback value is

used to control the bypass contactor on and off state. The supervisory mode shall allow the user to maintain hysteresis control over applications such as cooling towers and booster pumps even with the VFD out of service.

23. The user shall be able to select the text to be displayed on the keypad when an external safety opens. Example text display indications include "FireStat", "FreezStat", "Over pressure" and "Low suction". The user shall also be able to determine which of the four (4) safety contacts is open over the serial communications connection.

24. Smoke Control Override Mode (Override 1) – The bypass shall include a dedicated digital input that will transfer the motor from VFD mode to Bypass mode upon receipt of a dry contact closure from the Fire / Smoke Control System. The Smoke Control Override Mode action is not programmable and will always function as described in the bypass User's Manual documentation. In this mode, the system will ignore low priority safeties and acknowledge high priority safeties. All keypad control, serial communications control, and normal customer start / stop control inputs will be disregarded. This Smoke Control Mode shall be designed to meet the intent of UL864/UUKL.

25. Fireman's Override Mode (Override 2) – the bypass shall include a second, programmable override input which will allow the user to configure the unit to acknowledge some digital inputs, all digital inputs, ignore digital inputs or any combination of the above. This programmability allows the user to program the bypass unit to react in whatever manner the local Authority Having Jurisdiction (AHJ) requires. The Override 2 action may be programmed for "Run-to-Destruction". The user may also force the unit into Override 2 via the serial communications link.

26. Class 10, 20 or 30 (programmable) electronic motor overload protections shall be included.

PART 3 - EXECUTION

3.1 INSTALLATION

A. Installation shall be the responsibility of the mechanical contractor. The contractor shall install the drive in accordance with the recommendations of the VFD manufacturer as outlined in the VFD installation manual.

B. Power wiring shall be completed by the electrical contractor, to NEC code 430.122 wiring requirements based on the VFD input current. Caution: VFD's supplied without internal reactors have substantially higher input current ratings, which may require larger input power wiring and branch circuit protection. The contractor shall complete all wiring in accordance with the recommendations of the VFD manufacturer as outlined in the installation manual.

3.2 START-UP

A. Certified factory start-up shall be provided for each drive by a factory authorized service center. A certified start-up form shall be filled out for each drive with a copy provided to the owner, and a copy kept on file at the manufacturer.

3.3 PRODUCT SUPPORT

A. Factory trained application engineering and service personnel that are thoroughly familiar with the VFD products offered shall be locally available at both the specifying and installation locations. A toll free 24/365 technical support line shall be available.

B. A computer based training CD or 8-hour professionally generated video (VCR format) shall be provided to the owner at the time of project closeout. The training shall include installation, programming and operation of the VFD, bypass and serial communication.

3.4 WARRANTY

A. The VFD Product Warranty shall be 24 months from the date of certified start-up, not to exceed 30 months from the date of shipment. The warranty shall include all parts, labor, travel time and expenses. A toll free 24/365 technical support line shall be available.

END OF SECTION

SECTION 230290

DUCT MOUNTED COILS

PART 1 - GENERAL

Applicable provisions of the Conditions of the Contract and Division 1 General Requirements govern the work in this section. Submit shop drawings for checking and approval.

PART 2 - PRODUCTS

2.1 DUCT MOUNTED COILS

A. Coils as manufactured by Carrier shall be with aluminum plate fins, have collars drawn, belled, and firmly bonded to copper tubes by mechanical expansion of tubes. No soldering or tinning used in the bonding process.

B. Coils have galvanized steel casing and are mounted pitched in the unit casing. Coils are to be removable in duct flanges. Steam coils are continuous tube type and proof tested at 300 psig air pressure under water.

PART 3 - EXECUTION

3.1 INSPECTION

A. Inspect equipment space locations before beginning installation. Verify that the space is correct for entry and access. Do not proceed with installation of the equipment until unsatisfactory conditions have been corrected.

3.2 INSTALLATION

A. Comply with manufacturer's instructions and recommendations for installation of equipment, accessories and components.

B. All heating, ventilating and air conditioning equipment shall be carefully designed, constructed and installed so as to prevent any objectionable noise or vibration reaching any part of the building outside of the mechanical equipment room. Care shall also be taken to prevent transmission of noise or odor through ductwork into other spaces. The Contractor shall be required to rectify or replace at his own expense, any equipment not complying with the foregoing requirements.

3.3 CLEANING

A. Clean interior and exterior surfaces promptly after installation of equipment and components. Take care to avoid damage to protective coatings and finishes. Remove excess sealants, lubrication, dirt and other foreign substances.

END OF SECTION

SECTION 230320

STEAM UNIT HEATERS

PART 1 - GENERAL

Applicable Provisions of the Conditions of the Contract and Division 1 General Requirements govern work in this section. Submit shop drawings for checking and approval.

PART 2 - PRODUCTS

2.1 STEAM UNIT HEATERS

A. Furnish and install where shown on the Drawings model as manufactured by Sterling Co. or approved equal and shall be of sizes noted on the Drawing.

B. Casing shall be 20 gauge die-formed steel. Casing substrates shall be prepared for finishing with a hot wash, iron phosphatizing clear rinse, chromic acid rinse and oven drying. Paint finish shall be of lead-free, chromate-free, alkyd melamine resin base and applied with an electrostatic two-pass system.

C. Coil elements and headers shall be of heavy wall drawn seamless copper tubing. Element tubes shall be brazed into extruded header junctions. Pipe connection saddles shall be of cast bronze. Aluminum fins shall have drawn collars to assure permanent bond with expanded element tubes and exact spacing.

D. Motors shall be totally enclosed, resilient mounted with class B windings. All motors shall be designed for horizontal mounting.

E. Fans shall be of the aluminum blade, steel hub type designed and balanced to assure maximum air delivery, low motor horsepower requirements and quiet operation. Blades are spark proof. Fan guards shall be welded steel, zinc plated or painted.

F. Units shall be equipped with horizontal, individually adjustable louvers. Vertical louvers for 4-way air control shall be available as an optional extra.

PART 3 - EXECUTION

3.1 INSPECTION

A. Inspect equipment space locations before beginning installation. Verify that the space is correct for entry and access. Do not proceed with installation of the equipment until unsatisfactory conditions have been corrected.

3.2 INSTALLATION

A. Comply with manufacturer's instructions and recommendations for installation of equipment, accessories and components.

3.3 CLEANING

A. Clean interior and exterior surfaces promptly after installation of equipment and components. Take care to avoid damage to protective coatings and finishes. Remove excess sealants, lubrication, dirt and other foreign substances.

END OF SECTION

SECTION 230400

SHEETMETAL WORK AND RELATED ACCESSORIES

PART 1 - GENERAL

Applicable Provisions of the Conditions of the Contract and Division 1 General Requirements shall govern work in this section. Submit shop drawings for checking and approval.

PART 2 - PRODUCTS

2.1 SHEETMETAL DUCTWORK

A. Contractor shall furnish and install all sheet metal ducts as shown on the Drawings. While the Drawings shall be adhered to as closely as possible, the Engineer reserves the right to vary the run and size to meet the field conditions. Any duct size not shown shall be sized in proportion to the air carried at the same resistance in similar ductwork, or of size as directed.

B. All ductwork shall be constructed of galvanized steel gauges to 2 inch wg in accordance with the latest edition of the ASHRAE/SMACNA Guide. Bracing angles for ductwork shall be hot dipped galvanized for steel ductwork and appropriate gauge for aluminum ductwork. All ducts 18" and over in width shall be cross broken to prevent flutter. All ductwork exposed to weather shall be constructed to 2 in wg, type 304 stainless steel construction.

C. Round ductwork shall be galvanized steel, spiral lock seam construction of gauges in accordance with the latest edition of ASHRAE/SMACNA guide. Fittings shall be constructed in standing seam manner. All seams, joints and collars shall be sealed in accordance with SMACNA guidelines for medium pressure ductwork to minimize noise and streaking. Ductwork and fittings shall be connected with sheet metal couplings and sealed as to allow no leakage.

D. Ducts shall be braced as follows:

1. All ducts not exceeding 24" on one side shall be assembled with airtight slip joints.
2. 25" to 40" larger dimension 1" x 1" x 1/8" angles.
3. 41" to 60" larger dimension 1-1/2" x 1-1/2" x 1/8" angles.
4. All bracing angles shall be a minimum of 4' apart along the length of the duct.
5. Furnish and install all angles and frames for all registers, diffusers, grilles and louvers.
6. Support horizontal ducts with hangers spaced not more than 8' apart. Place hangers at all changes in direction. Use strap hangers for cuts up to 30" wide.

E. Comply with all State and Local regulations regarding fire stopping and fireproofing. Provide fusible link fire dampers as required by State, local and Underwriter authorities and where indicated on the Drawings. Each fire damper shall be installed in such a manner as to permit ready access for inspection and maintenance purposes.

F. Provide volume dampers for control of air volume and for balancing systems, where indicated, specified, directed and as required for the proper operation of the systems. Provide raised collars for volume dampers installed on insulated ducts. Dampers shall be of the same material as the duct, at least one gauge heavier that the duct, reinforced where indicating quadrant and locking device for adjusting damper and locking in position.

G. Where ducts fewer than 100 square inches penetrate a rated wall, steel ductwork system of a minimum 0.0127 inch thickness shall be used.

H. All elbows shall have a minimum center line radius of 150% of duct width. If the radius is smaller, turning vanes shall be used: Turning vanes shall be double thickness, fitted into slide strips and screwed or riveted to duct below.

I. Contractor shall furnish and install all access doors in ducts as required. Access doors shall be of the pan type 1" thick and shall be provided with two galvanized hinges and suitable latched. Access doors insulated with same thickness material as duct and shall be double casing construction.

2.2 REGISTERS AND DIFFUSERS

A. Registers and diffusers shall be installed where shown on the Drawings and shall be of the sizes specified and the type indicated on the drawing schedule.

B. All registers and diffusers shall be installed in accordance with manufacturer's recommendations.

C. Registers and diffusers shall be as manufactured by Price, Carnes, Hart and Cooley or Anemostat Co.

PART 3 - EXECUTION

3.1 INSPECTION

A. Inspect equipment space locations before beginning installation. Verify that the space is correct for entry and access. Do not proceed with installation of the equipment until unsatisfactory conditions have been corrected.

3.2 INSTALLATION

A. Comply with manufacturer's instructions and recommendations for installation of equipment, accessories and components.

B. All heating, ventilating and air conditioning equipment shall be carefully designed, constructed and installed so as to prevent any objectionable noise or vibration reaching any part of the building outside of the mechanical equipment room. Care shall also be taken to prevent transmission of noise or odor through ductwork into other spaces. The Contractor shall be required to rectify or replace at his own expense, any equipment not complying with the foregoing requirements.

3.3 CLEANING

A. Clean interior and exterior surfaces promptly after installation of equipment and components. Take care to avoid damage to protective coatings and finishes. Remove excess sealants, lubrication, dirt and other foreign substances.

END OF SECTION

SECTION 230410

PIPING, FITTINGS, VALVES AND NOTES (STEAM)

PART 1 - GENERAL

Applicable Provisions of the Conditions of the Contract and Division 1 General Requirements shall govern work in this section. Submit shop drawings for checking and approval.

1.1 PIPING NOTES

A. The Contractor shall erect all pipe, fittings, valves, hangers, anchors, expansion joints and all accessories specified, indicated on the Drawings or required to assure proper operation of all piping systems installed under this Contract. All piping shall be maintained at a proper level to assure satisfactory operation, venting and drainage. Piping and valves in any locality where possible shall be grouped neatly and shall be run so as to avoid reducing headroom or passage clearance.

B. All piping shall be new and of the material and weight specified under various services. Steel and wrought iron pipe 2" and larger shall be seamless or lap welded. All piping shall have the maker's name and brand rolled on each length of pipe.

C. All piping, fittings, valves and strainers shall be cleaned of grease, dirt and scale before installation. All temporary pipe openings shall be kept closed during the performance of the work. The ends of all piping shall be reamed smooth and all burrs removed before installation.

D. All piping shall be cut accurately to measurements taken on the job. Offset connections shall be installed alignment of vertical to horizontal piping and where required to make a true connection and to provide for expansion. Bent or sprung pipe shall not be installed where shown on Drawings and where necessary to provide for expansion of piping. Cold spring hot lines one-half estimated distance of maximum expansion. Suitable pipe anchors shall be installed where shown or required.

E. Piping connections shall have unions where necessary for replacement and repair of equipment. Gate valves and controls valves shall be installed where shown and where necessary for proper operation and service.

F. Vertical piping shall be plumb and horizontal piping shall be parallel to walls and partitions. Piping shall be supported as required to prevent the transmission of noise and vibration.

G. Work shall include all pipe, fittings, offsets and requirements for the installation of piping of other work including ducts and conduit. Reducing fittings shall be used where pipe changes size. All piping shall be installed with ample clearance to center accurately in sleeves through floors, and walls and partitions.

H. Piping shall be downgraded to drain connections at low points.

PART 2 - PRODUCTS

2.1 PIPING

A. All piping installed under this Section of the Specifications shall be in accordance with the following schedule.

1. Piping for low pressure shall be standard weight black steel pipe Schedule 40, Grade A53, black steel and Schedule 80, Grade A53 for medium and high pressure. All steam condensate piping shall be Schedule 80, Grade A53. Pipe 2" and smaller, cast iron screwed fittings. Pipe 2-1/2" and larger, steel welding fittings. Pipe and fittings as manufactured by National, Wheeling, Bethlehem or equal, manufactured in accordance with ASTM current edition. All pipes must be reamed before installation.

2. All drainage pipe lines, 2" larger except where galvanized screw pipe is shown on the Drawings or specified hereafter, shall be extra heavy cast iron soil pipe and fittings.

B. Threaded short and close nipples shall be Schedule 80, extra heavy weight of the same material as pipe in system in which they are installed.

2.2 VALVES

A. All valves, unless specified or noted otherwise, shall be designed for a working pressure of not less than 200 psi water or 125 psi steam with name and pressure rating of valve cast in body. All valves shall be of the same manufacturer, unless specified otherwise. Valves for cut-off shall be gate valves, unless otherwise specified.

B. All valves of same manufacturer: similar to Jenkins Bros., Walworth, Kennedy or approved equal.

C. Four inch and larger, flanged; smaller sizes, screwed.

D. All Gate and Globe valves shall be installed with handle in an upright position.

E. The Contractor shall furnish and install all valves shown on Drawings and all valves that are necessary for proper operation and maintenance of systems and equipment. All piping connections to each piece of equipment and all branch connections to mains shall have cut-off valves.

F. The following schedule of valves for steam, condensate, etc. is based on Jenkins Brothers, Inc. catalog numbers (except as noted); equivalent Lukenheimer, Walworth, O-I-C, Crane Fairbanks Company valves will be acceptable.

G. Gate Valves

1. Up to 2" : Bronze gate solid wedge, inside screw traveling stem union bonnet, -Fig. 47U
2. 2-1/2" and 3" : Iron body, bronze-mounted gate, solid wedge, OS&Y rising stem, -Fig. 650-A
3. 4" and larger: Iron body, bronze-mounted gate, solid wedge, OS&Y rising stem, -Fig. 651-A
4. Provide chain wheel gear operator on all valves installed 7 feet or higher.

2.3 FITTINGS

A. Nipples

1. All nipples shall have clean cut threads and shall be made from new pipe, standard weight for all lengths, except that close and shoulder nipples shall be extra heavy.

2. Fittings - 2-1/2 and Smaller: All fittings shall be standard weight steam pattern gray cast iron, Grinnell, Stockholm or equal approved.

3. Fitting - 3" and Larger: The Contractor has the option to use screwed, flanged or welded fittings so long as all ASME requirements are met.

B. Joints and Unions

1. Threaded joints shall be full and clean cut. The ends of pipe shall be reamed to the full inside diameter, all burrs shall be removed and no more than three threads shall be exposed beyond fittings when made up. Joints shall be made up tight with graphite base pipe joint compound. Exposed threads of ferrous pipe shall be painted with acid-resisting paint after caulking, lamp-wick or other material will be allowed for correction of defective joints.

2. Flange joints shall be made up perfectly square and tight. Screwed flanges and loose flanges shall be cast iron and welding flanges shall be steel. Flanges shall be faced true and bolted up tight with 1/16" Car-lock ring type gasket.

3. Bolts shall be high quality steel with hexagon nuts and heads. The Contractor shall apply grease to threads of bolt.

4. Welded joints in piping shall be by the electric or oxyacetylene process using welding rods if the characteristics similar to pipe material and as recommended by the pipe manufacturer and shall be done in accordance with the ASME Code for pressure piping. Welding shall be done by qualified welders under the requirements of the ASME Boiler and Pressure Vessel Code.

5. The pipe lengths shall be aligned with welding rings and the abutting pipe ends shall be concentric. Prior to welding, the groove and adjacent surfaces shall be thoroughly cleaned of all grease, scale or rust. During welding, all slag, or flux remaining on the bead shall be removed before laying down the next bead. The welding metal shall be thoroughly fused with the base metal at all sections of the weld. Short lengths of pipe may be beveled on the job with oxyacetylene torch, provided all scale and oxides are removed.

6. Joints shall be butt-welded, single V-type. All fittings shall be steel welding fittings. Elbows and fittings formed with coupling or welded cut pipe sections shall not be acceptable.

7. Bonney Weldolets or welding saddles may be used for branch connections, which are less than one-half the size of the main to which they connect.

8. Ground Joint Unions, Flange Connections, Reaming & Filling Ground joint unions shall be 200 lb. s.w.p. for brass. Flanges shall be 150 lb. s.w.p. for brass, 125 lb. s.w.p. for cast iron.

9. Ground joint unions of flanges shall be used only on exposed accessible piping. Where concealed, right and left nipples and couplings must be used. Where flanged connections are used, full size gaskets must be inserted.

C. Threads: Shall be standard, clean cut and tapered. All piping shall be reamed free from burrs. All piping shall be kept free of scale and dirt. Caulking of threads will not be permitted. All piping shall be threaded and made up in accordance with the current edition of the ASA Standard Specifications for pipe threads.

D. Unions

1. Unions for use on ferrous pipe 2" and smaller shall be malleable iron with brass to iron ground joint spherical seat and threaded connections. Unions 2 1/2" and over shall be flanged type with gasket.

2. Unions shall be installed wherever necessary for repair or replacement of equipment, valves, strainers, etc. Final connections to equipment shall be made in a manner that will permit removal without cutting of pipelines.

E. Expansion

1. The entire piping installation shall be installed with adequate provision for expansion. No rigid connections will be permitted.

2. Branches shall be of sufficient length and have 3 elbow swings to allow for pipe expansion.

3. Provide expansion joints, guides and anchors equal to “Flexonics” Type HCF where indicated on Drawings or where necessary for proper expansion compensation. Submit shop drawing.

4. Any breaks in the piping within the guarantee period due to improper provision for expansion must be replaced at the expense of this Contractor, and the conditions corrected to prevent future recurrence.

5. Any damages to surrounding areas and equipment due to this failure shall also be repaired and paid for at the expense of the Contractor.

6. Joints to have 150 psi rating, ANSI-B16.5 with liner and cover.

2.4 PIPING SLEEVES

A. Furnish sleeves built into place for all piping passing through walls, floors or building construction. Sleeves, not less than 1/2” larger in diameter than piping and its covering, if any, and extending full depth of construction pierced. Pack sleeves through walls/floors in accordance with Underwriters' Requirements.

B. Sleeves piercing exterior walls, integral waterproofed walls shall be standard weight steel piping. Furnish welded center flange buried in construction for sleeves through exterior walls below grade. At exterior walls, make pipes watertight in sleeves with oakum packing and caulked lead joints on both sides of wall. All other sleeves: Galvanized sheet steel with lockseam joints, #22 USSG for 3" or under. Sleeves for piping 4" and larger, #18 USSG.

C. Pipes passing through interior membrane waterproofed floors, cast iron flashing sleeve, with integral flashing flange and clamping ring, similar to Josam Series #1880. Adjust sleeves to floor construction with steel or wrought iron pipe nipples top and bottom, extending 3" above finished floor. Burn & J.R. Smith are equal.

D. Pipes passing through membrane waterproofed walls, cast iron flashing sleeve with internal flashing flange and clamping ring similar to Josam Series #1870. Make pipes watertight in sleeves with oakum packing and caulked lead joints. Burn & J.R. Smith are equal.

E. For flashing sleeves specified in Pars. C and D, lead flashing extended at least 10" around flashing sleeves, securely held in place by clamping device.

2.5 PIPING ENCLOSURES

A. Where concealed piping in ceilings and wall of finished spaces is not possible vertical or horizontal metal piping enclosures equal to "Sterling" model PCH (horizontal) or PCHV (vertical). Provide all required hangers, supports, corners, brackets, etc. color per Architect.

2.6 ESCUTCHEONS

A. Furnish tamperproof pipe escutcheons at all surfaces where exposed piping bare or covered, passes through walls, ceilings, floors or partitions.

B. Escutcheons: Stamped sheet metals, chromium plated over copper on all surfaces and satin finish on exposed side. Fasten escutcheons securely to pipe sleeves or to extensions of sleeves without any part of sleeve or extension being visible; escutcheons held in place by tamperproof screws and on covered pipe by internal spring tension, tamperproof.

C. Where sleeves or fittings project slightly from wall, partitions, floor or ceiling, provide special deep type escutcheons.

PART 3 - EXECUTION

3.1 GENERAL NOTES

A. Piping shall be installed as indicated on Drawings. Elevations and dimensions are indicated as a guide only and are subject to change with actual job conditions.

B. Mains shall pitch upward or be installed dead level as indicated. Horizontal runs shall be parallel to walls.

C. In general, all branch connections shall be top of bottom 45 degree or 90 degree, pitching up or down from mains.

D. All piping shall be adequately supported with approved type hangers so as to prevent absolutely any sagging of lines, or any undue strain on pipes or fittings. All pipe lines shall be capped during construction to prevent entry of dirt or other foreign material. All piping lines after erection shall be blown or flushed out to render the piping system as clean as possible before system water is added for operation.

END OF SECTION

SECTION 230420

SUPPORTS, SLEEVES AND PLATES

PART 1 - GENERAL

Applicable Provisions of the Conditions of the Contract and Division 1 General Requirements govern work in this section. Submit shop drawings for checking and approval.

1.1 DESCRIPTION OF WORK

A. This Contractor shall furnish and install all plates, hangers and supports for his equipment including piping, headers, fans, expansion tank, ductwork, etc.

B. All ductwork, piping and equipment shall be hung or supported from structural members only.

PART 2 - PRODUCTS

2.1 PIPING, DUCTWORK AND EQUIPMENT

A. All piping shall be supported from building structure in a neat and workmanlike manner wherever possible, parallel runs of horizontal piping shall be grouped together on trapeze hangers. Vertical risers shall be supported at each floor line with steel pipe clamps. Use of wire perforated metal to support pipes will not be permitted. Hanging pipes from other pipes will not be permitted.

B. Necessary structural members, hangers and supports of approved design to keep piping in proper alignment and prevent transmission of injurious thrusts and vibrations shall be furnished and installed. In all cases where hangers, brackets, etc., are supported from concrete construction, care shall be taken not to weaken concrete or penetrate waterproofing.

C. All hangers and supports shall be capable of screw adjustment after piping is erected. Hangers supporting piping expanding into loops, bends and offsets shall be secured to the building structure in such a manner that horizontal adjustment perpendicular to the run of piping supported may be made to accommodate displacement due to expansion. All such hangers shall be finally adjusted, both in the vertical and horizontal direction, when the supported piping is hot.

D. Pipe hangers shall be as manufactured by Grinnell, whose catalog numbers are given herein, or equivalent Carpenter and Paterson, or F&S Mfg. Co.

E. Piping shall be supported as follows unless otherwise indicated on the Drawings:

1. Heating piping shall be 1-1/2 " and smaller Fig. #260 adjustable clevis hanger. 2" and larger Fig. #174 one-rod swivel roll hanger.

2. Two-rod hangers shall be used for piping close to the ceiling slab or where conditions prohibit use of other hanger types.

3. Anchors for hanger rods shall be Phillips "Red Head" self-drilling type. Anchors shall be placed only in vertical surfaces.

4. Spacing of pipe supports shall not exceed 8 feet for pipes up to 1-1/2" and 10 feet on all other piping.

5. Hangers shall pass around insulation and a 16 gauge steel protective cradle; 12" long shall be inserted between hangers and insulation. Insulation under cradle shall be high density calcium silicate or approved equal to prevent crushing.

6. All piping shall be supported to allow free movement where expanding or contracting. Pipe shall be anchored as required or directed.

7. All lateral runs of piping shall be securely supported on hangers, rolls, brackets, etc. and in manner to allow for proper expansion and elimination of vibration.

8. 2" and smaller pipe, where run on walls, shall be supported on wrought iron "J" hook brackets with anchor bolts.

9. All horizontal pipes, where run overhead or on walls, shall be supported as follows unless otherwise indicated: On adjustable steel clevis type hangers suspended on hanger rods, pipe sizes up to and including 4".

F. Space limitations in hung ceilings spaces and conditions in other locations may require use of other type of hangers than those specified above. Suitable and approved pipe hangers shall be provided for such job conditions.

G. All supports shall be fastened to structural members or additional steel supports furnished by this Contractor.

H. Hanger rods shall be steel, threaded with nuts and lock nuts sizes in accordance with the following schedule:

Pipe Size	Rod Size
3/4" to 2" inclusive	3/8"
2-1/2" and 3' inclusive	1/2"
4" and 5" inclusive	5/8"
6"	3/4"
8" to 12" inclusive	7/8"

I. Hangers for copper tubing shall be tacked up with formed lead sheet on which tubing or pipe shall be placed.

J. Where pipes pass through masonry, concrete walls, foundations, or floors, this Contractor shall set sleeves as are necessary for passage of pipes. These sleeves shall be of sufficient size to permit insulation where required to be provided around pipe passing through. This Contractor shall be responsible for exact location of these sleeves.

K. Sleeves shall not be used in any portion of building where use of same would impair strength of construction features of the building. Inserts for supporting lateral pipes and equipment shall be placed and secured to form work, and all sleeves inserts locations shall be thoroughly checked with Architect so as not to conflict with other trades.

L. Where pipes pass through floor or walls, they shall be provided with chromium plated escutcheons.

M. Anchor horizontal piping where indicated and wherever necessary to localize expansion or prevent undue strain on branches. Anchors: Heavy forged construction entirely separate from supports.

N. Anchor vertical piping wherever indicated and wherever necessary to prevent undue strain on offsets and branches. Anchors, unless otherwise noted: Heavy steel clamps securely bolted and welded to pipes. Extension ends shall bear on building construction.

O. Ducts shall be hung with 1" x 1/8" metal straps. When width of duct is less than 48", hangers shall be fastened to side of ducts. Auxiliary steel supports that may be required for all mechanical equipment shall be furnished and installed by this Contractor. All operating equipment including fans, piping, etc. shall be supported so as to produce minimum amount of noise transmission.

P. Refer to "General Conditions" as well.

PART 3 - EXECUTION

3.1 INSPECTION

A. Inspect equipment space locations before beginning installation. Verify that the space is correct for entry and access. Do not proceed with installation of the equipment until unsatisfactory conditions have been corrected.

3.2 INSTALLATION

A. Comply with manufacturer's instructions and recommendations for installation of equipment, accessories and components.

B. All heating, ventilating and air conditioning equipment shall be carefully designed, constructed and installed so as to prevent any objectionable noise or vibration reaching any part of the building outside of the mechanical equipment room. Care shall also be taken to prevent transmission of noise or odor through ductwork into other spaces. The Contractor shall be required to rectify or replace at his own expense, any equipment not complying with the foregoing requirements.

3.3 CLEANING

A. Clean interior and exterior surfaces promptly after installation of equipment and components. Take care to avoid damage to protective coatings and finishes. Remove excess sealants, lubrication, dirt and other foreign substances.

END OF SECTION

SECTION 230430

INSULATION AND COVERINGS

PART 1 - GENERAL

Applicable Provisions of the Conditions of the Contract and Division 1 General Requirements govern work in this section. Submit shop drawings for checking and approval.

1.1 DESCRIPTION OF WORK

A. Furnish insulation for all piping, equipment and sheet metal work as noted.

B. Insulate no piping, ducts or equipment until tested and approved for tightness. All piping and ducts shall be dry when covered. Where existing insulation has been damaged, altered of removed during the course of the work, it shall be replaced with new insulation in a neat manner to match the adjacent insulation.

C. All insulation must be done by an approved Sub-Contractor or by mechanics skilled in this line of work.

D. Fire hazard classification shall be 2550 per ASTM E-84, NFPA 255 and UL 723. Insulation shall be rated non-combustible type classified flame spread - 25, smoke developed - 50.

PART 2 - PRODUCTS

2.1 DUCTWORK (INDOOR)

A. All supply, outside air intake and exhaust (on discharge side of fan) and return (in unconditioned spaces) ductwork shall be covered with fiberglass insulation with aluminum foil vapor barrier. All joints shall be lapped so maximum coverage is achieved.

B. All insulated ductwork shall be insulated with fiberglass board insulation with canvas finish in areas where ductwork is exposed.

C. Insulation thickness shall be in accordance with the latest edition of the New York State Energy Conservation Construction Code.

D. Thermal acoustic lining of ductwork where indicated shall be 1-1/2” thickness fiberglass unless otherwise noted. The lining shall have a mat facing and shall meet the Life Safety Standards as established by NFPA 90A and 9B and conform to the requirements of ASTMC 1071.

2.2 DUCTWORK (OUTDOOR)

A. All exposed ductwork shall be insulated with 2” flexible elastomeric thermal insulation with 12 mil laminated covering with pressure sensitive adhesive. Provide 6” wide seam tape with matching cladding. Armacell Model Armatuff insulation or approved equal.

B. Make proper provision with ductwork support(s) so that insulation is not crushed. All exterior ductwork must be designed with adequate slope (watershed) to prevent ponding water.

2.3 PIPING / EQUIPMENT (INDOOR)

A. All new or altered heating and condensate water system supply and return piping shall be covered with Manville Micro-Lok or equal approved fiberglass insulation with all service (factory applied) vapor retardant jacket. Seal with type H mastic.

B. Fittings shall be insulated with same material and thickness as adjoining pipe insulation and shall be pre-molded fittings or miter cut segmental insulation wired on. Over the insulation, apply a wrapper of OCF glass cloth sealed with type H mastic. Apply aluminum bands on pipe covering in addition to self-sealing feature.

C. Insulation Material: Molded fibrous glass insulation, density not less than 4 lbs. per cubic foot.

D. Insulation Thickness: Shall be in accordance with the latest edition of the New York State Energy Conservation Construction Code. For piping 1-1/2" or less insulation shall be 1-1/2" thick. For piping 2" or greater insulation shall be 3" thick for steam, 2" thick for hot water and 1-1/2" thick for chilled water, brine or refrigerant.

E. Jacket and Finish: White flame retardant type, meeting all requirements of "Fire Hazard Classification" of NFPA, similar to "Fiberglass" Type FRJ, Insul-Coustic, Johns-Manville or approved equal.

F. Insulation and Finishes for Fittings, Valves and Flanges

1. Valves, fittings and flanges other than vapor seal insulation: Insulated in same manner and same thickness as piping in which installed.
2. Use pre-molded sectional covering where available; otherwise use mitered segments of pipe covering.
3. Obtain written approval prior to using other than molded sectional covering.

G. Vapor seal Insulation for Valves, Fittings and Flanges: Same as above, except joints sealed with vapor barrier adhesive and wrapped with glass mesh tape. Each fitting shall be finished with two coats of vapor seal mastic adhesive.

H. Jacket and Finishes: Exposed fittings - 6 oz. canvas jacket adhered with lagging adhesive.

I. Concealed fittings: Standard weight canvas jacket adhered with lagging adhesive and with bands of 18 gauge copper coated steel - 2 bands at elbows, 3 at tee.

J. Insulation at Pipe Hangers

1. Where shields are specified at hangers on piping with fibrous glass covering, provide load bearing calcium silicate between shields and piping as follows:

   a. For pipe covering without vapor barrier jacket, furnish at each shield 12" - long calcium silicate section with canvas section with canvas jacket continuous between shield and insulation.

   b. For pipe covering with vapor barrier jacket, furnish at each shield 12" - long vapor barrier jacket section with section of fibrous glass replaced with section of calcium silicate. Vapor barrier jacket, continuous between shield and insulation for continuous vapor barrier.

K. Refrigerant piping shall be insulated with 1/2" Imcosheild un-split polyolefin insulation.

L. Equipment

1. Secure fibrous glass block or board insulation in place with wire or galvanized steel bands.

a. Small Areas: Secure insulation with 16 gauge wire on maximum 6" centers.

b. Large Areas: Secure insulation with 14 gauge wire or .015" thick by 1/2" wide galvanized steel bands on maximum 10" centers. Stagger insulation joints.

c. Irregular Surfaces: Where application of block or board insulation is not practical insulate with insulating cement built-up to same thickness as adjoining insulation.

2. Fill joints, voids and irregular surfaces with insulating cement to a uniform thickness.

3. Stretch wire mesh over entire insulated surface and secure to anchors with wire edges laced together.

4. Apply finishing cement, total of 1/2" thick, in 1/4" thick coats. Trowel second coat to a smooth hard finish.

5. Neatly bevel insulation around handholes, cleanouts, ASME stamp, manufacturer's nametag and catalog number.

M. Insulated Covers for Pumps: Do not extend pump insulation beyond or interfere with stuffing boxes or interfere with adjustment and servicing of parts regular maintenance or operating attention.

2.4 PIPING (OUTDOOR)

A. All supply and return piping shall be covered with 2" thickness insulation.

B. Insulation shall be calcium silicate with aluminum jacket.

C. Calcium silicate insulation shall conform with ASTM C 533, Type I, and shall be Manville "Thermo-12" or approved equal.

D. Insulation jacket shall be 0.016 inch thick aluminum for pipes 2-1/2 inches and larger, and 0.010 inch thick for pipes 2 inches and smaller with a built-in isolation felt. All seams and joints shall be weatherproof.

E. Refrigerant piping shall be insulated with 1/2" Imcosheild un-split polyolefin insulation.

PART 3 - EXECUTION

3.1 INSPECTION

A. Inspect equipment space locations before beginning installation. Verify that the space is correct for entry and access. Do not proceed with installation of the equipment until unsatisfactory conditions have been corrected.

3.2 INSTALLATION

A. Comply with manufacturer's instructions and recommendations for installation of equipment, accessories and components.

B. All heating, ventilating and air conditioning equipment shall be carefully designed, constructed and installed so as to prevent any objectionable noise or vibration reaching any part of the building outside of the mechanical equipment room. Care shall also be taken to prevent transmission of noise or odor through ductwork into other spaces. The Contractor shall be required to rectify or replace at his own expense, any equipment not complying with the foregoing requirements.

3.3 CLEANING

A. Clean interior and exterior surfaces promptly after installation of equipment and components. Take care to avoid damage to protective coatings and finishes. Remove excess sealants, lubrication, dirt and other foreign substances.

END OF SECTION

SECTION 230440

DAMPERS AND MISCELLANEOUS

PART 1 - GENERAL

Applicable Provisions of the Conditions of the Contract and Division 1 General Requirements govern work in this section. Submit shop drawings for checking and approval.

PART 2 - PRODUCTS

2.1 DAMPERS AND MISCELLANEOUS

A. Furnish and install where shown on Drawings ARROW PIN-LOCK Dampers No. OBDPL-507 (Opposed) as manufactured by the Arrow Louver & Damper Corp. of Maspeth, NY 11378, or approved equal. Frames and blades to 1/8" extruded aluminum.

B. Blades to be single unit PIN-LOCK design 6" wide, with the PIN-LOCK an integral section within the blade center axis. Frames to be a combination of 4" extruded aluminum channel and angle, with reinforcing bosses and groove inserts for vinyl seals.

C. Pivot rods to be 1/2" diameter extruded aluminum, PIN-LOCK design interlocking into blade section. Bearings to be "Double-Sealed" type with Celcon inner bearing on rod riding in Merlon Polycarbonate outer bearing inserted in frame so that outer bearing cannot rotate.

D. Blade linkage hardware is to be installed in angle or channel frame section out of air stream. All hardware to be of non-corrosive reinforced material or to be cadmium plated.

E. Rod bearing to be designed for minimum air leakage by means of overlapping design and by extruded vinyl seals to fit into integral ribbed groove inserts in both frames and blades. All dampers in excess of 10 sq. ft. free area to have reinforced corners by means of gusset plates.

F. Dampers shall be sized by the Control Manufacturer to properly control the flow of air and ensure minimum air stratification in mixing applications. Sizing shall be submitted for approval with information similar to that submitted on valve when sizing valve.

2.2 FIRE DAMPERS

A. Dampers shall be multi blade construction UL labeled and be installed in accordance with UL 555, with breakaway connections. The units shall have stainless steel actuator springs with locking devices for horizontally mounted type.

PART 3 - EXECUTION

3.1 INSPECTION

A. Inspect equipment space locations before beginning installation. Verify that the space is correct for entry and access. Do not proceed with installation of the equipment until unsatisfactory conditions have been corrected.

3.2 INSTALLATION

A. Comply with manufacturer's instructions and recommendations for installation of equipment, accessories and components.

B. All heating, ventilating and air conditioning equipment shall be carefully designed, constructed and installed so as to prevent any objectionable noise or vibration reaching any part of the building outside of the mechanical equipment room. Care shall also be taken to prevent transmission of noise or odor through ductwork into other spaces. The Contractor shall be required to rectify or replace at his own expense, any equipment not complying with the foregoing requirements.

3.3 CLEANING

A. Clean interior and exterior surfaces promptly after installation of equipment and components. Take care to avoid damage to protective coatings and finishes. Remove excess sealants, lubrication, dirt and other foreign substances.

END OF SECTION

SECTION 230450

LOUVERS

PART 1 - GENERAL

Applicable Provisions of the Conditions of the Contract and Division 1 General Requirements govern the work in this section. Submit shop drawings for checking and approval.

1.1 SUMMARY

A. Section Includes: Fixed, extruded-aluminum louvers.

1.2 PERFORMANCE REQUIREMENTS

A. Structural Performance: Louvers shall withstand the effects of gravity loads and the following loads and stresses within limits and under conditions indicated without permanent deformation of louver components, noise or metal fatigue caused by louver blade rattle or flutter, or permanent damage to fasteners and anchors.

1. Wind Loads: Determine loads based on pressures as indicated on Drawings.

2. Wind Loads: Determine loads based on a uniform pressure of 30 lbs./sq. ft., acting inward or outward.

B. Louver Performance Ratings: Provide louvers complying with requirements specified, as demonstrated by testing manufacturer's stock units identical to those provided, except for length and width according to AMCA 500-L.

C. Special Finish Warranty: The louver manufacturer shall supply an industry standard 20-year limited warranty against failure or excessive fading of the Fluoropolymer Powder Coat finish.

1.3 ACTION SUBMITTALS

A. Product Data: For each type of product indicated.

1. For louvers specified to bear AMCA seal, include printed catalog pages showing specified models with appropriate AMCA Certified Ratings Seals.

B. Shop Drawings: For louvers and accessories. Include plans, elevations, sections, details, and attachments to other work. Show frame profiles and blade profiles, angles, and spacing.

C. Samples: For each type of metal finish required.

1.4 INFORMATIONAL SUBMITTALS

A. Product Test Reports: Based on tests performed according to AMCA 500-L.

PART 2 - PRODUCTS

2.1 MATERIALS

A. Aluminum Extrusions: ASTM B 221, Alloy 6063-T5, T-52, or T6.

B. Aluminum Sheet: ASTM B 209, Alloy 3003 or 5005 with temper as required for forming, or as otherwise recommended by metal producer for required finish.

C. Fasteners: Use types and sizes to suit unit installation conditions.

1. For fastening aluminum, use aluminum or 300 series stainless-steel fasteners.
2. For fastening galvanized steel, use hot-dip-galvanized steel or 300 series stainless-steel fasteners.
3. For fastening stainless steel, use 300 series stainless-steel fasteners.
4. For color-finished louvers, use fasteners with heads that match color of louvers.

D. Bituminous Paint: Cold-applied asphalt emulsion complying with ASTM D 1187.

2.2 FABRICATION - GENERAL

A. Fabricate frames, including integral sills, to fit in openings of sizes indicated, with allowances made for fabrication and installation tolerances, adjoining material tolerances, and perimeter sealant joints.

B. Join frame members to each other and to fixed louver blades with fillet welds concealed from view unless otherwise indicated or size of louver assembly makes bolted connections between frame members necessary.

C. Horizontal, Drainable-Blade Louver:

1. Basis-of-Design Product: Subject to compliance with requirements, provide product by one of the following:

    a. Construction Specialties, Inc. model A4097
    b. Approved equal.

2. Louver Depth: 4 inches.

3. Frame and Blade Nominal Thickness: Not less than 0.060 inch for blades and 0.060 inch for frames.

4. Louver Performance Ratings

    a. Free Area: 53%.
    b. Point of Beginning Water Penetration: Not less than 900 fpm.
    c. Air Performance: Not more than 0.13-inch wg static pressure drop at 1040 fpm free-area intake velocity.

5. AMCA Seal: Mark units with AMCA Certified Ratings Seal.

2.3 LOUVER SCREENS

A. General: Provide screen at each exterior louver.

B. Louver Screen Frames: Same kind and form of metal as indicated for louver to which screens are attached.

C. Louver Screening

1. Bird Screening: Flattened, expanded aluminum, 5/8 by 0.050 inch thick.

2.4 ALUMINUM FINISHES

A. Powder Coating

1. All louvers shall be finished with C/S Powder Coat, a coating to be 1.5 to 3 mil. thick full strength 100% resin Fluoropolymer coating. Finish to allow zero VOCs to be emitted into facility of application. Finish to adhere to a 4H Hardness rating.

2. All finishing procedures shall be one continuous operation in the plant of the manufacturer. The coating shall meet or exceed all requirements of AAMA specification 2605 “Voluntary Specification for High Performance Organic Coatings on Architectural extrusions and Panels.”

3. Color and Gloss: As selected by Architect from manufacturer's full range.

2.5 INSTALLATION

A. Locate and place louvers and vents level, plumb, and at indicated alignment with adjacent work.

B. Use concealed anchorages where possible. Provide brass or lead washers fitted to screws where required to protect metal surfaces and to make a weathertight connection.

C. Provide perimeter reveals and openings of uniform width for sealants and joint fillers, as indicated.

D. Repair damaged finishes so no evidence remains of corrective work. Return items that cannot be refinished in the field to the factory and refinish entire unit or provide new units.

E. Protect galvanized and nonferrous-metal surfaces that will be in contact with concrete, masonry, or dissimilar metals from corrosion and galvanic action by applying a heavy coating of bituminous paint.

PART 3 - EXECUTION

3.1 INSPECTION

A. Inspect equipment space locations before beginning installation. Verify that the space is correct for entry and access. Do not proceed with installation of the equipment until unsatisfactory conditions have been corrected.

3.2 INSTALLATION

A. Comply with manufacturer's instructions and recommendations for installation of equipment, accessories and components.

3.3 CLEANING

A. Clean interior and exterior surfaces promptly after installation of equipment and components. Take care to avoid damage to protective coatings and finishes. Remove excess sealants, lubrication, dirt and other foreign substances.

END OF SECTION

SECTION 230460

AUTOMATIC TEMPERATURE CONTROLS

PART 1 - GENERAL

Applicable provisions of the conditions of the Contract and Division 1 General Requirements govern the work in this section. Submit shop drawings for checking and approval.

Subcontractor must familiarize himself with the terms of the above documents.

1.1 QUALIFICATIONS OF BIDDER

A. All bidders must be building automation contractors in the business of installing direct digital control building automation systems for a minimum of 10 years.

B. All bidders must have an office in the within 50 miles of jobsite.

C. All bidders must be authorized distributors or branch offices of the manufacturers specified.

D. All bidders must have a trained staff of application Engineers, who have been certified by the manufacturer in the configuration, programming and service of the automation system.

E. The following bidders have been pre-qualified:

1. Andover Controls Corporation

2. Or as approved by District.

1.2 SCOPE OF WORK

A. Except as otherwise noted, the control system shall consist of all Ethernet Network Controllers, Stand-alone Digital Control Units, workstations, software, sensors, transducers, relays, valves, dampers, damper operators, control panels, along with a complete system of electrical interlocking wiring to fill the intent of the Specification and provide for a complete and operable system. Except as otherwise specified, provide operators for equipment such as dampers if the equipment manufacturer does not provide these. Coordinate requirements with the various Contractors.

B. The BAS Contractor shall review and study all HVAC Drawings and the entire Specification to familiarize himself with the equipment and system operation and to verify the quantities and types of dampers, operators, alarms, etc. to be provided.

C. Prior to commencement of schedule programming meet with Owner to discuss block/individual scheduling of system/equipment and alarm protocols. Do not simply assume block scheduling of similar type of equipment (e.g.: Exhaust, fans unit ventilators, etc.). Review equipment designations and graphics screens to be provided. Take minutes of this meeting and issue them to the Construction Manager/Owner's representative.

D. All interlocking wiring (regardless of voltage) and installation of control devices associated with the equipment listed below shall be provided under this Contract. The BAS Contractor shall provide power wiring for all control equipment from available spare circuits. When the BAS system is fully installed and operational, the BAS Contractor and representatives of the Owner will review and check out the system. At that time, the BAS Contractor shall demonstrate the operation of the system and prove that it complies with the intent of the Drawings and Specifications.

E. The Contractor shall furnish and install a complete building automation system including all necessary hardware and all operating and applications software necessary to perform the control sequences of operation as called for in this Specification.

F. Provide services and manpower necessary for commissioning of system in coordination with the HVAC Contractor, Balancing Contractor and Owner's representative.

G. All work performed under this section of the Specifications will comply with all codes, laws and governing bodies. If the Drawings and/or Specifications are in conflict with governing codes, the Contractor shall submit a proposal with appropriate modifications to the project to meet code restrictions. If this Specification and associated Drawings exceed governing code requirements, the Specification will govern. The Contractor shall obtain and pay for all necessary construction permits and licenses.

1.3 TRAINING

A. Provide a minimum of (40) hours of on-site training for (3) system operators. The training will be hands-on type at the Owner's office. The training class will use the actual Operator's Manual that will be submitted for this project. In addition, provide (2) weeks of classroom training for one individual at the Manufacturer's sponsored training courses.

1.4 SYSTEM DESCRIPTION

A. The Building Automation System (BAS) shall consist of PC-based workstations and microcomputer controllers of modular design providing distributed processing capability and allowing future expansion of both input/output points and processing/control functions.

B. For this project the system shall consist of the following components:

1. Operator Workstation(s) Cyber-station: The BAS Contractor shall furnish (2) Operator Workstation Computers (One Notebook and one PC) and (2) printer(s) as described in Part 2 of the Specification. These workstations must be running the standard workstation software developed and tested by the manufacturer of the network controllers and the standalone controllers. No third party front-end workstation software will be acceptable.

2. Ethernet-based Network Controller(s): The BAS Contractor shall furnish Ethernet-based network controllers as described in Part 2 of the Specification. These controllers will connect directly to the Operator Workstation over Ethernet, provide communication to the Standalone Digital Control Units and/or other input/output Modules and serve as a gateway to equipment furnished by others (if applicable).

3. Standalone Digital Control Units (SDCUs): Provide the necessary quantity and types of SDCUs to meet the requirements of the project for mechanical equipment control including air handlers, central plant control, and terminal unit control. Each SDCU will operate completely standalone, containing all of the I/O and programs to control its associated equipment.

4. For this project, the existing Andover Netcontroller shall be upgraded to the latest Andover product.

C. Modem: A modem shall be furnished for remote interrogation of the system. The modem shall operate at a minimum of 56.6 KBaud and allow for access to the entire network of controllers.

1.5 WORK BY OTHERS

A. The BAS Contractor shall cooperate with other Contractors performing work on this project necessary to achieve a complete and neat installation. To that end, each Contractor shall consult the Drawings and Specifications for all trades to determine the nature and extent of others work.

B. The BAS Contractor shall furnish all control valves, sensor wells, flow meters and other similar equipment for installation by the Mechanical Contractor.

C. The BAS Contractor shall provide field supervision to the designated Contractor for the installation of the following:

1. Automatic control dampers
2. Fire/smoke dampers
3. Blank-off plates for dampers that are smaller than duct size.
4. Sheet metal baffle plates to eliminate stratification.

D. The Electrical Contractor shall provide the following: Furnish smoke detectors and wire to the building fire alarm system.

1.6 CODE COMPLIANCE

A. Provide BAS components and ancillary equipment, which are UL-916 listed and labeled.

B. All equipment or piping used in conditioned air streams, spaces or return air plenums shall comply with NFPA 90A Flame/Smoke/Fuel contribution rating of 25/50/0 and all applicable building codes or requirements.

C. All wiring shall conform to the National Electrical Code.

D. All smoke dampers shall be rated in accordance with UL 555S.

E. Comply with FCC rules, Part 15 regarding Class A radiation for computing devices and low power communication equipment operating in commercial environments.

F. Comply with FCC, Part 68 rules for telephone modems and data sets.

1.7 SUBMITTALS

A. All shop drawings shall be prepared in Visio Professional or AutoCAD software. In addition to the Drawings, the Contractor shall furnish a diskette containing the identical information. Drawings shall be B size or larger.

B. Shop drawings shall include a riser diagram depicting locations of all controllers and workstations, with associated network wiring. Also included shall be individual schematics of each mechanical system showing all connected points with reference to their associated controller. Typical will be allowed where appropriate.

C. Submittal data shall contain manufacturer's data on all hardware and software products required by the Specification. Valve damper and airflow station schedules shall indicate size, configuration, capacity and location of all equipment.

D. Software submittals shall contain narrative descriptions of sequences of operation, program listings, point lists, and a complete description of the graphics, reports, alarms and configuration to be furnished with the workstation software. Information shall be bound or in a three ring binder with an index and tabs.

E. Submit five (5) copies of submittal data and shop drawings to the Engineer for review prior to ordering or fabrication of the equipment. The Contractor prior to submitting shall check all Documents for accuracy.

F. The Engineer will make corrections, if required, and return to the Contractor. The Contractor will then resubmit with the corrected or additional data. This procedure shall be repeated until all corrections are made to the satisfaction of the Engineer and the submittals are fully approved.

1.8 SYSTEM STARTUP AND COMMISSIONING

A. Each point in the system shall be tested for both hardware and software functionality. In addition, each mechanical and electrical system under control of the BAS will be tested against the appropriate sequence of operation specified herein. Successful completion of the system test shall constitute the beginning of the warranty period. A written report will be submitted to the Owner indicating that the installed system functions in accordance with the Drawings and Specifications.

B. The BAS Contractor shall commission and set in operating condition all major equipment and systems, such as the chilled water, hot water and all air handling systems, in the presence of the equipment manufacturer’s representatives, as applicable, and the Owner and Architect’s representatives.

C. The BAS Contractor shall provide all manpower and engineering services required to assist the HVAC Contractor and Balancing Contractor in testing, adjusting, and balancing all systems in the building. The BAS Contractor shall have a trained technician available on request during the balancing of the systems. The BAS Contractor shall coordinate all requirements to provide a complete air balance with the Balancing Contractor and shall include all labor and materials in his Contract.

1.9 TRAINING

A. The BAS Contractor shall provide both on-site and classroom training to the Owner's representative and maintenance personnel per the following description:

B. On-site training shall consist of a minimum of (40) hours of hands-on instruction geared at the operation and maintenance of the systems. The curriculum shall include:

1. System Overview

2. System Software and Operation

   a. System access
   b. Software features overview
   c. Changing setpoints and other attributes
   d. Scheduling
   e. Editing programmed variables
   f. Displaying color graphics
   g. Running reports
   h. Workstation maintenance
   i. Application programming

3. Operational sequences including start-up, shutdown, adjusting and balancing.

4. Equipment maintenance.

1.10 OPERATING AND MAINTENANCE MANUALS

A. The operation and maintenance manuals shall contain all information necessary for the operation, maintenance, replacement, installation and parts procurement for the entire BAS. This documentation shall include specific part numbers and software versions and dates. A complete list of recommended spare parts shall be included with the lead-time and expected frequency of use of each part clearly identified.

B. Following project completion and testing, the BAS Contractor will submit As-Built Drawings reflecting the exact installation of the system. The as-built documentation shall also include a copy of all application software both in written form and on diskette.

1.11 WARRANTY

A. The BAS Contractor shall warrant the system for 12 months after system acceptance or beneficial use by the Owner. During the warranty period, the BAS Contractor shall be responsible for all necessary revisions to the software as required to provide a complete and workable system consistent with the letter and intent of the Sequence of Operation section of the Specification.

B. Updates to the manufacturer's software shall be provided at no charge during the warranty period.

PART 2 - PRODUCTS

2.1 SYSTEM ARCHITECTURE

A. General: The Building Automation System (BAS) shall consist of Network Control Units (ICUs), a family of Standalone Digital Control Units (SDCUs), input/output Unit Modules (IOU Modules), Operator Workstations (OWs), and one File Server to support system configurations. The BAS shall provide control, alarm detection, scheduling, reporting and information management for the entire facility, and Wide Area Network (WAN) if applicable, from a single ODBC-compliant database.

B. Level 1 Network Description: Level 1, the main backbone of the system, shall be an Ethernet LAN/WAN. Network Control Units, Operator Workstations and the Central File Server shall connect directly to this network without the need for Gateway devices.

C. Level 2 Network Description Level 2 of the system shall consist of one or more field buses managed by the Network Control Units. The Level 2 field buses may consist of one or both of the following types:

1. An RS485, token passing bus that supports up to 127 Standalone Digital Control Units (SDCUs) for operation of HVAC equipment and lighting,

   OR

2. An RS485 field bus that supports up to 32 devices from a family of plug-in, IOU modules.
   - These IOU modules may be mounted within the NCU enclosure or remotely mounted via a single, twisted, shielded pair of wires.

D. BAS:
The BAS shall be segmented, through software, into multiple local area networks (LANs) distributed over a wide area network (WAN), sharing a single file server. This enables workstations to manage a single LAN (or building), and/or the entire system with all devices being assured of being updated by and sharing the most current database. In the case of a single workstation system, the workstation shall contain the entire database, with no need for a separate file server.

E. Standard Network Support:
All NCUs, Workstation(s) and File Server shall be capable of residing directly on the Owner's Ethernet TCP/IP LAN/WAN with no required gateways. Furthermore, the NCU's, Workstation(s) and File Server shall be capable of using standard, commercially available, off-the-shelf Ethernet infrastructure components such as routers, switches and hubs. With this design the Owner may utilize the investment of an existing or new enterprise network or structured cabling system. This also allows the option of the maintenance of the LAN/WAN to be performed by the Owner's Information Systems Department as all devices utilize standard TCP/IP components.

F. Remote Communications

1. In addition to the above LAN/WAN architecture support, the same workstation software (front end) must be capable of managing remote systems via standard dial-up phone lines as a standard component of the software. Front-end "add-on" software modules to perform remote site communication shall not be acceptable.

2. The remote system architecture shall consist of two levels providing control, alarm detection, reporting and information management for the remote facility. Level 1 shall contain the Remote Site Control Unit, communicating to the remotely located, Operator Workstation(s) through the use of a modem and a standard dial-up phone line. Level 2 shall consist of one or more field buses controlled by the RSCU. The field buses may consist of one or both of two types:

   a. An RS485, token passing bus that supports up to 127 Standalone Digital Control Units (SDCUs) for operation of HVAC equipment and lighting,

   OR

   b. An RS485 field bus that supports up to 32 devices from a family of plug-in, IOU modules that may be mounted within the RSCU enclosure or remotely mounted on a single, twisted, shielded pair of wires.

G. System Expansion

1. The BAS system shall be scalable and expandable at all levels of the system using the same software interface, and the same Level 1 and Level 2 controllers. Systems that require replacement of either the workstation software or field controllers in order to expand the system shall not be acceptable.

2. The BAS shall be expandable to include Security and Access Control functions at any time in the future with no additional workstations, front-end software or Level 1 controllers required. Standalone Digital Control Units or IOU modules shall be able to be added to the existing Level 1 controller's field bus (es), to perform security and card access applications. In this way, an Owner's existing investment in wiring infrastructure may be leveraged and the cost and inconvenience of adding new field bus wiring will be minimized.

3. Additionally, an integrated video badging option must be able to be included with no additional workstations required. This photo ID option must share the same database as the BAS in order to eliminate the need for updating multiple databases.

4. The system shall use the same application programming language for all levels: Operator Workstation, Network Control Unit, Remote Site Control Unit and Standalone Digital Control Unit. Furthermore, this single programming language shall be used for all applications; environmental control, card access control, intrusion detection and security, lighting control, leak detection / underground storage tank monitoring, and digital data communication interfaces to third party microprocessor-based devices.

H. Support For Open Systems Protocols

1. The BAS design must include solutions for the integration of the following "open systems" protocols: BacNet, LonTalk™, and digital data communication to third party microprocessors such as chiller controllers, fire panels and variable frequency drives (VFD's).
2. The system shall also provide the ability to program custom ASCII communication drivers, which will reside in the NCU, for communication to third party systems and devices. These drivers will provide real time monitoring and control of the third party.

2.2 NETWORK CONTROL UNITS (NCUs)

A. General

1. Network Control Units shall be microprocessor based multi-tasking, multi-user, and employ a real time operating system. Each NCU control panel shall consist of modular hardware including power supply, CPU board and input/output modules. A sufficient number of NCUs shall be supplied to fully meet the requirements of this Specification and the attached point list.
2. NCUs for telephone dialup sites shall be of the same design as the Ethernet control units but without the plug-in Ethernet network interface card (NIC), i.e., NCUs, which include a NIC, shall be interchangeable whether used on a LAN/WAN or a dialup site.

B. Web Server Functionality

1. All NCUs on the Ethernet TCP/IP LAN/WAN shall be capable, out-of-the box, to be set up as a Web Server. The NCU shall have the ability to store HTML code and "serve" pages to a web browser. This provides the ability for any computing device utilizing a TCP/IP Ethernet connection and capable of running a standard Internet browser (Microsoft Internet Explorer™, Netscape Navigator™, etc.) to access real-time data from the entire BAS via any NCUs.

2. Graphics and text-based web pages shall be constructed using standard HTML code. The interface shall allow the user to choose any of the standard text or graphics-based HTML editors for page creation. It shall also allow the operator to generate custom graphical pages and forms.

3. The WEB server interface shall be capable of password security, including validation of the requesting PC's IP address. The WEB server interface shall allow the sharing of data or information between any controller, or process or network interface (BACnet, LonTalk and TCP/IP) that the BMS has knowledge of, regardless of where the point is connected on the BAS network or where it is acquired from.

4. The BAS network controller must act directly as the WEB server. It must directly generate the HTML code to the requesting user (i.e. WEB browser), eliminating the need for and reliance on any PC-based WEB server hardware or software. To simplify graphic image space allocation, HTML graphic images, if desired, shall be stored on any shared network device. The BAS WEB server shall have the ability to acquire any necessary graphics using standard pathing syntax within the HTML code mounted within the BAS WEB server. External WEB server hardware and software are not acceptable.

C. Hardware Specifications

1. Memory: A minimum of 4MB of RAM shall be provided for NCUs with expansion up to 8MB. The 8MB versions shall include a floating-point math co-processor.

2. Communication Ports: Each NCU shall provide communication to both the Workstation(s) and the field buses. In addition, each NCU must have at least 3 other communications ports that support a telephone modem, portable service tool, serial printer and connection to third party controllers such as a chiller control panel. On a LAN/WAN system the NCU shall be provided with a 10Mbps plug-in Ethernet TCP/IP network interface card (NIC).

3. Input/Output (I/O) - Each NCU shall support the addition of the following types of inputs and outputs:

   a. Digital Inputs for status/alarm contacts.
   b. Counter Inputs for summing pulses from meters.
   c. Thermistor inputs for measuring temperatures in space, ducts and thermowells.
   d. Analog inputs for pressure, humidity, flow and position measurements.
   e. Digital Outputs for on/off equipment control.
   f. Analog Outputs for valve and damper position control, and capacity control of primary equipment.

4. Modular Expandability: The system shall employ a modular I/O design to allow easy expansion. Input and output capacity is to be provided through plug-in modules of various types or DIN-mountable IOU modules. It shall be possible to combine I/O modules as desired to meet the I/O requirements for individual control applications.

5. Hardware Override Switches: All digital output units shall include three position manual override switches to allow selection of the ON, OFF, or AUTO output state. These switches shall be built into the unit and shall provide feedback to the controller so that the position of the override switch can be obtained through software. In addition, each analog output shall be equipped with an override potentiometer to allow manual adjustment of the analog output signal over its full range, when the 3 position manual override switch is placed in the ON position.

6. Local Status Indicator Lamps: Provide as a minimum LED indication of CPU status, Ethernet LAN status and field bus status. For each output, provide LED indication of the value of the output (On/Off). For each output module provide an LED which gives a visual indication of whether any outputs on the module are manually overridden.

7. Real Time Clock (RTC): Each NCU shall include a battery-backed, real time clock, accurate to 10 seconds per day. The RTC shall provide the following: time of day, day, month, year and day of week. In normal operation the system clock will be based on the frequency of the AC power. The system shall automatically correct for daylight savings time and leap years and be Year 2000 compliant.

8. Power Supply: The power supply for the NCUs shall be auto sensing, 120-220VAC, 60/50 Hz power, with a tolerance of +/- 20%. Line voltage below the operating range of the system shall be considered outages. The controller shall contain over voltage surge protection and require no additional AC power signal conditioning. Optionally, if indicated on the Drawings, the power supply shall accept an input voltage of (–48 VDC).

9. Automatic Restart After Power Failure: Upon restoration of power after an outage, the ECU shall automatically and without human intervention: update all monitored functions; resume operation based on current, synchronized time and status, and implement special start-up strategies as required.

10. Battery Backup: Each NCU with the standard 120-220VAC power supply shall include a programmable DC power backup system rated for a minimum of 72 hours of battery backup to maintain all volatile memory or, a minimum of 2 hours of full UPS including modem power. This power backup system shall be configurable such that at the end of a settable timeframe (such as 1 hour) of running on full UPS, the unit will shut off full UPS and switch to memory retention-only mode for the remainder of the battery power. The system shall allow the simple addition of more batteries to extend the above minimum battery backup times.

D. Software Specifications

1. General: The NCU shall contain flash ROM as the resident operating system. Application software will be RAM resident. Application software will only be limited by the amount of RAM memory. There will be no restrictions placed on the type of application programs in the system. Each NCU shall be capable of parallel processing, executing all control programs simultaneously. Any program may affect the operation of any other program. Each program shall have the full access of all I/O facilities of the processor. This execution of control function shall not be interrupted due to normal user communications including interrogation, program entry, printout of the program for storage, etc.

2. User Programming Language: The application software shall be user programmable. This includes all strategies, sequences of operation, control algorithms, parameters and setpoints. The source program shall be English language-based and programmable by the user. The language shall be structured to allow for the easy configuration of control programs, schedules, alarms, reports, telecommunications, local displays, mathematical calculations, passwords and histories. The language shall be self-documenting. Users shall be able to place comments anywhere in the body of a program. Program listings shall be configurable by the user in logical groupings.

E. Control Software

1. The NCU shall have the ability to perform the following pre-tested control algorithms:
   a. Proportional, Integral plus Derivative Control (PID)
   b. Self-Tuning PID
   c. Two Position Control
   d. Digital Filter
   e. Ratio Calculator

f. Equipment Cycling Protection

2. Mathematical Functions: Each controller shall be capable of performing basic mathematical functions (+, -, *, /), squares, square roots, exponential, logarithms, Boolean logic statements or combinations of both. The controllers shall be capable of performing complex logical statements including operators such as >, <, =, and, or, exclusive or, etc. These must be able to be used in the same equations with the mathematical operators and nested up to five parentheses deep.

3. Energy Management Applications: NCUs shall have the ability to perform any or all of the following energy management routines:

   a. Time of Day Scheduling
   b. Calendar Based Scheduling
   c. Holiday Scheduling
   d. Temporary Schedule Overrides
   e. Optimal Start
   f. Optimal Stop
   g. Night Setback Control
   h. Enthalpy Switchover (Economizer)
   i. Peak Demand Limiting
   j. Temperature Compensated Duty Cycling
   k. CFM Tracking
   l. Heating/Cooling Interlock
   m. Free Cooling
   n. Hot Water Reset
   o. Hot/Cold Deck Reset
   p. Chilled Water Reset

4. History Logging: Each controller shall be capable of logging any system variable over user defined time intervals ranging from 1 second to 1440 minutes. Any system variables (inputs, outputs, math calculations, flags, etc.) can be logged in history. A maximum of 32767 values can be stored in each log. Each log can record either the instantaneous, average, minimum or maximum value of the point. Logs can be automatic or manual. Logged data shall be downloadable to the Operator Workstation for long term archiving based upon user-defined time intervals, or manual command.

5. Alarm Management

   a. For each system point, alarms can be created based on high/low limits or conditional expressions. All alarms will be tested each scan of the NCU and can result in the display of one or more alarm messages or reports.
   b. Up to 8 alarms can be configured for each point in the controller.
   c. Messages and reports can be sent to a local terminal, to the front-end workstation(s), or via modem to a remote-computing device.
   d. Alarms will be generated based on their priority. A minimum of 255 priority levels shall be provided.
   e. If communication with the Operator Workstation is temporarily interrupted, the alarm will be buffered in the NCU. When communications return, the alarm will

be transmitted to the Operator Workstation if the point is still in the alarm condition.

6. Reporting

a. The NCU shall be able to generate user-definable reports to a locally connected printer or terminal. The reports shall contain any combination of text and system variables. Report templates shall be able to be created by users in a word processing environment. Reports can be displayed based on any logical condition or through a user command.

2.3 STANDALONE DIGITAL CONTROL UNITS (SDCUs)

A. General: Standalone Digital Control Units shall provide control of HVAC. Each controller shall have its own control programs and will continue to operate in the event of a failure or communication loss to its associated NCU.

B. Memory: Control programs shall be stored in battery backed-up RAM and EPROM. Each controller shall have a minimum of 32K bytes of user RAM memory and 128K bytes of EPROM.

C. Communication Ports: SDCUs shall provide a communication port to the field bus. In addition, a port shall be provided for connection of a portable service tool to support local commissioning and parameter changes with or without the NCU online. It shall be possible from a service port on any SDCU to view, enable/disable, and modify values of any point or program on any controller on the local field bus, any NCU or any SDCU on a different field bus.

D. Input/Output - Each SDCU shall support the addition of the following types of inputs and outputs:

1. Digital Inputs for status/alarm contacts.
2. Counter Inputs for summing pulses from meters.
3. Thermistor Inputs for measuring temperatures in space, ducts and thermowells.
4. Analog inputs for pressure, humidity, flow and position measurements.
5. Digital Outputs for on/off equipment control.
6. Analog Outputs for valve and damper position control, and capacity control of primary equipment.

E. Expandability: Input and output capacity shall be expandable through the use of plug-in modules. A minimum of two modules shall be added to the base SDCU before additional power is required.

F. Networking: Each SDCU will be able to exchange information on a peer-to-peer basis with other Standalone Digital Control Units during each field bus scan. Each SDCU shall be capable of storing and referencing global variables (on the LAN) with or without any workstations online. Each SDCU shall be able to have its program viewed and/or enabled/disabled either locally through a portable service tool or through a workstation connected to an NCU.

G. Indicator Lamps: SDCUs will have as a minimum, LED indication of CPU status, and field bus status.

H. Real Time Clock (RTC): An SDCU shall have a real time clock in either hardware or software. The accuracy shall be within 10 seconds per day. The RTC shall provide the following information: time of day, day, month, year and day of week. Each SDCU shall receive a signal, every hour, over the network from the NCU, which synchronizes all SDCU real time clocks.

I. Automatic Restart After Power Failure: Upon restoration of power, the SDCU shall automatically and without human intervention, update all monitored functions, resume operation based on current, synchronized time and status, and implement special start-up strategies as required.

J. Battery Back Up: Each SDCU shall have at least 3 years of battery back up to maintain all volatile memory.

K. Alarm Management

1. For each system point, alarms can be created based on high/low limits or conditional expressions. All alarms will be tested each scan of the SDCU and can result in the display of one or more alarm messages or reports.

2. Up to 8 alarms can be configured for each point in the controller enabling the escalation of the alarm priority (urgency) based upon which alarm(s) is/are triggered.

3. Alarm messages can be sent to a local terminal or modem connected to an NCU or to the Operator's Workstation(s).

4. Alarms will be generated based on their priority. A minimum of 255 priority levels shall be provided.

5. If communication with the NCU is temporarily interrupted, the alarm will be buffered in the SDCU. When communications return, the alarm will be transmitted to the NCU if the point is still in the alarm condition.

L. Air Handler Controllers (To be used on units with less than 40 points)

1. AHU Controllers shall be capable of meeting the requirements of the sequence of operation found in the Execution portion of this Specification and for future expansion.

2. AHU Controllers shall support all the necessary point inputs and outputs as required by the sequence and operate in a standalone fashion.

3. AHU Controllers shall be fully user programmable to allow for modification of the application software.

4. An LCD display shall be optionally available for readout of point values and to allow operators to change setpoints and system parameters.

5. A manual override switch shall be provided for all digital and analog outputs on the AHU controller. The position of the switch shall be monitored in software and available for operator displays and alarm notification.

M. Unitary Controllers

1. Unitary Controllers shall support, but not be limited to, the control of the following systems as described in the Execution portion of this Specification, and for future expansion:
   a. Unit Ventilators
   b. Heat Pumps (Air to Air, Water to Water)
   c. Packaged Rooftops
   d. Fan Coils (2 or 4 Pipe)

2. The I/O of each Unitary Controller shall contain the sufficient quantity and types as required to meet the sequence of operation found in the Execution portion of this Specification. In addition, each controller shall have the capability for time of day scheduling, occupancy mode control, after hour operation, lighting control, alarming and trending.

N. Lighting Controllers

1. Lighting controllers shall provide direct control of 20 Amp, 277 VAC lighting circuits using mechanically held, latching relays. Controllers will contain from 8 to 48 circuits per enclosure. Each controller shall also contain inputs for direct connection to light switches and motion detectors.

2. Each controller shall have the capability for time of day scheduling, occupancy mode control, after hour operation, alarming and trending.

O. Display Controllers

1. Display controllers are standalone, touch screen based operator interfaces. The controller shall be designed for flush mounting in a finished space, with a minimum display size of 9 x 9 inches.

2. Software shall be user programmable allowing for custom graphical images that simulate floor plans, menus, equipment schematics along with associated real time point values coming from any NCU on the network.

3. The touch screen display shall contain a minimum of 64 possible touch cells that permit user interaction for changing screens, modifying setpoints or operating equipment.

4. Systems that do not offer a display controller as specified must provide a panel mounted computer with touch screen capability as an alternative.

2.4 OPERATOR WORKSTATION REQUIREMENTS

A. General

1. The BAS workstation software shall be a multi-workstation system where the database is located on a central file server. The client software on multi-workstation system shall access the file server database program via an Ethernet TCP/IP network running at either 10MBPS or 100MBPS.

2. Workstations shall be Pentium 4 based personal computers operating under the Microsoft NT operating system. The application software shall be capable of communication to all Network Control Units and Stand-alone Digital Control Units, feature high-resolution color graphics, alarming, reporting, and be user configurable for all data collection and data presentation functions.

3. For multi-workstation systems, a minimum of 256 workstations shall be allowed on the Ethernet network along with the central file server. In this client/server configuration, any changes or additions made from one workstation will automatically appear on all other workstations without the requirement for manual copying of files. Multi-workstation systems with no central database will not be acceptable. Multi-workstation systems with distributed/tiered file servers and a central (master) database will be acceptable.

B. Workstation Requirements (One Notebook Computer and One Desktop PC)

1. The workstation(s) shall consist of the following:

   a. 2 GHz Pentium 4 processor with 512MB of RAM
   b. Microsoft Windows 2000 Professional™ or XP Professional operating system
   c. Serial port, parallel port
   d. 10/100MBPS Ethernet NIC
   e. 80 GB hard disk
   f. CD-ROM drive
   g. High resolution (minimum 1024 x 768), 17” flat panel display
   h. Mouse
   i. Full function keyboard
   j. Audio sound card and speakers
   k. License agreement for all applicable software.

C. File Server Hardware Requirements

1. The file server computer shall contain of the following:

   a. 2 GHz Pentium 4 processor with 1GB of RAM
   b. Microsoft Windows 2000 Server™ operating system
   c. 10/100MBPS Ethernet NIC
   d. 80 GB hard disk
   e. CD-ROM drive
   f. High resolution (minimum 1024 x 768), 17” flat panel display

g. Mouse
h. Full function keyboard
i. License agreement for all applicable software.

D. Provide one Windows 2000-compatible 56 Kbaud modem.

E. Printer: Provide an alarm printer and a separate report/graphics printer. The alarm printer shall be an Epson dot matrix or equivalent and the report printer shall be a HP LaserJet.

F. Workstation Software

1. General Description: The software architecture must be object-oriented in design, a true 32-bit application suite utilizing Microsoft's OLE, COM, DCOM and ODBC technologies. These technologies make it easy to fully utilize the power of the operating system to share, among applications (and therefore to the users of those applications), the wealth of data available from the BAS.

2. The workstation functions shall include monitoring and programming of all DDC controllers. Monitoring consists of alarming, reporting, graphic displays, long term data storage, automatic data collection and operator-initiated control actions such as schedule and setpoint adjustments.

3. Programming of controllers shall be capable of being done either off-line or on-line from any operator workstation. All information will be available in graphic or text displays. Graphic displays will feature animation effects to enhance the presentation of the data, to alert operators of problems, and to facilitate location of information throughout the DDC system. All operator functions shall be selectable through a mouse.

G. System Database: The files server database engine must be Microsoft SQL Server, or another ODBC-compliant, relational database program. This ODBC (Open Database Connectivity)-compliant database engine allows for an Owner to utilize "their" choice of database and due to its "open" architecture, allows an Owner to write custom applications and/or reports which communicate directly with the database avoiding data transfer routines to update other applications. The system database shall contain all point configurations and programs in each of the controllers that have been assigned to the network. In addition, the database will contain all workstation files including color graphic, alarm reports, text reports, historical data logs, schedules, and polling records.

H. User Interface: The BAS workstation software shall allow the creation of a custom, browser-style interface linked to the user that has logged into the workstation software. This interface shall support the creation of "hot-spots" that the user may link to view/edit any object in the system or run any object editor or configuration tool contained in the software. Furthermore, this interface must be able to be configured to become a user's "PC Desktop" – with all the links that a user needs to run other applications. This, along with the Windows 2000 user security capabilities, will enable a system administrator to setup workstation accounts that not only limit the capabilities of the user within the BAS software but may also limit what a user can do on the PC and/or LAN/WAN. This might be used to ensure, for example, that the user of an alarm

monitoring workstation is unable to shut-down the active alarm viewer and/or unable to load software onto the PC.

I. User Security: The software shall be designed so that each user of the software can have a unique username and password. This username/password combination shall be linked to a set of capabilities within the software, set by and editable only by, a system administrator. The sets of capabilities shall range from view only, acknowledge alarms, enable/disable and change values, program, and administer. The system shall allow the above capabilities to be applied independently to each and every class of object in the system. The system must allow a minimum of 256 users to be configured per workstation. There shall be an inactivity timer adjustable in software that automatically logs off the current operator after the timer has expired.

J. Configuration Interface

1. The workstation software shall use a familiar Windows Explorer™-style interface for an operator or programmer to view and/or edit any object (controller, point, alarm, report, schedule, etc.) in the entire system. In addition, this interface shall present a "network map" of all controllers and their associated points, programs, graphics, alarms, and reports in an easy to understand structure. All object names shall be alphanumeric and use Windows long filename conventions. Object names shall not be required to be unique throughout the system. This allows consistency in point naming. For example, each VAV controller can have an input called Space Temperature and a setpoint called CFM Setpoint. The VAV controller name shall be unique such as VAV for LAB101. Systems requiring unique object names throughout the system will not be acceptable.

2. The configuration interface shall also include support for template objects. These template objects shall be used as building blocks for the creation of the BAS database. The types of template objects supported shall include all data point types (input, output, string variables, setpoints, etc.), alarm algorithms, alarm notification objects, reports, graphics displays, schedules, and programs. Groups of template object types shall be able to be set up as template subsystems and systems. The template system shall prompt for data entry if necessary. The template system shall maintain a link to all "child" objects created by each template. If a user wishes to make a change to a template object, the software shall ask the user if he/she wants to update all of child objects with the change. This template system shall facilitate configuration and programming consistency and afford the user a fast and simple method to make global changes to the BAS.

K. Color Graphic Displays

1. The system shall allow for the creation of user defined, color graphic displays for the viewing of mechanical and electrical systems or building schematics. These graphics shall contain point information from the database including any attributes associated with the point (engineering units, etc.). In addition, operators shall be able to command equipment or change setpoints from a graphic through the use of the mouse. Requirements of the color graphic subsystem include:

2. SVGA, bit-mapped displays. The user shall have the ability to import AutoCAD generated picture files as background displays.

3. A built-in library of animated objects such as dampers, fans, pumps, buttons, knobs, gauges, ad graphs which can be "dropped" on a graphic through the use of a software configuration "wizard". These objects shall enable operators to interact with the graphic displays in a manner that mimics their mechanical equivalents found on field installed control panels. Using the mouse, operators shall be able to adjust setpoints, start or stop equipment, modify PID loop parameters, or change schedules.

4. Status changes or alarm conditions must be able to be highlighted by objects changing screen location, size, color, text, blinking or changing from one display to another.

5. Graphic panel objects shall be able to be configured with multiple "tabbed" pages allowing an operator to quickly view individual graphics of equipment, which make up a subsystem or system.

6. Ability to link graphic displays through user-defined objects, alarm testing, or the result of a mathematical expression. Operators must be able to change from one graphic to another by selecting an object with a mouse - no menus will be required.

L. Automatic monitoring: The software shall allow for the automatic collection of data and reports from any controller through either a hardwire or modem communication link. The frequency of data collection shall be completely user-configurable.

M. Alarm Management

1. The software shall be capable of accepting alarms directly from controllers, or generating alarms based on evaluation of data in controllers and comparing to limits or conditional equations configured through the software. Any alarm (regardless of its origination) will be integrated into the overall alarm management system and will appear in all standard alarm reports, be available for operator acknowledgment, and have the option for displaying graphics, or reports.

2. Alarm management features shall include:

a. A minimum of 255-alarm notification levels. Each notification level will establish a unique set of parameters for controlling alarm display, acknowledgment, keyboard annunciation, alarm printout and record keeping.

b. Automatic logging in the database of the alarm message, point name, point value, connected controller, timestamp, username and time of acknowledgement, username and time of alarm silence (soft acknowledgement)

c. Automatic printing of the alarm information or alarm report to an alarm printer or report printer.

d. Playing an audible beep or audio (wav) files on alarm initiation or return to normal.

e. Sending an e-mail or alphanumeric text to anyone listed in a workstation's email account address list on either the initial occurrence of an alarm and/or if the alarm is repeated because an operator has not acknowledged the alarm within a

user-configurable timeframe. The ability to utilize email and alphanumeric paging of alarms shall be a standard feature of the software integrated with the operating system's mail application interface (MAPI). No special software interfaces shall be required.

f. Individual alarms shall be able to be re-routed to a workstation or workstations at user-specified times and dates. For example, a critical high temp alarm can be configured to be routed to a Facilities Dept. workstation during normal working hours (7am-6pm, Mon-Fri) and to a Central Alarming workstation at all other times.

g. An active alarm viewer shall be included which can be customized for each user or user type to hide or display any alarm attributes.

h. The font type and color, and background color for each alarm notification level as seen in the active alarm viewer shall be customizable to allow easy identification of certain alarm types or alarm states.

i. The active alarm viewer can be configured such that an operator must type in text in an alarm entry and/or pick from a drop-down list of user actions for certain alarms. This ensures accountability (audit trail) for the response to critical alarms.

3. Custom Report Generation

a. The software will contain a built-in custom report generator, featuring word processing tools for the creation of custom reports. These custom reports shall be able to be set up to automatically run or be generated on demand. Each workstation shall be able to associate reports with any word processing or spreadsheet program loaded on the machine. When the report is displayed, it will automatically spawn the associated report editor such as MS Word™, WordPerfect™, Notepad, or Lotus 123™.

- Reports can be of any length and contain any point attributes from any controller on the network.
- The report generator will have access to the user programming language in order to perform mathematical calculations inside the body of the report, control the display output of the report, or prompt the user for additional information needed by the report.
- It shall be possible to run other executable programs whenever a report is initiated.
- Report Generator activity can be tied to the alarm management system, so that any of the configured reports can be displayed in response to an alarm condition.

b. Standard reports shall include:

- Points in each controller
- Points in alarm
- Disabled points
- Overridden points
- Operator activity report
- Alarm history log
- Program listing by controller with status
- Network status of each controller

4. Spreadsheet-Style Reports:
   The software shall allow the simple configuration of row/column (spreadsheet-style) reports on any class of object in the system. These reports shall be user-configurable and shall be able to extract live (controller) data and/or data from the database. The user shall be able to set up each report to display in any text font, color and background color. In addition, the report shall be able to be configured to filter data, sort data and highlight data, which meets user-defined criteria.
5. HTML Reporting:
   The above spreadsheet-style reports shall be able to be run to an HTML template file. This feature will create an HTML "results" file in the directory of the HTML template. This directory can be shared with other computer users, which will allow those users with access to the directory to "point" their web browser at the file and view the report.

6. Scheduling

   a. It shall be possible to configure and download from the workstation schedules for any of the controllers on the network.

   b. Time of day schedules shall be in a calendar style and shall be programmable for a minimum of one year in advance. Each standard day of the week and user-defined day types shall be able to be associated with a color so that when the schedule is viewed it is very easy, at-a-glance, to determine the schedule for a particular day even from the yearly view. To change the schedule for a particular day, a user shall simply click on the day and then click on the day type.

   c. Each schedule will appear on the screen viewable as the entire year, monthly, week and day. A simple mouse click shall allow switching between views. It shall also be possible to scroll from one month to the next and view or alter any of the schedule times.

   d. Schedules will be assigned to specific controllers and stored in their local RAM memory. Any changes made at the workstation will be automatically updated to the corresponding schedule in the controller.

7. Programmer's Environment

   a. The programmer's environment will include access to a superset of the same programming language supported in the controllers. Here the programmer will be able to configure application software off-line (if desired) for custom program development, write global control programs, system reports, wide area networking data collection routines, and custom alarm management software.

On the same screen as the program editor, the programming environment shall include dock able debug and watch bars for program debugging and viewing updated values and point attributes during programming. In addition, a wizard tool shall be available for loading programs from a library file in the program editor.

b. Saving/Reloading: The workstation software shall have an application to save and restore field controller memory files. This application shall not be limited to saving and reloading an entire controller. It must also be able to save/reload individual objects in the controller. This allows off-line debugging of control programs, for example, and then reloading of just the modified information.

c. Data Logging: The workstation software shall have the capability to easily configure groups of data points with trend logs and display the trend log data. A group of data points shall be created by drag-and-drop method of the points into a folder. The trend log data shall be displayed through a simple menu selection. This data shall be able to be saved to file and/or printed.

d. Audit Trail: The workstation software shall automatically log and timestamp every operation that a user performs at a workstation, from logging on and off a workstation to changing a point value, modifying a program, enabling/disabling an object, viewing a graphic display, running a report, modifying a schedule, etc.

8. Fault Tolerant File Server Operation

a. The system shall provide the option to provide fault tolerant operation in the event of the loss of the CPU, disk drives, or other hardware required to maintain the operational integrity of the system. Operational integrity includes all user interfaces, monitoring of alarm points and access points, and executing access control functions.

b. The switchover mechanism provided shall be automatic. Should the failure be caused by hardware, then the system shall immediately switch to the backup computer. Should the system failure be caused by software (instruction or data), the system shall not pass the faulted code to the backup computer, otherwise the backup shall fail in the same manner of the primary computer.

c. Switchover to the backup computer shall be initiated and effective (complete) in a manner and time frame that precludes the loss of event data, and shall be transparent to the system users, except for an advisory alarm message indicating that the switchover has occurred.

d. When the system fails-over from the primary to the backup computer, no alarm or other event shall be lost, and the backup computer shall take control of all system functions.

e. A single component failure in the system shall not cause the entire system to fail. All system users shall be informed of any detectable component failure via an alarm event. System users shall not be logged off as a result of a system failure or switchover.

f. The primary computer shall provide continual indication that the backup computer is unavailable until such time that the fault has been purged.

2.5 PORTABLE OPERATOR'S TERMINAL

A. Full screen, laptop service tools shall communicate directly to all controllers. The laptop software shall enable users to monitor both instantaneous and historical point data, modify control parameters, and enable/disable any point or program in any controller on the network.

B. The laptop computer will be a Pentium-based portable computer with a minimum of 16MB of RAM memory, a 3 ½" floppy disk drive and a 500MB hard disk drive.

C. The laptop service tool will connect to any Ethernet controller or standalone controller via a dedicated service port. From this single connection, the user shall be able to communicate with any other controller on the LAN.

D. The laptop service tool will limit operator access by passwords. The service tool must support, at a minimum, the following password-protected user types: Administrator, Modify Parameters, View Only.

E. The laptop software shall include built-in menus for viewing points by controller, enabling, disabling and viewing programs, configuring controllers, and communicating to other controllers on the network.

2.6 DDC SENSORS AND POINT HARDWARE

A. Temperature Sensors

1. All temperature devices shall use precision thermistors accurate to +/- 1 degree F over a range of –30 to 230 degrees F. Space temperature sensors shall be accurate to +/- .5 degrees F over a range of 40 to 100 degrees F.

2. Standard space sensors shall be available in an off white enclosure for mounting on a standard electrical box.

3. Where manual overrides are required, the sensor housing shall feature both an optional sliding mechanism for adjusting the space temperature setpoint, as well as a push button for selecting after hours operation.

4. Where a local display is specified, the sensor shall incorporate either an LED or LCD display for viewing the space temperature, setpoint and other operator selectable parameters. Using built in buttons; operators shall be able to adjust setpoints directly from the sensor.

5. Duct temperature sensors shall incorporate a thermistor bead embedded at the tip of a stainless steel tube. Probe style duct sensors are useable in air handling applications where the coil or duct area is less than 14 square feet.

6. Averaging sensors shall be employed in ducts, which are larger than 14 square feet. The averaging sensor tube must contain at least one thermistor for every 3 feet, with a minimum tube length of 12 feet.

7. Immersion sensors shall be employed for measurement of temperature in all chilled and hot water applications as well as refrigerant applications. Thermal wells shall be brass or stainless steel for non-corrosive fluids below 250 degrees F. and 300 series stainless steel for all other applications.

8. A pneumatic signal shall not be allowed for sensing temperature.

B. Humidity Sensors

1. Humidity devices shall be accurate to +/- 5% at full scale for space and +/- 3% for duct and outside air applications. Suppliers shall be able to demonstrate that accuracy is NIST traceable.

2. Provide a hand held field calibration tool that both reads the output of the sensor and contains a reference sensor for ongoing calibration.

C. Pressure Sensors

1. Air pressure measurements in the range of 0 to 10" water column will be accurate to +/- 1% using a solid-state sensing element. Acceptable manufacturers include Modus Instruments and Mamac.

2. Differential pressure measurements of liquids or gases shall be accurate to =/- 0.5% of range. The housing shall be NEMA 4 rated.

D. Current and KW Sensors

1. Current status switches shall be used to monitor fans, pumps, motors and electrical loads. Current switches shall be available in solid and split core models and offer either a digital or an analog signal to the automation system. Acceptable manufacturer is Veris or approved equal.

2. Measurement of three-phase power shall be accomplished with a kW/kWH transducer. This device shall utilize direct current transformer inputs to calculate the instantaneous value (kW) and a pulsed output proportional to the energy usage (kWH). Provide Veris Model 6000 Power Transducer or approved equal.

E. Flow Sensors

1. Provide an insertion vortex flow meter for measurement of liquid or gas flows in pipe sizes above 3 inches.

2. Install the flow meter on an isolation valve to permit removal without process shutdown.

3. Sensors shall be manufactured by EMCO or approved equal.

F. Electric/Pneumatic Transducers

1. Electric to pneumatic transducers shall operate from either a PWM or analog signal. E/P transducers shall be rated for 0 - 20 psi operation and accurate to 2% of full scale. E/P transducers shall have a maximum air consumption of 100 SCIM.

2. E/P transducers may be installed at the end device (damper or valve), or mounted separately in a field interface panel, or as part of the controller. All transducers will be calibrated. Panel mounted transducers shall be Sensycon or approved equal.

G. Electric/Pneumatic Solenoid Valves:
Electric solenoid operated pneumatic valves (EP's) shall have a three port operation: common, normally open and normally closed. They shall be rated for 50 psig when used for 25 psig or less applications or rated for 150 psig when used for 100 psig or less applications. The coils shall be equipped with transient suppression devices to limit transients to 150 percent of the rated coil voltage.

2.7 CONTROL VALVES (With Electric Actuator)

A. Provide automatic control valves suitable for the specified controlled media (water or glycol). Provide valves, which mate and match the material of the connected piping. Equip control valves with the actuators of required input power type and control signal type to accurately position the flow control element and provide sufficient force to achieve required leakage specification.

B. Control valves shall meet the heating and cooling loads specified and closes off against the differential pressure conditions within the application. Valves should be sized to operate accurately and with stability from 10% to 100% of the maximum design flow.

C. Trim material shall be stainless steel for hot water and high differential pressure applications.

D. Electric actuation should be provided on all terminal unit reheat applications.

2.8 DAMPERS (With Electric Actuators)

A. Automatic dampers furnished by the Building Automation Contractor shall be single or multiple blade as required. Dampers are to be installed by the HVAC Contractor under the supervision of the BAS Contractor. All blank-off plates and conversions necessary to install smaller than duct size dampers are the responsibility of the Sheetmetal Contractor.

B. Damper frames are to be constructed of 13 gauge galvanized sheet steel mechanically joined with linkage concealed in the side channel to eliminate noise as friction. Compressible spring stainless steel side seals and acetyl or bronze bearings shall also be provided.

C. Damper blade width shall not exceed eight inches. Seals and 3/8 inch square steel zinc plated pins are required. Blade rotation is to be parallel or opposed as shown on the schedules.

D. For high performance applications, control dampers will meet or exceed the UL Class I leakage rating.

E. Control and smoke dampers shall be Nailor or approved equal.

F. Provide opposed blade dampers for modulating applications and parallel blade for two position control.

2.9 DAMPER ACTUATORS

A. Electronic Actuators - shall be direct coupled over the shaft, enabling it to be mounted directly to the damper shaft without the need for connecting linkage. The actuator shall have electronic overload circuitry to prevent damage. For power-failure/safety applications, an internal mechanical, spring return mechanism shall be built into the actuator housing. Non-spring return actuators shall have an external manual gear release to allow positioning of the damper when the actuator is not powered.

B. Pneumatic Actuators - shall be of the synthetic elastomer diaphragm piston type and shall be fully proportioning unless otherwise specified. They shall have full metal bodies and utilize replaceable diaphragms. Damper actuators on large sections of modulating dampers (>25 sq. ft.) or high face velocity applications (such as fan inlet vanes) shall be equipped with pilot positioners to provide repeatability and quick response. Also provide pilot positioners on steam valves requiring 1/3 – 2/3 operation.

2.10 SMOKE DETECTORS

A. Air duct smoke detectors shall be by Air Products & Controls or approved equal. The detectors shall operate at air velocities from 300 feet per minute to 4000 feet per minute.

B. The smoke detector shall utilize a photoelectric detector head.

C. The housing shall permit mechanical installation without removal of the detector cover.

D. The detectors shall be listed by Underwriters Laboratories and meet the requirements of UL 268A.

2.11 AIRFLOW MEASURING STATIONS

A. Provide a thermal anemometer using instrument grade self-heated thermistor sensors with thermistor temperature sensors. The flow station shall operate over a range of 0 to 5,000 feet/min with an accuracy of +/- 2% over 500 feet/min and +/- 10 ft/min for reading less than 500 feet/min.

B. The output signal shall be linear with field selectable ranges including 0-5 VDC, 0-10VDC and 4-20 mA.

C. Furnish Ebtron Series 3000 airflow stations or approved equal.

PART 3 - EXECUTION

3.1 CONTRACTOR RESPONSIBILITIES

A. General: The Contractor or a Sub-Contractor shall perform installation of the building automation system. However, all installation shall be under the personal supervision of the Contractor. The Contractor shall certify all work as proper and complete. Under no circumstances shall the design, scheduling, coordination, programming, training, and warranty requirements for the project be delegated to a Sub-Contractor.

B. Demolition: Remove controls, which do not remain as part of the building automation system, all associated abandoned wiring and conduit and all associated pneumatic tubing. The Owner will inform the Contractor of any equipment, which is to be removed, that will remain the property of the Owner. The Contractor will dispose of all other equipment that is removed.

C. Access to Site: Unless notified otherwise, entrance to building is restricted. No one will be permitted to enter the building unless their names have been cleared with the Owner or the Owner's representative.

D. Code Compliance: All wiring shall be installed in accordance with all applicable electrical codes and will comply with equipment manufacturer's recommendations. Should any discrepancy be found between wiring Specifications in Division 26 and Division 23, wiring requirements of Division 26 will prevail for work specified in Division 26.

E. Cleanup: At the completion of the work, all equipment pertinent to this Contract shall be checked and thoroughly cleaned, and all other areas shall be cleaned around equipment provided under this Contract. Clean the exposed surfaces of tubing, hangers and other exposed metal of grease, plaster or other foreign materials.

3.2 WIRING, CONDUIT, TUBING AND CABLE

A. All wire will be copper and meet the minimum wire size and insulation class listed below:

Wire Class	Wire Size	Isolation Class
Power	12 Gauge	600 Volt
Class One	14 Gauge Std.	600 Volt
Class Two	18 Gauge Std.	300 Volt
Class Three	18 Gauge Std.	300 volt
Communications	Per Mfr.	Per Mfr.

B. Power and Class One wiring may be run in the same conduit. Class Two and Three wiring and communications wiring may be run in the same conduit.

C. Where different wiring classes terminate within the same enclosure, maintain clearances and install barriers per the National Electric Code.

D. Where wiring is required to be installed in conduit, EMT shall be used. Conduit shall be minimum 1/2 inch galvanized EMT. Setscrew fittings are acceptable for dry interior locations. Watertight compression fittings shall be used for exterior locations and interior locations subject

to moisture. Provide conduit seal off fitting where exterior conduits enter the building or between areas of high temperature/moisture differential.

E. Flexible metallic conduit (max. 3 feet) shall be used for connections to motors, actuators, controllers, and sensors mounted on vibration producing equipment. Liquid-tight flexible conduit shall be use in exterior locations and interior locations subject to moisture.

F. Junction boxes shall be provided at all cable splices, equipment termination and transitions from EMT to flexible conduit. Interior dry location J-boxes shall be galvanized pressed steel, nominal four-inch square with blank cover. Exterior and damp location JH-boxes shall be cast alloy FS boxes with threaded hubs and gasket covers.

G. Where the space above the ceiling is a supply or return air plenum, the wiring shall be plenum rated. Teflon wiring can be run without conduit above suspended ceilings. EXCEPTION: Any wire run in suspended ceilings that is used to control outside air dampers or to connect the system to the fire management system shall be in conduit.

H. Coaxial cable shall conform to RG62 or RG59 rating. Provide plenum rated coaxial cable when running in return air plenums.

I. Fiber optic cable shall include the following sizes; 50/125, 62.5/125 or 100/140. Only glass fiber is acceptable, no plastic.

J. Fiber optic cable shall only be installed and terminated by an experienced contractor. The BAS contractor shall submit to the Engineer the name of the intended contractor of the fiber optic cable with his submittal documents.

3.3 HARDWARE INSTALLATION

A. Installation Practices for Wiring and Tubing

1. All controllers are to be mounted vertically and per the manufacturer's installation documentation.

2. The 120VAC power wiring to each Ethernet or Remote Site controller shall be a dedicated run, with a separate breaker. Each run will include a separate hot, neutral and ground wire. The ground wire will terminate at the breaker panel ground. This circuit will not feed any other circuit or device.

3. A true earth ground must be available in the building. Do not use a corroded or galvanized pipe, or structural steel.

4. Wires are to be attached to the building proper at regular intervals such that wiring does not drop. Wires are not to be affixed to or supported by pipes, conduit, etc.

5. Conduit in finished areas will be concealed in ceiling cavity spaces, plenums, and furred spaces and wall construction. Exception; metallic surface raceway may be used in finished areas on masonry walls. All surface raceway in finished areas must be color matched to the existing finish within the limitations of standard manufactured colors.

6. Conduit, in non-finished areas where possible, will be concealed in ceiling cavity spaces, plenums, furred spaces and wall construction. Exposed conduit will run parallel to or at right angles to the building structure.

7. Wires are to be kept a minimum of three (3) inches from hot water or condense piping.

8. Where sensor wires leave the conduit system, they are to be protected by a plastic insert.

9. Wire will not be allowed to run across telephone equipment areas.

B. Installation Practices for Field Devices

1. Well-mounted sensors will include thermal conducting compound within the well to insure good heat transfer to the sensor.

2. Actuators will be firmly mounted to give positive movement and linkage will be adjusted to give smooth continuous movement throughout 100 percent of the stroke.

3. Relay outputs will include transient suppression across all coils. Suppression devices shall limit transients to 150% of the rated coil voltage.

4. Water line mounted sensors shall be removable without shutting down the system in which they are installed.

5. For duct static pressure sensors, the high-pressure port shall be connected to a metal static pressure probe inserted into the duct pointing upstream. The low-pressure port shall be left open to the plenum area at the point that the high-pressure port is tapped into the ductwork.

6. For building static pressure sensors, the high-pressure port shall be inserted into the space via a metal tube. Pipe the low-pressure port to the outside of the building.

C. Enclosures

1. For all I/O requiring field interface devices, these devices, where practical, will be mounted in a field interface panel (FIP). The Contractor shall provide an enclosure, which protects the device(s) from dust, moisture, conceals integral wiring and moving parts.

2. FIP's shall contain power supplies for sensors, interface relays and Contractors, safety circuits, and I/P transducers.

3. The FIP enclosure shall be of steel construction with baked enamel finish; NEMA 1 rated with a hinged door and keyed lock. The enclosure will be sized for 20% spare mounting space. All locks will be keyed identically.

4. All wiring to and from the FIP will be to screw type terminals. Analog or communications wiring may use the FIP as a raceway without terminating. The use of

wire nuts within the FIP is prohibited.

5. All outside mounted enclosures shall meet the NEMA-4 rating.

6. The tubing and wiring within all enclosures shall be run in plastic track. Wiring within controllers shall be wrapped and secured.

D. Identification

1. Identify all control wires with labeling tape or sleeves using either words, letters, or numbers that can be exactly cross-referenced with As-Built Drawings.

2. Identify all pneumatic tubing with labeling tape or sleeves using either words, letters, or numbers that can be exactly cross-referenced with As-Built Drawings.

3. All field enclosures, other than controllers, shall be identified with a Bakelite nameplate. The lettering shall be in white against a black or blue background.

4. Junction box covers will be marked to indicate that they are a part of the BAS system.

5. All I/O field devices (except space sensors) that are not mounted within FIP's shall be identified with nameplates.

6. All I/O field devices inside FIP's shall be labeled.

E. Existing Controls:
Existing controls which are to be reused must each be tested and calibrated for proper operation. Existing controls which are to be reused and are found to be defective requiring replacement, will be noted to the Owner. The Owner will be responsible for all material and labor costs associated with their repair.

F. Control System Switch-Over

1. Demolition of the existing control system will occur after the new temperature control system is in place including new sensors and new field interface devices.

2. Switch over from the existing control system to the new system will be fully coordinated with the Owner. A representative of the Owner will be on site during switch over.

3. The Contractor shall minimize control system downtime during switch over. Sufficient installation mechanics will be on site so that the entire switch over can be accomplished in a reasonable time frame.

G. Location

1. The location of sensors is per Mechanical and Architectural Drawings.

2. Space humidity or temperature sensors will be mounted away from machinery generating heat, direct light and diffuser air streams.

3. Outdoor air sensors will be mounted on the north building face directly in the outside air. Install these sensors such that the effects of heat radiated from the building or sunlight is minimized.

4. Field enclosures shall be located immediately adjacent to the controller panel(s) to which it is being interfaced.

3.4 SOFTWARE INSTALLATION

A. General:
The Contractor shall provide all labor necessary to install, initialize, start-up and debug all system software as described in this section. This includes any operating system software or other third party software necessary for successful operation of the system.

B. Database Configuration:
The Contractor will provide all labor to configure those portions of the database that are required by the points list and sequence of operation.

C. Color Graphic Slides:
Unless otherwise directed by the Owner, the Contractor will provide color graphic displays as depicted in the Mechanical Drawings for each system and floor plan. For each system or floor plan, the display shall contain the associated points identified in the point list and allow for set point changes as required by the Owner.

D. Reports

1. The Contractor will configure a minimum of 6 reports for the Owner as listed below:
   a. Central Plant Status Report
   b. Air Handler Status Report
   c. Energy Consumption Report
   d. Space Temperature Report
   e. Specialty Equipment Status Report

E. Documentation

1. As-built software documentation will include the following:
   a. Descriptive point lists
   b. Application program listing
   c. Application programs with comments
   d. Printouts of all reports
   e. Alarm list
   f. Printouts of all graphics

3.5 COMMISSIONING AND SYSTEM STARTUP

A. Point-to-Point Checkout: Each I/O device (both field mounted as well as those located in FIP's) shall be inspected and verified for proper installation and functionality. A checkout sheet itemizing each device shall be filled out, dated and approved by the Project Manager for submission to the Owner or Owner's representative.

B. Controller and Workstation Checkout: A field checkout of all controllers and front-end equipment (computers, printers, modems, etc.) shall be conducted to verify proper operation of both hardware and software. A checkout sheet itemizing each device and a description of the associated tests shall be prepared and submitted to the Owner or Owner's representative by the completion of the project.

C. System Acceptance Testing

1. All application software will be verified and compared against the sequences of operation. Control loops will be exercised by inducing a setpoint shift of at least 10% and observing whether the system successfully returns the process variable to setpoint. Record all test results and attach to the Test Results Sheet.
2. Test each alarm in the system and validate that the system generates the appropriate alarm message, that the message appears at all prescribed destinations (workstations or printers), and that any other related actions occur as defined (i.e. graphic panels are invoked, reports are generated, etc.). Submit a Test Results Sheet to the Owner.
3. Perform an operational test of each unique graphic display and report to verify that the item exists, that the appearance and content are correct, and that any special features work as intended. Submit a Test Results Sheet to the Owner.
4. Perform an operational test of each third party interface that has been included as part of the automation system. Verify that all points are properly polled, that alarms have been configured, and that any associated graphics and reports have been completed. If the interface involves a file transfer over Ethernet, test any logic that controls the transmission of the file, and verify the content of the specified information.

3.6 SEQUENCES OF OPERATION

A. Indoor Energy Recovery Unit (ERU-1)

1. Point List

a. Supply Fan Status
b. Exhaust Fan Status
c. OA, EA, Air Temperatures
d. OA, EA, Damper
e. Discharge Temperature
f. Remote Steam Coil Control Valve

2. Sequence of Operation

a. Unoccupied - In this mode:

Supply and Exhaust fans off, OA and EA dampers closed, Perimeter Radiation heat shall be first stage of heat to the space. If additional heat is required, the respective energy recovery unit shall start and run to maintain the night setback temperature (60°F). The remote steam coil control valve shall modulate as required.

b. Occupied - In this mode:

- The OA and EA dampers will open and thru a hard wired interlock the Supply and Exhaust fans will start.
- Energy transfer will be both sensible and latent energy between air steams. Latent energy transfer media transfer will be accomplished by direct water vapor transfer from one air steam to the other, without exposing transfer media in succeeding cycles directly to the exhaust air and then to the fresh air.
- The steam coil (HC-1) control valve shall modulate as required to maintain occupied heating discharge setpoint (72˚F adjustable) as sensed by the remote temperature sensor.
- An adjustable dead band offset will prevent short cycling.

c. Alarms: In this mode:

- The freezestat mounted after the heating coil will protect the coils from freezing. Should the freezestat go into alarm the outside air and exhaust fans will shut off. The OA and EF dampers will be closed. The steam coil valve will be open. An alarm will be generated at the operators work station. Note: The freezestat will be able to be reset from the operator's work station.
- Should the command not equal the status within 90 seconds from start-up an alarm will be generated at the operator's workstation.
- Should any temperature fall outside of its preset limits (high/low) an alarm will be generated at the operator's work station.

B. Ductless Split System Units (HP-1 / CU-1)

1. Point List

a. Space Temperature
b. Occupied/Unoccupied

2. Sequence of Operation

a. Cooling/heating shall operate as required based upon its own packaged controls to maintain hard wired thermostat set point (adjustable). Heat pump shall operate as required, providing heating or cooling to zone as required.

C. Unit Heaters

1. Point List

    a. Space Temperature
    b. Space Temperature Setpoint
    c. Fan Start/Stop
    d. Steam Coil Control Valve

2. Sequence of Operation

    a. Unit fan shall cycle and steam valve open based on space temperature setpoint.

3.7 TRAINING

A. The Contractor shall supply personnel to train key customer personnel in the operation and maintenance of the installed system. The training program shall be designed to provide a comprehensive understanding and basic level of competence with the system. It shall be sufficiently detailed to allow customer personnel to operate the system independent of any outside assistance. On-line context sensitive HELP screens shall be incorporated into the system to further facilitate training and operation.

B. The training plan shall include detailed session outlines and related reference materials. The customer personnel shall be able to utilize these materials in the subsequent training of their co-workers.

1. Training time shall not be less than a total of 8 hours, and shall consist of:

    a. 4 hours during normal day shift periods for system operators. Specific schedules shall be established at the convenience of the customer.
    b. 4 hours of system training shall be provided to customer supervisory personnel so that they are familiar with system operation.
    c. The specified training schedule shall be coordinated with the customer and will follow the training outline submitted by the Contractor as part of the submittal process.
    d. If further training is needed, the Contractor shall provide another 8 hours at no extra cost.

END OF SECTION

SECTION 230470

TESTING, START-UP AND ADJUSTMENTS

PART 1 - GENERAL

Applicable Provisions of the Conditions of the Contract and Division 1 General Requirements govern work in this section.

1.1 TESTING, START-UP AND ADJUSTMENTS

A. Furnish all materials, supplies, labor and power required for testing. Make preliminary tests and prove work satisfactory. Notify Architect and all authorities having jurisdiction in ample time to be present for final testing of all piping. Test before insulating or concealing any piping. Repair defects disclosed by tests, or if required by Architect, replace defective work with new work without additional cost to Owner. Make tests in stages if so ordered by Architect to facilitate work of others. Use of wicking in tightening leaking joints not permitted.

B. HVAC Contractor is responsible for work of other trades disturbed or damaged by tests and/or repair and replacement of his work and shall cause work so disturbed or damaged to be restored to its original condition at his own expense.

C. Unless otherwise specified, all piping systems shall be hydrostatically tested to 150 psig. Tests shall be of four (4) hour duration during which time piping shall show no leaks and during time no sealing of leaks will be permitted.

D. HVAC Contractor shall balance out system and submit test reports showing operating data to include the following:

1. C.F.M. of all air handling equipment.
2. C.F.M. at each air outlet.
3. G.P.M. for equipment.
4. R.P.M. for each fan and fan motor.
5. Motor power consumption.
6. Air temperature readings before and after coils.
7. Water temperature readings in and out of coils and through equipment.
8. Pressure gauge readings before and out of all pertinent equipment.

E. If the performance of the systems does not conform to the design parameters the Contractor shall return to the site until the systems perform as designed.

F. HVAC Contractor shall furnish services of qualified personnel, thoroughly familiar with job, to operate and make all adjustments so that system and control equipment shall operate as intended. This shall include adjustment/replacement of sheaves/impellers to achieve design performance. Adjustments shall be made including balancing of water and air systems in cooperation with qualified representatives of mechanical equipment manufacturers and temperature control manufacturer. This shall include any required adjustment/replacement of sheaves, belts, impellers, etc. to achieve design performance. Architect/Engineer is to be notified when this balancing is to be performed.

G. When all work is in an acceptable operating condition, furnish operating and maintenance manuals as specified in General Requirements.

H. All HVAC equipment shall be carefully designed, constructed and installed so as to prevent any objectionable noise or vibration reaching any part of the building outside of the mechanical equipment room. Care shall also be taken to prevent transmission of noise or odor through ductwork into other spaces.

I. Contractor shall include in his Bid, adjustment of air quantity below scheduled C.F.M. for air systems deemed "noisy" by Owner subsequent to initial balancing.

J. The Contractor shall be required to rectify of replace at his own expense, any equipment not complying with the foregoing requirements.

K. Final inspection and approval shall be made only after proper completion of all of above requirements.

L. If the performance of the systems does not conform to the design parameters the Contractor shall return to the site until the systems perform as designed.

END OF SECTION

SECTION 230480

GENERAL LABELING, VALVE CHARTS AND PIPING IDENTIFICATION

PART 1 - GENERAL

Applicable Provisions of the Conditions of the Contract and Division 1 General Requirements govern work in this section. Submit shop drawings for checking and approval.

1.1 GENERAL LABELING AND VALVE CHARTS

A. This Contractor shall have appropriate descriptive labels, identification tags and nameplates of equipment, valves, etc. furnished and installed under this Contract and shall be properly placed and permanently secured to (or adjacent to) the item being installed. All such labels, identifications, tags, nameplates, etc. shall be selected by the Architect/Engineer.

B. In general, labels shall be the lamacoid type of sufficient size to permit easy identification, black coated, white edged, with letters 3/16" high. Major equipment, apparatus, control panels, etc. shall have 8" x 4" lamacoid plates with lettering of appropriate size.

C. Provide tags for all valves, automatic and manual dampers. Tags shall be Type #2020 anodized aluminum of #1420 lamacoid engraved. Tags may not necessarily be standard. Fasten tags to valve or damper with brass chain.

D. All nameplates, labels, identifications and tags shall be as manufactured by the Seton Name Plate Co., of New Haven, CT or approved equal. Submit complete schedules, listings and descriptive data together with samples for checking and approval before purchasing. Labeling shall include the "number" of the equipment, valve, dampers, switch, etc. and service of the valve.

E. Mount on laminated plastic boards with transparent surface all valves, wiring diagrams, control diagrams, instruction charts, permits, etc. Valve chart shall be non-fading with original copies laminated.

1.2 IDENTIFICATION OF PIPING

A. This Contractor shall provide on all piping, semi-rigid, wrap around plastic identification markers equal to Seton Snap-Around and/or Seton Strap-On pipe markers.

B. Each marker background is to be appropriately color coded with a clearly printed legend to identify the contents of the pipe. Directions of flow arrows are to be included on each marker.

C. Identification of all piping shall be adjacent to each valve, at each pipe passage through wall, floor and ceiling construction and at each branch and riser take-off.

D. Identification shall be on all horizontal pipe runs, marked every 15 ft. as well as at each inlet outlet of equipment.

END OF SECTION

SECTION 230490

GUARANTEE

PART 1 - GENERAL

Applicable Provisions of the Conditions of the Contract and Division 1 General Requirements govern work in this section.

1.1 GUARANTEE

A. The Contractor shall remove, replace and/or repair at his own expense and at the convenience of the Owner, any defects in workmanship, materials, ratings, capacities and/or characteristics occurring in the work within one (1) year or within such longer period as may be provided in the Drawings and/or Section of the Specifications, which guarantee period shall commence with the final acceptance of the entire Contract in accordance with the guarantee provisions stated in the General Conditions, and the Contractor shall pay for all damage to the system resulting from defects in the work and all expenses necessary to remove, replace, and/or repair any other work which may be damaged in removing, replacing and/or repairing the work.

END OF SECTION

SECTION 260100

GENERAL CONDITIONS

PART 1 - GENERAL

Applicable Provisions of the Conditions of the Contract and Division 1 General Requirements govern the work in this section.

1.1 DESCRIPTION OF WORK

A. It is the intention of the Specification and Drawings to call for finish work, tested and ready for operation.

B. Any apparatus, appliance material or work not shown on the Drawings but mentioned in the Specifications, or vice versa, or any incidental accessories or ancillary devices necessary to make ready for operation even if not particularly specified, shall be furnished, delivered and installed under their respective Division without additional expense to the Owner.

C. Minor details not usually shown or specified, but necessary for proper installation and operation, shall be included in the work as though they were hereinafter specified or shown.

D. Work under each section shall include giving written notice to the Architect of any materials or apparatus believed inadequate or unsuitable, in violation of laws, ordinances, rules and regulations of authorities having jurisdiction; and any necessary items of work omitted. In the absence of such written notice, it is mutually agreed that work under each section has included the cost of all necessary items for the approved satisfactory functioning of the entire system without extra compensation.

E. Small scale drilling through walls and floors which may contain asbestos shall be performed by a person with a “restricted asbestos handler allied trades certificate” and shall have a copy of it in his possession at all times while working of the project.

1.2 DRAWINGS

A. Drawings are diagrammatic and indicate the general arrangement of the system and work included in the Contract. (Do not scale the drawings). Consult the Architectural Drawings and details for exact location of fixtures and equipment; where same are not definitely located, obtain this information from the general construction supervisor.

B. Work under each section shall closely follow Drawings in layout of work; check Drawings of other Divisions to verify spaces in which work will be installed. Maintain maximum headroom; do not begin work until unsatisfactory conditions are corrected.

C. Make reasonable modifications in the layout as needed to prevent conflict with work of other Sections of the Specifications or for proper execution of the work.

D. It shall be understood that the right is reserved by the Architect/Engineer to change the location of equipment and apparatus to a reasonable extent as building conditions may dictate, prior to their installation without extra cost to the Owner.

1.3 SURVEYS AND MEASUREMENTS

A. Base all measurements, both horizontal and vertical, from established benchmarks. All work shall agree with these established lines and levels. Verify all measurements at site and check the correctness of same as related to the work.

B. Before proceeding with the work resolve discrepancies between actual measurements and those indicated, which prevent following good practice or intent of the Drawings or Specifications.

1.4 CODES AND STANDARDS

A. The Codes and Standards listed below apply to all Electrical work codes or standards that are mentioned in these Specifications; the latest edition or revision shall be followed:

1. NEMA - Standards
2. ANSI CI - National Electrical Code (NFPA 70)
3. ANSI C50 - Rotating Electrical Machinery
4. ANSI C51.1 - Construction and guide for selection, installation and use of electric motors.
5. ANSI C52.1 - Motors and Generators

B. The following State and Local Codes shall apply: New York State Uniform Fire Prevention and Building Code, and Local Building Codes.

C. The following abbreviations are used within this Division of the Specifications:

1. IES - Illuminating Engineering Society.
2. NEC - National Electrical Code
3. ANSI - American National Standards Institute
4. ASTM - American Society for testing and materials
5. EPA - Environmental Protection Agency
6. IEEE - Institute of Electrical and Electronic Engineers
7. NEMA - National Electrical Manufacturers Association
8. NFPA - National Fire Protection Association.
9. OSHA - Occupational Safety and Health Administration
10. UL - Underwriter's Laboratories

1.5 PERMITS AND FEES

A. Give all necessary notices, obtain all permits and pay all Government and State sales taxes and fees where applicable, and other costs, including utility connections or extensions in connection with work of this Division. File all necessary plans, prepare all documents and obtain all necessary approvals of all Governmental and State departments having jurisdiction; obtain all necessary certificates of inspections for his work and deliver a copy to the Architect before request for acceptance and final payment for the work. Pay fees for utility construction/connections.

B. Include in the work, without extra cost to the Owner, any labor, materials, services, and apparatus, Drawings in order to comply with all applicable laws, ordinances, rules and regulations, whether or not shown on the Drawings and/or specified.

C. All materials furnished and all work installed shall comply with the rules and recommendations of the National Fire Protection Association, with the requirements of the local utility companies, with the recommendations of fire insurance rating organization having jurisdiction and with the requirements of all governmental departments having jurisdiction.

D. All materials and equipment for the electrical portion of the mechanical systems shall bear the approval label of or shall be listed by the Underwriter's Laboratories, Inc.

1.6 TEMPORARY LIGHT AND POWER

A. The Contractor shall furnish, install, maintain and, upon direction to do so, remove system of temporary lighting and power for the use of all construction trades.

B. The Electrical Contractor shall provide adequate electrical service for the needs of all Contracting Trades.

C. Wiring shall be provided for temporary use during building construction, including grounding and fused main cut-off switches. Temporary electric lines with branch switches shall be provided for lighting and for taps for electric tools, pumps and other temporary equipment; all connected to a main line looped through floor spaces and up stair wells or shafts. All power outlets shall be grounded to an equipment ground wire in an approved manner. Electric lines shall be extended to power tools, which cannot be located within reach of extension cords.

D. Light bulbs shall be provided in sufficient quantity to light the building for safety purposes. Extension cords shall be provided as may be essential to the proper execution of the work. Temporary lighting shall be provided for all stairs and other locations where needed for safety or the proper execution of the work.

E. The Electrical Contractor shall maintain temporary lighting and power systems in good working condition, including the relocation and reinstallation when required to avoid interference with the progress of construction.

F. Provide ground-fault personnel ampere protection for all single phase, 15 and 20 ampere receptacles. All receptacles and portable cord connectors shall have NEMA standard locking type configurations.

G. The Electrical Contractor shall turn lights on and off at the beginning and end of each working day of any trade unless otherwise directed. He shall arrange for all temporary light and power for all trades which do not have holidays (days off) similar to the electrical trade. The Electrical Contractor shall patch and repair all openings left damaged by the installation and removal of the temporary light and power.

1.7 MANUFACTURER'S IDENTIFICATION

A. Manufacturer's nameplate, name or trademark and address shall be attached permanently to all equipment and materials furnished under this Division. The nameplate of a contractor or distributor may not be used.

1.8 SHOP DRAWINGS

A. Submit for approval detailed shop drawings of all equipment and materials in accordance with working procedures.

B. Furnish all necessary templates and patterns for installation work and for the purpose of making adjoining work conform; furnish setting plans and shop details to other trades as necessary.

C. Submit shop drawings for the following:

1. Light fixtures.
2. Receptacles, switches, occupancy sensors.
3. Overcurrent protective devices.
4. Panelboards.
5. Fire Alarm System

1.9 MATERIALS AND WORKMANSHIP

A. All materials and apparatus necessary for the work, except as specifically indicated otherwise, shall be new, of first class quality and shall be furnished, delivered, erected, connected and finished in every detail and shall be so selected and arranged as to fit properly into the building spaces. Where no specific kind or quality of material is given, a first class standard article as accepted by the Architect shall be furnished.

B. Furnish the services of an experienced Superintendent who shall be constantly in charge of the installation of the work, together with all skilled workmen, helpers, and labor to unload, transfer, erect, connect up, adjust, start, operate and test each system.

C. Unless otherwise specifically indicated on the Drawings or Specifications, all equipment and materials shall be installed in accordance with the recommendations of the manufacturer. This includes the performance of such tests as the manufacturer recommends.

1.10 PROTECTION

A. Work under each Section shall include protecting the work and materials of all other Sections from damage from work or workmen and shall include making good all damage thus caused. Be responsible for work and equipment until finally inspected, tested, and accepted; protect work against theft, injury or damage; and carefully store material and equipment received on site, which is not immediately installed. Close open ends of work with temporary covers or plugs during construction to prevent entry of obstructing or other foreign material.

B. Work under each section includes receiving, unloading, uncrating, storing, protecting, setting in place and connecting up completely of any equipment supplied under each section. Work under each section shall also include exercising special care in handling and protecting equipment and fixtures and shall include the cost of replacing any of the above equipment and fixtures which are missing or damaged by reason of mishandling of failure to protect on the part of the Contractor.

1.11 BASES AND SUPPORTS

A. Unless specifically noted otherwise, provide all necessary supports, pads, bases, and piers required for all equipment under this Division. Provide all temporary bases and supports as required.

B. All equipment, unless shown otherwise, shall be securely attached to the building structure. Attachments shall be of a strong and durable nature; any attachments that are, insufficient, shall be replaced as directed by the Architect.

1.12 SLEEVES, INSERTS AND ANCHOR BOLTS

A. All conduits passing through floors, walls or partitions shall be provided with sleeves having an internal diameter one inch larger than the outside diameter of the conduit, or insulation enclosing the conduit.

B. Furnish all sleeves, inserts, and anchor bolts necessary to be installed under other sections of the Specifications to accommodate work of this section.

C. Sleeves through outside walls shall be cast iron sleeves with intermediate integral flange. Sleeves shall be set with ends flush with each face of wall. The remaining space shall be packed with oakum to within 2 inches of each face of the wall. The remaining shall be packed and made watertight with a waterproof compound.

D. Sleeves through concrete floors or interior masonry walls shall be schedule 40 black steel pipe, set flush with finished walls or ceiling surfaces but extending 2 inches above finished floors.

E. Sleeves through interior partitions shall be 22 gauge galvanized sheet steel, set flush with finished surfaces or partitions.

F. Inserts shall be individual or strip type of pressed steel construction with accommodation for removable nuts and threaded rods up to 3/4" inch diameter, permitting lateral adjustment. Individual inserts shall have an opening at the top to allow reinforcing rods up to 1/2" diameter to be passed through the insert body. Strip inserts shall have attached rods having hooked ends to allow fastening to reinforcing rods. Inserts shall be as manufactured by Carpenter and Patterson, Inc. or Grinnell Co., Inc.

G. Penetrations through fire-rated walls, ceilings and floors in which cables, conduits pass, shall be sealed by a UL approved fire stop fitting classified for an hourly rating equal to the fire rating of the floor, wall or ceiling shall be Gedney Fire Seal Type CFSF of CAPS.

1.13 PAINTING

A. All finish painting in finished areas shall be performed by others.

B. All materials shipped to the job site under the Division, such as panels and plates, shall have a prime coat and standard manufacturer's finish unless otherwise specified.

C. Inaccessible conduits, hangers, supports and anchors and ducts shall be coated prior to installing.

D. All components of the fire alarm system raceway shall be painted red. This includes but is not limited to conduit, junction boxes, pullboxes.

1.14 CUTTING AND PATCHING

A. All cutting and patching required for the work of this Division shall be done by this Division.

B. Work under this Division shall include furnishing, locating and setting inserts and/or sleeves. Do all drilling and cutting necessary for the installation.

C. All holes cut through concrete slabs and structural steel shall be punched or drilled from the underside. No structural member shall be cut without the written acceptance of the Architect and all such cutting shall be done in a manner directed by him.

D. Refer to Division 1 for additional requirements.

1.15 SCAFFOLDING, RIGGING, HOISTING

A. Furnish all scaffolding, rigging, hoisting, and services necessary for erection and delivery into the premises of any equipment and apparatus furnished under this Division. Remove same from premises when no longer needed.

1.16 WATERPROOFING

A. Where any work penetrates waterproofing, including waterproof concrete and floors in wet areas. Submit proposed method of installation for review by the Architect before beginning work. Furnish all necessary sleeves, caulking and flashing necessary to make opening absolutely watertight.

1.17 ACCESSIBILITY AND ACCESS PANELS

A. Be responsible for the sufficiency of the size of shafts and chases, the adequate thickness of partitions, and the adequate clearance in double partitions and hung ceilings for the proper installation of the work of this Division.

B. Locate all equipment, which must be serviced, operated or maintained in fully accessible positions. Minor deviations from Drawings may be allowed for better accessibility with approval of the Architect.

1.18 CLEANING

A. Thoroughly clean all equipment of all foreign substances inside and out before being placed in operation.

B. If any foreign matter should stop any part of a system after being placed in operation, the system shall be disconnected, cleaned and reconnected whenever necessary to locate and remove obstructions. Any work damaged in the course of removing obstructions shall be repaired or replaced when the system is reconnected at no additional cost to the Owner.

C. Upon completion of work remove from the premises all rubbish, debris, and excess materials. Any oil or grease stains on floor areas caused by work of this Division shall be removed and floor areas left clean.

1.19 RECORD DRAWINGS

A. Maintain at the job site a record set of Electrical Drawings on which any changes in location of equipment, panels, devices, and major conduits shall be recorded. Indicate dimensions of all items installed underground or in concrete.

1.20 OPERATING INSTRUCTIONS

A. Upon completion of all work and all tests, the Contractor shall furnish the necessary skilled labor and helpers for operating his system and equipment for a period specified under each applicable Section of this Division. During this period, he shall instruct the Owner or his representative fully in the operation, adjustment and maintenance of all equipment furnished. Give at least 7 days' notice to the Owner in advance of this period.

B. Furnish four complete bound sets for delivery to the Architect of typewritten or blueprinted instructions for operating and maintaining all systems and equipment included in this Division. All instruction shall be submitted in draft for review prior to final issue. Manufacturer's advertising literature or catalogs may not be used for operating and maintenance instruction.

C. In the above-mentioned instructions, include the maintenance schedule for the principal items of equipment furnished under this Division.

D. The manufacturer shall attest in writing that his equipment has been properly installed prior to start. The following is some of the equipment necessary for this inspection: fire alarm system. These letters will be bound into the operating and maintenance books.

1.21 ADJUSTING AND TESTING

A. After all equipment and accessories to be furnished are in place, they shall be put in final adjustment and subjected to such operating tests as will assure the Architect that they are in proper adjustment and in satisfactory permanent operating condition.

B. This particular work shall include the services of a factory engineer to inspect the installation and assist in the initial startup and adjustment to the equipment. The period of these services shall be for such time as necessary to secure proper installation and adjustments. After the equipment is placed in permanent operation, there shall be furnished the service of said engineer for the purpose of supervising the initial operation of the equipment and to instruct the personnel responsible for operation and maintenance of the equipment.

C. At the completion of the job when all panels, devices, etc. are at full working load the Contractor shall provide infrared scan thermographic inspection test of all connection points, terminals, etc. of wires #8 AWG and larger to detect "hot-spots" in the electrical current flow. Correct all hot-spots.

1.22 UNDERWRITER'S LABEL

A. All electrical equipment and materials shall be new and shall comply with the standards of and shall bear the label of the Underwriter's Laboratories.

1.23 ELECTRICAL SAFETY INSPECTION

A. Electrical Contractor shall arrange for an Electrical Safety Inspection to be performed by the Local Inspection Agency (i.e.: New York Electrical Inspection Services, Atlantic Inland, Middle Department Inspection Agency). A Certificate of Compliance “Underwriter’s Certificate” shall be issued to the Owner. All costs and coordination required shall be included in this Contractors Base Bid.

1.24 REMOVALS

A. The scope of removals shown on the Drawings are diagrammatic only and indicate the intent of the work to be performed and not the complete scope of demolition and/or removal work. It shall be the responsibility of this Contractor to remove any electrical devices even if not specifically indicated to be removed on these Drawings in order to accommodate new work.

B. All power conductors, control wiring and conduit associated with mechanical equipment such as fans, pumps, etc. designated for removal on the HVAC Drawings shall be removed clear back to the source of power and disconnected. All motor starters, disconnect switches, control devices, etc. shall be removed. Refer to HVAC Drawings for extent of HVAC removals.

C. Any device removed shall include (but shall not be limited to) the removal of all associated wiring, conduit, boxes, and auxiliary devices back to the previous device on the circuit, or back to the panelboard or origin of the circuit or any other items that are not incorporated in new layout, until such removal is complete. If the removal of any device interrupts service of any other device that is to remain, the Contractor shall provide all materials and labor to ensure continuity of service to those devices to remain.

D. Junction boxes, pullboxes, wireways, conduits, or any other devices required to reconnect circuitry shall be installed concealed within the ceilings, partitions and/or walls, floors, no surface or exposed circuiting shall be permitted, unless specifically indicated.

E. The Electrical Contractor shall patch all openings in walls, ceilings or roof that are left open as a result of removals. Refer to cutting and patching section.

F. Any electrical device removed including but not limited to disconnect switches, panelboards, etc. shall be cleaned, protected and turned over to the Owner or disposed of as directed by Owner.

END OF SECTION

SECTION 260125

SCOPE OF WORK

PART 1 - GENERAL

Applicable Provisions of the Conditions of the Contract and Division 1 General Requirements govern work in this section.

1.1 SCOPE OF WORK

A. The work under this section includes all labor, materials, equipment, tools, transportation and the performance of all work necessary and required for furnishing and installing all Electrical work shown on the Contract Documents, as specified herein and as otherwise required by job conditions or reasonably implied, including, but not necessarily limited to the following:

1. The installation of new Fire Alarm Control Panel interfacing with existing FACP and the addition of new fire alarm devices (i.e., automatic fan shutdown for, new HVAC equipment) and the replacement of the existing ones as shown on Drawings.

2. The contractor shall dispose of all debris, including but not limited to fixtures, equipment, lamps, ballast, wiring devices and the like in accordance with, as defined by governing law and regulations of the jurisdiction where the work is being performed.

3. Conduit, conduit fittings, junction and pull boxes and all appurtenances necessary for the raceway systems including necessary supports and fasteners.

4. Electrical conductors, connectors, fittings and connection lugs.

5. Branch circuit devices, outlet boxes, pull boxes, motor disconnect switches, etc.

6. Power wiring to HVAC and Plumbing equipment including disconnect switches as shown and/or required by NEC.

7. Provide new data wiring/conduit/wiremold to data rack patch panel as indicated on Drawings.

8. Lighting fixtures and lamps including exterior lighting and occupancy sensor.

9. Core drilled holes for conduit passing through walls, ceilings and floors.

10. All necessary cutting, patching and core drilling incidental to the electrical work.

11. Temporary light and power.

12. Licenses, permits, inspection and approvals.

13. Grounding as required as per NEC.

14. Sleeves for conduit and watertight caulking between conduit and sleeve.

15. Testing.

16. Cutting, patching and drilling.

B. Coordination Drawings (if applicable): Attention is directed to Division 1 for coordination drawing requirements for this project. These drawings are critical to the proper execution of the work and failure to honor these requirements may become the basis for denial of any and all claims for either or both "time" and "money".

1.2 WORK NOT INCLUDED

A. The following related items will be done by others:

1. Furnishing motors and controllers.

2. Concrete work.

END OF SECTION

SECTION 260150

APPROVED MANUFACTURERS

PART 1 - GENERAL

Applicable provisions of the Conditions of the Contract and Division 1 General Requirements govern work in this section.

1.1 APPROVED MANUFACTURERS

A. The following list of manufacturers constitutes an approved list:

1.	Disconnect Switches	Siemens, Square D, GE
2.	Conduit (steel)	Wheatland, Allied, Republic Conduit
3.	Conduit Fittings (steel)	Appleton, Crouse-Hind, O-Z, T & B, M & W
4.	Wire and Cable	General, South Wire, Rome, Cerro
5.	Splicing Connectors	3M, O-Z, Thomas & Betts
6.	Outlet Boxes	Appleton, National, Steel City, Raco
7.	Wiring Devices	Arrow-Hart, Hubbell, P & S
8.	Fuses	Bussman, Ferraz-Shawmut, Littlefuse
9.	Lamp	GE, Sylvannia, Philips
10.	Motion Sensors	Watt Stopper, Sensorswitch
11.	Fire Alarm System	Siemens
12.	Public Address System	Telecor, Inc.

B. All materials and appliances shall have listing of Underwriters Laboratories, Inc. and be so labeled, or shall conform to their requirements, in which case certified statements to that effect shall be furnished by the manufacturer with a copy of an examination report by a recognized independent testing laboratory acceptable to the Architect and his Engineer. Use new materials and appliances throughout.

C. Where several types or makes of materials are specified, the Contractor has the option of using any of these, but after a type or make has been selected and has received the approval of the Architect, it shall be used throughout.

D. The Contractor shall provide all structural supports for the proper attachment of equipment supplied by him and also for all equipment supplied to him under other sections of the Specifications for mounting and connections.

E. Secure all equipment to the building structure independently. Do not secure to work of other trades such as ceiling lath, piping racks, etc., unless specified or noted otherwise.

F. Wall mounted equipment shall be directly secured to wall by means of steel bolts. Maintain at least 1/4" air space between equipment and supporting wall. Pre-fabricated steel channels providing a high degree of mounting flexibility, such as those manufactured by Kindorf and Unistrut, shall be used for mounting arrays of equipment.

G. All fastening, supports, hangers, anchors, etc., shall be of a type made for the specific purpose. On masonry walls, metallic expansion shield and machine screws shall be used. Screws with wooden plugs or anchors will not be acceptable on any part of the work.

END OF SECTION

SECTION 260200

CONDUIT

PART 1 - GENERAL

Applicable provisions of the conditions of the Contract and Division 1 General Requirements govern the work in this section. Submit shop drawings for checking and approval.

1.1 WORK INCLUDED

A. The work under this section shall include the furnishing of all material, labor, tools and services necessary to install rigid metal conduit, electrical metallic tubing and liquid tight flexible metal conduit, including all fittings to complete all work shown on the Drawings or specified herein.

1.2 RELATED WORK

A. Cutting and patching.

B. Trenching: Excavation and backfill for conduit and utility on site.

C. Sheet metal flashing and trim.

1.3 REFERENCE FOR METAL RACEWAY

A. UL 5 - Surface Metal Raceways and Fittings.

B. UL 870 - Wireways, Auxiliary Gutters, and Associated Fittings

PART 2 - PRODUCTS

2.1 RIGID STEEL CONDUIT

A. Industry standard heavy wall conduit.

B. Minimum 3/4" trade size.

C. Threaded.

D. Hot dipped galvanized finish by means of plating after cutting of threads.

2.2 INTERMEDIATE METAL CONDUIT

A. Industry standard steel conduit.

B. Minimum 3/4" trade size.

C. Threaded.

D. Hot dipped galvanized finish by means of plating after cutting of threads.

2.3 ELECTRICAL METALLIC TUBING

A. Industry standard thin wall conduit of galvanized steel only.

B. Minimum 3/4" trade size, Maximum 4" trade size.

2.4 FLEXIBLE METAL CONDUIT

A. Galvanized steel tape formed into an industry standard interlocking coil.

B. Minimum 3/4" trade size except for connection of lighting fixtures.

C. Grounding type.

D. Separate ground conductor.

E. Use for short connections to motor terminal box, other vibrating equipment using a minimum length of 18" with 50% slack and a maximum of 6'.

F. From outlet box to recessed lighting fixtures with a maximum length of 6'.

2.5 WIREWAYS

A. Lay-in type, UL listed as wireway or auxiliary gutter.

B. Wireway shall be of code gauge steel construction (UL standard for Wireway Auxiliary Gutters and Associated Fittings) with removable cover. Tamperproof screws shall be provided for sealing covers to prevent access by unauthorized personnel. Wireway shall be provided with knockouts.

C. Connector and covers shall be attached so that removal of connectors is not necessary to utilize the lay-in feature.

D. Finish: All sheet metal parts shall be provided with a rust inhibiting phosphating coating and baked enamel finish. All hardware shall be plated to prevent corrosion. All screws extending into the wireway shall be protected by spring nuts or otherwise guarded to prevent wire insulation damage.

2.6 CONDUIT SUPPORTS

A. Conduit clamps, straps and supports: Steel or malleable iron.

2.7 CONDUIT FITTINGS

A. Use compression fittings for all EMT in exposed areas. Utilize set screw fittings only above hung ceilings and concealed areas.

2.8 SURFACE METAL RACEWAY

A. Metal raceway shall be of a two-piece design with a base and snap-on cover.

B. Raceway and all components shall be listed by Underwriters Laboratories.

C. Single Channel: Steel, zinc plated, off-white finish suitable for repainting. Two piece design with metal base and snap-on cover. Provide Wiremold V700, Hubbell Inc. 750 Series, or Panduit PMR5/PMR7.

D. Dual Channel: Steel, galvanized, off-white finish but suitable for repainting. Two-piece design with metal base and snap-on cover, minimum 0.04" thick base and cover. Base shall be divided by a removable barrier section. Provide duplex receptacles mounted in top cell and communication outlets in the bottom cell. Coordinate communications jack requirements with owner's IT personnel. Provide Wiremold V4000, Wiremold DS4000 Series, Hubbell Inc. 4000 Series or Panduit PMR40.

PART 3 - EXECUTION

3.1 CONDUIT SIZING, ARRANGEMENT AND SUPPORT

A. Minimum size - 3/4". Provide grounding bushings on all conduits 1-1/4" and larger.

B. Arrange conduit to maintain headroom and present a neat appearance.

C. Route exposed conduit and conduit above accessible ceilings parallel and perpendicular to walls and adjacent piping.

D. Draw up couplings and fittings full and tight. Protect threads cut in field from corrosion. Paint newly threaded joints of steel conduit with T & B "Kopershield" compound before installation. Running threads prohibited; use three-piece unions or split couplings instead. Use only compression fittings for all EMT in areas where it will be exposed in finished and unfinished areas. Provide set screw fittings only when installed above hung ceilings.

E. Maintain minimum 6-inch clearance between conduit and piping. Maintain 12-inch clearance between conduit and heat sources such as flues; steam pipes and heating appliances.

F. Arrange conduit supports to prevent distortion of alignment by wire pulling operations. Fasten conduit using galvanized straps, lay-in adjustable hangers, clevis hangers, or bolted split stamped galvanized hangers.

G. Group conduit in parallel runs where practical and use conduit rack constructed of steel channel with conduit straps or clamps. Provide space for 25 percent additional conduit.

H. Do not fasten conduit with wire or perforated pipe straps. Remove all wire used for temporary conduit support during construction, before conductors are pulled.

I. Exposed conduit on ceiling shall be parallel or perpendicular to wall and vice versa to ceiling when installed on wall. Secure conduit clamps and supports to masonry materials by toggle bolt, expansion bolt or steel insert. Spacing or conduit supports shall not exceed 7 feet.

3.2 CONDUIT INSTALLATION

A. Cut conduit square using a saw or pipe cutter, Deburr cut ends.

B. Bring conduit to the shoulder of fittings and couplings and fasten securely.

C. Use conduit hubs or sealing locknuts for fastening conduit to cast boxes and for fastening conduit to sheet metal boxes in damp or wet locations.

D. Install no more than the equivalent of three 90-degree bends between boxes.

E. Use conduit bodies to make sharp changes in direction, as around beams.

F. Use hydraulic one-shot conduit bender or factory elbows for bends in conduit larger than 2-inch size.

G. Avoid moisture traps where possible; where unavoidable, provide junction box with drain fitting at conduit low point.

H. Use suitable conduit caps to protect installed conduit against entrance of dirt and moisture.

I. Provide No. 12 AWG insulated conductor or suitable pull string in empty conduit, except sleeves and nipples.

J. Install expansion-deflection joints where conduit crosses building expansion or seismic joints.

K. Where conduit penetrates fire-rated walls and floors, provide pipe sleeves two sizes larger than conduit; Pack void around conduit with fire-stop fittings with UL listed fire rating equal to wall or floor ratings; Seal opening around conduit with UL listed foamed silicone elastomer compound.

L. Installation of conduit in slab shall comply with ACI 318.

M. Route conduit through roof openings for piping and duct work where possible; otherwise, route through roof with pitch pocket.

N. Maximum size conduit in slabs above grade: 1 inch. Do not route conduits to cross each other in slabs above grade. Conduits crossing each other may not be larger than 3/4 inch.

O. All conduit used for fire alarm system shall be painted red.

3.3 CONDUIT INSTALLATION OF SCHEDULE

A. Underground installations: PVC minimum Schedule 40, unless otherwise noted on Drawings.

B. Installations in or under concrete slab: PVC minimum Schedule 40, unless otherwise noted on Drawings.

C. Exposed outdoor locations: Rigid galvanized steel conduit.

D. Wet interior locations: Rigid galvanized steel conduit.

E. Concealed dry interior locations and above accessible ceiling for receptacle and lighting branch wiring: Electrical metallic tubing up to first junction box and flexible metallic tubing (MC cable only) thereafter.

F. Concealed dry interior locations other than receptacle and lighting branch wiring: Electrical metallic tubing.

G. Concealed dry interior locations and above accessible ceiling for fire alarm runs: Fire alarm armored cable type MC with red stripe as manufactured by AFC series 1800.

H. Concealed and exposed dry interior location for feeder runs: Electric metallic tubing.

I. Exposed dry interior in unfinished locations other than Boiler Rooms: Electric metallic tubing

J. Final connections to motors: Flexible metallic tubing (MC cable). Minimum of 10" to maximum of 6' for connections to motors.

K. Existing exposed dry interior locations (finished spaces), for branch wiring and fire alarm wiring, one-piece steel raceway (similar to Wiremold V-500, V-700).

L. Final connections to motors: Flexible metallic tubing (MC cable). Minimum of 18" to maximum of 6' for connections to motors.

M. All conduit installed in boiler room up to 10'-0" AFF and lower shall be rigid galvanized steel conduit. All conduit above 10'-0" shall be electric metallic tubing.

N. Final connections to equipment and/or motors in boiler room, outdoors and potentially wet indoor areas: liquid tight, flexible; minimum of 18" to maximum 6'-0" connections.

END OF SECTION

SECTION 260300

WIRE AND CABLE

PART 1 - GENERAL

Applicable provisions of the conditions of the Contract and Division 1 General Requirements govern the work in this section. Submit shop drawings for checking and approval.

1.1 WORK INCLUDED

A. The work under this section shall include the furnishing of all material, labor, tools and services necessary to wire and cable in raceway specified in other sections to complete all work shown on the Drawings or specified herein.

PART 2 - PRODUCTS

2.1 BUILDING WIRE

A. Thermoplastic-insulated building wire: Type THHN.

B. Rubber insulated building wire: NEMA WC 3.

C. Feeders and branch circuits larger than number 6 AWG: Copper, stranded conductor, 600 volt insulation, type THHN.

D. Feeder and branch circuits 6 AWG and smaller: Copper conductor, 600 volt insulation, THWN/THHN, 6 and 8 AWG, stranded conductor; Smaller than 8 AWG, solid conductor.

E. Service feeders and branch circuits in conduit in contact with earth shall be type XHHW.

F. Control circuits: Copper, stranded conductor 600 volt insulation, THHN.

2.2 ARMORED CABLE

A. BX or pre-manufactured cables are not acceptable except for Type MC for branch wiring after the first junction box (for receptacle and lighting branch circuits) and final connections to motors in interior dry accessible locations, minimum length shall be 18” with a maximum length of 6’ for motors. Except for outdoor and boiler room equipment and/or motors. Provide flexible liquid tight conduit.

B. Type MC fire alarm cable with red stripe for concealed fire alarm wiring as manufactured by AFC series 1800.

C. Armored cable, Type MC size 14 through 6 AWG: Copper conductor, 600 volt thermoplastic insulation, rated 90 degrees C., with separate green ground conductor.

2.3 REMOTE CONTROL AND SIGNAL CABLE

A. Control cable for Class 2 or Class 3 remote control and signal circuits:
Copper conductor, 300 volt insulation, rated 60 degree C, individual conductors twisted together shielded and covered with a nonmetallic jacket; UL listed for use in air handling ducts, hollow spaces used as ducts and plenums. Verify wiring type with manufacturer.

2.4 COLOR CODING

A. All wiring shall be color-coded. Neutral wire shall be white throughout and each phase wire shall be identified any place in the system by its color code. All conductors in panel boxes and junction boxes shall be properly tagged with red non-flammable tags properly attached.

B. Wire shall be color coded as follows:

120/208 volt system		Fire Alarm
A Phase	Black	Red
B Phase	Red	
C Phase	Blue	

C. Equipment ground wires or ground jumpers shall be Green.

D. In addition to the basic color-coding described the following additional identification and tagging shall apply.

1. The switch legs for the local wall switches and in switch panel shall have distinctive stripes. In instances where color-coding is not practicable, such as short runs of heavy feeder cables, taping the ends of the cable with coded colors as indicated above or tagging will be permitted.

2. Cables shall be tagged in all pull boxes, wireways and wiring gutters of panels.

3. Where two (2) or more circuits run to or through a control device, outlet box or junction box, each circuit shall be tagged as a guide in making connections.

4. Tags shall identify wire or cable by number and/or piece of equipment served as shown on the Drawings.

PART 3 - EXECUTION

3.1 GENERAL WIRING METHODS

A. Use no wire smaller than 12 AWG for power and lighting circuits, and no smaller than 14 AWG for control wiring.

B. Use 10 AWG conductor for 20 ampere, 120 volt branch circuit home runs longer than 75 feet and for 20 ampere.

C. Use 10 AWG conductor for 20 ampere, 277 volt branch circuit home runs longer than 200 feet for 20 ampere.

D. Place an equal number of conductors for each phase of a circuit in same raceway or cable. No more than one of each phase shall be supported by a single neutral.

E. Splice only in junction or outlet boxes.

F. Neatly tag, identify, train and lace wiring inside boxes, equipment and panelboards.

G. Make conductor lengths for parallel circuits equal.

3.2 WIRING INSTALLATION IN RACEWAYS

A. Pull all conductors into a raceway at the same time. Use UL listed wire pulling lubricate for pulling 4 AWG and larger wires.

B. Completely and thoroughly swab raceway system before installing conductors.

C. Install wire in raceway after interior of building has been physically protected from the weather and all mechanical work likely to injure conductors has been completed.

3.3 CABLE INSTALLATION

A. Support cables above accessible ceilings; do not rest on ceiling tiles. Use spring metal clips or metal cable ties to support cables from structure (not ceiling suspension system). Include bridle rings or drive rings.

B. Use suitable cable fitting and connectors.

3.4 WIRING CONNECTIONS AND TERMINATIONS

A. Splice only in accessible junction boxes.

B. Use solderless pressure connections with insulating covers for copper wire splices and tape, 8 AWG and smaller. For 10 AWG and smaller, use insulated spring wire connectors with plastic caps.

C. Provide extended gutters and tap blocks or pull boxes with tap rail systems similar to Burndy MT Series or Burndy Electrorail system for wire splices 6 AWG and larger.

D. Tape uninsulated conductors with electrical tape to 150 percent of the insulation value of conductor.

E. Thoroughly clean wires before installing lugs and connectors.

F. Make splices, taps and terminations to carry full ampacity of conductors without perceptible temperature rise.

G. Terminate spare conductors with electrical tape.

3.5 FIELD QUALITY CONTROL

A. Field inspection and testing will be performed under provisions of the Specifications.

B. Inspect wire and cable for physical damage and proper connection.

C. Torque test conductor connections and terminations to manufacturer's recommended values.

D. Perform continuity test on all power and equipment branch circuit conductors. Verify proper phasing connections.

3.6 WIRE AND CABLE INSTALLATION SCHEDULE

A. All wiring and cable shall be installed in conduit unless otherwise noted. Refer to conduit section 26 0200 for conduit types at various locations.

END OF SECTION

SECTION 260320

OVERCURRENT PROTECTIVE DEVICES

PART 1 - GENERAL

Applicable Provisions of the Conditions of the Contract and Division 1 General Requirements govern the work in this section. Submit shop drawings for checking and approval.

1.1 WORK INCLUDED

A. Work of this section includes all labor, materials, equipment and services necessary to complete the electrical work as shown of the Drawings and specified herein, including, but not limited to, the following:

B. Circuit Breakers

1. Standard molded case circuit breakers "bolted in" type.
2. Solid state circuit breakers.
3. Current limiting circuit breakers.
4. Enclosed circuit breakers.

1.2 SUBMITTALS

A. Shop drawings showing dimensions, location of equipment and method of installation.

B. Product Data: Manufacturer’s printed data, catalog cuts.

1.3 DISCONNECT SWITCHES

A. Non-fusible switch assemblies: Quick-make, quick-break, load interrupter enclosed knife switch with externally operable handle interlocked to prevent opening front cover when switch is in ON position. Handle lockable in OFF position.

B. Enclosures: NEMA Type 1, 3R or 4 as required.

1.4 CIRCUIT BREAKERS

A. "Bolted-In" type, manually operated, quick-make, quick-break, mechanically trip-free operating mechanisms for simultaneous operation, of all poles, with contacts, arc interrupters and trip elements for each pole. "Plug-in" breakers are not permitted. New circuit breakers to be installed in existing panelboards shall be U.L. certified for installation in those panelboards and be labeled with make and model.

B. Tripping units shall be "thermal-magnetic" type having bimetallic elements for time delay overload protection, and magnetic elements for short circuit protection.

C. Manually operable by mean of toggle type operating handles having tripped positions midway between the "on-off" position. Handle to be clearly labeled as to breaker rating.

D. Minimum frame size for all circuit breakers, 1, 2, or 3 pole shall be 100 amperes.

E. Their interrupting rating shall not be less than 25,000 amperes RMS symmetrical at 208 volt for distribution panels and 10,000 amperes for power panels.

1.5 APPLICATIONS

A. Category of Application for Fuses

1. Feeders on switchboards.
2. Combination motor starters.

B. Category of Application for Circuit Breakers

1. Panelboards.
2. Switchboards.
3. Individual enclosures.
4. Combination motor starters.

1.6 SPARE FUSES

A. Upon Engineer's acceptance of the electrical distribution system, provide spare fuses as follows: 10% of each type and rating installed 600 amperes and smaller (minimum of 3). Provide spare fuse cabinet with directory to store all spare fuses. Locate as directed by Engineer and/or Owner.

1.7 APPROVED MANUFACTURERS

A. Circuit Breakers: Siemens, General Electric, Square D.

1.8 INSTALLATION

A. All material installation shall be in accordance with manufacturer recommendations and the provisions of all applicable codes.

B. All circuit breakers shall be selectively coordinated.

C. Install disconnect switches where indicated on Drawings.

D. Disconnects shall have NEMA 3R enclosure.

1.9 RECORD DRAWINGS

A. Shop drawings showing dimensions, location of equipment and method of installation.

B. Product Data: Manufacturer’s printed data, catalog cuts, performance curves.

END OF SECTION

SECTION 260350

BOXES

PART 1 - GENERAL

Applicable Provisions of the Conditions of the Contract and Division 1 General Requirements govern the work in this section. Submit shop drawings for checking and approval.

1.1 WORK INCLUDED

A. The work under this section shall include the furnishing of all material, labor, tools and services necessary to install wall and ceiling outlet boxes, floor boxes, pull and junction boxes to complete all work shown on the Drawings or specified herein.

1.2 RELATED WORK

A. Access doors.

B. Wiring devices: Service fittings and fire-rated poke-through fittings for floor boxes.

C. Cabinets and enclosures.

PART 2 - PRODUCTS

2.1 OUTLET BOXES

A. Sheet metal outlet boxes: ANSI/NEMA OS 1; Galvanized steel, with 1/2 inch male fixture studs where required.

B. Cast boxes: Cast ferroalloy, deep type, gasketed cover, threaded hubs.

C. Typical receptacle box shall be 4" square metal boxes, 30.8 cubic inch capacity with brackets as required. Provide 4" square raised device covers.

2.2 PULL AND JUNCTION BOXES

A. Sheet metal boxes: ANSI/NEMA OS 1; Galvanized steel.

B. Sheet metal boxes larger than 12 inches in any dimension: Hinged enclosure in accordance with Section 260450.

C. Cast metal boxes for outdoor and wet location installations: NEMA 250; Type 4 and type 6, flat-flanged, surface-mounted junction box, UL listed as raintight. Galvanized cast iron box and cover with ground flange, neoprene gasket, and stainless steel cover screws.

D. Cast metal boxes for underground installation: NEMA 250; Type 4, inside flanged, recessed cover box for flush mounting, UL listed as raintight. Galvanized cast iron box and plain cover with neoprene gasket and stainless cover screws.

PART 3 - EXECUTION

3.1 COORDINATION OF BOX LOCATIONS

A. Provide electrical boxes as required in excess of that shown on Drawings and as required for splices, taps, wire pulling, equipment connections and code compliance.

B. Electrical box locations shown on Contract Drawings are approximate unless dimensioned. Verify location of floor boxes and outlets in offices and work areas prior to rough-in.

C. Locate and install boxes to allow access. Where installations are accessible, coordinate locations and sizes of required access doors with Division 1.

D. Locate and install to maintain headroom and to present neat appearance.

3.2 OUTLET BOX INSTALLATION

A. Do not install boxes back-to-back in walls. Provide minimum 6 inch separation, except provide minimum 24 inch separation in acoustic-rated walls.

B. Locate boxes in masonry walls to require cutting of masonry unit corner only. Coordinate masonry cutting to achieve neat openings for boxes.

C. Provide knockout closures for unused openings.

D. Support boxes independently of conduit except for cast iron boxes that are connected of rigid metal conduits, both supported within 12 inches of box.

E. Use multiple-gang boxes where more than one device is mounted together; do not use sectional boxes. Provide barriers to separate wiring of different voltage systems.

F. Install boxes in wall without damaging wall insulation.

G. Coordinate mounting heights and locations of outlets mounted above counters, benches and backspaces.

H. Position outlets to locate luminaries as shown on reflected ceiling plans.

I. In inaccessible ceiling areas, position outlets and junction boxes within 6 inches of recessed luminaire, to be accessible through luminaire ceiling opening.

J. Provide recessed outlet boxes in finished areas; secure boxes to interior wall and partition studs, accurately positioning to allow for surface finish thickness. Use stamped steel stud bridges for flush outlets in hollow stud wall, and adjustable steel channel fasteners for flush ceiling outlet boxes.

K. Align wall-mounted outlet boxes for switches, thermostats, and similar devices.

L. Provide cast outlet boxes in exterior locations exposed to the weather and wet locations.

3.3 PULL AND JUNCTION BOX INSTALLATION

A. Locate pull boxes and junction boxes above accessible ceilings or in unfinished areas.

B. Support pull and junction boxes independent of conduit.

END OF SECTION

SECTION 260400

WIRING DEVICES

PART 1 - GENERAL

Applicable Provisions of the Conditions of the Contract and Division 1 General Requirements govern work in this section. Submit shop drawings for checking and approval.

1.1 WORK INCLUDED

A. The work under this section shall include the furnishing of all materials, labor, tools and services necessary to install receptacles, service fittings device plates and box covers to complete all work shown on the Drawings or specified herein.

1.2 REFERENCES

A. FS W-C-596 - Electrical power connector, plug, receptacles and cable outlet.

B. FS W-S-896 - Switch, toggle.

C. NEMA WD 1 - General purpose wiring devices.

D. NEMA WD 5 - Specific-purpose wiring devices.

1.3 SUBMITTALS

A. Submit product data under Provisions of Contract and Division 1.

B. Provide product data showing configurations, finishes, dimensions and manufacturer's instructions.

PART 2 - PRODUCTS

2.1 RECEPTACLES

A. Convenience and straight-blade receptacles: 125 V, 2 pole, 3 wire, 20 ampere specification grade, ground fault interrupting or isolated ground type.

B. Internal ground clip of receptacles shall be in one piece with the receptacle mounts.

C. Receptacles with riveted ground clips will not be accepted.

2.2 WALL SWITCHES

A. Wall switches for lighting circuits and motor loads under 1/2 hp: AC general use snap switch with toggle handle, rated 20 amperes and 120-277 volts AC.

B. Handle: Ivory plastic.

C. Pilot light type: Lighted handle. Pilot strap in adjacent gang.

D. Locator type: Lighted handle.

2.3 COVER PLATES

A. Decorative cover plate: Stainless steel 302/304 smooth Hubbell "S" series.

PART 3 - EXECUTION

3.1 INSTALLATION

A. Install receptacles on roof along parapet wall.

B. Install specific use receptacles at heights shown on contract drawings.

C. Drill opening for poke - through fitting installation in accordance with manufacturer's instructions.

D. Install plates on switch, receptacle, and blank outlets in finished areas, using jumbo size plates for outlets installed in masonry walls.

E. Install galvanized steel plates on outlet boxes and junction boxes in unfinished areas, above accessible ceilings and on surface mounted outlets.

F. Install devices and wall plates flush and level.

END OF SECTION

SECTION 260450

CABINETS AND ENCLOSURES

PART 1 - GENERAL

Applicable Provisions of the conditions of the Contract and Division 1 General Requirements govern the work in this section. Submit shop drawings for checking and approval.

1.1 WORK INCLUDED

A. The work under this section shall include the furnishing of all materials, labor, tools and services necessary to install hinged cover enclosures to complete all work shown on the Drawings or specified herein.

1.2 REFERENCES

A. NEMA 250 - Enclosures for electrical equipment (1000 volts maximum).

B. Submittals - Submit product data under Provisions of Contract and Division 1.

PART 2 - PRODUCTS

2.1 HINGED COVER ENCLOSURES

A. Construction: NEMA 250; Type 1 and 3R steel.

B. Finished: Manufacturer's standard enamel finish.

C. Covers: Continuous hinge, held closed by operable by key.

D. Provide barriers between normal and emergency wiring. Barriers shall be of non-current carrying material of adequate thickness for mechanical strength but in no case less than 1/4". Each barrier shall have an angle iron framing support all around.

2.2 FABRICATION

A. Shop assemble enclosures in accordance with ANSI/NEMA ISC 6.

B. Provide knockouts on enclosures.

PART 3 - EXECUTION

3.1 INSTALLATION

A. Install enclosures plumb; Anchor securely to wall and structural supports at each corner, minimum.

B. Provide necessary feet for free-standing equipment enclosures.

C. Install trim plumb.

END OF SECTION

SECTION 260500

SUPPORTING DEVICES

PART 1 - GENERAL

Applicable Provisions of the Conditions of the Contract and Division 1 General Requirements govern work in this section. Submit shop drawings for checking and approval.

1.1 WORK INCLUDED

A. The work under this section shall include the furnishing of all material, labor, tools and services necessary to install rigid metal conduit, electrical metallic tubing and flexible metal conduit, including all fittings to complete all work shown on the Drawings or specified herein.

1.2 RELATED WORK

A. Conduit and equipment supports.

B. Fastening hardware.

1.3 REFERENCES

A. Conduit supports.

1.4 QUALITY ASSURANCE

A. Support system shall be adequate for weight of equipment and conduit, including wiring, which they carry.

PART 2 - PRODUCTS

2.1 MATERIALS

A. Support channel: Galvanized or painted steel.

B. Hardware: Corrosion resistant.

PART 3 - EXECUTION

3.1 INSTALLATION

A. Do not fasten supports to piping, ductwork, mechanical equipment, or conduit.

B. Do not use powder-actuated anchors.

C. Fabricate supports from structural steel or steel channel, rigidly welded or bolted to present a neat appearance. Use hexagon head bolts with spring lock washers under all nuts.

D. In wet locations install free-standing electrical equipment on concrete pads.

E. Install surface mounted cabinets and panelboards with minimum of four anchors. Provide steel channel supports to stand cabinet one inch off wall.

F. Bridge studs top and bottom with channels to support flush mounted cabinets and panelboards in stud walls.

END OF SECTION

SECTION 260550

GENERAL LABELING AND IDENTIFICATION

PART 1 - GENERAL

Applicable Provisions of the conditions of the Contract and Division 1 General Requirements govern the work in this section. Submit shop drawings for checking and approval.

1.1 WORK INCLUDED

A. The work under this section shall include the furnishing of all material, labor, tools and services necessary to install nameplates, tape labels, wire markers, conduit color coding to complete all work shown on the Drawings or specified herein.

1.2 RELATED WORK

A. Painting.

1.3 SUBMITTALS

A. Submit shop drawings under provisions of Division 1.

B. Include schedule for nameplates and tape labels.

PART 2 - PRODUCTS

2.1 MATERIALS

A. Nameplates: Engraved three-layer laminated plastic, white letters on a black background.

B. Tape labels: Embossed adhesive tape with 3/16 inch black letters on a white background.

C. Wire and cable markers: Cloth markers, split sleeve or tubing type.

PART 3 - EXECUTION

3.1 INSTALLATION

A. De-grease and clean surfaces to receive nameplates and tape labels.

B. Install nameplates and tape labels parallel to equipment lines.

C. Secure nameplates to equipment fronts using screws, rivets, or adhesive. Secure nameplate to inside face of recessed panelboard doors in finished locations.

D. Embossed tape will not be permitted for any application. Use embossed tape only for identification of individual wall switches and receptacles and control device stations.

3.2 WIRE IDENTIFICATION

A. Provide wire markers on each conductor in panelboard gutters, pull boxes, outlet and junction boxes and at load connection. Identify each branch circuit or feeder number for power and lighting circuits and each control wire number as indicated on equipment manufacturer's shop drawings for control wiring.

3.3 NAMEPLATE ENGRAVING SCHEDULE

A. Provide nameplates to identify all control equipment and loads served including year of installation. Letter height: 1/2 inch for individual switches, loads served, and control equipment identification. For example:

MP-1 INSTALLED 2019

B. Individual circuit breakers, switches and motor starters in panelboards, switchboards and motor control centers: 1/4 inch, identify circuit and load served, including location.

C. Individual circuit breakers, enclosed switches and motor starters: 1/2 inch, identify load served.

3.4 FIRE ALARM

A. All fire alarm raceway components shall be painted red and identified.

END OF SECTION

SECTION 260575

INTERIOR LUMINAIRES

PART 1 - GENERAL

Applicable provisions of the Conditions of the Contract and Division 1 General Requirements govern work in this section. Submit shop drawings for checking and approval.

1.1 WORK INCLUDED

A. Interior luminaires and accessories.

B. Emergency lighting units.

C. Exit signs.

D. LED Driver.

E. LED dimming and controls.

F. LED emergency power supply.

G. Lamps.

H. Luminaire accessories.

1.2 REFERENCES

A. ANSI/IES RP-16-10 – Nomenclature and Definitions for Illuminating Engineering.

B. ANSI C78.37 7 – Specifications for the Chromaticity of Solid-State Lighting (SSL) Products.

C. IES LM-79-08 – Electric and Photometric Measurements of Solid-State Lighting Products.

D. IES LM-80-08 – Measuring Lumen Maintenance of LED Light Sources.

E. IES 7M-21-11 – Projecting Long Term Lumen Maintenance of LED Light Sources.

F. IES LM-82-11 – IES Approved Method for the Characterization of LED Light Engines and LED Lamps for Electrical and Photometric Properties as a Function of Temperature.

G. UL 8750 – LED Equipment for Use in Lighting Products.

H. NEMA WD 6 - Wiring Devices – Dimensional Requirements.

I. NFPA 70 - National Electrical Code.

J. NFPA 101- Life Safety Code.

1.3 QUALIFICATIONS

A. Manufacturer: Company specializing in manufacturing the Products specified in this section with minimum five (5) years documented experience.

1.4 REGULATORY REQUIREMENTS

A. Conform to requirements of NFPA 70 and to requirements of NFPA 101.

B. Products: Listed and classified by Underwriters Laboratories, Inc. (UL), American National Standards Institute (ANSI) and Illuminating Engineering Society (IES).

PART 2 - PRODUCTS

2.1 LUMINAIRES

A. Furnish Products as scheduled.

2.2 EXIT SIGNS

A. Manufacturers: As scheduled.

B. Description: Exit sign fixture suitable for use as emergency lighting unit.

C. Housing: Extruded aluminum or steel as per schedule.

D. Face: Aluminum stencil face with red letters, unless otherwise noted.

E. Directional Arrows: Universal type for field adjustment, direction per drawing.

F. Mounting: Universal, for field selection or per drawing.

G. Lamps: L.E.D.

H. Input Voltage: As scheduled.

2.3 LED DRIVERS

A. Manufacturers: As scheduled.

B. Voltage: As scheduled.

2.4 LAMPS

A. Lamp Types: As specified for luminaire. LED source.

PART 3 - EXECUTION

3.1 INSTALLATION

A. Install suspended luminaires and exit signs using pendants supported from swivel hangers. Provide pendent length required to suspend luminaire at indicated height.

B. Support luminaires 2 x 4 foot (600 x 1200 mm) and larger in size independent of ceiling framing.

C. All lay-in luminaries shall be supported with chains to building structure.

D. Install surface mounted luminaires and exit signs plumb and adjust to align with building lines and with each other. Secure to prevent movement.

E. Exposed Grid Ceilings: Support surface mounted luminaires on grid ceiling directly from building structure. Provide auxiliary members spanning ceiling grid members to support surface mounted luminaires. Fasten surface mounted luminaires to ceiling grid members using bolts, screws, rivets, or suitable clips.

F. Install wall mounted luminaires, emergency lighting units and exit signs at 80" above finished floor, unless otherwise noted.

G. Install accessories furnished with each luminaire.

H. Make wiring connections to branch circuit using building wire with insulation suitable for temperature conditions within luminaire.

I. Bond products and metal accessories to branch circuit equipment grounding conductor.

J. Install specified lamps in each emergency lighting unit, exit sign, and luminaire.

3.2 FIELD QUALITY CONTROL

A. Operate each luminaire after installation and connection. Inspect for proper connection and operation.

3.3 ADJUSTING

A. Aim and adjust luminaires as indicated.

B. Position exit sign directional arrows as indicated.

3.4 CLEANING

A. Clean electrical parts to remove conductive and deleterious materials.

B. Remove dirt and debris from enclosures.

C. Clean photometric control surfaces as recommended by manufacturer.

D. Clean finished and touch up damage.

3.5 PROTECTION OF FINISHED WORK

A. Relamp luminaires that have failed lamps as substantial completion.

END OF SECTION

SECTION 260585

DIGITAL LIGHTING CONTROL SYSTEM

PART 1 – GENERAL

Applicable provisions of the Conditions of the Contract and Division 1 General Requirements govern work in this section. Submit shop drawings for checking and approval.

1.1 SUMMARY

A. Section Includes

1. Digital Lighting Controls
2. Emergency Lighting Control (if applicable)

B. Related Sections

1. Section 26 0400 Wiring Devices: Receptacles
2. Section 26 0575 Interior Luminaires.
3. Electrical Sections, including wiring devices, apply to the work of this Section.

C. Control Intent – Control Intent includes, but is not limited to:

1. Defaults and initial calibration settings for such items as time delay, sensitivity, fade rates, etc.
2. Initial sensor and switching zones.
3. Initial time switch settings.
4. Task lighting and receptacle controls.
5. Emergency Lighting control (if applicable).

1.2 REFERENCES

A. American National Standards Institute/Institute of Electrical and Electronic Engineers (ANSI/IEEE)

B. Underwriter Laboratories of Canada (ULC)

C. International Electrotechnical Commission (IEC)

D. International Organization for Standardization (ISO)

E. National Electrical Manufacturers Association (NEMA)

F. WD1 (R2005) - General Color Requirements for Wiring Devices.

G. Underwriters Laboratories, Inc. (UL)

1. 20 – Plug Load Controls
2. 508– Industrial Controls
3. 916 – Energy Management Equipment.
4. 924 – Emergency Lighting

1.3 SYSTEM DESCRIPTION & OPERATION

A. The Lighting Control and Automation system as defined under this section covers the following equipment:

1. Digital Occupancy Sensors – Self-configuring, digitally addressable and calibrated occupancy sensors with LCD display and two-way active infrared (IR) communications.
2. Digital Switches – Self-configuring, digitally addressable pushbutton on/off, dimming, and scene switches with two-way active infrared (IR) communications.
3. Digital Daylighting Sensors – Single-zone closed loop, multi-zone open loop and single-zone dual-loop daylighting sensors with two-way active infrared (IR) communications can provide switching, bi-level, tri-level or dimming control for daylight harvesting.
4. Digital Room Controllers – Self-configuring, digitally addressable one, two or three relay plenum-rated controllers for on/off control. Selected models include 0-10 volt or line voltage forward phase control dimming outputs and integral current monitoring capabilities.
5. Digital Plug-Load Controllers – Self-configuring, digitally addressable, single relay, plenum-rated application-specific controllers. Selected models include integral current monitoring capabilities.
6. Digital Lighting Management (DLM) local network – Free topology, plug-in wiring system (Cat 5e) for power and data to room devices.
7. Digital Lighting Management (DLM) segment network – Linear topology, BACnet MS/TP network (1.5 twisted pair, shielded,) to connect multiple DLM local networks for centralized control
8. Segment Manager – provides web browser-based user interface for system control, scheduling, power monitoring, room device parameter administration and reporting.
9. Programming and Configuration software – Optional PC-native application capable of accessing DLM control parameters within a room, for the local network, via a USB adapter, or globally, for many segment networks simultaneously, via BACnet/IP communication.
10. LMZC-301 – Digital Zone Controller. Accepts program changes from handheld configuration tool for date and time, location, holidays, event scheduling, button binding and group programming. Provides BACnet MS/TP-compliant digital networked communication between other lighting controls and/or building automation system (BAS).
11. Emergency Lighting Control Unit (ELCU) – allows a standard lighting control device to control emergency lighting in conjunction with normal lighting in any area within a building.

1.4 LIGHTING CONTROL APPLICATIONS

A. Unless relevant provisions of the applicable local Energy Codes are more stringent, provide a minimum application of lighting controls as follows:

1. Space Control Requirements – Provide occupancy/vacancy sensors with Manual- or Partial-ON functionality in all spaces except toilet rooms, storerooms, library stacks, or other applications where hands-free operation is desirable and Automatic-ON occupancy sensors are more appropriate. Provide Manual-ON occupancy/vacancy sensors for any enclosed office, conference room, meeting room, open plan system and training room. For spaces with multiple occupants, or where line-of-sight may be obscured, provide ceiling- or corner-mounted sensors and Manual-ON switches.

2. Daylit Areas – Provide daylight-responsive automatic control in all spaces (conditioned or unconditioned) where daylight contribution is available as defined by relevant local building energy code:

a. All luminaires within code-defined daylight zones shall be controlled separately from luminaires outside of daylit zones.
b. Daytime setpoints for total ambient illumination (combined daylight and electric light) levels that initiate dimming shall be programmed in compliance with relevant local building energy codes.
c. Multiple-leveled switched daylight harvesting controls may be utilized for areas marked on drawings.
d. Provide smooth and continuous daylight dimming for areas marked on drawings. Daylighting control system may be designed to turn off electric lighting when daylight is at or above required lighting levels, only if system functions to turn lamps back on at dimmed level, rather than turning full-on prior to dimming.

3. Conference, meeting, training, auditoriums, and multipurpose rooms shall have controls that allow for independent control of each local control zone. Rooms larger than 300 square feet shall instead have at least four (4) pre-set lighting scenes unless otherwise specified. Occupancy / vacancy sensors shall be provided to extinguish all lighting in the space. Spaces with up to four moveable walls shall include controls that can be reconfigured when the room is partitioned.

1.5 SUBMITTALS

A. Submittals Package: Submit the shop drawings, and the product data specified below at the same time as a package.

B. Shop Drawings
1. Composite wiring and/or schematic diagram of each control circuit as proposed to be installed.
2. Show exact location of all digital devices, including at minimum sensors, room controllers, and switches for each area on reflected ceiling plans. (Contractor must provide AutoCAD format reflected ceiling plans.)
3. Provide room/area details including products and sequence of operation for each room or area. Illustrate typical acceptable room/area connection topologies.
4. Network riser diagram including floor and building level details. Include network cable specification and end-of-line termination details, if required. Illustrate points of connection to integrated systems. Coordinate integration with mechanical and/or other trades.

C. Product Data: Catalog sheets, specifications and installation instructions.

D. Include data for each device which:
1. Indicates where sensor is proposed to be installed.
2. Prove that the sensor is suitable for the proposed application.

1.6 QUALITY ASSURANCE

A. Manufacturer: Minimum [10] years' experience in manufacture of lighting controls.

1.7 PROJECT CONDITIONS

A. Do not install equipment until following conditions can be maintained in spaces to receive equipment:
1. Ambient temperature: 0° to 40° C (32° to 104° F).
2. Relative humidity: Maximum 90 percent, non-condensing.

1.8 WARRANTY

A. Provide a five year limited manufacturer's warranty on all room control devices and panels.

1.9 MAINTENANCE

A. Spare Parts: Provide spares of each product to be used for maintenance as listed below: Refer to design documents. Coordinate with owner for quantity prior to purchase order.

PART 2 – PRODUCTS

2.1 MANUFACTURERS

A. Acceptable Manufacturer

1. WattStopper
   a. System: Digital Lighting Management (DLM)
2. Basis of design product: WattStopper Digital Lighting Management (DLM) or subject to compliance and prior approval with specified requirements of this section, one of the following:
   a. Refer to design documents.

B. Substitutions: [If Permitted]

1. All proposed substitutions (clearly delineated as such) must be submitted in writing for approval by the design professional a minimum of 10 working days prior to the bid date and must be made available to all bidders. Proposed substitutes must be accompanied by a review of the specification noting compliance on a line-by-line basis.
2. By using pre-approved substitutions, the contractor accepts responsibility and associated costs for all required modifications to circuitry, devices, and wiring. The contractor shall provide complete engineered shop drawings (including power and control wiring) with deviations from the original design highlighted for review and approval prior to rough-in.

2.2 DIGITAL LIGHTING CONTROLS

A. Furnish the Company's system which accommodates the square-footage coverage requirements for each area controlled, utilizing room controllers, digital occupancy sensors, switches, daylighting sensors and accessories which suit the lighting and electrical system parameters.

2.3 DIGITAL WALL OR CEILING MOUNTED OCCUPANCY SENSOR

A. Wall or ceiling mounted (to suit installation) passive infrared (PIR), ultrasonic or dual technology digital (passive infrared and ultrasonic) occupancy sensor.

B. Digital Occupancy Sensors shall provide graphic LCD display for digital calibration and electronic documentation. Features include the following:

1. Digital calibration and pushbutton configuration for the following variables:
   a. Sensitivity – 0-100% in 10% increments
   b. Time delay – 1-30 minutes in 1 minute increments
   c. Test mode – Five second time delay
   d. Detection technology – PIR, Ultrasonic or Dual Technology activation and/or re-activation.
   e. Walk-through mode
   f. Load parameters including Auto/Manual-ON, blink warning, and daylight enable/disable when photosensors are included in the DLM local network.

2. Programmable control functionality including:

    a. Each sensor may be programmed to control specific loads within a local network.
    b. Sensor shall be capable of activating one of 16 user-definable lighting scenes.
    c. Adjustable retrigger time period for manual-on loads. Load will retrigger (turn on) automatically within a configurable period of time (default 10 seconds) after turning off.
    d. On dual technology sensors, independently configurable trigger modes are available for both Normal (NH) and After Hours (AH) time periods. The retrigger mode can be programmed to use the following technologies:
        i Ultrasonic and Passive Infrared
        ii Ultrasonic or Passive Infrared
        iii Ultrasonic only
        iv Passive Infrared only

3. Independently configurable sensitivity settings for passive infrared and ultrasonic technologies (on dual technology sensors) for both Normal (NH) and After Hour (AH) time periods.

4. One or two RJ-45 port(s) for connection to DLM local network.

5. Two-way infrared (IR) transceiver to allow remote programming through handheld commissioning tool and control by remote personal controls.

6. Device Status LEDs, which may be disabled for selected applications, including:

    a. PIR detection
    b. Ultrasonic detection
    c. Configuration mode
    d. Load binding

7. Assignment of occupancy sensor to a specific load within the room without wiring or special tools.

8. Manual override of controlled loads.

9. All digital parameter data programmed into an individual occupancy sensor shall be retained in non-volatile FLASH memory within the sensor itself. Memory shall have an expected life of no less than 10 years.

C. Units shall not have any dip switches or potentiometers for field settings.

D. Multiple occupancy sensors may be installed in a room by simply connecting them to the free topology DLM local network. No additional configuration will be required.

E. WattStopper product numbers: LMPX, LMDX, LMPC, LMUC, LMDC

2.5 DIGITAL WALL SWITCHES

A. Low voltage momentary pushbutton switches in 1, 2, 3, 4, 5 and 8 button configuration. Wall switches shall include the following features:

1. Two-way infrared (IR) transceiver for use with personal and configuration remote controls.
2. Removable buttons for field replacement with engraved buttons and/or alternate color buttons. Button replacement may be completed without removing the switch from the wall.
3. Configuration LED on each switch that blinks to indicate data transmission.
4. Load/Scene Status LED on each switch button with the following characteristics:
   a. Bi-level LED
   b. Dim locator level indicates power to switch
   c. Bright status level indicates that load or scene is active
5. Dimming switches shall include seven bi-level LEDs to indicate load levels using 14 steps.
6. Programmable control functionality including:
   a. Button priority may be configured to any BACnet priority level, from 1-16, corresponding to networked operation allowing local actions to utilize life safety priority
   b. Scene patterns may be saved to any button other than dimming rockers. Once set, buttons may be digitally locked to prevent overwriting of the preset levels.
7. All digital parameter data programmed into an individual wall switch shall be retained in non-volatile FLASH memory within the wall switch itself. Memory shall have an expected life of no less than 10 years.

B. Two RJ-45 ports for connection to DLM local network.

C. Multiple digital wall switches may be installed in a room by simply connecting them to the free topology DLM local network. No additional configuration shall be required to achieve multi-way switching.

D. The following switch attributes may be changed or selected using a wireless configuration tool:

1. Load and Scene button function may be reconfigured for individual buttons (from Load to Scene, and vice versa).
2. Individual button function may be configured to Toggle, On only or Off only.
3. Individual scenes may be locked to prevent unauthorized change.
4. Fade Up and Fade Down times for individual scenes may be adjusted from 0 seconds to 18 hours.
5. Ramp rate may be adjusted for each dimmer switch.
6. Switch buttons may be bound to any load on a room controller and are not load type dependent; each button may be bound to multiple loads.

E. WattStopper product numbers: LMSW-101, LMSW-102, LMSW-103, LMSW-104, LMSW-105, LMSW-108, LMDM-101. Available in white, light almond, ivory, grey, red and black; compatible with wall plates with decorator opening.

2.6 DIGITAL ROOM CONTROLLERS AND PLUG-LOAD CONTROLLERS

A. Digital controllers for lighting and plug loads automatically bind the room loads to the connected devices in the space without commissioning or the use of any tools. Room and plug load controllers shall be provided to match the room lighting and plug load control requirements. The controllers will be simple to install, and will not have dip switches or potentiometers, or require special configuration for standard Plug n' Go applications. The control units will include the following features:

1. Automatic room configuration to the most energy-efficient sequence of operation based upon the devices in the room.

2. Simple replacement – Using the default automatic configuration capabilities, a room controller may be replaced with an off-the-shelf.

3. Multiple room controllers connected together in a local network must automatically prioritize each room controller, without requiring any configuration or setup, so that loads are sequentially assigned using room controller device ID's from highest to lowest.

4. Device Status LEDs to indicate:
   a. Data transmission
   b. Device has power
   c. Status for each load
   d. Configuration status

5. Quick installation features including:
   a. Standard junction box mounting
   b. Quick low voltage connections using standard RJ-45 patch cable

6. Based on individual configuration, each load shall be capable of the following behavior on power up following the loss of normal power:
   a. Turn on to 100%
   b. Remain off
   c. Turn on to last level

7. Each load shall be configurable to operate in the following sequences based on occupancy:
   a. Auto-on/Auto-off (Follow on and off)
   b. Manual-on/Auto-off (Follow off only)

8. The polarity of each load output shall be reversible, via digital configuration, so that on is off and off is on.

9. BACnet object information shall be available for the following objects:
   a. Load status
   b. Electrical current
   c. Total watts per controller
   d. Schedule state – normal or after-hours
   e. Demand response control and cap level
   f. Room occupancy status
   g. Total room lighting and plug loads watts
   h. Total room watts/sq. ft.
   i. Force on/off all loads

10. UL 2043 plenum rated

11. Manual override and LED indication for each load

12. Dual voltage (120/277 VAC, 60 Hz), or 347 VAC, 60 Hz (selected models only). 120/277 volt models rated for 20A total load, derating to 16A required for some dimmed loads (forward phase dimming); 347 volt models rated for 15A total load; plug load controllers carry application-specific UL 20 rating for receptacle control.

13. Zero cross circuitry for each load

14. All digital parameter data programmed into an individual room controller or plug load controller shall be retained in non-volatile FLASH memory within the controller itself. Memory shall have an expected life of no less than 10 years.

B. On/Off Room Controllers shall include:

1. One or two relay configuration
2. Efficient 150 mA switching power supply
3. Three RJ-45 DLM local network ports with integral strain relief and dust cover
4. WattStopper product numbers: LMRC-101, LMRC-102

C. On/Off/Dimming enhanced Room Controllers shall include:

1. Real time current monitoring
2. Multiple relay configurations
   a. One, two or three relays (LMRC-21x series)
   b. One or two relays (LMRC-22x series)

3. Efficient 250 mA switching power supply

4. Four RJ-45 DLM local network ports with integral strain relief and dust cover

5. One dimming output per relay
   a. 0-10V Dimming - Where indicated, one 0-10 volt analog output per relay for control of compatible ballasts and LED drivers. The 0-10 volt output shall automatically open upon loss of power to the Room Controller to assure full light output from the controlled lighting. (LMRC-21x series)
   b. Line Voltage, Forward Phase Dimming - Where indicated, one forward phase control line voltage dimming output per relay for control of compatible two-wire or three-wire ballasts, LED drivers, MLV, forward phase compatible ELV, neon/cold cathode and incandescent loads. (LMRC-22x series)
   c. Each dimming output channel shall have an independently configurable minimum and maximum calibration trim level to set the dimming range to match the true dynamic range of the connected ballast or driver.
   d. The LED level indicators on bound dimming switches shall utilize this new maximum and minimum trim.
   e. Each dimming output channel shall have an independently configurable minimum and maximum trim level to set the dynamic range of the output within the new 0-100% dimming range defined by the minimum and maximum calibration trim.
   f. Calibration and trim levels must be set per output channel.
   g. Devices that set calibration or trim levels per controller are not acceptable.
   h. All configuration shall be digital. Devices that set calibration or trim levels per output channel via trim pots or dip-switches are not acceptable.

6. Each load shall have an independently configurable preset on level for Normal Hours and After Hours events to allow different dimmed levels to be established at the start of both Normal Hours and After Hours events.

7. Fade rates for dimming loads shall be specific to bound switch buttons, and the load shall maintain a default value for any bound buttons that do not specify a unique value.

8. The following dimming attributes may be changed or selected using a wireless configuration tool:
   a. Establish preset level for each load from 0-100%
   b. Set high and low trim for each load
   c. Set lamp burn in time for each load up to 100 hours

9. Override button for each load provides the following functions:
   a. Press and release for on/off control
   b. Press and hold for dimming control

10. WattStopper product numbers: LMRC-211, LRMC-212, LRMC-213, LMRC-221, LMRC-222

D. Plug Load Room Controllers shall include:

1. One relay configuration with additional connection for un-switched load
2. Configurable additive time delay to extend plug load time delay beyond occupancy sensor time delay (e.g. a 10 minute additive delay in a space with a 20 minute occupancy sensor delay ensures that plug loads turn off 30 minutes after the space is vacated).
3. Factory default operation is Auto-on/Auto-off, based on occupancy
4. Real time current monitoring of both switched and un-switched load (LMPL-201 only)
5. Efficient switching power supply
   a. 150mA (LMPL-101)
   b. 250mA (LMPL-201)
6. RJ-45 DLM local network ports
   a. Three RJ-45 ports (LMPL-101)
   b. Four RJ-45 ports (LMPL-201)
7. WattStopper product numbers: LMPL-101, LMPL-201.

2.7 DLM LOCAL NETWORK (Room Network)

A. The DLM local network is a free topology lighting control physical connection and communication protocol designed to control a small area of a building.

B. Features of the DLM local network include:

1. Plug n' Go® automatic configuration and binding of occupancy sensors, switches and lighting loads to the most energy-efficient sequence of operation based upon the device attached.
2. Simple replacement of any device in the network with a standard off the shelf unit without requiring commissioning, configuration or setup.
3. Push n' Learn® configuration to change the automatic configuration, including binding and load parameters without tools, using only the buttons on the digital devices in the local network.
4. Two-way infrared communications for control by handheld remotes, and configuration by a handheld tool including adjusting load parameters, sensor configuration and binding, within a line of sight of up to 30 feet from a sensor, wall switch or IR receiver.

C. Digital room devices connect to the local network using pre-terminated Cat 5e cables with RJ-45 connectors, which provide both data and power to room devices. Systems that utilize RJ-45 patch cords but do not provide serial communication data from individual end devices are not acceptable.

D. If manufacturer's pre-terminated Cat 5e cables are not used for the installation, the contractor is responsible for testing each cable following installation and supplying manufacturer with test results.

E. WattStopper Product Number: LMRJ-Series

2.8 CONFIGURATION TOOLS

A. A wireless configuration tool facilitates optional customization of DLM local networks using two-way infrared communications, while PC software connects to each local network via a USB interface.

B. Features and functionality of the wireless configuration tool shall include but not be limited to:

1. Two-way infrared (IR) communication with DLM IR-enabled devices within a range of approximately 30 feet.
2. High visibility organic LED (OLED) display, pushbutton user interface and menu-driven operation.
3. Must be able to read and modify parameters for room controllers, occupancy sensors, wall switches, daylighting sensors, network bridges and relay panels, and identify room devices by type and serial number.
4. Save up to eight occupancy sensor setting profiles and apply profiles to selected sensors.
5. Temporarily adjust light level of any load(s) on the local network and incorporate those levels in scene setting. Set room mode for testing of Normal Hours (NH) and After Hours (AH) parameter settings.
6. Adjust or fine-tune daylighting settings established during auto-configuration, and input light level data to complete configuration of open loop daylighting controls.
7. Set room mode for testing of Normal Hours (NH) and After Hours (AH) parameter settings.
8. Verify status of building level network devices.

C. WattStopper Product Numbers: LMCT-100, LMCI-100/LMCS-100

2.9 SEGMENT MANAGER

A. For networked applications, the Digital Lighting Management system shall include at least one segment manager to manage network communication. It shall be capable of serving up a graphical user interface via a standard web browser utilizing either unencrypted TCP/IP traffic via a configurable port (default is 80) or 256 bit AES encrypted SSL TCP/IP traffic via a configurable port (default is 443).

B. Each segment manager shall have integral support for at least three segment networks. Segment networks may alternately be connected to the segment manger via external routers and switches, using standard Ethernet structured wiring. Each router shall accommodate one segment network. Provide the quantity of routers and switches as shown on the plans.

C. Operational features of the Segment Manager shall include the following:

1. Connection to PC or LAN via standard Ethernet TCP/IP via standard Ethernet TCP/IP with the option to use SSL encrypted connections for all traffic.
2. Easy to learn and use graphical user interface, compatible with Internet Explorer 8, or equal browser. Shall not require installation of any lighting control software to an end-user PC.
3. Log in security capable of restricting some users to view-only or other limited operations.

4. Automatic discovery of DLM devices and relay panels on the segment network(s). Commissioning beyond activation of the discovery function shall not be required to provide communication, monitoring or control of all local networks and lighting control panels.
5. After discovery, all rooms and panels shall be presented in a standard navigation tree format. Selecting a device from the tree will allow the device settings and operational parameters to be viewed and changed by the user.
6. Ability to view and modify room device operational parameters. It shall be possible to set device parameters independently for normal hours and after hours operation including sensor time delays and sensitivities, and load response to sensor including Manual-On or Auto-On.
7. Ability to set up schedules for rooms and panels, view and override current status of panel channels and relays and assign relays to groups. Schedules shall automatically set controlled zones or areas to either a normal hours or after hours mode of operation. Support for a minimum of 100 unique schedules, each with up to four time events per day. Support for annual schedules, holiday schedules and unique date-bound schedules.
8. Ability to group rooms and loads for common control by schedules, switches or network commands.
9. Ability to monitor connected load current and display power consumption for areas equipped with room controllers incorporating the integral current monitoring feature.
10. Provide capabilities for integration with a BAS via BACnet protocol. At a minimum, the following points shall be available to the BAS via BACnet IP connection to the segment manager: room occupancy state; room schedule mode; room switch lock control; individual occupancy sensor state; room lighting power; room plug-load power; load ON/OFF state; load dimming level; panel channel schedule state; panel relay state; and Segment Manager Group schedule state control.
11. The Segment Manager shall allow access and control of the overall system database via Native Niagara AX FOX connectivity. Systems that must utilize a Tridium Niagara controller in addition to the programming, scheduling and configuration server are not acceptable.

D. Segment Manager shall support multiple DLM rooms as follows:

1. Support up to 120 network bridges and 900 digital in-room devices (LMSM-3E).

2. Support up to 300 network bridges and 2,200 digital in room devices, connected via network routers and switches (LMSM-6E).

E. WattStopper Product Numbers: LMSM-3E, LMSM-6E, NB-ROUTER, NB-SWITCH, NB-SWITCH-8, NB-SWITCH-16.

2.10 PROGRAMMING, CONFIGURATION AND DOCUMENTATION SOFTWARE

A. PC-native application for optional programming of detailed technician-level parameter information for all DLM products, including all parameters not accessible via BACnet and the handled IR configuration tool. Software must be capable of accessing room-level parameter information locally within the room when connected via the optional LMCI-100 USB programming adapter, or globally for many segment networks simultaneously utilizing standard BACnet/IP communication.

1. Additional parameters exposed through this method include but are not limited to:
   a. Occupancy sensor detection LED disable for performance and other aesthetic spaces where blinking LEDs present a distraction.
   b. Six occupancy sensor action behaviors for each controlled load, separately configurable for normal hours and after hours modes. Modes include: No Action, Follow Off Only, Follow On Only, Follow On and Off, Follow On Only with Override Time Delay, Follow Off Only with Blink Warn Grace Time, Follow On and Off with Blink Warn Grace Time.
   c. Separate fade time adjustments per load for both normal and after hours from 0 - 4 hours.
   d. Configurable occupancy sensor re-trigger grace period from 0 - 4 minutes separate for both normal hours and after hours.
   e. Separate normal hours and after hours per-load button mode with modes including: Do nothing, on only, off only, on and off.
   f. Load control polarity reversal so that on events turn loads off and vice versa.
   g. Per-load DR (demand response) shed level in units of percent.
   h. Load output pulse mode in increments of 1second.
   i. Fade trip point for each load for normal hours and after hours that establishes the dimmer command level at which a switched load closes its relay to allow for staggered On of switched loads in response to a dimmer.

2. Generation of reports at the whole file, partial file, or room level. Reports include but are not limited to:
   a. Device list report: All devices in a project listed by type.
   b. Load binding report: All load controller bindings showing interaction with sensors, switches, and daylighting.
   c. BACnet points report: Per room Device ID report of the valid BACnet points for a given site's BOM.
   d. Room summary report: Device manifest for each room, aggregated by common BOM, showing basic sequence of operations.
   e. Device parameter report: Per-room lists of all configured parameters accessible via hand held IR programmer for use with O&M documentation.
   f. Scene report: All project scene pattern values not left at defaults (i.e. 1 = all loads 100%, 2 = all loads 75%, 3 = all loads 50%, 4 = all loads 25%, 5-16 = same as scene 1).
   g. Occupancy sensor report: Basic settings including time delay and sensitivity(ies) for all occupancy sensors.

3. Network-wide programming of parameter data in a spreadsheet-like programming environment including but not limited to the following operations:
   a. Set, copy/paste an entire project site of sensor time delays.
   b. Set, copy/paste an entire project site of sensor sensitivity settings.
   c. Search based on room name and text labels.
   d. Filter by product type (i.e. LMRC-212) to allow parameter set by product.
   e. Filter by parameter value to search for product with specific configurations.

4. Network-wide firmware upgrading remotely via the BACnet/IP network.
   a. Mass firmware update of entire rooms.
   b. Mass firmware update of specifically selected rooms or areas.
   c. Mass firmware upgrade of specific products.

B. WattStopper Product Number: LMCS-100, LMCI-100

2.11 EMERGENCY LIGHTING CONTROL DEVICES

A. Emergency Lighting Control Unit – A UL 924 listed device that monitors a switched circuit providing normal lighting to an area. The unit provides normal ON/OFF control of emergency lighting along with the normal lighting. Upon normal power failure the emergency lighting circuit will close, forcing the emergency lighting ON until normal power is restored. Features include:
   1. 120/277 volts, 50/60 Hz, 20 amp ballast rating
   2. Push to test button
   3. Auxiliary contact for remote test or fire alarm system interface

B. WattStopper Product Numbers: ELCU-100, ELCU-200.

PART 3 – EXECUTION

3.1 OPTIONAL PRE-INSTALLATION MEETING

A. A factory authorized manufacturer's representative shall provide the electrical contractor a functional overview of the lighting control system prior to installation. The contractor shall schedule the pre-installation site visit after receipt of approved submittals to review the following:
   1. Confirm the location and mounting of all digital devices, with special attention to placement of occupancy and daylighting sensors.
   2. Review the specifications for low voltage control wiring and termination.
   3. Discuss the functionality and configuration of all products, including sequences of operation, per design requirements.
   4. Discuss requirements for integration with other trades.

3.2 CONTRACTOR INSTALLATION AND SERVICES

A. Contractor to install all devices and wiring in a professional manner. All line voltage connections to be tagged to indicate circuit and switched legs.

B. Contractor to install all room/area devices using manufacturer's factory-tested Cat 5e cable with pre-terminated RJ-45 connectors. If pre-terminated cable is not used for room/area wiring, the contractor is responsible for testing each field-terminated cable following installation and shall supply the lighting controls manufacturers with test results. Contractor to install any room to room network devices using manufacturer-supplied LM-MSTP network wire. Network wire substitution is not permitted and may result in loss of product warranty per DLM SEGMENT NETWORK section of specification. Low voltage wiring topology must comply with manufacturer's specifications. Contractor shall route network wiring as shown in submittal drawings as closely as possible, and shall document final wiring location, routing and topology on as built drawings.

C. Install the work of this Section in accordance with manufacturer's printed instructions unless otherwise indicated. Before start-up, contractor shall test all devices to ensure proper communication.

D. Calibrate all sensor time delays and sensitivity to guarantee proper detection of occupants and energy savings. Adjust time delay so that controlled area remains lighted while occupied.

E. Provide written or computer-generated documentation on the configuration of the system including room by room description including:
   1. Sensor parameters, time delays, sensitivities, and daylighting setpoints.
   2. Sequence of operation, (e.g. manual ON, Auto OFF. etc.)
   3. Load Parameters (e.g. blink warning, etc.)

F. Post start-up tuning – After 30 days from occupancy contractor shall adjust sensor time delays and sensitivities to meet the Owner's requirements. Provide a detailed report to the Architect / Owner of post start-up activity.

3.3 FACTORY SERVICES

A. Upon completion of the installation, the manufacturer's factory authorized representative shall start up and verify a complete fully functional system.

B. The Electrical Contractor shall provide both the manufacturer and the electrical engineer with three weeks written notice of the system start up and adjustment date.

C. Upon completion of the system start up, the factory-authorized technician shall provide the proper training to the owner's personnel on the adjustment and maintenance of the system.

3.4 OPTIONAL COMMISSIONING SUPPORT SERVICES

A. On this project, a commissioning agent will be hired to verify the installation and programming of all building systems, which includes the lighting control system. Manufacturer should include an extra day of technician's time to review the functionality and settings of the lighting control hardware with the commissioning agent, including reviewing submittal drawings and ensuring that instructions on how to configure each device are readily available. Manufacturer is NOT responsible for helping the commissioning agent inspect the individual devices. It will be the commissioning agent's responsibility to create and complete any forms required for the commissioning process, although the manufacturer or contractor may offer spreadsheets and/or printouts to assist the agent with this task.

B. The commissioning agent shall work with the Electrical Contractor during installation of the lighting control hardware to become familiar with the specific products. The agent may also accompany the manufacturer's technicians during their start-up work to better understand the process of testing, calibration and configuration of the products. However, the contractor and manufacturer shall ensure that interfacing with the agent does not prevent them from completing the requirements outlined in the contract documents.

3.5 OPTIONAL ACCEPTANCE TESTING SUPPORT SERVICES

A. On all California projects, a certified lighting controls acceptance test technician (CLCATT) must verify the installation of the lighting control system. Manufacturer should include an extra day of factory technician's time to assist the CLCATT review the functionality and settings of the lighting control hardware per the requirements in the California State forms. It will be the CLCATT's responsibility to create and complete any forms required for the commissioning process, although the manufacturer or contractor may offer spreadsheets and/or printouts to assist the CLCATT with this task.

END OF SECTION

SECTION 260600

DISCONNECT SWITCHES

PART 1 - GENERAL

Applicable provisions of the conditions of the Contract and Division 1 General Requirements govern the work in this section. Submit shop drawings for checking and approval.

1.1 WORK INCLUDED

A. The work under this section shall include the furnishing of all materials, labor, tools and services necessary to install disconnect switches, fuses and enclosures to complete all work shown on the Drawings or specified herein.

1.2 SUBMITTALS

A. Submit product data under Provisions of Contract and Division 1.

B. Include outline Drawings with dimensions, equipment ratings for voltage, capacity, horsepower and short circuit.

PART 2 - PRODUCTS

2.1 ACCEPTABLE MANUFACTURERS - DISCONNECT SWITCHES

A. Siemens.

B. Square 'D'.

C. General Electric.

D. Or approved equal.

2.2 DISCONNECT SWITCHES

A. Non-fusible switch assemblies: Quick-make, quick-break, load interrupter enclosed knife switch with externally operable handle interlocked to prevent opening front cover with switch in ON position. Handle lockable in OFF position.

B. Enclosures: NEMA Type 1; 3R; 4 as indicated on Drawings.

PART 3 - EXECUTION

3.1 INSTALLATION

A. Install disconnect switches where indicated on Drawings.

B. Install fuses in fusible disconnect switches.

C. Disconnects installed outdoors shall have NEMA 3R enclosures.

D. Disconnects installed indoors in dry locations shall have NEMA 1 enclosure.

END OF SECTION

SECTION 260650

GROUNDING

PART 1 - GENERAL

Applicable provisions of the conditions of the Contract and Division 1 General Requirements govern the work in this section. Submit shop drawings for checking and approval.

1.1 WORK INCLUDED

A. The work under this section shall include the furnishing of all materials, labor, tools and services necessary to install the power system grounding to complete all work shown on the Drawings or specified herein.

1.2 RELATED WORK

A. Panelboards.

B. Raceways.

C. Connection Equipment.

D. Electric Equipment.

E. Tests and Acceptance.

1.3 SUBMITTALS

A. Manufacturers' data, catalog cuts of ground rods, connectors, bushings, etc., along with recommended installation procedures.

PART 2 - PRODUCTS

2.1 WIRING

A. All wiring used for grounding shall be insulated copper, unless otherwise noted. Size shall be in accordance with code for the application, minimum #12.

B. Where used in conjunction with computer equipment, grounding conductors shall be equal in size to the phase conductors.

C. Avoid splices in ground conductors.

2.2 RACEWAY

A. Grounding continuity shall be maintained for all metallic raceways.

B. Provide bonding jumpers across metal parts separated by non-conducting materials.

C. Where a grounding conductor is installed as a supplement to metallic raceway serving as the equipment grounding conductor, bonding conductor to the raceway at each end.

D. All raceway accessories, such as locknuts, bushings, expansion fittings, etc. shall be installed to provide maximum metal-to-metal bonding.

2.3 CLAMPS

A. Provide approved ground clamps for connecting grounding conductors to pipe, conduits, wireways, building steel, grounding rods, etc.

B. Where bond will be in an inaccessible location or as an alternate to ground clamps, provide exothermic weld, similar to Cadweld.

2.4 ACCESSORIES

A. Provide all necessary accessories of appropriate size and material for connection or termination of grounding conductors including:

1. Straps.
2. Clamps.
3. Lugs.
4. Bars and buses.
5. Isolators (where applicable).
6. Locknuts and bushings.

2.5 ACCEPTABLE MANUFACTURERS

A. Copperweld.

B. Cadweld (for exothermic welds).

C. O.Z. Gedney.

D. Burndy.

PART 3 - EXECUTION

3.1 RACEWAYS

A. Grounding continuity is to be maintained for all metallic raceways. Provide necessary clamps, bushings, straps and locknuts to assure continuity.

B. For non-metallic or flexible raceways, provide a separate equipment-grounding conductor bonded to both ends.

C. Where indicated, an additional equipment-grounding conductor shall be provided in metallic raceway.

D. Where indicated, an isolated ground conductor shall be provided in addition to the equipment-grounding conductor. Bond at each end to the isolated ground terminal identified.

3.2 EQUIPMENT

A. All equipment shall be grounded.

B. Where isolated grounding is indicated, it shall be for the isolation of internal equipment components only. All metallic enclosures of such equipment shall be connected to the equipment ground system.

3.3 TESTING

A. Upon completion of the installation, confirm the grounding continuity of all raceways, conductors and equipment. Maximum allowable resistance is 25 ohms.

3.4 RECORD DRAWINGS

A. Submit record As-Built Drawings indicating the location of all points where grounding conductors are bonded to steel, rods, plates, etc.

B. Indicate the location of all grounding buses not installed within distribution equipment.

END OF SECTION

SECTION 260800

ADDRESSABLE FIRE ALARM SYSTEM

PART 1 - GENERAL

Applicable provisions of the conditions of the Contract and Division 1 General Requirements govern the work in this section. Submit shop drawings for checking and approval.

1.1 RELATED DOCUMENTS

A. Related Sections

1. Division 1 General Requirements.

1.2 SUMMARY

A. Section Includes

1. This specification describes an addressable Fire Detection and alarm signaling system. The control panel shall be intelligent device addressable, analog detecting, low voltage and modular, with digital communication techniques, in full compliance with all applicable codes and standards. The features and capacities described in this specification are required as a minimum for this project and shall be furnished by the successful contractor.
2. The system shall be in full compliance with National and Local Codes.
3. The system shall include all required hardware, raceways, interconnecting wiring and software to accomplish the requirements of this specification and the contract drawings, whether or not specifically itemized herein.
4. All equipment furnished shall be new and the latest state of the art products of a single manufacturer, engaged in the manufacturing and sale of analog fire detection devices for over ten years.
5. The system as specified shall be supplied, installed, tested and approved by the local Authority Having Jurisdiction, and turned over to the owner in an operational condition.
6. In the interest of job coordination and responsibilities the installing contractor shall contract with a single supplier for fire alarm equipment, engineering, programming, inspection and tests, and shall be capable of providing a "UL Listing Certificate" for the complete system.
7. The system specified shall be that of ™ PRO which meets the project requirements. Other systems shall be submitted 10 days prior to bid date for approval by the Engineer. All system approved shall meet all the requirements spelled out in this specification. System approval shall be in writing by the Engineer and a copy shall be submitted with the system submittals.

1.3 ALLOWANCES

A. Specify products and work included in this Section that are covered by cash or quantity allowance. Do not include amounts. Insert descriptions of items in Part 2 or 3 to provide information affecting the cost of the Work that is not included under the allowance.

1.4 UNIT PRICES

A. Specify products and work included in this Section that are covered by unit prices. Do not include amounts. Insert descriptions of items in Part 2 or 3 to provide information affecting the cost of the Work that is not included under the unit price.

1.5 DEFINITIONS

A. ASME: American Society of Mechanical Engineers

B. FACP: Fire alarm control panel.

C. FM: FM Global (Factory Mutual)

D. Furnish: To supply the stated equipment or materials.

E. IBC: The 2009 Edition of the International Building Code inclusive of all "Amendments" by the local municipality.

F. Install: To set in position and connect or adjust for use.

G. LED: Light-emitting diode.

H. NCC: Network Command Center

I. NFPA: National Fire Protection Association. Definitions in NFPA 72 apply to fire alarm terms used in this Section.

J. NICET: National Institute for Certification in Engineering Technologies.

K. Provide: To furnish and install the stated equipment or materials.

L. UL: Underwriters Laboratories

1.6 SYSTEM DESCRIPTION

A. The system shall be a complete, electrically supervised fire detection and notification system, with a microprocessor based operating system having the following capabilities, features, and capacities:

1. System shall provide an output port for monitoring purposes by external systems. Communications to an external system shall be RS-232 or RS-485 communications.

2. The local system shall provide status indicators and control switches for all of the following functions:
   a. Audible and visual notification alarm circuit zone control.
   b. Status indicators for sprinkler system water-flow and valve supervisory devices.
   c. Any additional status or control functions as indicated on the drawings, including but not limited to; emergency generator functions, fire pump functions, door unlocking and security with bypass capabilities.

1.7 PERFORMANCE REQUIREMENTS

A. General Performance: Comply with NFPA 72 and all contract documents and specification requirements.

B. All interconnections between this system and the monitoring system shall be arranged so that the entire system can be UL-Certificated.

C. System shall be a complete, supervised, non-coded, addressable multiplex Fire Alarm system conforming to NFPA 72.

D. The system shall have Style 6 circuits for each floor. The system shall operate in the alarm mode upon actuation of any alarm initiating device. The system shall remain in the alarm mode until all initiating device(s) are reset and the fire alarm control panel is manually reset and restored to normal.

E. The system shall be capable of the following configurations. Both configurations are permitted on the same network.

1. The system shall support 504 addressable devices, distributed between eight loops each of which may be divided in any ratio on one, two, three, or eight separate, isolated Class B circuits.

F. The system shall support H or O -series devices and Siemens Cerberus™ PRO series devices.

G. The system shall have a built-in digital alarm communication transmitter.

H. The system shall provide an off-normal warning prior to reset for all active devices.

I. The system shall be capable of remote monitoring via Siemens Cerberus™ PROView®, a proprietary software system that provides a graphical representation of the fire alarm control panel at a remote PC when connected via Ethernet to the system. The display will show the exact state of the panel, including blinking LEDs, and with menu buttons for control.

J. The system shall be capable of being configured either at the control panel or via a PC Tool.

K. The system shall provide the following functions and operating features:

1. The FACP and auxiliary power panels shall provide power, annunciation, supervision and control for the system.
2. Provide Class B initiating device circuits.
3. Provide two Class B notification appliance circuits (NAC) each arrange circuits to allow individual, selective, and visual notification by zone. Notification appliance circuits shall be zoned to correspond with the building fire barriers, floors and other building features.
4. Strobes shall be synchronized throughout the entire building.
5. Provide electrical supervision of the primary power (AC) supply, presence of the battery, battery voltage, and placement of system modules within the control panel.

L. The system shall provide a field test function where one person can test the complete system or a specific area while maintaining full operational function of other areas not being tested. Alarms, supervisory signals, trouble signals shall be logged on the system printer and in system history during the walk-test.

M. Alarm functions shall override trouble or supervisory functions. Supervisory functions shall override trouble functions.

N. Fire alarm signal initiation shall be by one or more of the following devices:

1. Manual pull station
2. Heat detector
3. Addressable Multi-criteria, dual optical smoke detectors
4. Standard Addressable Duct smoke detector

O. Activation of any system fire, security, supervisory, trouble, or status initiating device shall cause the following actions and indications at all network Person Machine Interfaces using basic graphics and multiple detail screens.

1. Fire Alarm Condition

   a. Sound an audible alarm and display a custom screen/message defining the building in alarm and the specific alarm point initiating the alarm in a graphic display.
   b. Log into the system history archives all activity pertaining to the alarm condition.
   c. Print alarm condition on system printer (A Printer is not part of this contract).
   d. Sound the ANSI 117-1 signal with synchronized audible notification appliances and synchronized strobes throughout the facility.
   e. Audible signals shall be silenced from the fire alarm control panel by an alarm silence switch. Visual signals shall be programmable to flash until system reset or alarm silencing, as required.
   f. System operated duct detectors as per local requirements shall accomplish HVAC shut down. All duct detector shall be provided with a Remote Indicator Lamp shown or not shown on the contract drawings. This Remote Lamp shall be provided with a custom label by the Electrical Contractor identifying its purpose. (i.e.: AHU-1 RETURN)
   g. Door closure devices shall operate by floor or by local requirements.

2. Supervisory Condition

   a. Display the origin of the supervisory condition report at the local fire alarm control panel graphic LCD display.
   b. Activate supervisory audible and dedicated visual signal.
   c. Audible signals shall be silenced from the control panel by the supervisory acknowledge switch.
   d. Record within system history the initiating device and time of occurrence of the event.
   e. Print supervisory condition to system printer (A Printer is not part of this contract).

3. Trouble Condition

   a. Display at the local fire alarm control panel graphic LCD display, the origin of the trouble condition report.
   b. Activate trouble audible and visual signals at the control panel and as indicated on the drawings.
   c. Audible signals shall be silenced from the fire alarm control panel by a trouble acknowledge switch.
   d. Trouble conditions that have been restored to normal shall be automatically removed from the trouble display queue and not require operator intervention. This feature shall be software selectable and shall not preclude the logging of trouble events to the historical file.
   e. Trouble reports for primary system power failure to the master control shall be automatically delayed for a period of time equal to 25% of the system standby battery capacity to eliminate spurious reports as a result of power fluctuations.
   f. Record within system history, the occurrence of the event, the time of occurrence and the device initiating the event.
   g. Print trouble condition to system printer (A Printer is not part of this contract).

P. Thermal Movements: Allow for thermal movements from ambient and surface temperature changes.

1.8 SUBMITTALS

A. Product Data: For each type of product indicated. Include construction details, material descriptions, dimensions of individual components and profiles, and finishes. Include rated capacities, operating characteristics, electrical characteristics, and furnished specialties and accessories. Complete manufacturer's catalog data including supervisory power usage, alarm power usage, physical dimensions, and finish and mounting requirements.

B. Power calculations. Battery capacity calculations. Battery size shall be a minimum of 125% of the calculated requirement. Provide the following supporting information:

1. Supervisory power requirements for all equipment.
2. Alarm power requirements for all equipment.
3. Power supply rating justification showing power requirements for each of the system power supplies. Power supplies shall be sized to furnish the total connected load in a worst-case condition plus 25% spare capacity.
4. Voltage drop calculations for wiring runs demonstrating worst-case condition.
5. NAC circuit design shall incorporate a 25% spare capacity.
6. Addressable SLC circuit design shall incorporate 25% spare capacity.
7. IDC circuit design shall allow only a single initiating device installed on each IDC so that it is uniquely identified on the system.

C. Submit manufacturer's requirements for testing Signaling Line Circuits and device addresses prior to connecting to control panel. At a minimum the following tests shall be required; device address, the usage (Alarm, Supervisory etc.), environmental compensation, temperature ratings for thermal detectors and smoke detector sensitivities. This requirement shall need approval before any wiring is connected to the control panel.

D. Shop Drawings: Include plans, elevations, sections, details, and attachments to other work.

1. Detail equipment assemblies and indicate dimensions, weights, loads, required clearances, method of field assembly, components, and location and size of each field connection.

2. Wiring Diagrams: For power, signal, and control wiring.

3. Complete drawings covering the following shall be submitted by the contractor for the proposed system:
   a. Floor plans in a CAD compatible format at a scale of 1/8"=1'-0" showing all equipment and raceways, marked for size, conductor count with type and size, showing the percentage of allowable National Electric Code fill used.
   b. Provide a Fire Alarm system function matrix as referenced by NFPA 72, Figure A-7-5.2.2 (9). Matrix shall illustrate alarm input/out events in association with initiation devices. Matrix summary shall include system supervisory and trouble output functions. Include any and all departures, exceptions, variances or substitutions from these specifications and/or drawings at time of bid.

4. Installation drawings shop drawings, and as-built drawings shall be prepared by an individual experienced with the work specified herein.

5. Incomplete submittals shall be returned without review, unless with prior approval of the Engineer.

E. Fire Alarm Shop Drawings: This electrical contractor shall also submit all documents, drawings, calculations, etc. identified in Paragraph 907.1.2 of the IBC to the Local Authority Having Jurisdiction (AHJ) for "Approval" prior to commencing work. All costs for Permits and Inspections by the AHJ shall be by the Electrical Contractor.

F. Coordination Drawings: Reflected ceiling plan(s) and other details, drawn to scale, on which the following items are shown and coordinated with each other, using input from Installers of the items involved:

1. Light fixtures.
2. HVAC registers

G. Qualification Data: For qualified Installer, Applicator, manufacturer, fabricator, professional engineer, testing agency, and factory-authorized service representative.

H. Source quality-control reports.

I. Field quality-control reports.

J. Operation and Maintenance Data: For all fire alarm equipment, to include in operation and maintenance manuals.

K. Software and Firmware Operational Documentation

1. Software operating and upgrade manuals.
2. Program Software Backup: On magnetic media or compact disk, complete with data files.
3. Device address list.
4. Printout of software application and graphic screens.

L. Warranty: Sample of special warranty.

1.9 QUALITY ASSURANCE

A. Manufacturer Qualifications: The publications listed below form a part of this publication to the extent referenced. The publications are referenced in the text by the basic designation only. The latest version of each listed publication shall be used as a guide unless the authority having jurisdiction has adopted an earlier version.

1. FM Global (Factory Mutual (FM)):FM Approval Guide

2. National Fire Protection Association (NFPA)
   a. NFPA 70 National Electrical Code
   b. NFPA 72 National Fire Alarm Code
   c. NFPA 90A Standard For The Installation of Air Conditioning and Ventilating Systems
   d. NFPA 101 Life Safety Code

3. Underwriters' Laboratories, Inc. (UL) equipment standards, Latest Edition
   a. UL Fire Protection Equipment Directory
   b. UL Electrical Construction Materials Directory
   c. UL 38 – Manually Actuated Signaling Boxes for Use With Fire Protection Signaling Systems
   d. UL 228 – Door Holding Devices
   e. UL 268 - Smoke Detectors for Fire Protective Signaling Systems
   f. UL 268A - Smoke Detectors for Duct Application

g. UL 464 - Audible Signal Appliances
h. UL 497A – Secondary Protectors for Communications Circuits
i. UL 521 - Heat Detectors for Fire Protective Signaling Systems
j. UL 864 - Control Units for Fire Protective Signaling Systems
k. UL 1283 – Electromagnetic Interference Filters
l. UL 1449 - Transient Voltage Surge Suppressors
m. UL 1971 - Signaling Devices for the Hearing Impaired

4. International Code Council
   a. International Building Code, 2009 Edition.
   b. International Fire Code, 2009 Edition.

5. State and Local Building Codes as adopted and/or amended by The Authority Having Jurisdiction, ADA, and/or State and local equivalency standards as adopted by The Authority Having Jurisdiction.

6. NY-MEA

7. ISO 9002

B. Supplier Qualifications

1. The manufacturer of the supplied products must utilize multi-channel product distribution on a national basis to be considered for this bid. The manufacturer must have factory branches as well as independent distributors to allow the end user with the ability to utilize factory trained and authorized competitive service providers after system installation and commissioning.
2. Provide the services of a factory trained and certified representative or technician, experienced in the installation and operation of the type of system provided. The representative shall be licensed in the State if required by law.
3. The technician shall supervise installation, software documentation, adjustment, preliminary testing, final testing and certification of the system. The technician shall provide the required instruction to the owner's personnel in the system operation and maintenance.
4. The suppliers shall furnish evidence they have an experienced service organization, which carries a stock of spare and repair parts for the system being furnished.
5. The equipment supplier shall be authorized and trained by the manufacturer to calculate, design, install, test, and maintain the air sampling system and shall be able to produce a certificate stating such upon request.

C. Installer Qualifications

1. Before commencing work, submit data showing that the manufacturer has successfully installed fire alarm systems of the same scope, type and design as specified.
2. The contractor shall submit copies of all required Licenses and Bonds as required in the State having jurisdiction.
3. The contractor shall employ on staff a minimum of one NICET level II technician or a professional engineer, registered in the State of the installation.
4. Contractors unable to comply with the provisions of Qualification of Installers shall present proof of engaging the services of a subcontractor qualified to furnish the required services.

D. Testing Agency Qualifications: Qualified for testing indicated.

E. Source Limitations for fire alarm equipment: Obtain fire alarm equipment from single source.

F. Surface-Burning Characteristics: As determined by testing identical products according to ASTM E 84 by a qualified testing agency. Identify products with appropriate markings of applicable testing agency.

1. Flame-Spread Index: 25 or less.
2. Smoke-Developed Index: 50 or less.
3. Combustion Characteristics: ASTM E 136.

G. 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.

H. Pre-installation Conference: Conduct conference at Project site.

1.10 DELIVERY, STORAGE AND HANDLING

A. Deliver products to project site in original, unopened packages with intact and legible manufacturers' labels identifying product and manufacturer, date of manufacture, and shelf life if applicable.

B. Store materials inside, under cover, above ground, and kept dry and protected from physical damage until ready for use. Remove from site and discard wet or damaged materials.

1.11 PROJECT CONDITIONS

A. Installed products or materials shall be free from any damage including, but not limited to, physical insult, dirt and debris, moisture, and mold damage.

B. Environmental Limitations: Do not deliver or install products or materials until spaces are enclosed and weather-tight, wet work in spaces is complete and dry, and temporary HVAC system is operating and maintaining ambient temperature and humidity conditions at occupancy levels during the remainder of the construction period.

1.12 WARRANTY

A. Special Warranty: Manufacturer's standard form in which manufacturer agrees to repair or replace fire alarm equipment that fail(s) in materials or workmanship within specified warranty period.
1. Warranty Period: 1 year from date of Substantial Completion.

1.13 SERVICE AGREEMENT

A. Technical Support: Beginning with Substantial Completion, provide software support for 1 year.

B. Upgrade Service: Update software to latest version at Project completion. Install and program software upgrades that become available within two years from date of Substantial Completion. Upgrading software shall include operating system. Upgrade shall include new or revised licenses for use of software.
1. Provide 30 days' notice to Owner to allow scheduling and access to system and to allow Owner to upgrade computer equipment if necessary.

1.14 EXTRA MATERIALS

A. Furnish extra materials that match products installed and that are packaged with protective covering for storage and identified with labels describing contents including:

1. Air Duct Smoke Detector Housing: Furnish one (1) of each type installed.

2. Remote Detector Indicator: Furnish quantity equal to 2 percent of the number of units of each type installed but not less than two (2) of each type.

3. Control Module: Furnish quantity equal to 2 percent of the number of units of each type installed but not less than two (2) of each type.

4. Monitoring Module: Furnish quantity equal to 2 percent of the number of units of each type installed but not less than two (2) of each type.

5. System Keys: Provide Six (6) of each type.

PART 2 – PRODUCTS

2.1 MANUFACTURERS

A. Manufacturers: Subject to compliance with requirements all equipment shall be Siemens Cerberus™ PRO FC-924 by Open Systems Metro.

1. In order to assure the Owner of all factory warranties, all equipment shall be obtained from an approved factory authorized distributor. The manufacturer and/or his authorized distributor shall show satisfactory evidence that he maintains a fully equipped factory authorized service organization, stocked with factory approved replacement parts and is capable of furnishing adequate inspection and service of equipment.

2. Provided and subject to compliance with requirements herein, the following alternate manufacturers are approved:
   a. Notifier a GE-Honeywell Company.
   b. EST, UTC Fire & Security, A United Technologies Company.
   c. Or approved equal.

2.2 CONTROL PANEL

A. The fire alarm control panel shall be microprocessor based using multiple microprocessors throughout the system providing rapid processing of smoke detector and other initiation device information to control system output functions.

B. There shall be a watchdog circuit, which shall verify the system processors and the software program. Problems with either the processors or the system program the panel shall activate a trouble signal and reset the panel.

C. The system modules shall communicate with an RS 485 network communications protocol. All module wiring shall be to terminal blocks, which will plug into the system card cage.

D. The system shall be capable of the following configurations. Both configurations are permitted on the same network. The system shall support 504 addressable devices, distributed between eight loops each of which may be divided in any ratio on one, two, three, or eight separate, isolated Class B circuits.

E. The system shall be capable of supporting unshielded wiring applications.

F. System Components

1. The System Periphery board shall be capable of 504 intelligent devices distributed between one, two, three, or four Class B SLC circuits. Any trouble on one circuit shall not affect the other circuit. This module controls the signaling from the initiation devices reporting alarms and troubles to the control panel. This module shall also provide the signaling to the field devices for the controlling the output of specific initiation devices. The on board microprocessor provides the periphery board with the ability to function even if the main microprocessor fails. LED's on the board shall provide annunciation for the following; Power, Gnd. Fault, Alarm, Trouble. This board is integral to the system. The board shall be model number FCI2017-U1.

2. The system periphery board shall be capable of supporting two system drivers of 504 intelligent devices distributed between one, two, three, or four Class B SLC circuits, for a total panel capacity of 504 addressable devices. Any trouble on one circuit shall not affect the other circuit. This module controls the signaling from the initiation devices reporting alarms and troubles to the control panel. This module shall also provide the signaling to the field devices for the controlling the output of specific initiation devices. The on board microprocessor provides the periphery board with the ability to function even if the main microprocessor fails. LED's on the board shall provide annunciation for the following: Power, Gnd. Fault, Alarm, Trouble. This board is integral to the system. The board shall be model number FCI2017-U1.

3. The Signal Line Circuits (SLC) shall be tested for opens, shorts and communications with all addressable devices installed before connection to the control panel. Systems without this capability shall have a test panel installed for initial testing to eliminate any possible damage short term or long term to the control panel. After initial testing replace the test panel and proceed with complete testing.

4. The standard Operator Interface shall have the ability to view events, acknowledge, silence, and reset the system and any networked Siemens Cerberus™ PRO control panels, when configured as a global PMI.

5. The LED Operator Interface shall have the ability to view events, acknowledge, silence, and reset the system and any networked Siemens Cerberus™ PRO control panels, when configured as a global PMI. Additionally, the operator interface provides twelve multicolored configurable LEDs for annunciating system status.

6. The System Periphery Board shall contain 2 Class B NAC circuits rated at 3 amps each with power-limited outputs. The zones shall be isolated and independently supervised. There shall be at least 6 unique codes/signals for each circuit based on system logic. These signals shall be Temporal Code 3 (Evacuation), Steady (Such as "Recall"), Temporal Code 3 (for CO alarms), March Time 120ppm, March Time 60ppm, and March Time 30ppm. The card shall have the following LED's to provide trouble shooting and annunciation; Power, Gnd. Fault, Zone Activation or Trouble. This functionality shall be integral to the system. The card shall be model number FCI2017-U1.

7. The control panel shall be equipped with four Form C relays for alarm, trouble, supervisory, and programmable output. The system shall provide the mounting of all system cards, field wiring, and panel's inter-card wiring. All power limited field wiring shall be separated from all non-power limited internal wiring. The card shall be model number FCI2017-U1.

G. System response time from alarm to output shall be an average of three (3) seconds.

H. All system cards and modules shall have Flash memory for downloading the latest module firmware.

I. Passwords

1. Technician Level Password - There shall be a 5 character password that a user must enter into the control panel in order to perform such maintenance- and control-related functions at the panel as:
   a. Arming and disarming devices.
   b. Activating, deactivating or modifying detector ASD and sensitivity settings.
   c. Activating and deactivating the History Log function and deleting obsolete entries.
   d. Changing the system time and date.

2. Maintenance Level Password - There shall be a 5 character password that a user must enter into the control panel in order to access the panel's reporting functions and walktest functions.

3. Acknowledge Silenceable Reset Access - There shall be a key required to open a locked cabinet that a system user must use in order to acknowledge events, turn silenceable audibles and visuals on and off, and perform panel resets.

J. Degrade Mode Alarm Activation: Each Siemens Cerberus™ PRO panel shall operate as a stand-alone fire alarm control panel with complete functionality in the event of loss of communications with other Siemens Cerberus™ PRO panels on a network.

K. Software Modifications: The system structure and software shall place no limit on the type or extent of software modifications on-site. Modification of software shall not require power-down of the system or loss of system fire protection while modifications are being made. Systems that require the use of external programmers or change of EPROMs are not acceptable.

L. Logic: The fire alarm system shall support generic functions that deal with binary states (True/False, high/low), and produce desired outputs from one or more binary inputs (for example, alarm outputs from detector or manual station inputs). AND, OR, NOT, Any N, Latches, Start Timer, Delay Timer, Restart Timer are generic functions. Generic functions can be used as inputs to other function. The system shall support 500 logic functions.

M. History: The system shall store 20,000 events in history. Trouble warnings will occur when the History buffer is full.

N. Reports

1. The system shall have the ability to provide configuration, status, queue and history reports.

2. Configuration reports shall provide the following information:
   a. Custom Messages
   b. Database Information
   c. Entity Type
   d. Device Usage
   e. Zone usage
   f. Device Category
   g. Firmware revision

3. Status reports shall provide the following information:
   a. Disarmed cards and devices
   b. ASD settings
   c. Sensitivity in %/foot
   d. Alarm threshold in %/foot
   e. Temperature in degrees C
   f. Walk-test

4. Queue reports shall provide the following information:
   a. Alarm events with custom message and event time
   b. Supervisory events with custom message and event time
   c. Trouble events with custom message and event time
   d. Status events with custom message and event time
   e. Information events

5. History reports shall provide Address, History Type, Description, Time & Date and Custom Message. The following event types shall be reported:
   a. Alarm events
   b. Supervisory events
   c. Status changes
   d. Alarm verification
   a. Output activation from logic
   b. System Reset
   c. Event Acknowledgements
   d. Block Acknowledgements
   e. Audible Silence System Flag Changes
   f. Sensitivity Changes
   g. Arm / Disarm Commands
   h. Arm / Disarm By Logic
   i. Manual Output Overrides
   j. Output Overrides By Logic
   k. Time Changes
   l. Menu Logins
   m. ASD Changes
   n. Walk-test
   o. Device Input to Logic Activations/Deactivations

2.3 POWER SUPPLY

A. The system Power Supply/FP2012-U1 shall be a 300 Watt, 10amp supply that provides 24VDC power for system operation. The power supply shall be filtered and regulated. The power supply provides power for all system operation, including signaling line circuits, notification appliance circuits, auxiliary power, battery charger, and all optional modules. The power supply shall be rated for 120/240 VAC 50/60 Hz. The module shall be model number FP2012-U1.

B. The battery charger shall be able to charge the system batteries up to 100 AH batteries. Battery charging shall be microprocessor controlled and programmed with a special software package to select charging rates and battery sizes. An optional Thermistor for monitoring battery temperature to control charging rate shall be available.

C. Transfer from AC to battery power shall be instantaneous when AC voltage drops to a point where it is not sufficient for normal operation.

2.4 SYSTEM ENCLOSURE

A. Provide the enclosure needed to hold all the cards and modules as specified with at least spare capacity for two cards. Provide the color as to the local AHJ requirements. The outer doors shall be capable of being a left hand open. The inner door shall have a left hand opening.

B. Provide black cabinet enclosure.

2.5 AUXILIARY POWER SUPPLY – NOTIFICATION APPLIANCE EXTENDER

A. Auxiliary Power Supply, Notification Appliance Extender shall be the Siemens Cerberus Pro PAD-3 shall provide 6 amps of 24 VDC power for multiple uses. All 6 amps can be directed to 4 Notification Appliance Circuits (NAC s) with each rated at 3amps/power limited.

B. Either 1 or 2 inputs can control the four outputs. These outputs are compatible with all Siemens Cerberus Pro notification appliances and can be configured so that the inputs can be programmed as steady outputs, ANSI temporal outputs, or synchronized strobe outputs. It shall provide silencable horn/strobe horns while the strobes remain on using one set of wires.

C. The PAD-3 shall provide a 3 amp auxiliary output for driving other portions of the fire alarm system such as door holders. This 24 VDC filtered output shall be power limited.

D. A Form C dry contact for trouble monitoring.

E. The PAD-3 offers battery supervision and management as is required of fire alarm system components.

F. Ground faults are transmitted as are any other trouble conditions. Trouble conditions not only change the state of the trouble contact in the unit, but they also break the notification circuit input to create a trouble signal in the fire alarm control unit.

2.6 INTELLIGENT INITIATING DEVICES

A. General: All initiation devices shall be insensitive to initiating loop polarity. Specifically, the devices shall be insensitive to plus/minus voltage connections.

B. Duct Smoke Detectors – Addressable

1. For duct detector applications, the smoke detector shall be an intelligent digital photoelectric detector. Detectors shall be listed for use as open area protective coverage, in duct installation and sampling assembly installation and shall be insensitive to air velocity changes.
2. The detector communications shall allow the detector to provide alarm input to the system and alarm output from the system within four (4) seconds. The detector shall be mounted in a duct detector housing listed for that purpose. The duct detector shall support the use of an LED remote indicator. The duct detector shall be supplied with the appropriate sampling tubes to fit the installation.
3. The intelligent duct detector shall be model number AD2-P Series. Where required there shall be available a duct housing with an on-board relay.
4. Duct smoke detector housing shall allow use in duct systems with air velocity ranging from 100 to 4,000 feet per minute, within temperature ranges of 32°F to 120°F per minute, and with relative humidity ranging from 0 to 95%.
5. Duct Housings: FDBZ492 Global Air Duct Housing for Conventional and Addressable Detectors.

2.8 DEVICE PROGRAMMING UNIT

A. Device Programming Unit: A programming tool shall be provided as part of this contract. It shall program the intelligent devices with addresses. The unit shall test the device to respond to its address. Dipswitches and rotary switches shall not be acceptable. The programmer shall be model DPU with carrying case.

2.9 NOTIFICATION APPLIANCES

A. Continuity check shall occur for entire NAC circuit prior to attaching any audible / visual-notification appliances

B. Dust cover shall fit and protect the mounting plate

C. Dust cover shall be easily removed when the appliance is installed over the back plate

D. Removal of an appliance shall result in a trouble condition by the Fire Alarm Control Panel (FACP)

2.10 DIGITAL COMMUNICATOR

A. The Multi-Point Digital Alarm Communicator FCA2015-U1 shall be UL864 listed to provide point identification of alarm, supervisory, security and trouble events to a Central or Remove Receiving Station. The DACT shall support the following:

1. Ademco Contact ID or SIA protocol
2. Ademco Contact ID selection shall provide the ability to transmit events for up to 999 individual zones
3. SIA selection shall provide the ability to transmit events for up to 10000 individual points
4. Programming of accounts and phone numbers
5. Dual phone line interface
6. Line fault monitoring.
7. Automatic 24-hour test
8. The DACT supports configurable alarm, alarm restoral, trouble, trouble restoral, supervisory, supervisory restoral, and reset events.
9. The DACT supports Ademco Contact ID alarm event codes for general alarm, smoke detector alarm, waterflow alarm, duct alarm, and manual alarm events.
10. Optionally, the DACT can be programmed to report events by event queue only.

PART 3 - EXECUTION

3.1 EXAMINATION

A. Examine areas and conditions 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. Perform work in accordance with the requirements of NFPA 70, NFPA 72 and NECA 1-2006, Standard of Good Workmanship in Electrical Contracting.

B. Fasten equipment to structural members of building or metal supports attached to structure, or to concrete surfaces.

C. In the event that limited energy cable installation is allowed, all cable runs shall be run at right angles to building walls, supported from structure at intervals not exceeding 3 feet and where installed in environmental air plenums, be rated for such use and tied/supported by components listed for environmental air plenums installation.

D. Wiring Method: Install cables in raceways and cable trays except within consoles, cabinets, desks, and counters and except in accessible ceiling spaces and in gypsum board partitions where unenclosed wiring method may be used. Conceal raceway and cables except in unfinished spaces.

E. Wiring Method: Conceal conductors and cables in accessible ceilings, walls, and floors where possible.

F. Wiring within Enclosures: Bundle, lace, and train conductors to terminal points with no excess and without exceeding manufacturer's limitations on bending radii. Provide and use lacing bars and distribution spools.

G. Provide primary power for each panel from normal/ emergency panels as indicated on the Electrical Power Plans. Power shall be 120 VAC service, transformed through a two-winding, isolation type transformer and rectified to low voltage DC for operation of all circuits and devices.

3.3 BOXES, ENCLOSURES AND WIRING DEVICES

A. Boxes shall be installed plumb and firmly in position.

B. Extension rings with blank covers shall be installed on junction boxes where required.

C. Junction boxes served by concealed conduit shall be flush mounted.

D. Upon initial installation, all wiring outlets, junction, pull and outlet boxes shall have dust covers installed. Dust covers shall not be removed until wiring installation when permanent dust covers or devices are installed.

E. "Fire alarm system" decal or silk-screened label shall be applied to all junction box covers.

3.4 CONDUCTORS

A. Each conductor shall be identified as shown on the drawings at each with wire markers at terminal points. Attach permanent wire markers within 2 inches of the wire termination. Marker legends shall be visible.

B. All wiring shall be supplied and installed in compliance with the requirements of the National Electric Code, NFPA 70, Article 760, and that of the manufacturer.

C. Wiring for strobe and audible circuits shall be a minimum 14 AWG, signal line circuits minimum 18 AWG twisted.

D. All splices shall be made using solderless connectors. All connectors shall be installed in conformance with the manufacturer recommendations.

E. Crimp-on type spade lugs shall be used for terminations of stranded conductors to binder screw or stud type terminals. Spade lugs shall have upset legs and insulation sleeves sized for the conductors.

F. The installation contractor shall submit for approval prior to installation of wire, a proposed color code for system conductors to allow rapid identification of circuit types.

G. Wiring within sub panels shall be arranged and routed to allow accessibility to equipment for adjustment and maintenance.

3.5 DEVICES

A. Relays and other devices to be mounted in auxiliary panels are to be securely fastened to avoid false indications and failures due to shock or vibration.

B. Wiring within panels shall be arranged and routed to allow accessibility to equipment for adjustment and maintenance.

C. All devices and appliances shall be mounted to or in an approved electrical box.

3.6 IDENTIFICATION

A. Identify system components, wiring, cabling, and terminals. Comply with requirements for identification specified in Division 26 Section "Identification for Electrical Systems."

B. Permanently label or mark each conductor at both ends with permanent alphanumeric wire markers.

C. A consistent color code for Fire Alarm system conductors throughout the installation.

3.7 FIELD QUALITY CONTROL

A. Manufacturer's Field Service: Engage a factory-authorized service representative to inspect components, assemblies, and equipment installations, including connections, and to assist in testing.

B. Testing General

1. All Alarm Initiating Devices shall be observed and logged for correct zone and sensitivity. These devices and their bases shall be tagged with adhesive tags located in an area not visible when installed, showing the initials of the installing technician and date.
2. Wiring runs shall be tested for continuity, short circuits and grounds before system is energized. Resistance, current and voltage readings shall be made as work progresses.
3. The acceptance inspector shall be notified before the start of the required tests. All items found at variance with the drawings or this specification during testing or inspection by the acceptance inspector shall be corrected.
4. Test reports shall be delivered to the acceptance inspector as completed.
5. All test equipment, instruments, tools and labor required to conduct the system tests shall be made available by the installing contractor. The following equipment shall be a minimum for conducting the tests:
    a. Ladders and scaffolds as required to access all installed equipment.
    b. Multi-meter for reading voltage, current and resistance.
    c. Two way radios and flashlights.
    d. A manufacturer recommended device for measuring air flow through air duct smoke detector sampling assemblies.
    e. Decibel meter.
    f. In addition to the testing specified to be performed by the installing contractor, the installation shall be subject to test by the acceptance inspector.

3.8 ACCEPTANCE TESTING

A. A written acceptance test procedure (ATP) for testing the Fire Alarm system components and installation will be prepared by the engineer in accordance with NFPA 72 and this specification. The contractor shall be responsible for the performance of the ATP, demonstrating the function of the system and verifying the correct operation of all system components, circuits, and programming.

B. A program matrix shall be prepared by the installing contractor referencing each alarm input to every output function affected as a result of an alarm condition on that input.

C. The installing contractor prior to the ATP shall prepare a complete listing of all device labels for alphanumeric annunciator displays.

D. Loop Resistance Tests: Measure and record the resistance of each circuit with each pair of conductors in the circuit short-circuited at the farthest point from the circuit origin. The tests shall be witnessed by the owner and test results recorded for use at the final acceptance test.

E. Preliminary Testing: Conduct preliminary tests to ensure that all devices and circuits are functioning properly. After preliminary testing is complete, provide a letter certifying that the installation is complete and fully operable. The letter shall state that each initiating and indicating device was tested in place and functioned properly. The letter shall also state that all panel functions were tested and operated properly. The Contractor and an authorized representative from each supplier of equipment shall be in attendance at the preliminary testing to make necessary adjustments.

F. Final Acceptance Test: Notify the owner in writing when the system is ready for final acceptance testing. Submit request for test at least 14 calendar days prior to the test date. A final acceptance test will not be scheduled until megger test results, the loop resistance test results, and the submittals required in Part 1 are provided to the owner. Test the system in accordance with the procedures outlined in NFPA 72.

1. Verify that the control unit is in the normal condition as detailed in the manufacturer's operating and maintenance manual.
2. Test each initiating and indicating device and circuit for proper operation and response. Disconnect the confirmation feature for smoke detectors during tests to minimize the amount of smoke or test gas needed to activate the detector.
3. Test the system for all specified functions in accordance with the contract drawings and specifications and the manufacturer's operating and maintenance manual.
4. Visually inspect all wiring.
5. Verify that all software control and data files have been entered or programmed into the FACP.
6. Verify that Shop Drawings reflecting as-built conditions are accurate.
7. Measure the current in circuits to assure that there is the calculated spare capacity for the circuits.
8. Measure voltage readings for circuits to assure that voltage drop is not excessive.
9. Measure the voltage drop at the most remote appliance on each notification appliance circuit.

G. The acceptance inspector shall use the system record drawings in combination with the documents specified in this specification during the testing procedure to verify operation as programmed. In conducting the ATP, the acceptance inspector shall request demonstration of any or all input and output functions. The items tested shall include but not be limited to the following:

1. System wiring shall be tested to demonstrate correct system response and correct subsequent system operation in the event of:

    a. Open, shorted and grounded signal line circuits.
    b. Open, shorted and grounded notification, releasing circuits.
    c. Primary power or battery disconnected.

2. System notification appliances shall be demonstrated as follows:

    a. All alarm notification appliances actuate as programmed.

3. System indications shall be demonstrated as follows:

    a. Correct message display for each alarm input at the control display.
    b. Correct annunciator light for each alarm input at each annunciator and graphic display as shown on the drawings.
    c. Correct history logging for all system activity.

4. System off-site reporting functions shall be demonstrated as follows:

    a. Correct zone transmitted for each alarm input
    b. Trouble signals received for disconnect

5. Secondary power capabilities shall be demonstrated as follows:

    a. System primary power shall be disconnected for a period of time as specified herein. At the end of that period, an alarm condition shall be created and the system shall perform as specified for a period as specified.

    b. System primary power shall be restored for forty-eight hours and system-charging current shall be normal trickle charge for a fully charged battery bank.

    c. System battery voltages and charging currents shall be checked at the fire alarm control panel.

3.9 DOCUMENTATION

A. System documentation shall be furnished to the owner and shall include but not be limited to the following:

1. System record drawings and wiring details including one set of reproducible drawings, and a CD ROM with copies of the record drawings in DXF format for use in a CAD drafting program.

2. System operation, installation and maintenance manuals.

3. System matrix showing interaction of all input signals with output commands.

4. Documentation of system voltage, current and resistance readings taken during the installation, testing and ATP phases of the system installation.

5. System program showing system functions, controls and labeling of equipment and devices.

6. Provide (3) copies of the Fire Alarm system programmer disc/ thumb drive to owner.

3.10 PROTECTION

A. Remove and replace devices and panel components that are wet, moisture damaged, or mold damaged.

3.11 DEMONSTRATION

A. Instructor: Include in the project the services of an instructor, who shall have received specific training from the manufacturer for the training of other persons regarding the inspection, testing and maintenance of the system provided. The instructor shall train the employees designated by the owner, in the care, adjustment, maintenance, and operation of the Fire Alarm system.

B. Training sessions shall cover all aspects of system performance, including system architecture, signaling line circuit configurations, sensor and other initiating device types, locations, and addresses, fire alarm control panel function key operation, and other functions as designated by the owner.

C. Required Instruction Time: Provide 16 hours of instruction after final acceptance of the system. The instruction shall be given during regular working hours on such dates and times as are selected by the owner. The instruction may be divided into two or more periods at the discretion of the owner. One training session shall be videotaped by the contractor. Videotapes shall be delivered to the owner.

D. Provide a typeset printed or typewritten instruction card mounted behind a Lexan plastic or glass cover in a stainless steel or aluminum frame. Install the frame in a conspicuous location observable from the FACP. The card shall show those steps to be taken by an operator when a signal is received as well as the functional operation of the system under all conditions, normal, alarm, supervisory and trouble. The instructions shall be approved by the owner.

E. Comprehensive system troubleshooting training shall be provided for a single individual designated by the owner. This session shall be separate and distinct from the above described sessions.

F. All training sessions shall be conducted following final system certification and acceptance. Three additional training sessions shall be provided for all security personnel on all shifts six months after final system certification.

G. All training sessions shall be conducted by an authorized Fire Alarm system distributor representative, who has received specific training from the manufacturer for the training of other persons regarding the inspection, testing, and maintenance of the system provided.

END OF SECTION

SECTION 260810

DATA CABLING SYSTEM

PART 1- GENERAL

Applicable provisions of the Conditions of the Contract and Division 1 General Requirements govern work in this section. Submit shop drawings for checking and approval.

1.1 WORK INCLUDED

A. The work covered by this specification includes the system integration and construction described, including all labor necessary to perform and complete such work; all materials and equipment incorporated or to be incorporated in such work; and all services, facilities, tools and equipment necessary or used to perform and complete such work and all systems configuration, testing and turnover for a fully operational and functioning backbone system.

B. Before the start of any work coordinate all equipment, devices, cable, racks, supports etc. with Owner.

1.2 IT INFRASTRUCTURE SYSTEM

A. Lateral Cabling

1. Provide, test and document Category 6 UTP copper horizontal communications cabling as shown in Construction Documents. Horizontal cabling in existing Basement shall derive from existing data racks in the Coat Room located on the First Floor. Cable shall terminate at each data outlet location and at patch panel as per Construction Documents. Cabling shall be run above the ceiling supported by J-hooks, inside surface mounted raceway or within conduit. Leave 10' slack neatly coiled and tie wrapped in closet for flexibility.

2. Core drill and provide conduit sleeve as required to provide access through cinderblock walls into classrooms for lateral cabling above ceilings.

3. All lateral cabling installation shall be concealed above ceiling. In areas that require being exposed cable shall be run in the following manner: In unfinished area install cable in EMT conduit and in finished area (classrooms, offices, corridors, etc.) provide steel surface mounted raceway to hide and protect lateral cable. No cabling shall be run exposed except in data rack closet on cable management.

B. Provide all cable termination patch panels, blocks, equipment racks and cable management organizers, rear support wire management, ladder rack, cross connect supports and guide rings as required for a full and complete installation

C. Provide all outlet jacks, connectors, terminating devices, faceplates, and similar components required for a complete installation as indicated in detail in construction documents.

D. Provide all labeling and documentation of all cables, racks, outlets and hardware installed under this contract.

E. Provide all testing and test documentation as described below.

F. Provide J-STD-607-A standard-compliant telecommunications ground backbone cables, bus bars, connectors and components required for a complete telecommunications grounding system installation.

G. Provide all connections to the telecommunications grounding system.

H. Provide fire-stopping of all rated wall penetrations and openings through rated walls after installation of telecommunications cabling.

I. Provide all non-specified miscellaneous hardware, including, but not limited to nuts, bolts, re-enterable cable ties, spiral wrap, wire rings, supporting hardware and similar components required for a complete cabling system installation.

J. Remove all abandoned cabling.

1.3 DATA

A. Lateral Cabling

1. Provide, test and document Category 5E cable and as shown in construction documents. Horizontal cabling shall derive from Teachers outlet to Smartboard as indicated in construction documents. Category 5E cabling shall be run above the ceiling supported by J-hooks, inside surface mounted raceway or within conduit. Leave 5' slack neatly coiled and tie wrapped above ceiling to data closet.

2. All lateral cabling installation shall be concealed above ceiling and vertical cabling in wall in conduit stub-ups. In areas that require being exposed cable shall be run in steel surface mounted raceway to hide and protect cable. No cabling shall be run exposed.

B. Provide all cable and wire termination at outlets and guide rings as required for a full and complete installation.

C. Provide all outlet jacks, connectors, terminating devices, faceplates, and similar components required for a complete installation as indicated in detail in Construction Documents.

D. Provide all labeling and documentation of all cables, outlets and hardware installed under this contract.

E. Provide all testing and test documentation of cables.

F. Provide all non-specified miscellaneous hardware, including, but not limited to nuts, bolts, re-enterable cable ties, spiral wrap, wire rings, supporting hardware and similar components required for a complete cabling system installation.

G. Remove all abandoned cabling.

1.4 SUBMITTALS

A. General: The contractor shall submit product documentation for all components that will be used for this project. The documentation must be approved before order and installation. The contractor shall furnish the product documentation on any substituted product with the bid response. The remaining submittals shall be furnished for approval one (1) week after award of contract.

B. Product Data: Provide manufacturer's catalog information showing dimensions, colors, and configurations to be consistent with existing building arrangement. Coordinate with Owner before the start of any work.

C. At completion of installation, furnish a complete set of As-Built documents, including plan view and elevation drawings, cable test results and cable termination and cross connection schedules.

D. As-Built drawings shall be submitted in format as indicated in Division 1. As-built cable schedules shall be provided in (1) hard copy, (1) computer CD format and thumb drive.

1.5 QUALITY ASSURANCE

A. All products and materials shall be new, clean, and free of defects or damage and of first quality.

B. The Contractor shall be responsible for the receipt, delivery and safe storage of materials and equipment to the job site. Deliver materials (except bulk materials) in manufacturers' unopened containers.

C. The Contractor shall comply with all applicable governmental regulations and with all Federal, State, County, City, and other applicable codes, ordinances, regulations and BICSI installation practices.

D. Local electrical and building codes may differ from national codes. Follow the most stringent code or recommendations.

E. It is the intent of these Specifications to provide a complete workable telecommunications cabling system ready for the Owner's use. Any item not specifically shown on the Drawings or called for in the Specifications, but normally required to conform to the intent, is to be considered as part of the Contract.

F. Any given item of equipment or material shall be the product of one manufacturer throughout the facility. Multiple manufacturers of any one item shall not be permitted, unless specifically noted otherwise or approved by the Owner.

G. These Specifications are equipment and performance Specifications. Actual installation shall be as indicated on the Drawings. Any discrepancies found between the Specifications and Drawings shall be brought to the attention of the Construction Manager. Installation and details indicated on the Drawings shall govern if they differ from the Specifications.

H. Certain terms such as "shall, provide, install, complete, etc." are not used in some parts of these Specifications. This does not indicate that the items shall be less than completely installed or that systems shall be less than complete.

1.6 COORDINATION OF THE WORK

A. Coordinate project and schedule work with the general contractor in accordance with the schedule and construction sequence.

B. Wherever work interconnects with work of other trades, provide the information necessary to properly install all the connections and equipment. Identify all items of work that require access so that the ceiling trade will know where to install access doors and panels, and where to leave ceiling spaces accessible for wiring installation.

C. Attend all construction meetings as requested by the Owner or Construction Manager.

D. Maintain a complete file of shop drawings available at all times to the Construction Manager.

E. Prior to actual installation, without extra charge, make reasonable modifications in the layout as needed to prevent conflict with work of other trades or for proper compliance with the design intent.

PART 2 - PRODUCTS

Substitutions or alternates for the manufacturers listed will not be permitted without the written consent of the Owner. Refer to Section 1.4, Submittals, for further information.

2.1 UTP COPPER CABLE

A. For Horizontal Cable, Plenum rated, (4) 23 AWG twisted unshielded pairs, to meet or exceed Category 5E code performance standards, solid copper, insulated conductors, UL Listed CMP Manufacturer: Commscope, Hitachi or AMP Netconnect - Color – Data and Telephone: Blue.

2.2 TERMINATION HARDWARE

A. Patch Panel for UTP terminations. Meet or exceed TIA and ISO Category 6 component performance requirements. Provide Universal wiring T568A or T568B. All terminations shall be T568B. Manufacturer: AMP Netconnect.

B. Category 6 Modular Jack for UTP terminations. Meet or exceed TIA and ISO Category 6 component performance requirements. Provide Universal wiring T568A or T568B. All terminations shall be T568B. Color – Blue for Data and White for Voice. Manufacturer: AMP Netconnect.

2.3 OUTLET COMPONENTS

A. Refer to construction documents, provide Hubbell for outlet component type for data/telephone and audio/visual

B. For Teacher’s Desk location refer to Legend on Drawing E001.

C. For Smartboard/TV refer to Legend on Drawing E001.

D. For Data and combination Telephone/Data refer to Legend on Drawing E001.

2.4 FIRE STOP FITTINGS

A. Flame stopper providing fire stopping to existing through-wall cable penetrations. Up to four hour F and T ratings ensures product will maintain the integrity of fire rated walls whether empty, partially filled or fully loaded. Plenum rated and low air (smoke) leakage.

B. Manufacturer: Nelson Firestop Product, Part No.: Nelson FSP (Putty Bars), Nelson CLK (Silicone Sealant), Nelson LBS (Latex Sealant), Nelson ES1399 (Elastomeric Sealant) or approved equal.

2.5 LABELS

A. Labels. Self-adhesive, self-laminating, with white matte finish printing area, clear plastic shield. Pin feed for machine printing. Used for cable identification. Labels shall be provided on both ends of all cables. 1" width for horizontal cabling, 2" width for riser cabling. Length as required for other cable media.
Manufacturer: W. H. Brady Co. Type: 1" Width for horizontal cabling, 2" Width for riser cabling and length as required for other cable media or approved equal.

B. Labels. White polyester. Laser printable for use on face plates. 1" x 4". Coordinate label placement with Owner.
Manufacturer: W. H. Brady Co., Part Number: CL-211-619 or approved equal.

C. Labels. White Polyester. Laser printable. For use on patch panels. 3/4" x 1/4", 1" x 1/2".
Manufacturer: W. H. Brady Co., Part Number: CL-041-619 (0.75" x 0.25") or approved equal.

D. Labels. White polyester. Laser printable. Used for cable ladders, racks, frames, etc., as required.
Manufacturer: W. H. Brady Co., Part Number: BCDAT-2-619 or approved equal.

E. Labels. Paper label inserts for 110 blocks. Utilize EIA 606 compliant colors.

Manufacturer: W. H. Brady Co.

Part Number: DATA-177-124-BL – Blue – Data Cables

Part Number: DATA-177-124-RD –Purple – VOIP

Part Number: DATA-177-124-WT – White – Wireless Access Point

Part Number: DATA-177-124-PK – Pink – Security

Part Number: DATA-177-124-YL –Yellow – Misc. riser

Part Number: DATA-177-124-GR –Green – PBX Termination

Or approved equal.

F. Confirm all labeling methods with Owner before the start of any work.

PART 3 - EXECUTION

3.1 GENERAL

A. Follow manufacturers' instructions for installing all telecommunications cabling. Where instructions are unavailable, follow approved industry practice.

B. Compare communications drawings and specifications with the drawings and specifications of other trades, report any discrepancies to the Consultant; and obtain written instructions for changes necessary in the work. Include most stringent requirements in bid.

C. Repairs or changes caused by contractor's neglect shall be made at contractor's expense. Protect finished work of other trades from damage or defacement and remedy any damages as required.

D. Clean up all debris generated by installation activities and discard as directed by the Construction Manager.

E. Maintain a current copy of this Specification and related Drawings at the job site at all times.

3.2 CABLE DISTRIBUTION

A. Follow room boundaries when pulling cables through ceilings for distribution into walls, conduits, wiring channels, outlets, etc.

B. All cable distribution from the Data Closet/Rack to all work locations (except as noted) shall be run in the ceiling plenum. Ceiling support grids and service hangers shall not be used to support cabling.

C. Cable shall be loose bundled into cable supports. Use only approved re-enterable cable ties to secure cables in overhead distribution.

3.3 EMI/RFI AVOIDANCE

A. To avoid electromagnetic interference (EMI) route cables to maintain the following minimum distances:
   1. Twelve inches from lighting fixtures.
   2. Thirty-six inches from electrical lines of 5 KVA or greater.
   3. Forty inches from transformers or motors.

B. Maintain minimum twelve-inch separation between telecommunication cables running exposed in ceiling and parallel electrical cables/conduits.

C. Telecommunication cables shall cross electrical cables/conduits only at 90 degree angles.

3.4 STAFFING

A. Designate a qualified foreman. The foreman shall be present in the field at all times during the performance of the work.

B. Provide a supervisory work force sufficient to maintain efficient performance of the contractor's responsibilities.

C. Use only skilled and reliable work force and discontinue the services of anyone employed on this project upon written request by the Owner, Architect, Construction Manager or Consultant.

D. Use personnel who are qualified (at minimum) to perform all of the installation and testing work activities required under the contract.

E. Provide and use the proper tools in good working order for the performance of the work. The Consultant reserves the right to review the tools and tool maintenance procedures of the contractor and require replacements to be obtained.

F. Telephone and data industry cable installation standards, TIA/EIA and BICSI standards, and manufacturers' instructions shall be used for in-process quality control and final acceptance of the work.

G. All workers entering work site shall require valid Identification which shall be run through National database before entering work site.

3.5 CABLE SLACK

A. Provide a minimum of 12-inches of slack at each terminal box or behind each faceplate after jack installation is completed to allow for easy dismounting and extension of outlet covers and wire terminations.

B. Provide a minimum of 5-feet slack in a loop in UTP at the head of each stub-up or distribution conduit.

3.6 FIRE STOPPING

A. Seal all penetrations through fire rated walls and walls created by or made on the behalf of the contractor so that the original fire rating of the wall is maintained as required by Article 300-21 of the National Electric Code.

B. Use sealant material that has passed fire exposure testing in accordance with standard time-temperature curve in the standard, UL, ASTM E 119, and NFPA 251 and the hose stream test in accordance with UL 1OB.

C. Provide removable fire-stopping pillows (IPC flamesafe sealbags or approved equivalent) in an approved fashion in openings greater than 4" diameter, or 4" x 4" square cross section. Provide wire mesh grate over bags as recommended by manufacturer subsequent to installation.

3.7 CABLE TESTING

A. Test all cables installed under the contract.

B. Pre-installation Inspection

1. Visually inspect all cables, cable reels and shipping cartons for shipping damage. Return visibly damaged items to the manufacturer.

2. Prior to testing, submit for review and approval copies of test report forms proposed for use. Forms shall, at minimum, contain: Project name; Contractor's name; Date of test; Media type and description; Make, model and serial number of the test equipment used and date of last calibration.

C. Post Installation Testing

1. Test only completed systems. Partial or statistically sampled testing is not acceptable, except by prior, written approval from the Consultant.

2. Paired and multi-conductor metallic cables: perform an end-to-end test for continuity, ground fault, shorts and crossed pairs for each cable pair/conductor.
   a. Test cable pairs from the work area outlet, through all conductors to patch board in data closet/rack room.

3. 4-pair Category 5E UTP: in addition to end-to-end tests listed above.
   a. Test for length, capacitance, attenuation, noise, resistance, NEXT, FEXT, ELFEXT, PSNEXT, PSELFEXT and delay skew with injected standard signals. Utilizing automated test equipment, set up and measure a basic link to determine the actual swept frequency ACR. Compare the ACR to the ISO/IEC Cat 5E/Class E ACR at 300 or 350 MHz. Test bi-directionally in accordance with ANSI/TIA/EIA-568-( ).
   b. Test cabling not cross connected or patched within the closet as a permanent link.

4. For 4-pair replace the entire cable if a bad pair or conductor is found.

5. Remove defective cable in its entirety from point to point. Do not abandon cables in place.

6. The Consultant reserves the right to observe the conduct of any or all portions of the testing process and to conduct, and to require the Contractor, using the Contractor's equipment and labor, a random re-test of up to five (5) percent of the cable plant to confirm documented test results.

7. Document all test results and corrective procedures and submit to the Consultant within ten (10) working days of test completion.

8. In addition to the actions specified above, the contractor may be required to be present while the owner or owner's designated representatives conduct performance tests of the transport electronics connected to the cabling system.

3.8 ACCEPTANCE

A. Once testing has been completed, both as-built and testing documentation have been delivered to the Consultant, and the Consultant is satisfied that all work is in accordance with the contract documents, the Consultant shall notify the contractor in writing of the acceptance of the work performed. The date of this acceptance shall constitute the commencement of the warranty period.

3.9 CABLE IDENTIFICATION SYSTEM

A. Use color coding in accordance with the EIA-606 standards.

B. Jacks, faceplates and wall outlets at the user locations, termination blocks and individual lateral cables shall be labeled with (at minimum) machine generated black uppercase lettering on a permanent adhesive label stock, covered with a permanent water resistant sealer. Labeling stock and/or lettering must be used that provides a high contrast with the color of the terminating equipment, faceplate or cable.

C. Place labels on both ends of the cable at least 4 inches from the point at which the cable is terminated on the connector or terminal block.

D. Provide permanent, machine generated cable tags. Temporary tags are acceptable only during construction. Label each tag with the appropriate cable number as shown on the drawings and as indicated on the cable schedules provided by the Consultant.

E. Cable identification numbers shown on the plans are presented in an abbreviated format. All cables ID's shall (at minimum) indicate the floor, originating closet ID, and the sequential cable number shown on drawings.

F. If at any time during the job the permanent cable tag becomes illegible or is defaced or removed, immediately replace it with a duplicate pre-printed cable tag.

3.10 PANEL IDENTIFICATION

A. Furnish a nameplate for each patch panel, cross-connect field, equipment rack, etc. Unless otherwise noted, use a permanent adhesive label stock, covered with a permanent water-resistant sealer.

3.11 TERMINATING BLOCKS, DISTRIBUTION RACKS AND PATCH PANELS

A. Assemble and install all equipment per manufacturers' printed instructions.

B. Terminate all horizontal Category 6 UTP cables directly on the 110-type termination strips at the rear of rack-mounted 48-port patch panels, unless otherwise noted.

C. Label patch panels and window jack locations.

3.12 CABLE PULLING

A. Do not exceed a pulling tension of 25 lbs. on 4-pair UTP cables.

B. To limit the incidence of micro-bending of the individual fiber strands, use mesh-type, swivel-eye pulling grips for all fiber optic cable pulling. This type of pulling grip is also recommended for all other building cable, as required.

3.13 CABLE INSTALLATION

A. Special Conditions

1. Furnish and install communications cables per the drawings and specifications provided by the Consultant and per manufacturer's recommendations.

2. Install backbone cable as an uninterrupted conductor section from the point of origination to the point of termination as indicated on the drawings, without splices or mechanical couplers between the points of origin and termination.

3. Install each station cable as an uninterrupted conductor section from the data closet/rack to the user-end termination point, as indicated on the drawings, without splices or mechanical couplers between the points of origin and termination.

4. Contractor shall support all backbone cable, data, telephone and all audio/visual horizontal cable bundles on J-hooks. Install J-hooks with the appropriate mounting hardware every 5-feet OC (maximum) for open cable runs. J-hooks shall not be fastened to suspended ceiling support structures, electrical or plumbing piping or any other trade work.

5. Provide all other outlet configurations in accordance with the Drawings.

B. Terminate all four-pair UTP horizontal cables on 4-pair Category 5E jacks. The pinning configuration of the outlet jacks shall be T568B unless otherwise specified by the Owner prior to installation. The jacks shall then be inserted into appropriate faceplates for flush wall mounted receptacles, surface-mounted channels or boxes.

C. Unless otherwise noted, route all data/telephone cable above the finished ceilings, transitioning vertically to wall mounted back boxes and/or surface-mounted wiring channels via conduit stub-ups into the ceiling void as required.

D. Label each outlet and each cable with an appropriate ID number.

E. Provide proper cable bends and supports.

F. Fiber cable terminations shall consist of MTRJ connector and SC connectors. Coordinate with Owner before the start of any work.

END OF SECTION

SECTION 260825

PUBLIC ADDRESS SYSTEM

PART 1- GENERAL

Applicable provisions of the Conditions of the Contract and Division 1 General Requirements govern work in this section. Submit shop drawings for checking and approval.

1.1 WORK INCLUDED

A. The work under this section shall include the furnishing of all material, labor, tools and services necessary to wire and cable in raceway specified in other sections to complete all work shown on the Drawings or specified herein.

1.2 QUALITY ASSURANCE

A. Manufacturers must be regularly engaged in the manufacture of integrated communication systems, and ancillary equipment, of types and capacities required. Approved products shall have been in satisfactory use in similar service for not less than five years.

B. Installer's Qualifications: Firms with at least five years of successful installation experience with projects utilizing integrated communications systems and equipment similar to that required for this project.

C. All items of equipment including wire and cable shall be designed by the manufacturer to function as a complete system and shall be accompanied by the manufacturer's complete service notes and drawings detailing all interconnections.

D. The Contractor shall be an established communications and electronics Contractor that has had and currently maintains a locally run and operated business for at least five years. The Contractor shall be a duly authorized distributor of the equipment supplied with full manufacturer's warranty privileges.

E. The Contractor shall show satisfactory evidence, upon request, that he maintains a fully equipped service organization capable of furnishing adequate inspection and service to the system. The Contractor shall maintain at his facility the necessary spare parts in the proper proportion as recommended by the manufacturer to maintain and service the equipment being supplied.

F. Except where specifically noted otherwise, all equipment supplied shall be the standard product of a single manufacturer of known reputation and experience in the industry. The Contractor shall have attended the manufacturers installation and service school and upon request must show proof of attending such a school.

G. Installing contractor must have a service office within 75 miles of the site and be expected of providing service within a 24-hour period of time.

1.3 SUBMITTALS

A. Submit the shop drawings, product data, and quality control submittals specified below at the same time as a package.

B. Shop Drawings: Composite wiring and/or schematic diagrams of the complete system as proposed to be installed. Drawing shall include relative position of all major components, typical connections, field components, accessories, and cable types.

C. Include catalog cutsheets, manufacturers default specifications, Users operation guide, and bill of materials.

D. Quality control shall include the following:

1. Submit the Name, address, and telephone number of the nearest fully equipped service organization.

2. Submit a certificate of completion of installation and service training from the system manufacturer.

E. Program the operational characteristics matching the operation described herein, adjusting for call routing, transfers, priorities, and volume levels.

F. Remove all existing conduit, wire device, etc., being abandoned due to relocation.

G. The Contractor shall provide a minimum of eight hours of in-service training with this system. These sessions shall be broken into segments, which will facilitate the training of individuals in the operation of this system. Operator Manuals and User Guides shall be provided at the time of this training.

PART 2 - PRODUCTS

2.1 RACEWAYS AND CABLES

A. Electrical work will conform to the National Electric Code and applicable local ordinances.

B. All 125-volt electrical conductors shall be installed in galvanized electrical metallic tubing with compression type fittings and couplings, minimum 1/2" size conduit.

C. All low-voltage wires and cables concealed in walls shall be run in EMT conduit from flush outlet boxes to above accessible ceilings. Provide conduit where cables penetrate firewalls above ceilings.

D. All EMT entering boxes shall be served with insulating throat connectors and locknuts.

E. No raceway shall be located in proximity of hot water lines or excessive heat.

F. Where raceways cannot be run concealed in walls, use Wiremold Series surface raceway complete with all fittings, box extension rings, and required accessories. Co-ordinate routing of surface raceways with the Owner.

G. Use Cast "C" clamps, "U" straps, or ring hangers attached to rods, and/or brackets fastened to structure.

H. No perforated straps or tie wires permitted for supporting raceways.

I. Use wire ties for supporting low voltage cables run concealed above ceilings. Do not run cables loose on ceiling tiles. Support from structure above. Group cables in bundles.

J. Tie mounts, plates, and anchors shall be used.

K. Ground all electrical apparatus in accordance with the National Electric Code.

2.2 ACCEPTABLE MANUFACTURERS

A. The system shall be manufactured by Telecor, Inc. or approved equal.

B. Manufacturer's names are listed herein to establish a standard. The products of other manufacturers will only be acceptable if approved by the specifying architect and the Owner 10-days prior to the bid. The substitute material must be of a quality as good or better than the material specified, and will serve with equal efficiency and dependability, the purpose for which the items specified were intended.

C. Final approval of these alternates shall be determined at the time of completion. Failure to provide the "functional equivalent" shall result in the removal of the alternate system and installation of the specified system at the contractor's cost.

D. The intent is to establish a standard of quality, function and features. It is the responsibility of the bidder to ensure that the proposed product meets or exceeds the intent of these specifications.

E. The functions and features specified are vital to the operation of this facility and therefore inclusion in the list of acceptable manufacturers does not release the contractor from compliance with the requirements of this specification.

2.3 PRODUCT OVERVIEW

A. Furnish and install all equipment, accessories, and materials in accordance with the specifications and drawings to provide a complete and operating Communication system as outlined below.

B. Following is an outline of the basic functions required, set as a minimum standard. These functions must be included in the bid. Any exceptions to these functions must be listed and submitted as part of the bid. If several manufacturers are required to provide these functions proof must be provided that they will function as one integrated system to the user.

C. Intercom Features/Public Address Features

1. Individual intercom circuit for every Classroom
2. Urgent Call Placement
3. Monitor Areas of the building during a crisis from the rescue team or on site security officer.
4. All Call Announcements.
5. Emergency Announcements.
6. Automatic Page.
7. Urgent Call-In Page.
8. 32 Zones of Audio Program Distribution.
9. 32 Zones of Paging.
10. Monitor areas of the building during a crisis from the rescue team or on site security.
11. Page areas of the building during a crisis from the rescue team or on site security officer.
12. Temporary Speaker Exclusion for Special Events.
13. Complete System Programming and diagnostics from LAN, WAN or Internet.

D. Time Control and Event Scheduler

1. 16 Schedules of Class Change Signals.
2. 32 Zones of Class Change Signals.
3. 1536 Class Change Signal Events.
4. Weekly System Event Scheduler.
5. Supports Electronic Message Displays for Timekeeping, Count up-down timers and full alphanumeric messaging.
6. Automatic Daylight Savings Time Correction.

2.4 INTERCOM/PA FEATURES AND PRODUCT DESCRIPTION

A. Supply and install a complete microprocessor based Public Address and Intercom system using 25-volt speakers and horns.

B. The system shall consist of the Central Control Unit, Administrative Control Console(s) and Rack Equipment. All other necessary devices that are required by this specification to create a complete and operational system such as Staff Phones, Call Buttons, Speakers, Horns, Amplifiers, Program Sources must be supplied under this contract.

C. The system shall be capable of multiple open voice intercom paths used for intercom, paging, program distribution, or emergency paging. The system shall be initially equipped with minimum of one intercom speech path.

D. Provide a separate circuit for each classroom and administrative office so each room can be individually addressed.

E. Corridor speakers, classrooms and outside horns shall be combined into groups of owners' preference. There must be 32 independent software paging zones that each circuit may be a part of. Each individually point must also have the ability to be paged independent of the software zones.

F. The system will have the ability to utilize VOIP intercom stations in addition to industry standard 25 volt speakers. The VOIP stations will operate in the same manner as the conventional speakers. The system must be a hybrid system having the capability of using either or both types of stations wherever it is deemed necessary and practical by the owner. The VOIP stations must have the ability to incorporate a call switch and must be capable of operating on the existing school LAN/WAN network.

G. The system specified is based on the Telecor XL system providing at least the following features and functions. It shall be installed and programmed by an authorized and certified Telecor dealer. The central control unit shall have the capacity for expanding the system to 300 stations and 4 Administrative Consoles with the addition of plug in modules, as required.

H. It shall be complete with circuitry for accomplishing all functions for signaling and communications to all stations, page zones, and administrative control consoles. The unit shall contain all required electronics on modular, plug-in type boards for ease of service and future expansion.

I. All programmable functions shall be stored in a non-volatile EEPROM memory and shall not be lost in event of a power failure.

1. Programming functions shall be accomplished through the use of a standard Internet web-browser interface. Any PC connected to the school's network and provided with the proper authorization shall have multi-level access to system programming. Any off-site PC shall have multi-level access to the system through the use of the public internet, provided they have been granted proper authorization by the school.

2. The intercom system shall be connected to a (school provided) Ethernet network port using the TCP/IP protocol for PC programming, performing diagnostics, or logging transactions either on or off-site.

3. The system shall support remote programming and support through a wide area network connection.

4. The programming interface shall support configurations for multiple sites and allow the user, after logon, to select which site to program from a list of all sites.

5. The user interface shall support user names and passwords. There shall be multiple levels of access allowed. Some users may only have view privileges only while others may only edit their site.

6. The program shall also serve as part of the documentation process. Page Zones and bell schedules shall support user-definable names and display as pick lists when editing the configuration.

7. Diagnostic functions shall be accomplished through any PC connected to the school network and provided with the proper authorization and diagnostic software. Any off-site PC shall have access to the system for diagnostics through the use of the public internet, provided that they have been granted proper authorization and have been provided diagnostic software.

8. Although the Intercom PA system is programmed through a PC interface, the system shall not have to rely upon a personal computer for day to day operation. All programming information is loaded into the intercom system allowing independent operation of the system.

9. The final copy of the program and the configuration of data files shall be provided to the school in electronic format.

J. The audio channel(s) shall be priority driven allowing for the highest priority signal type access to a voice channel. The system shall be user programmable to allocate, upon demand, either of the channel(s) to facilitate simultaneous intercom conversations, pages, program distributions, or combination thereof.

1. Call switches shall be provided and shall be programmable and capable of routing incoming calls from classrooms to a specific control console or specific group of consoles. Every point shall be individually programmed. Up to 16 different console groups can be assigned.

2. Calls may be answered from any annunciating control console, administrative telephone, attendant console and Caller ID enabled single-line telephones. When calls are routed to multiple consoles or console display units simultaneously, once answered, the call shall be automatically cancelled from all other consoles or displays.

3. The system shall support both "normal calls" and "emergency calls" from a single call switch. Merely depressing the call switch repetitively 3 times or flashing the hook-switch of the room telephone 3 times shall initiate emergency calls. Call switches may also be programmed to initial an emergency call by pressing and holding the button for three seconds.

4. If an emergency call is not answered within a user programmable time, the call will automatically call all other Administrative Control Consoles in the system.

5. The system shall be capable of monitoring supervised call-in lines. Any supervised line shall alert the control console if the line is cut. The system can be checked daily from the control console for damaged lines.

6. All call switches shall be associated with a speaker assembly.

7. Every call switch point shall support an independent programmable priority level.

K. Pre-announce tones will alert the classroom of incoming calls with distinct tones for each priority level. To prevent unauthorized monitoring, the tone will sound whenever the classroom is being monitored and will repeat at regular intervals. Facilities shall also be provided to defeat the tone repeat function from the administrative console if it is not desired.

L. Provide automatic gain control on intercom speech to assure constant speech level.

M. System shall have the capabilities of interfacing with a local Gym or Auditorium Sound System, providing automatic bridging of the local system, whenever it is accessed from the console. The system shall automatically track the local system, controlling the audio program as programmed from the control console.

N. System will provide emergency and All Call paging and a minimum of 32 zones of group paging. The paging zones shall be independent of the time tone and audio program distribution zones. Systems sharing zones for both paging and time tone shall not be acceptable.

O. 32 different sections of the building can be monitored either on or off the premises from a control console or telephone.

P. System shall support up to 5 low-impedance microphones, which can be individually programmed to announce in any individual room or assigned to any of the 32 paging zones. The microphone(s) shall be software programmable for control and distribution thus eliminating the need to go to the central electronics for set-up.

Q. Distribution of paging announcements can be made from any administrative control console, telephone, or dedicated microphone set-up.

R. Emergency announcements shall have the highest priority over any other system function.

S. System shall support general announcements made from a conventional microphone to facilitate reading a script and the participation of multiple announcers.

T. Keying the microphone shall automatically mute all other audio programs at a lower priority in the system and transmit the microphone audio to All Rooms or specific speaker zones, as programmed into the system software.

U. The system must have the capability of distributing audio program sources from any administrative control console, telephone system phone or intercom system DTMF phone. Program distribution shall be accomplished on an all rooms basis, selected rooms basis or an individual room.

V. Classroom phones, if required, must have the ability to add or remove themselves from an ongoing program from their room phone.

W. Inputs shall be provided from at least 3 different line level sources and 5 different low impedance sources. Available inputs include microphones, tuners, tape players, or auxiliary sources.

1. The program source(s) can be located remotely from the central electronics so that the customer does not have to go to the communications closet to select the program.

2. The control console shall be able to selectively monitor program sources being distributed.

X. Any area of the building shall be software programmable into 32 zones for easy selection of receiving audio programs. These zones shall be independent from the page and time tone zones. Individual rooms shall also be included or excluded independently from receiving audio programs.

Y. Systems whose only method of distributing an audio program is by the use of mechanical switch banks shall not be accepted.

Z. Systems, which cannot support the distribution of program material by at least two separate methods, will not be acceptable.

AA. The Central Control Unit shall provide a 0 dB signal for connections to an external amplifier for distribution of program audio, time signals and paging announcements.

BB. The system shall provide capability for multiple open voice intercom paths used for intercom, paging, program distribution, or emergency paging (Minimum of two).These paths shall be global, non-blocking circuitry. Systems offering multiple-speech paths, which are restricted to a single speech path per group of room stations or circuit card, due to hardware constraints, will not be accepted. The intercom channels shall be universal allocating channels on demand.

CC. The system shall support the automatic distribution of user programmable, class change time signals (Bell Schedule) to all selected areas:

1. The system shall support a minimum of 1536 events and 16 schedules.

2. Building time zones shall be used to select which areas receive the tone. They must be totally independent from page zones and program zones.

3. Ability to produce 8 different tone signals for classroom time changes or emergency signals selected from a combination of over 1500 tones.

4. All time signal programming shall be accomplished from a control console or a PC utilizing a standard web browser program.

5. The duration of the tone, as well as frequency, burst length and output level shall be software programmable from the console or a web browser.

6. The system shall support running all time schedules concurrently.

7. All system tones shall be user programmable for the following durations in seconds: 2, 3.5, 5, 6, 8, 10, 12.

8. The system shall provide the ability to have music on class change allowing any source to be distributed to specific program zones.

DD. The intercom channel(s) must be equipped with an auto call back function allowing callers to simply request call back in the event that a channel is busy alleviating the need to repeatedly call the system.

2.5 TELEPHONY FEATURES AND PRODUCT DESCRIPTION

A. The system shall integrate to the facility phone system to allow any authorized telephone system extension to:

1. Place intercom calls to any classroom or work area.
2. Make paging announcements to any of the 32 zones.
3. Initiate system tones to any area of the facility.
4. Distribute programs to any zones and zone monitor any area of the building.

B. The system shall allow the facility phone system to answer any calls from call switches or intercom handsets. When the phone system is equipped with standard Caller-ID support, all information about the caller such as room number and call priority will be available on the display of the telephone.

C. The integration to the phone system will utilize unused CO ports from the KSU/PBX or VOIP Hybrid System. This system is described in another section of the project documents. Coordinate with the phone system vendor to ensure the availability of these ports. Up to 2 ports may be required.

2.6 ADMINISTRATIVE TELEPHONES

A. The intercom/paging system control console shall be microcomputer based, desk top console, occupying no more than 75 sq. inches of desk space and weighing 2 lbs. It shall be manufactured of high impact, molded plastic with a standard 12 button keypad. It shall be Model MCC-300.

B. The console shall provide selected, two-way voice communications and signaling between the console and room stations as well as between other control consoles in the system. The console shall be equipped with a telephone handset with a retractable cord to allow private conversations. A built-in microphone and speaker shall provide for push-to-talk intercom conversations.

C. Incoming calls shall be annunciated on a two line 20-character LCD backlit digital display by room number and priority level. The display shall be angle adjustable to ensure the clearest viewing of console information.

D. All incoming calls shall be held in memory and displayed sorted by priority and order received. Each of the six levels of priority shall be displayed by a unique priority prefix and call-in tone. The console shall also have facilities for reviewing all incoming calls stored in memory.

E. The distribution of program material shall be controlled from the administrative control console, room selector switch or DTMF intercom handset. System shall support distribution to any of 31 distribution zones, individual rooms or combination thereof.

F. Paging announcements shall be distributed from the control console on an Emergency All Call, All Call, All-Call multiple zone, or individual basis to classroom speakers.

G. Any control console in the system shall have the ability to be designated as the current console and have the incoming calls from room stations, enunciate at that specific console. This function shall be programmed from the control console and shall allow for simple transfer of the current console assignment to any other console in the system.

H. The console shall also provide the ability for the operator to place on hold, or clear any incoming calls registered in the system from the console keypad.

I. Facilities for activating and controlling remote devices from the control console keypad. The system shall control the operation of external bells, utilizing the internal time clock within the system.

J. Capabilities for user programming of alphanumeric architectural room numbers from the control console. The system shall be capable of using 2, 3, 4 digit number, or a letter (A = I) and a 3 digit number. The number for both the classroom speaker and the telephone shall be the same.

K. The console shall retain the last room number dialed until another room number is dialed or previous call is cancelled.

L. Ability to manually distribute tone signals on an all-call basis from the keypad of the Administrative Control Console cabinet.

M. The console shall have the ability to program or change all of the operational characteristics of the Intercom/PA system.

2.7 PROGRAM SOURCES

A. Provide an AM/FM CD player, Telecor model T-CDP or approved equal. The unit shall be equipped with an LCD information display, front panel indicators and controls, clock, bass, treble, bass enhance, mute and digital signal processing.

1. The AM section shall be tuned over a range of 531 to 1602 KHz. The FM section shall be tuned over a range of 87.5 to 108.0 MHz. The unit shall be equipped to accommodate storage of up to 12 memory selections, six from each band. Storage can be manually accomplished or automatically performed by the unit based on the strongest signals.

2. The CD player shall provide utilize a sampling frequency of 44.1 KHz. The unit shall provide controls for play, stop, fast forward, rewind, track forward, track reverse, pause and eject. The unit shall provide a preview function, which will play the first 10 seconds of each track on the CD. The unit shall allow for random track play mode by the push of a single button.

2.8 AMPLIFIERS

A. The power amplifiers shall be manufactured by Telecor. The system shall be sized at watt per classroom, 1 watt per corridor speaker, and 3.5 watts per horn. The amplifier load shall not exceed 80% capacity.

B. The amplifiers shall be capable of producing an audio output of 60, 125 or 250 watts RMS at less than 1% distortion with a balanced output.

C. They shall be designed to operate on a line voltage of 115 AC. One amplifier shall be provided for each audio channel.

2.9 EQUIPMENT RACKING

A. The central electronics equipment shall be contained in an upright rack, Telecor model 242, 261 or 277 or approved equal. The rack must be sized by the contractor to house all components required by this specification plus 20% spare for additions.

B. The rack shall be 21.9" wide and 18.5" deep. It shall be constructed of CRS, using 16 gauge material for the top and bottom of the rack and 14 gauge material for the sides. The rack shall be equipped with both front & rear mounting rails, punched on standard EIA centers. The rack shall be complete with a hinged, locking rear door. The rack shall be finished in Black Baked Enamel.

2.10 CALL SWITCHES

A. The Call Switch shall be a Telecor model CS-1 or approved equal. Furnish and install where indicated on the plans.

1. The switch shall be a momentary action, push-button switch mounted on a 1-gang brushed stainless steel plate suitable for flush or surface mounting on a standard single gang back box with 3 - 9/32" mounting centers.

2. The stainless steel plate shall be inscribed "Push to Call".

2.11 SPEAKERS

A. The loudspeaker/transformer/baffle assembly shall be a Telecor model STB-11 or approved equal. It shall be used for flush mounting on ceilings. Furnish and install as indicated on the plans.

1. The loudspeaker size shall be 8 inches in diameter and have a power handling capacity of 15 watts. The voice coil shall be of high-temperature bonded construction, be one inch in diameter and have an impedance of 8 ohms. The speaker shall have a frequency range of at least 50 Hz to 15,000 Hz and an axial sensitivity of 91dB at 4 ft, with a 1 watt input signal @ 1000Hz.

2. The loudspeaker shall be equipped with a factory wired 25/70 volt line-matching transformer. The transformer shall have the primary taps at 1/4, 1/2, 1, 2 and 4 watts. The insertion loss shall be no greater than 1.0 dB. The transformer shall be mounted to the speaker with the secondary leads soldered to the speaker terminals.

3. The assembly shall include a baffle constructed of 22 gauge, cold-rolled steel finished with a mar-resistant white, semi-gloss, epoxy coating. The baffle shall have a diameter of 13". The STB-11 shall mount to a T8 support bridge, used to attach the assembly to suspended ceilings. The support bridge will accept an enclosure, model H8, to provide a protective enclosure. The H8 enclosure shall attach to the support bridge with appropriate mounting screws.

B. The loudspeaker/transformer/baffle and enclosure shall be Telecor models S8T2570, B25 and SH-20SB. It shall be used for surface mounting on walls or ceilings. Furnish and install as indicated on the plans.

1. The speaker/transformer assembly shall be a Telecor model S8T2570 or approved equal. The loudspeaker size shall be 8 inches with a ceramic magnet and seamless cone. The ceramic magnet shall weigh no less than 6 oz. The speaker shall have a frequency range of at least 50 Hz to 15,000Hz at a 10 watt handling capability, and an axial sensitivity of at least 95 dB at 4 feet, with a 1 watt input. The voice coil shall be 1.0 inch in diameter with an 8 impedance. The loudspeaker shall be equipped with a factory wired 25/70 volt line-matching transformer. The transformer shall have the primary taps at 1/4, 1/2, 1, 2 and 4 watts. The insertion loss shall be no greater than 1.0 dB. The transformer shall be mounted to the speaker with the secondary leads soldered to the speaker terminals.

2. The baffle shall be a Telecor Model B25 or approved equal. It shall be constructed of 22 gauge, cold rolled steel and finished with a mar-resistant, white, semi-gloss, epoxy coating. Speaker studs shall be concealed. The baffle shall measure 12 " square and shall mount a standard 8" loudspeaker. It shall mount to a Telecor H20 or SH20-SB enclosure.

3. The enclosure shall be a Telecor Model SH20-SB or approved equal suitable for the surface installation of 8" speaker/baffle assembles. The enclosure shall be suitable for ceiling or wall installation. It shall be a welded assembly, constructed of 18 gauge, cold rolled steel and finished with a mar-resistant, white, semi-gloss, epoxy coating. The interior shall be coated to prevent mechanical and acoustical resonances. The enclosure is furnished with four "J" clips to facilitate screw mounting of the baffle.

C. The loudspeaker/transformer/ baffle assembly shall be a Telecor model WB-11 or approved equal. It shall be used for surface mounting on walls. Furnish and install s indicated on the plans.

1. The baffle/enclosure shall be constructed of " medium density fiberboard, glued in all 4 joints and using a corner bead of adhesive to add structural integrity. The construction shall be of a miter-fold design and covered in a walnut-grain vinyl, with a black cloth grill.

2. The front baffle shall be sloped, providing directional sound dispersion. The loudspeaker shall have a diameter of 8 inches and a power handling capacity of 15 watts. The voice coil shall be of high-temperature bonded construction, be one inch in diameter and have an impedance of 8 ohms. The speaker shall have a frequency range of at least 50 Hz to 15,000 Hz and an axial sensitivity of 91dB at 4 ft, with a 1 watt input signal @ 1,000Hz.

3. The loudspeaker shall be equipped with a factory wired 25/70 volt line-matching transformer. The transformer shall have the primary taps at 1/4, 1/2, 1, 2 and 4 watts. The insertion loss shall be no greater than 1.0 dB. The transformer shall be mounted to the speaker, with the secondary leads soldered to the speaker terminals.

4. The enclosure shall measure 9" wide and 10" high with a projection of 5" at the top and 3" at the bottom. A mounting bracket shall be located on the rear of the enclosure to facilitate installation.

2.12 HORN LOUDSPEAKERS

A. The horn style loudspeaker shall be a Telecor model A-15T or approved equal. Furnish and install as indicated on the plans.

1. The horn shall be a double re-entrant type, with a flared bell and an integral compression driver rated for 15 watts of continues audio power. The frequency response shall be 375 - 14,000Hz. Nominal sensitivity shall be such that a sound pressure level of 110 dB at 1000 Hz (on axis) at distance of one meter is produced with an input of one watt. Sound dispersion shall be no less than 100 degrees, regardless of the mounting position.

2. The horn shall contain a weatherproof, built-in, 25/70 volt line matching transformer. Power taps shall be at 0.48, 0.94, 1.8, 7.5 or 15 watts for a 25V line and 1, 2, 3.8, 7.5 or 15 watts for a 70 V line. The power taps shall be screwdriver adjustable. Impedance selection shall be 5,000, 2500, 1300, 666, 333, 87, or 45 ohms.

3. The unit shall include a die-cast universal mounting bracket, allowing the horn to be positioned both in the vertical and horizontal planes with a single adjustment. The wiring terminals and the screwdriver power tap shall be enclosed by a clear plastic cover for security and weather protection.

4. The horn shall be finished in a grey epoxy. Dimensions shall be 9-1/4" deep with a diameter of 8”.

B. The horn style loudspeaker shall be a Telecor model A-30T or approved equal. Furnish and install as indicated on the plans.

1. The horn shall be a double re-entrant type, with a flared bell and an integral compression driver rated for 30 watts of continues audio power. The frequency response shall be 275 - 14,000Hz. Nominal sensitivity shall be such that a sound pressure level of 115 dB at 1000 Hz (on axis) at distance of one meter is produced with an input of one watt. Sound dispersion shall be no less than 90 degrees, regardless of the mounting position.

2. The horn shall contain a weatherproof, built-in, 25/70 volt line matching transformer. Power taps shall be at 0.94, 1.8, 7.5, 15 or 30 watts for a 25V line and 2, 3.8, 7.5, 15 or 30 watts for a 70 V line. The power taps shall be screwdriver adjustable. Impedance selection shall be 5,000, 2500, 1300, 666, 333, 168, 87, or 45 ohms.

3. The unit shall include a die-cast universal mounting bracket, allowing the horn to be positioned both in the vertical and horizontal planes with a single adjustment. The wiring terminals and the screwdriver power tap shall be enclosed by a clear plastic cover for security and weather protection.

4. The horn shall be finished in a grey epoxy. Dimensions shall be 10" deep with a diameter of 10”.

C. Features

1. Wide Range Response
2. Pre-Assembled
3. Dual 25/70 V Transformer
4. Low Mounting Profile

D. Description

1. The Telecor S8T2570, 8" loudspeaker/transformer assembly is designed for use in a wide variety of sound distribution and communications systems. It is excellent for music and voice reproduction, exhibiting exceptional voice transmission characteristics.

2. The Telecor S8T2570, 8" loudspeaker/transformer assembly is designed for use in a wide variety of sound distribution and communications systems. It is excellent for music and voice reproduction, exhibiting exceptional voice transmission characteristics.

3. The assembly consists of an 8" cone loudspeaker, equipped with a dual 25/70 volt line-matching transformer. The transformer features color-coded primary taps at ½, 1, 2, and 4 watts. Secondary leads are soldered to the speaker terminals

E. Architect's & Engineer's Specifications

1. The speaker/transformer assembly shall be a Telecor model S8T2570 or approved equal, furnished and installed as indicated on the plans.

2. The loudspeaker size shall be 8 inches with a ceramic magnet and seamless cone. The ceramic magnet shall weigh no less than 6 oz. The speaker shall have a frequency range of at least 50 Hz to 15,000Hz at a 10 watt handling capability, and an axial sensitivity of at least 95 dB at 4 feet, with a 1 watt input. The voice coil shall be 1.0 inch in diameter with an 8 impedance.
3. The loudspeaker shall be equipped with a factory wired 25/70 volt line-matching transformer. The transformer shall have the primary taps at ½, 1, 2, and 4 watts. The insertion loss shall be no greater than 1.0 dB. The transformer shall be mounted to the speaker with the secondary leads soldered to the speaker terminals.

F. S8T2570 Speaker Assembly Specifications

1. Cone Speaker

a.	Speaker Diameter:	8" (203 mm)
b.	Power Rating:	10 watts
c.	Frequency Range:	50 Hz to 15,000 Hz
d.	Magnet:	6 oz
e.	Axial Sensitivity:	95dB @ 4 ft. (1 watt input)
f.	Depth:	2 3/4" (70 mm)
g.	Mounting Holes:	4 holes @ 90 degrees 7 5/8" d (19.4 cm)

2. Transformer

Type:	Dual voltage (25/70 volt)
Power Rating:	4 watts
Freq. Response:	50 to 18,000 Hz
Primary Taps:	25 volt / 70 volt
Secondary Taps:	4,2,1, and ½ watt
Prim. Impedance:	25 volt: 155, 312, 625, 1250 ohms, 70 volt: 1225, 2450, 4900, 9800 ohms
Sec. Impedance:	8 ohms
Terminations:	4" color-coded leads

3. Partial List of Associated Equipment

B11	Round Speaker Baffle
B25	Square Speaker Baffle
B25-S	Square Speaker Baffle
H10	Round Recessed Enclosure
H20	Square Recessed Enclosure
SH20-SB	Square Surface Enclosure
SH20	Square Surface Mounting Frame
CC1	Channel Supports

END OF SECTION

SECTION 260900

GUARANTEE

PART 1 - GENERAL

Applicable Provisions of the Conditions of the Contract and Division 1 General Requirements govern work in this section.

1.1 GUARANTEE

A. The Contractor shall remove, replace and/or repair at his own expense and at the convenience of the Owner, any defects in workmanship, materials, ratings, capacities and/or characteristics occurring in the work within one (1) year or within such longer period as may be provided in the Drawings and/or Section of the Specifications, which guarantee period shall commence with the final acceptance of the entire Contract in accordance with the guarantee provisions stated in the General Conditions, and the Contractor shall pay for all damage to the system resulting from defects in the work and all expenses necessary to remove, replace, and/or repair any other work which may be damaged in removing, replacing and/or repairing the work.

END OF SECTION

SECTION 28 1000

SECURITY SYSTEMS GENERAL CONDITIONS

1.01 GENERAL

a. Installation of Electronic Security System to include but not limited to:
   1. Closed Circuit Television (CCTV)
   2. Building Access Control
   3. Parking Lot and Bus Driveway Access Control
   4. Perimeter Door Alarms
   5. Video Intercom
   6. Burglar alarm
   7. Additional interfaces: Building Lighting, electrified locks and Fire alarm systems

b. Electronic security related equipment such as cameras, card readers, power supplies and others will be furnished to the bidder by the City of Yonkers (COY) / Yonkers Public Schools (YPS) authority and are not part of this contract. System commissioning, programming and testing will be performed by owner's representatives and are not part of this contract. This bidder/ contractor ("contractor", "EC") is to provide all necessary labor, pipe, fasteners, wire and other electrical components needed to INSTALL AND TERMINATE owner's provided materials AS WELL AS WORK WITH OWNER's REPRESENTATIVE DURING THE COMMISSIONONING PROCESS and to provide the owner with a complete, turn key system.

1. All wire, conduit, supporting devices, boxes, connections, stub ups and rough in will be furnished and installed by this bidding Electrical Contractor ("contractor", "EC"). EC shall connect and terminate and punch down the devices to the patch panel/ control panel designated in the SE-xxx drawings. EC shall machine label, tag on both ends, and test for continuity, on all connections. EC shall certify network cabling and provide supporting testing reports to the owner to ensure proper wire has been installed, proper installation and cable lengths. EC shall test for ground faults and wire integrity on card access, burglar alarm and door stations wiring prior to turn over to owner.

2. The EC shall provide firestopping for all penetrations required for work of their contract.

3. Electronics system's Commissioning shall be done by the Owner's representative. EC shall have a responsible electrician/foreman with knowledge of the project on site installation during commissioning to correct any installation faults as instructed by Owner's representative.

4. All burglar alarm device wiring is to be home-run to designated closet wall field device equipment.

c. Install system as per security drawing's set SE-100's to and including SE-700's and follow specific notes regarding intent, means and methods

d. The general conditions for contracts of construction, referred to in the contract documents as the general conditions, together with the following articles of the specifications, which amend, modify and supplement various articles and provisions of the general conditions, are made part of the Contract and shall apply to all work under the Contract.

e. All articles or parts of articles of the general conditions not so amended, modified or supplemented by these specifications shall remain in full force and effect. Should any discrepancy become apparent between the general conditions and the specifications the Contractor shall notify Owner/Engineer, in writing and the Owner/Engineer shall interpret and decide such matters in accordance with the provisions of the General Conditions.

f. The Contractor shall comply with all applicable governmental regulations and with all Federal, State, County, City, and other applicable codes and ordinances.

g. These specifications call out certain duties of the Contractor and his suppliers. They are not intended as a material list of items required by the Contract.

h. This division of the specifications covers the security systems for the various schools and other city sites located in Yonkers, NY.

i. Contractor should note that it shall be necessary to coordinate with other contractors who will be working in the space at the same time as this work.

j. It is the intent of these specifications to provide complete and workable electronic security system ready for the Owner's use. Any item not specifically shown on the drawings or called for in the specifications, but normally required to conform with the intent, are to be considered as part of the Contract.

k. These specifications are equipment and performance specifications. Actual installation shall be as indicated on the Drawings. Any discrepancies found between the Specification and the Drawing shall be immediately brought to the attention of the Owner/Engineer.

1.02 DEFINITIONS

a. Certain terms such as "shall", “provide”, “install”, “complete”, “startup" are not used in some parts of these specifications. This does not indicate that the items shall be less than completely installed or that systems shall be less than complete.

b. Utilize the following abbreviations for discernment on the Drawings and within the Specifications:

1.	NEC	National Electrical Code
2.	OSHA	Occupational Safety and Health Act
3.	ANSI	American National Standards Institute

4.	NFPA	National Fire Protection Association
5.	IEEE	Institute of Electrical and Electronics Engineers
6.	CCTV	Closed Circuit Television
7.	UL	Underwriters' Laboratories, Inc.
8.	ASTM	American Society of Testing Materials
9.	FCC	Federal Communications Commission
10.	FBO	Furnished by others
11.	EC	Bidding (electrical) contractor

c. Utilize the following definitions for discernment within the Specifications:

1. "PROVIDE" or "FURNISH" means to supply, purchase, transport, place, erect, connect, test and turn over to Owner, complete and ready for regular operation, the particular work referred to.

2. "SUPPLY" means to purchase, procure, acquire, and deliver complete with related accessories.

3. "INSTALL" means to move from property line, set in place, join, unite, fasten, link, attach, set up or otherwise connect together before testing and turning over to Owner of equipment supplied under another division. Installation to be complete and ready for regular operation, the particular work referred to.

4. "WIRING" or "CABLING," means the inclusion of all fittings, conductors, connectors, connections, termination's and termination hardware and all other items necessary and/or required in connection with such work.

5. "DATA GATHERING PANEL", "iSTAR", "CONTROLLERS" means the inclusion of installations all I/O hardware, power supplies, alarm controllers, reader controllers, output relays, communications devices and housings necessary to interface card readers, alarm contacts, door locking and control hardware, etc. to the system.

6. "CONDUIT" or "CABLE TRAY" or "LADDER RACK" means the inclusion of all fittings, hangers, supports, sleeves, etc.

7. "AS DIRECTED" means as directed by the Owner or his representative.

8. "CONCEALED," means embedded in masonry or other construction, installed behind wall furring or within double partitions, or installed within hung ceilings or under raised floors.

9. "EXPOSED" means not installed underground or "CONCEALED" as defined above.

10. "APPROVED," means as accepted and authorized, in writing, by the Owner or Engineer.

11. "COY", "YPS" or "OWNER" means City of Yonkers, Yonkers Public Schools

12. "ENGINEER" or "AGENT" means owner or his designated representative

1.03 SCOPE OF WORK

d. The work covered by these specifications includes the installations described herein and illustrated on the drawings, including all labor necessary to perform and complete such construction, all materials and equipment incorporated in or to be incorporated in such installations and all services, facilities, tools and equipment necessary or used to perform and complete such installations.

e. The scope of work includes, but is not limited to, the work described herein and in the following specifications sections, as applicable:

1. Division 26 – Electrical Specifications

2. Preparation and submission of unit pricing sheets, shop drawings, testing reports, record drawings, and documentation.

3. Termination, connectorization, labeling, testing and documentation of all cables and components provided under these specification sections.

4. Tile cuts, as noted on the drawings and in the individual specification sections, under equipment racks, server racks, frames, cabinets, etc.

5. Fire stopping of all conduits, cable trays rated wall and floor penetrations, etc. as noted.

6. Furnish shop drawings to the Construction Manager and the Engineer and receive written approval prior to fabrication, assembly and installation. The shop drawing submission shall be within sufficient time to allow endorsement by the Engineer prior to commencement of the work.

7. Provide system's installation changes that were made due to field conditions to the owner. Documentation including copies of all relevant drawings and equipment manuals.

8. Provide warranty services for bidder's work portion only for the specified period from the date of acceptance.

9. Remove and dispose of all refuse related to the security system installation from site.

10. Panduit Laser Machine Labeling and documentation of all cables, wiring boxes, equipment cabinets, pull boxes and termination strips installed under this contract. Use of hand label machines such as 'Brother-P-Touch' is not acceptable

11. Installation, final connections and terminations of all security cabling and owner's provided equipment.

12. Position cameras in the direction that is acceptable to the owner and follow owner's instruction for camera views. Be present and work with Owner's representative during commissioning and re-point cameras as needed to the owner's

13. Be present at and work with owner's commissioning agent during system's turn on. Remedy all installation and wiring faults as per agent's direction.

f. Bidding Contractor - Provided under this contract. Follow Division 26 for additional scope instructions

1. 120 VAC power wiring. Connection between 120 VAC power sources and all security equipment panels and equipment cabinets.

2. Conduits, electrical, and pull boxes (provided under electrical work). NEMA Type 1 enclosure for all junction boxes provided under this work.

3. Fire-stopping of all rated wall and floor penetrations.

1.04 MATERIALS SUPPLIED BY OTHERS AND INSTALLED UNDER THIS WORK

a. All Electronic Equipment noted on drawings SE-000 to SE-700's inclusive

1.05 SITE VISIT

a. Prior to bid submission, the Contractor shall visit the site and examine the drawings of other trades to determine the existing design conditions that may affect the work. The Contractor shall be held responsible for any assumptions in regard thereto.

b. The Contractor shall verify all dimensions and distances in the field and document the cable lengths and materials to be furnished and installed. The provision and installation of non-specified miscellaneous hardware, i.e., nuts, bolts, tie wraps, etc., and shall be the Contractor's responsibility.

c. Contractor should note this is an existing facility under construction. Existing site conditions, other contract documents and the overall construction schedule must be carefully reviewed to determine all required interfacing and timing of the work.

d. Existing Contract Documents for all other trades shall be made available for review through the General Contractor.

1.06 CONTRACTOR QUALIFICATIONS

a. The Contractor shall provide Contractor Qualifications to include name/address of three (3) similar security projects performed in the past 5 years.

1.07 BIDDING

a. The bidder’s submittal shall include detailed labor costs break down for installation of the provided equipment including the ADD/DEDUCT form. ADD/DEDUCT form to have a single dollar amount to be applied to either adding or deleting an item.

b. Materials costs shall reflect all miscellaneous hardware, connectors, and materials required and shown as a separate cost.

c. Material, labor, documentation and shipping totals shall be entered in a Master Costs forms.

d. Substitute Equipment

1. All cable and fiber (where applicable) shall be bid as specified.

2. Equivalency in quality, performance, construction, and function shall be demonstrated by submitting, as applicable or required by the Engineer, the following:

a) Specifications.

b) Laboratory test data.

c) List of advantages to the Owner and the Engineer.

d) Cost differences compared to the "as specified" bid package.

3. The drawings and specifications are based on specific equipment, functions and arrangements. Additions or revisions to equipment, materials, and labor may be necessary for the proper fit and function of any proposed substitute items to the purpose, arrangement and intent originally indicated. It is the responsibility of the Bidder to determine the electrical needs for such additions and/or revisions and identify them in the Bidder's submittal.

4. Costs for any additional labor and additions or revisions to wiring, space requirements, equipment or other materials, required for the use of substitute equipment shall be included by the Bidder without claim for subsequent additional payment.

5. Consideration in the Bidding for a proposed substitute will be given only if, in the opinion of the Engineer, the substitute is equal to and/or offers significant advantage to the project over the specified item.

e. Installation materials supplied shall be complete, model numbers accurate, and the performance shall conform to manufacturer's specifications.

f. All materials shall be new and shall conform to applicable codes.

g. Repair or replace any items damaged during installation.

h. Procure and pay for all necessary permits, licenses, inspections, and observe any requirements stipulated therein.

i. Comply with all applicable labor regulations and applicable union and trade regulations.

j. The installation shall conform to the latest safety codes and regulations. Where conflicts exist, the most stringent code or regulation shall apply.

k. Adhere to all Quality Assurance items in the Sub-Contract Agreement issued by the Owner/Engineer.

1.08 SUBMITTALS

a. As directed by the Owner/Engineer and the Construction Program, submit hand marked detailed field changes so that they can be incorporated onto the final as-built set (by others)

b. Shop drawings shall be based on actual equipment, installation, and field conditions. Note however, that locations and other information provided herein are only approximate. Therefore, where possible, make equipment and field measurements prior to the preparation of shop drawings, fabrication and installation to ensure proper fit and function of the equipment. However, this requirement shall not delay the progress of the work. Allow for trimming and fitting wherever the taking of field, or other measurements, before fabrication might delay the work. Costs for failure to coordinate

equipment details with site conditions and designated equipment locations shall be borne by the Security Contractor.

c. The review and approval of shop drawings shall be general only and shall not relieve the Contractor from responsibility for proper installation or for deviations from the specifications or drawings due to field conditions; conflict with the work of others that may result from such deviations; or for errors of any sort.

d. Shop drawings shall include and clearly indicate any proposed modification of the specifications or drawings.

e. Shop drawings shall include and clearly indicate the addition of any items not detailed herein, but necessary to provide a properly functioning and complete system.

f. Changes to riser diagrams for power and grounding, Security systems cabling and fiber optic/patch panel, data gathering panels, power supplies interconnections, and all Security field devices.

1.09 DELVERY, STORAGE AND HANDLING

a. Delivery of Materials: Coordinate with owner's designated agent

b. Storage of Materials, Equipment and Fixtures: Store materials suitably sheltered from the elements, but readily accessible for inspection until installed. Store all items subject to moisture damage in dry, heated spaces. Provide space requirements for storage in submittals list. The General Contractor shall assign storage space.

c. Store all materials in a secure fashion to prevent the loss of these materials due to pilferage or theft.

1.10 COORDINATION OF WORK

a. Carefully check space requirements and the physical confines of the area of work to ensure that all material can be installed in the spaces allotted thereto, including equipment racks, and cable supports.

b. Transmit to other trades in a timely manner all information required for work to be provided under their respective Sections in ample time for installation.

c. Wherever work interconnects with or contacts the work of other trades, coordinate with other trades to ensure that all trades have the information necessary so that they may properly install all the necessary connections and equipment. Identify all items of work that require access so that the floor tile trade shall know where to install tile cutouts.

d. Attend all construction meetings, at the project site or at other location, as requested by the Owner or General Contractor.

e. When directed by the Owner, the Contractor shall, without extra charge, make reasonable modifications in the layout as needed to prevent conflict with work of other trades or for

proper compliance with the design intent.

1.11 CODES, REGULATIONS AND STANDARDS

a. The installation shall be in compliance with the requirements of the National Electrical Code, OSHA, recommendations and the rules, regulations and requirements of all state and federal codes.

b. The installation shall comply fully with all county, city, and state laws and ordinances, regulations and codes applicable to the installation.

c. All equipment shall be equal to or exceed the minimum requirements of NEMA, IEEE, ASME, ANSI and Underwriters' Laboratories.

1.12 SPECIAL CONDITIONS

a. The requirements and recommendations of all standards, specifications and codes referred to herein, including the security systems drawings, shall be considered a part of these specifications.

b. All local fees, permits, and services of inspection authorities shall be obtained and paid for by the Contractor. The Contractor shall cooperate fully with local utility companies with respect to their services. Contractor shall include in his price, all costs to be incurred relative to the installation of the system described herein.

1.13 WARRANTY

a. For a period of 1 year after full acceptance, Contractor to Repair/Replace any defects in its work/materials to remedy the condition.

1.14 MATERIALS

a. Where specific items are called out in the specification or indicated on the drawings for a specific application, use those products or materials. Otherwise, use first class products and materials that have been approved by the owner/engineer at the time of bid. Materials substituted after the time of bid a subject to prior approval by the Owner/Engineer.

1.15 GENERAL INSTALLATION

a. Requirements herein referring to materials, or work related to, or that may affect the system but not within the work scope of this specification, shall apply to the supplying and/or installing contractor who shall comply with said requirements. Where conflict exists with other specifications concerning such work, this specification takes precedence unless otherwise approved in writing by the Owner/Engineer.

b. Follow manufacturers' instructions for installing, connecting, and adjusting all equipment and cabling.

c. The locations of equipment, power outlets, boxes, devices, etc. indicated on the drawings are approximately correct and are understood to be subject to such revision as may be found necessary or desirable at the time the work is installed.

d. Exercise particular caution with reference to the location of all field devices they have precise and definite locations accepted by the Owner/Engineer before proceeding with the installation.

e. Maintain a current copy of this bid specification at the job site at all times.

f. Maintain a complete file of shop drawings and other submissions at the job site at all times. These shop drawings and submissions shall be made available to the Owner/Engineer at his request.

g. Keep all items protected before and after installation, with dust and moisture proof barrier materials. It shall be the contractor's responsibility to ensure the integrity of these protective measures throughout the life of the project.

h. Ensure that safe ingress and egress from all work sites is maintained during movement and installation of materials.

i. Clean up all debris generated by installation activities. Keep all work areas free of debris at all times.

j. Perform all tests required by local authorities in addition to tests specified herein.

k. At all times during the construction, protect all equipment from damage and theft. Equipment in the equipment room shall not be installed until such time as other trades have completed their work in that area so that the equipment will not be moved or damaged.

l. Upon project completion, provide hand corrected as-built drawings and documentation as defined herein.

1.16 STAFFING

a. The Contractor shall keep a qualified foreman in charge of the work at all times. The foreman shall be present in the field at all times during the performance of the work. Such foreman shall be replaced if deemed unsatisfactory by the Owner.

b. The Contractor shall provide a supervisory work force sufficient to efficiently execute the Contractor's responsibilities.

c. The Contractor shall provide the level of manpower necessary to meet all construction schedules.

d. The Contractor shall use only skilled, experienced and reliable workers and shall discontinue the services of anyone employed on this project upon written request of the Owner.

e. Manufacturer's installation instructions shall be used for in-process quality control and final acceptance of the work installation.

f. Craft personnel shall be required to provide and use the proper tools and test equipment in the performance of each activity. Tools must be in good working order and test equipment must be properly calibrated. Contractor is responsible for safe storage of tools and is responsible for their security.

1.17 COMPONENT INSTALLATION

a. Location of Equipment

1. The specifications describe only approximate locations of the work. Verify all locations in the field.

2. Some access doors may be existing. Bidder is to wire owner provided electrified locks as needed for both new and existing doors.

3. Locate equipment and accessories to provide easy access for proper service and maintenance.

b. Conduit and Raceway System

1. Security cabling shall be in ferrous conduit, as shown on the drawings and described in the electrical and conduit specifications.

a) With Owner’s prior approval, properly supported exposed security cabling shall be permitted above an accessible finished ceiling within the secure areas.

b) All security wiring installed in an inaccessible area shall be installed in appropriate metallic conduit.

2. Exposed conduit shall be parallel with, or at right angles to, walls and ceilings. It shall be adequately supported by means of approved galvanized iron clamps or hangers.

3. Conduit fill shall not exceed 40% of conduit cross-sectional area.

4. Nominal trade sizes for conduit shall be 3/4-inch minimum and 4-inch maximum.

5. All junction boxes and pull boxes utilized in the raceway system shall be installed.

c. Mounting Boxes/Enclosures

1. Mounting boxes and enclosures shall be rigidly and securely mounted to the building structure. Wiring contained in them shall be accessible. Install blanking devices or threaded plugs in all unused holes.

2. Clean all interiors thoroughly before installing plates, panels or covers.

d. Electrical Power 120 VAC

1. Any Electrical work to be provided and installed by the Contractor as described herein, shall be performed in accordance with all applicable electrical codes.

2. Review and coordinate electrical power system installation with the Electrical Trade Contractor to ensure proper function and operation of the Security systems.

3. Verify that all power circuits designated for Security equipment, both fixed-in-place and portable, are properly wired, phased and grounded. Report any discrepancies found to the Engineer and the Owner/Engineer so that appropriate corrective action can be taken.

4. Provide distribution of electrical power within all equipment racks, enclosures and consoles. For each branch circuit provide a minimum of two (2) spare receptacles in each plugmold strip. Provide a minimum of one (1) unswitched receptacle power strip (rack mounted) per each equipment rack cabinet group.

e. Finishes

1. All enclosures, housings and supporting structures supplied by the Contractor not having a standard factory protective finish shall be painted. Paint specifications will be supplied by the Owner/Engineer or indicated herein.

2. Any equipment or materials supplied, which are exposed to public view, shall be approved by the Owner/Engineer. Provide, as may be required by the Owner/Engineer, custom color and/or finish for all such items. This does NOT exclude equipment or materials that are supplied with standard colors or finishes as specified herein.

3. Finish and color of blank, perforated vent, and custom rack panels shall match each other as closely as possible.

f. Installation of Cabling

1. Run all wiring in compliance with the requirements of the electrical specification and in accordance with authorities and codes having jurisdiction. Provide separate conduit for control wiring under this Section. Follow manufacturers' instructions for installing, connecting, and adjusting all equipment and cabling.

2. Installation of all wire and cable shall include ensuring proper:

   a) Types

   b) Lengths

   c) Routing

   d) Quantities

   e) Pulling tensions

   f) Circuit identification

   g) Wire/cable group separations

3. Do not pull through any box, enclosure, or fitting where change of conduit or raceway alignment or direction occurs. Do not bend conductors to less than recommended radius. Employ temporary guides, sheaves, rollers, and other necessary items to protect cables from excess tension, abrasion, or damaging bending during pulling.

4. Provide wire pulling lubricants and pulling tensions strictly in accordance with wire and cable manufacturer's recommendations.

5. Cover edges of cable pass through holes in chassis, racks, boxes, plates, etc. with rubber grommets or Heyco or Brady GRNY nylon grommets.

6. Use Velcro-type cable ties for bundling cabling as required and securing cable bundles to racks as required. Use integral brass grommets for screw attachment. Attach to backboards using flat-headed screws with rigid support. Lengths vary as required. Types vary as required.

7. Provide ample service loops at each termination so that plates, panels, and equipment can be de-mounted for inspection, service, and so equipment in drawers or on slides can move freely.

8. Permanently identify all wires and cables at each end by labeling with Panduit or Brady (for example, not Brother P Touch type) wire markers printed on LaserJet or dot matrix printer via computer software program. Labeling information shall include the following:

a) Cable prefixes and cable numbers as per Security Wiring Riser and CCTV Wiring Riser drawings.

b) Descriptive information related to the cable's equipment source.

c) Descriptive information related to the cable's equipment destination.

d) Enter all identifications on wire/cable run schedules and/or as part of the shop drawings.

9. Use the same wire color coding for the same circuit, circuit functions, or phasing throughout the system. No splices shall exist in any length of wire run except where noted on specification drawings or approved by the Engineer.

10. Exercise care in wiring to avoid damage to cables. Cables shall be well supported and neatly dressed between racks, cabinets, consoles, or modules. Make all connections to jacks and connectors with rosin-core solder. Soldering shall be neat and shall not exhibit "cold" solder joints. Avoid "solder splatter" which can cause shorts in exposed terminals or wiring.

11. Connections made with screw actuated pressure type terminal strips shall be made by stripping approximately 6mm of insulation from the stranded conductor, inserting the un-tinned wire into the pressure terminal, and tightening the terminal screw using a small screw driver which securely fits the screw head.

12. All exposed shield drain wires shall be sheathed in properly sized clear tubing, clear shrink tube, or white "spaghetti". Floating shields (at device outputs) shall be insulated using the proper size heat shrink tubing and completely protected against shorting to any other conductors or connector shell.

13. CAT-6/5E for CCTV, Intercoms and other connections shall only be using proper crimp type connectors of appropriate for the equipment or device terminations.

14. Cable Separation

a) Cabling shall be bundled separately from other system cabling. Each cable bundle shall be tie wrapped and supported J - hooks every 5-feet.

b) Separate cables running parallel to electrical cables/conduits by a minimum of 12-inches. Maintain at least 18-inch separation from all lighting ballasts and fixtures.

c) Cables, which must cross-electrical cables/conduits, shall do so only at 90-degree angles.

g. Installation of Security Equipment Panels

1. Provide security equipment panel installation in accordance with the provided SE series drawings.

h. Installation of Security Equipment Racks and Cabinets

1. Provide security equipment rack and cabinet installation in accordance with industry expected standards and per provided SE drawings.

1.18 IDENTIFICATION

a. Furnish a nameplate for each security equipment panel, NEMA and power supply enclosures provided under this work. Plates shall be Panduit, self-laminating or 2 1/4" lamacoid or aluminum with a black enamel background with etched or engraved upper case 1/4” white letters or black and white laminated Bakelite plate with beveled edges. Coordinate labeling and nameplate requirements with the Owner/Engineer prior to installation. Nameplates shall be screwed on with countersunk screws.

b. All cables and terminal strips shall be labeled with machine generated black uppercase lettering on a permanent adhesive label stock, covered with a permanent water resistant sealer. Labels shall be placed on both ends of the cable and no more than 6" from the point at which the cable is broken out into individual copper pairs or from the connector or terminal block. All labels shall be readily visible.

c. Hand lettered label stock shall not be accepted for final installation. Hand lettered stock is only acceptable for use with temporary labeling required during construction phases.

d. If at any time during the project, the cable label becomes illegible or removed, the Contractor shall immediately replace it with a duplicate pre-printed cable label.

e. All cable IDs shall be both physically and visually accessible upon completion of the project.

1.19 FIRE STOP PENETRATION SEALANT

a. Provide fire-resistant materials of a type and composition necessary to restore fire ratings to all wall or floor or ceiling penetrations. Material must be properly classified and meet national and local codes.

b. All penetrations through fire rated floors and walls shall be sealed to prevent the passage of cold smoke, fire, toxic gas or water through the penetration either before, during or after a fire. The fire rating of the penetration seal shall be at least that of the floor or wall into which it is installed, so that the original fire rating of the floor or wall is maintained as required by Article 300-21 of the National Electrical Code.

c. No flammable material may be used to line the chase or hole in which the fire stop material is to be installed.

d. When damming materials are to be left in place after the seal is complete, and then all such materials shall be non-flammable.

e. When damming materials are to be left in place after the seal is complete, and then all such materials shall be non-flammable.

f. The sealant shall remain resilient and pliable to allow the removal and/or addition of cable without the necessity of drilling holes. It shall adhere to itself perfectly to allow any and all repairs to be made with the same material. It shall allow for vibration, expansion and/or contraction of anything passing through the penetration without affecting the seal, or cracking, crumbling and spalling.

g. When sealant is injected into a penetration, the material shall expand to surround all the items within the penetration and maintain pressure against the walls of the penetration as well as the pass- through items. The material shall cure within five minutes. No heat shall be required to further expand the material to prevent the passage of fire and smoke or water.

h. The materials shall have been subjected to fire exposure in accordance with standard time-temperature curve in the Standard, UL, ASTM E 119 and NFPA 251. The fire stop material shall have also been subjected to the hose stream test in accordance with UL 10B.

1.20 GROUNDING

a. Grounding and shielding shall conform to the following procedures. AC grounding applies only to power circuits intended for powering Security equipment.

b. It is the primary intent of the following procedures to provide a safe system for personnel to operate.

c. The power cord from active equipment shall not have its third prong-grounding conductor defeated.

d. To reduce noise voltages in the system it is intended that only one ground connection path exist between two pieces of equipment.

e. Where mounting hardware is indicated as a means of grounding, ensure both a solid electrical and mechanical connection is made.

f. Cable shields shall be considered grounded if connected to the shield connection points provided by the manufacturer of active equipment.

g. Conduit/mounting boxes:

1. Permanently and effectively, bond to building earth ground per applicable codes. Insulated connections between conduit and wall boxes, junction boxes, or wireways are not permitted.

h. Passive Equipment Chassis: Connect an appropriately sized (green) insulated ground cable to the copper ground terminal block (provided under the electrical contract), to the

ground bus bar within each equipment rack. This ground bus bar shall be bonded to bright metal of each equipment rack with the appropriate anti-oxidant employed at the copper to rack interface. Each adjacent equipment rack shall have its grounding conductor home-run to the copper ground terminal block.

1.21 SYSTEM PROGRAMING AND INIALIZATION

a. Programming, software and materials necessary for initial configuration, programming and start-up of access control and CCTV systems is by others.

1. Provide all labor and materials necessary to during system's commissioning.

2. Provide labor to attend weekly project meetings for the duration of the project.

1.22 TRAINING

a. Allow a minimum of 8 hours to walk the site with the owner for needed training on provided materials and installations to show location of junction boxes, breaker panels etc.

1.23 INSPECTIONS AND TESTING

a. Help perform field I/O calibration and commissioning, system commissioning and integrated system program commissioning. Document all commissioning information on commissioning data sheets that shall be submitted prior to acceptance testing. Notify the Owner/Engineer in writing of the testing schedule so that operating personnel may observe calibration and commissioning.

1. Inspections and Cable Testing

2. System Programming

3. System Operation

4. Component Commissioning

5. Primary Power Failure

6. Fire alarm Interface Test

b. After the installation is complete, in addition to any other required testing as described herein, and at such times as the Owner/Engineer directs, be present while the Owner/Engineer conducts an operating test for approval. The installation shall be demonstrated to be in accordance with the requirements of this specification. Any defects revealed shall be corrected promptly at the Contractor's expense and the tests performed again.

c. As a minimum, test, as described below, all cables installed under these specifications.

1. Conduct cable testing as described below upon completion of installation. Test fully completed systems only.

2. Multi-conductor metallic cables: End-to-end testing of each cable pair/conductor for continuity ground fault, proper termination, shorts and crossed pairs.

3. If a bad conductor is found, replace the entire cable. Remove any cables that contain a defective conductor from ceiling and/or floor duct. Do not abandon defective cables in place.

d. The Owner/Engineer reserves the right to observe of any or all portions of the testing process.

e. The Owner/Engineer further reserves the right to conduct, using contractor equipment and labor, a random re-test of 10% of the cables to confirm documented test results. Such retests may be observed and reported on by a third-party contractor retained by the Owner/Engineer.

f. All test results and corrective procedures are to be documented and submitted to the Owner/Engineer within five (5) working days of test completion

1.24 ACCEPTANCE

a. Submit a detailed acceptance procedure designed to demonstrate compliance with contract installation requirements at least 2 weeks before the start of testing. This procedure to be approved prior to the start of the testing.

b. During acceptance testing, provide services to owner’s security systems technician.

c. Coordinate testing period so that free access, work lighting and electrical power are available on site.

d. Furnish three portable VHF or UHF business band, two-way radios with sufficient range to cover the entire project. Include extra rechargeable batteries, battery charger and belt "holsters".

e. Ensure that technical areas are in a clean and orderly condition, ready for acceptance testing.

1.25 RECORD DRAWINGS

a. During construction, the Contractor shall keep an accurate record of all deviations between the work as shown on the drawings and that, which is accurately installed.

END OF SECTION

SECTION 31 10 – SITE CLEARING

PART 1-GENERAL

1.1 RELATED DOCUMENTS

A. Drawings, Division 01 General Requirements and Section 01 50 00 Temporary Facilities and Controls apply to this Section.

1.2 SUMMARY

A. Section Includes:

1. Protecting existing vegetation to remain.
2. Removing existing vegetation.
3. Clearing and grubbing.
4. Stripping and stockpiling topsoil.
5. Removing above- and below-grade site improvements.
6. Disconnecting, capping or sealing, and removing site utilities or abandoning site utilities in place.
7. Temporary erosion and sedimentation control measures.

1.3 DEFINITIONS

A. Subsoil: All soil beneath the topsoil layer of the soil profile, and typified by the lack of organic matter and soil organisms.

B. Surface Soil: Soil that is present at the top layer of the existing soil profile at the Project site. In undisturbed areas, the surface soil is typically topsoil; but in disturbed areas such as urban environments, the surface soil can be subsoil.

C. Topsoil: Top layer of the soil profile consisting of existing native surface topsoil or existing in-place surface soil and is the zone where plant roots grow. Its appearance is generally friable, pervious, and black or a darker shade of brown, gray, or red than underlying subsoil; reasonably free of subsoil, clay lumps, gravel, and other objects more than 2 inches (50 mm) in diameter; and free of subsoil and weeds, roots, toxic materials, or other nonsoil materials.

D. Plant-Protection Zone: Area surrounding individual trees, groups of trees, shrubs, or other vegetation to be protected during construction, and indicated on Drawings.

E. Tree-Protection Zone: Area surrounding individual trees or groups of trees to be protected during construction, and defined by a circle concentric with each tree with a radius 1.5 times the diameter of the drip line unless otherwise indicated.

F. Vegetation: Trees, shrubs, groundcovers, grass, and other plants.

1.4 MATERIAL OWNERSHIP

A. Except for stripped topsoil and other materials indicated to be stockpiled or otherwise remain on the Site, cleared materials shall become Contractor's property and shall be removed from the Site.

1.5 SUBMITTALS

A. Record Drawings: Identifying and accurately showing locations of capped utilities and other subsurface structural, electrical, and mechanical conditions.

1.6 PROJECT CONDITIONS

A. Traffic: Minimize interference with adjoining roads, streets, walks, and other adjacent occupied or used facilities during site-clearing operations per applicable Highway Permits, Division 01 General Requirements, and Drawings.

B. Do not commence site clearing operations until temporary erosion- and sedimentation-control and plant-protection measures are in place.

C. The following practices are prohibited within protection zones:
   1. Storage of construction materials, debris, or excavated material.
   2. Parking vehicles or equipment.
   3. Foot traffic.
   4. Erection of sheds or structures.
   5. Impoundment of water.
   6. Excavation or other digging unless otherwise indicated.
   7. Attachment of signs to or wrapping materials around trees or plants unless otherwise indicated.

D. Do not direct vehicle or equipment exhaust towards protection zones.

E. Prohibit heat sources, flames, ignition sources, and smoking within or near protection zones.

F. Soil Stripping, Handling, and Stockpiling: Perform only when the topsoil is dry or slightly moist.

PART 2-PRODUCTS

2.0 MATERIALS

A. Satisfactory Soil Material: Requirements for satisfactory soil material are specified in Division 31 Section "Earth Moving."

1. Obtain approved borrow soil material off-site when satisfactory soil material is not available on-site.

PART 3-EXECUTION

3.1 PREPARATION

A. Protect and maintain benchmarks and survey control points from disturbance during construction.

B. Locate and clearly identify trees, shrubs, and other vegetation to remain or to be relocated. Flag each tree trunk at 54 inches (1372 mm) above the ground.

C. Protect existing site improvements to remain from damage during construction.

1. Restore damaged improvements to their original condition, as acceptable to Owner.

3.2 TEMPORARY EROSION AND SEDIMENTATION CONTROL

A. Provide in accordance with Drawings and Section 01 50 00 Temporary Facilities and Controls.

3.3 TREE AND PLANT PROTECTION

A. General: Protect trees and plants remaining on-site according to Drawings.

B. Repair or replace trees, shrubs, and other vegetation indicated to remain or be relocated that are damaged by construction operations, in a manner approved by Landscape Architect.

3.4 EXISTING UTILITIES

A. Contractor (with consent of owner) shall arrange for disconnecting and sealing indicated utilities that serve existing structures before site clearing.

1. Verify that utilities have been disconnected and capped before proceeding with site clearing.

B. Locate, identify, disconnect, and seal or cap utilities indicated to be removed or abandoned in place.

1. Arrange with utility companies to shut off indicated utilities.
2. Owner will arrange to shut off indicated utilities when requested by Contractor.

C. Locate, identify, and disconnect utilities indicated to be abandoned in place.

D. Interrupting Existing Utilities: Do not interrupt utilities serving facilities occupied by Owner or others unless permitted under the following conditions and then only after arranging to provide temporary utility services according to requirements indicated:

1. Notify Architect not less than two days in advance of proposed utility interruptions.
2. Do not proceed with utility interruptions without Architect's written permission.

E. Excavate for and remove underground utilities indicated to be removed.

3.5 CLEARING AND GRUBBING

A. Remove obstructions, trees, shrubs, and other vegetation to permit installation of new construction.

1. Do not remove trees, shrubs, and other vegetation indicated to remain or to be relocated.
2. Grind down stumps and/or remove stumps, roots, obstructions, and debris to a depth of 24 inches below exposed subgrade.
3. Use only hand methods for grubbing within protection zones.
4. Chip removed tree branches and dispose of off-site.

B. Fill depressions caused by clearing and grubbing operations with satisfactory soil material unless further excavation or earthwork is indicated.

1. Place fill material in horizontal layers not exceeding a loose depth of 8 inches, and compact each layer to a density equal to adjacent original ground.

3.6 TOPSOIL STRIPPING

A. Remove sod and grass before stripping topsoil.

B. Strip topsoil to depth of 6 inches in a manner to prevent intermingling with underlying subsoil or other waste materials.

C. Top soil material shall be screened to be 1” minus and stockpiled onsite. Topsoil shall be in accordance with Section 2.2 of Turfs and Grasses Section 32 92 00

D. Stockpile topsoil away from edge of excavations without intermixing with subsoil. Grade and shape stockpiles to drain surface water. Cover to prevent windblown dust and erosion by water.

1. Limit height of topsoil stockpiles to 72 inches, unless otherwise authorized by Engineer.
2. Do not stockpile topsoil within protection zones.
3. Stockpile surplus topsoil to allow for respreading deeper topsoil.

3.7 SITE IMPROVEMENTS

A. Remove existing above- and below-grade improvements as indicated and necessary to facilitate new construction.

B. Remove slabs, paving, curbs, gutters, and aggregate base as indicated.

1. Unless existing full-depth joints coincide with line of demolition, neatly saw-cut along line of existing pavement to remain before removing adjacent existing pavement. Saw-cut faces vertically.

3.8 DISPOSAL OF SURPLUS AND WASTE MATERIALS

A. Remove surplus soil material, unsuitable topsoil, obstructions, demolished materials, and waste materials including trash and debris, and legally dispose of them off the Site.

B. Separate recyclable materials produced during site clearing from other nonrecyclable materials. Store or stockpile without intermixing with other materials and transport them to recycling facilities. Do not interfere with other Project work.

END OF SECTION 31 10 00

SECTION 31 20 00 –EARTH MOVING

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

A. Drawings, Division 01 General Requirements and Section 01 50 00 Temporary Facilities and Controls apply to this Section.

1.2 SUMMARY

A. This Section includes the following:

1. Preparing subgrades for curbs, walks, pavements, lawns, and plantings.
2. Excavating and backfilling for stormwater practices and utility structures.
3. Subbase course for concrete walks and pavements.
4. Excavating and backfilling trenches for buried utilities and pits for buried utility structures.
5. Excavation for mass grading of site.

1.3 DEFINITIONS

A. Backfill: Soil materials used to fill an excavation.

1. Initial Backfill: Backfill placed beside and over pipe in a trench, including haunches to support sides of pipe.
2. Final Backfill: Backfill placed over initial backfill to fill a trench.

B. Bedding Course: Layer placed over the excavated subgrade in a trench before laying pipe.

C. Borrow: Satisfactory soil imported from off-site for use as fill or backfill.

D. Excavation: Removal of material encountered above subgrade elevations.

1. Additional Excavation: Excavation below subgrade elevations as directed by Engineer.
2. Bulk Excavation: Excavations more than 10 feet (3 m) in width and pits more than 30 feet (9 m) in either length or width.
3. Unauthorized Excavation: Excavation below subgrade elevations or beyond indicated dimensions without direction by Engineer. Unauthorized excavation, as well as remedial work directed by Engineer, shall be without additional compensation.

E. Fill: Soil materials used to raise existing grades.

F. Rock: Rock material in beds, ledges, unstratified masses, and conglomerate deposits and boulders of rock material exceeding 1 cu. yd. (0.76 cu. m) in place that cannot be removed by rock excavating equipment equivalent to the following in size and performance ratings, without systematic drilling, ram hammering, ripping, or blasting, when permitted.

1. Excavation of Trenches and Pits: Late-model, track-mounted hydraulic excavator; equipped with a 42-inch- (1065-mm-) wide, short-tip-radius rock bucket; rated at not less than 120-hp (89-kW) flywheel power with bucket-curling force of not less than 25,000 lbf (111 kN) and stick-crowd force of not less than 18,700 lbf (83 kN); measured according to SAE J-1179.
2. Bulk Excavation: Late-model, track-mounted loader; rated at not less than 210-hp (157- kW) flywheel power and developing a minimum of 45,000-lbf (200-kN) breakout force; measured according to SAE J-732.

G. Structures: Slabs, tanks, curbs, mechanical and electrical appurtenances, or other man-made stationary features constructed above or below the ground surface.

H. Subbase Course: Layer placed between the subgrade and asphalt paving, or layer placed be- tween the subgrade and a concrete pavement or walk.

I. Subgrade: Surface or elevation remaining after completing excavation, or top surface of a fill or backfill immediately below subbase, drainage fill, or topsoil materials.

J. Utilities: include on-site underground pipes, conduits, ducts, and cables, as well as underground services within 5 feet of the building.

1.4 SUBMITTALS

A. Product Data: For the following:

1. Each type of detectable warning tape.
2. Drainage fabric.
3. Separation fabric.

B. Material Test Reports: From a qualified testing agency indicating and interpreting test results for compliance of the following with requirements indicated:

1. Classification according to ASTM D 2487 of each on-site or borrow soil material pro- posed for fill and backfill.
2. Analytical results demonstrating imported soil meets constituent concentration requirements for “Unrestricted Use” as defined by NYSDEC Part 375 and DER-10 technical guidance documents unless another use category and alternate constituent concentrations are approved by Engineer.

C. Blasting plan approved by authorities having jurisdiction, for record purposes.

1.5 PROJECT CONDITIONS

A. Existing Utilities: Do not interrupt utilities serving facilities occupied by Owner or others unless permitted in writing by Engineer and then only after arranging to provide temporary utility services according to requirements indicated:

1. Notify Engineer not less than two days in advance of proposed utility interruptions.
2. Do not proceed with utility interruptions without Engineer's written permission.
3. Contact utility-locator service for area where Project is located before excavating.

B. Demolish and completely remove from site existing underground utilities indicated to be re- moved. Coordinate with utility companies to shut off services if lines are active.

PART 2 - PRODUCTS

2.1 SOIL MATERIALS

A. General: Provide borrow soil materials when sufficient satisfactory soil materials are not avail- able from excavations.

B. Satisfactory Soils: ASTM D 2487 soil classification groups GW, GP, GM, SW, SP, and SM, or a combination of these group symbols; free of rock or gravel larger than 3 inches (75 mm) in any dimension, debris, waste, frozen materials, vegetation, and other deleterious matter.

C. Unsatisfactory Soils: ASTM D 2487 soil classification groups GC, SC, ML, MH, CL, CH, OL, OH, and PT, or a combination of these group symbols.

1. Unsatisfactory soils also include satisfactory soils not maintained within 2 percent of optimum moisture content at time of compaction.

D. Backfill and Fill: Satisfactory soil materials.

E. Subbase: Naturally or artificially graded mixture of natural or crushed gravel, crushed stone, and natural or crushed sand; meeting the requirements of NYSDOT Item # 304.12.

F. Engineered Fill: Naturally or artificially graded mixture of natural or crushed gravel, crushed stone, and natural or crushed sand; ASTM D 2940; with at least 90 percent passing a 1-1/2-inch (38-mm) sieve and not more than 12 percent passing a No. 200 (0.075-mm) sieve.

G. Bedding: Naturally or artificially graded mixture of natural or crushed gravel, crushed stone, and natural or crushed sand; ASTM D 2940; except with 100 percent passing a 1-inch (25-mm) sieve and not more than 8 percent passing a No. 200 (0.075-mm) sieve.

H. Crushed Stone: Washed, narrowly graded mixture of crushed stone, or crushed or uncrushed gravel; meeting the requirements of NYSDOT Item # 623.12 and gradation requirements of NYSDOT Item # 605.0901.

I. Rip Rap: Medium stone fill of crushed or uncrushed rock meeting the requirements of NYSDOT Item # 620.04, unless otherwise specified on the Drawings.

2.2 ACCESSORIES

A. Detectable Warning Tape: Acid- and alkali-resistant polyethylene film warning tape manufactured for marking and identifying underground utilities, minimum 6 inches (150 mm) wide and 4 mils (0.1 mm) thick, continuously inscribed with a description of utility, with metallic core encased in a protective jacket for corrosion protection, detectable by metal detector when tape is buried up to 30 inches (750 mm) deep; colored as follows:

1. Red: Electric.
2. Yellow: Gas, oil, steam, and dangerous materials.
3. Orange: Telephone and other communications.
4. Blue: Water systems.
5. Green: Sewer systems.

B. Drainage Fabric: Nonwoven geotextile, specifically manufactured as a drainage geotextile; made from polyolefins, polyesters, or polyamides; and with the following minimum properties determined according to ASTM D 4759 and referenced standard test methods:

1. Grab Tensile Strength: 110 lbf (490 N); ASTM D 4632.
2. Tear Strength: 40 lbf (178 N); ASTM D 4533.
3. Puncture Resistance: 50 lbf (222 N); ASTM D 4833.
4. Water Flow Rate: 150 gpm per sq. ft. (100 L/s per sq. m); ASTM D 4491.
5. Apparent Opening Size: No. 50 (0.3 mm); ASTM D 4751.

C. Separation Fabric: Woven geotextile, specifically manufactured for use as a separation geotextile; made from polyolefins, polyesters, or polyamides; and with the following minimum proper- ties determined according to ASTM D 4759 and referenced standard test methods:

1. Grab Tensile Strength: 200 lbf (890 N); ASTM D 4632.
2. Tear Strength: 75 lbf (333 N); ASTM D 4533.
3. Puncture Resistance: 90 lbf (400 N); ASTM D 4833.
4. Water Flow Rate: 4 gpm per sq. ft. (2.7 L/s per sq. m); ASTM D 4491.
5. Apparent Opening Size: No. 30 (0.6 mm); ASTM D

4751. PART 3 - EXECUTION

3.1 PREPARATION

A. Protect structures, utilities, sidewalks, pavements, and other facilities from damage caused by settlement, lateral movement, undermining, washout, and other hazards created by earthwork operations.

B. Protect subgrades and foundation soils against freezing temperatures or frost. Provide protective insulating materials as necessary.

C. Provide erosion-control measures to prevent erosion or displacement of soils and discharge of soil-bearing water runoff or airborne dust to adjacent properties and waterways.

3.2 DEWATERING

A. Provide in accordance with Section 01 50 00 Temporary Facilities and Controls.

3.3 EXCAVATION, GENERAL

A. Unclassified Excavation: Excavation to subgrade elevations regardless of the character of sur- face and subsurface conditions encountered, including rock, soil materials, and obstructions.

1. If excavated materials intended for fill and backfill include unsatisfactory soil materials and rock, replace with satisfactory soil materials.

3.4 EXCAVATION FOR STRUCTURES

A. Excavate to indicated elevations and dimensions within a tolerance of plus or minus 1 inch (25 mm). Extend excavations a sufficient distance from structures for placing and removing concrete formwork, for installing services and other construction, and for inspections.

1. Excavations for Equipment Pads: Do not disturb bottom of excavation. Excavate by hand to final grade just before placing concrete reinforcement. Trim bottoms to required lines and grades to leave solid base to receive other work.
2. Excavation for Underground Tanks, Basins, and Mechanical or Electrical Utility Structures: Excavate to elevations and dimensions indicated within a tolerance of plus or mi- nus 1 inch (25 mm). Do not disturb bottom of excavations intended for bearing surface.

3.5 EXCAVATION FOR WALKS AND PAVEMENTS

A. Excavate surfaces under walks and pavements to indicated cross sections, elevations, and grades.

3.6 EXCAVATION FOR UTILITY TRENCHES

A. Excavate trenches to indicated gradients, lines, depths, and elevations.

1. Beyond building perimeter, excavate trenches to allow installation of top of pipe below frost line.

B. Excavate trenches to uniform widths to provide a working clearance on each side of pipe or conduit. Excavate trench walls vertically from trench bottom to 12 inches (300 mm) higher than top of pipe or conduit, unless otherwise indicated.

1. Clearance: As indicated.

C. Trench Bottoms: Excavate and shape trench bottoms to provide uniform bearing and support of pipes and conduit. Shape subgrade to provide continuous support for bells, joints, and barrels of pipes and for joints, fittings, and bodies of conduits. Remove projecting stones and sharp objects along trench subgrade.

1. For pipes and conduit less than 6 inches (150 mm) in nominal diameter and flat-bottomed, multiple-duct conduit units, hand-excavate trench bottoms and support pipe and conduit on an undisturbed subgrade.
2. For pipes and conduit 6 inches (150 mm) or larger in nominal diameter, shape bottom of trench to support bottom 90 degrees of pipe circumference. Fill depressions with tamped sand backfill.
3. Excavate trenches 6 inches (150 mm) deeper than elevation required in rock or other un- yielding bearing material to allow for bedding course.

3.7 APPROVAL OF SUBGRADE

A. Notify Engineer when excavations have reached required subgrade.

B. If Engineer determines that unsatisfactory soil is present, continue excavation and replace with compacted backfill or fill material as directed.

C. Proof roll subgrade with heavy pneumatic-tired equipment to identify soft pockets and areas of excess yielding. Do not proof roll wet or saturated subgrades.

D. Reconstruct subgrades damaged by freezing temperatures, frost, rain, accumulated water, or construction activities, as directed by Engineer.

3.8 UNAUTHORIZED EXCAVATION

A. Fill unauthorized excavation under foundations or wall footings by extending bottom elevation of concrete foundation or footing to excavation bottom, without altering top elevation. Lean concrete fill may be used when approved by Engineer.

1. Fill unauthorized excavations under other construction or utility pipe as directed by Engineer.

3.9 STORAGE OF SOIL MATERIALS

A. Stockpile borrow materials and satisfactory excavated soil materials. Stockpile soil materials without intermixing. Place, grade, and shape stockpiles to drain surface water. Cover to pre- vent windblown dust.

1. Stockpile soil materials away from edge of excavations. Do not store within drip line of remaining trees.
2. Soil material shall be screened to be 3" minus and stockpiled on site. Soil material shall be in accordance with section 2.1 of Earth Moving 31 20 00.
3. Top soil material shall be screened to be 1" minus and stockpiled onsite. Topsoil shall be in accordance with Section 2.2 of Turfs and Grasses Section 32 92 00.

3.10 BACKFILL

A. Place and compact backfill in excavations promptly, but not before completing the following:

1. Construction below finish grade including, where applicable, dampproofing, waterproofing, and perimeter insulation.
2. Surveying locations of underground utilities for record documents.
3. Inspecting and testing underground utilities.
4. Removing concrete formwork.
5. Removing trash and debris.
6. Removing temporary shoring and bracing, and sheeting.
7. Installing permanent or temporary horizontal bracing on horizontally supported walls.

3.11 UTILITY TRENCH BACKFILL

A. Place and compact bedding course on trench bottoms and where indicated. Shape bedding course to provide continuous support for bells, joints, and barrels of pipes and for joints, fit- tings, and bodies of conduits.

B. Backfill trenches excavated under footings and within 18 inches (450 mm) of bottom of footings; fill with concrete to elevation of bottom of footings.

C. Place and compact initial backfill of subbase material, free of particles larger than 1 inch (25 mm), to a height of 12 inches (300 mm) over the utility pipe or conduit.

1. Carefully compact material under pipe haunches and bring backfill evenly up on both sides and along the full length of utility piping or conduit to avoid damage or displacement of utility system.

D. Coordinate backfilling with utilities testing.

E. Fill voids with approved backfill materials while shoring and bracing, and as sheeting is re- moved.

F. Place and compact final backfill of satisfactory soil material to final subgrade.

G. Install warning tape directly above utilities, 18 inches below finished grade, except 6 inches be- low subgrade under pavements and slabs.

3.12 FILL

A. Preparation: Remove vegetation, topsoil, debris, unsatisfactory soil materials, obstructions, and deleterious materials from ground surface before placing fills.

B. Plow, scarify, bench, or break up sloped surfaces steeper than 1 vertical to 4 horizontal, so fill material will bond with existing material.

C. Place and compact fill material in layers to required elevations as follows:

1. Under grass and planted areas, use satisfactory soil material.
2. Under walks and pavements, use satisfactory soil material.
3. Under steps and ramps, use engineered fill.

3.13 MOISTURE CONTROL

A. Uniformly moisten or aerate subgrade and each subsequent fill or backfill layer before compaction to within 2 percent of optimum moisture content.

1. Do not place backfill or fill material on surfaces that are muddy, frozen, or contain frost or ice.
2. Remove and replace, or scarify and air-dry, otherwise satisfactory soil material that exceeds optimum moisture content by 2 percent and is too wet to compact to specified dry unit weight.

3.14 COMPACTION OF BACKFILLS AND FILLS

A. Place backfill and fill materials in layers not more than 8 inches (200 mm) in loose depth for material compacted by heavy compaction equipment, and not more than 4 inches (100 mm) in loose depth for material compacted by hand-operated tampers.

B. Place backfill and fill materials evenly on all sides of structures to required elevations, and uniformly along the full length of each structure.

C. Compact soil to not less than the following percentages of maximum dry unit weight according to ASTM D 698:

1. Under utility structures and paved shoulders, scarify and recompact top 12 inches (300 mm) of existing subgrade and each layer of backfill or fill material at 95 percent.
2. Under walkways, scarify and recompact top 6 inches (150 mm) below subgrade and compact each layer of backfill or fill material at 92 percent.
3. Under lawn or unpaved areas, scarify and recompact top 6 inches (150 mm) below sub- grade and compact each layer of backfill or fill material at 90 percent.
4. Under NYSDOT travel lanes and within 1 on 1 slope of travel lanes backfill trench with select granular fill meeting NYSDOT Item #623.12 or #605.0901.

3.15 GRADING

A. General: Uniformly grade areas to a smooth surface, free from irregular surface changes. Comply with compaction requirements and grade to cross sections, lines, and elevations indicated.

1. Provide a smooth transition between adjacent existing grades and new grades.
2. Cut out soft spots, fill low spots, and trim high spots to comply with required surface tolerances.

B. Site Grading: Slope grades to direct water away from buildings and to prevent ponding. Finish subgrades to required elevations within the following tolerances:

1. Lawn or Unpaved Areas: Plus or minus 1 inch (25 mm).
2. Walks: Plus or minus 1 inch (25 mm).
3. Pavements: Plus or minus 1/2 inch (13 mm).

3.16 SUBBASE AND BASE COURSES

A. Under pavements and walks, place subbase course on prepared subgrade and as follows:

1. Place base course material over subbase.
2. Compact subbase and base courses at optimum moisture content to required grades, lines, cross sections, and thickness to not less than 95 percent of maximum dry unit weight ac- cording to ASTM D 1557.
3. Shape subbase and base to required crown elevations and cross-slope grades.
4. When thickness of compacted subbase or base course is 6 inches (150 mm) or less, place materials in a single layer.
5. When thickness of compacted subbase or base course exceeds 6 inches (150 mm), place materials in equal layers, with no layer more than 6 inches (150 mm) thick or less than 3 inches (75 mm) thick when compacted.

B. Pavement Shoulders: Place shoulders along edges of subbase and base course to prevent lateral movement. Construct shoulders, at least 12 inches (300 mm) wide, of

satisfactory soil materials and compact simultaneously with each subbase and base layer to not less than 95 percent of maximum dry unit weight according to ASTM D 1557.

3.17 FIELD QUALITY CONTROL

A. Testing Agency: Contractor shall engage a qualified independent geotechnical engineering testing agency to perform field quality-control testing.

B. Allow testing agency to inspect and test subgrades and each fill or backfill layer. Proceed with subsequent earthwork only after test results for previously completed work comply with requirements.

C. Testing agency will test compaction of soils in place according to ASTM D 1556, ASTM D 2167, ASTM D 2922, and ASTM D 2937, as applicable. Tests will be performed at the following locations and frequencies:

1. Paved Areas: At subgrade and at each compacted fill and backfill layer, at least one test for every 2000 sq. ft. (186 sq. m) or less of paved area, but in no case fewer than three tests.
2. Trench Backfill: At each compacted initial and final backfill layer, at least one test for each 150 feet (46 m) or less of trench length, but no fewer than two tests.

D. When testing agency reports that subgrades, fills, or backfills have not achieved degree of compaction specified, scarify and moisten or aerate, or remove and replace soil to depth required; recompact and retest until specified compaction is obtained.

3.18 PROTECTION

A. Protecting Graded Areas: Protect newly graded areas from traffic, freezing, and erosion. Keep free of trash and debris.

B. Repair and reestablish grades to specified tolerances where completed or partially completed surfaces become eroded, rutted, settled, or where they lose compaction due to subsequent construction operations or weather conditions.

1. Scarify or remove and replace soil material to depth as directed by Engineer; reshape and recompact.

C. Where settling occurs before Project correction period elapses, remove finished surfacing, back- fill with additional soil material, compact, and reconstruct surfacing.

1. Restore appearance, quality, and condition of finished surfacing to match adjacent work, and eliminate evidence of restoration to the greatest extent possible.

3.19 DISPOSAL OF SURPLUS AND WASTE MATERIALS

A. Disposal: Transport surplus satisfactory soil offsite.

1. Remove waste material, including unsatisfactory soil, trash, and debris, and legally dis- pose of it offsite.

END OF SECTION 31 20 00

SECTION 31 23 16.26 - ROCK REMOVAL

PART 1-GENERAL

1.1 RELATED DOCUMENTS

A. Drawings, Section 31 20 00 Earth Moving, and Division 01 General Requirements apply to this Section.

1.2 SUMMARY

A. This Section includes rock removal for site utilities and to the grades shown on the Drawings including the loosening, removing, transporting, storing and disposal of all materials requiring blasting, barring, or wedging for removal from their original beds, and backfill of rock excavations with acceptable materials.

1.3 SUBMITTALS

A. The following items shall be submitted:

1. Blasting plan conforming to the Town ordinances.

2. Before any drilling or blasting operations begin the Contractor shall obtain all permits and licenses required.

3. Seismic Survey Report: Owner to provide for record purposes; from seismic survey agency.

4. Preexcavation Photographs or Videotape: In addition to what is required in Division 01 General Requirements, show existing conditions of adjoining construction and site improvements, including finish surfaces, that might be misconstrued as damage caused by earthwork operations. Submit before earthwork begins.

1.4 DEFINITIONS

A. Rock

1. See Section 31 20 00 Earth Moving.

1.5 QUALITY ASSURANCE

A. Provide in accordance with Division 01 General Requirements.

B. Blasting: Comply with applicable requirements in NFPA 495, "Explosive Materials Code," and prepare a blasting plan reporting the following:

Types of explosive and sizes of charge to be used in each area of rock removal, types of blasting mats, sequence of blasting operations, and procedures that will

prevent damage to site improvements and structures on Project site and adjacent properties.

C. Seismic Survey Agency: An independent testing agency, acceptable to authorities having jurisdiction, experienced in seismic surveys and blasting procedures to perform the following services:

1. Report types of explosive and sizes of charge to be used in each area of rock removal, types of blasting mats, sequence of blasting operations, and procedures that will prevent damage to site improvements and structures on Project site and adjacent properties.
2. Seismographic monitoring during blasting operations.

D. Geotechnical Testing Agency Qualifications: An independent testing agency qualified according to ASTM E 329 to conduct soil materials and rock-definition testing, as documented according to ASTM D 3740 and ASTM E 548.

E. Preexcavation Conference: Conduct preexcavation conference at the Site.

F. Any Blasting shall be performed in small and controlled blasts so as not to cause disruption or damage to the adjacent roadway, its user, or adjacent residences. Any damage to the adjacent road and / or users, the residences within the vicinity of blasting (distance to monitor structures for damage per the Laws and Regulations for blasting) or belongings of the inhabitants shall be replaced by the contractor at no additional expense to the Owner.

PART 2-PRODUCTS

NOT USED

PART 3-EXECUTION

3.1 BLASTING

A. General

1. Handling of explosives and blasting shall be done only by experienced persons.

2. Handling and blasting shall be in accordance with all Federal, State and local laws, rules and regulations relating to the possession, handling, storage and transportation and use of explosives.

3. All blasts in open cut shall be properly covered and protected with approved blasting mats.

4. Charges shall be of such size that the excavation will not be unduly large and shall be so arranged and timed that adjacent rock, upon or against which pipelines or structures are to be built, will not be shattered.

5. Blasting will not be permitted within 25 feet of pipelines or structures, unless approved by engineer.

6. All existing pipes or structures exposed during excavation shall be adequately protected from damage before proceeding with the blasting.

B. Repair of Damages Due to Blasting

1. Any injury or damage to the work or to existing pipes or structures shall be repaired or rebuilt by the Contractor at his expense.

2. Whenever blasting may damage adjacent rock, pipes or structures, blasting shall be discontinued and the rock removed by drilling, barring, wedging or other methods.

3. The contractor shall be responsible for repairing/replacing any damage caused by blasting to the adjacent roads, its users, or structures within the vicinity of blasting as required by the Laws and Regulations. This includes the personal property of the inhabitants.

C. Explosives

1. At no time shall an excessive amount of explosives be kept at the site of the work. Such explosives shall be stored, handled and used in conformity with all applicable laws and regulations.

2. Accurate daily records shall be kept showing the amounts of explosives on hand, both at the site and at any storage magazine, the quantities received and issued, and the purpose for which issued.

3. The Contractor shall be responsible for any damage or injury to any persons, property or structures as a result of his handling, storage or use of explosives.

D. Rock Clearance in Trenches

1. Ledge rock, boulders and large stones shall be removed from the sides and bottom of the trench to provide clearance for the specified embedment of each pipe section, joint or appurtenance; but in no instance shall the clearance be less than 6 inches. Additional clearance at the pipe bell or joint shall be provided to allow for the proper make-up of the joint.

2. At the transition from an earth bottom to a rock bottom the minimum bottom clearance shall be 12 inches for a distance of not less than 5 feet.

3.2 EXCAVATION AND BACKFILL

A. Rock removal and backfilling shall be performed in accordance with the applicable provisions of the Section 31 20 00 Earth Moving.

B. The rock excavated shall be disposed of as spoil and no rock processing is permitted on the subject property.

END OF SECTION 31 23 16.26

SECTION 31 23 33 – TRENCHING AND BACKFILLING

PART 1 GENERAL

1.1 SUMMARY

A. This Section includes excavation and backfill as required for pipe installation or other construction in the trench, and removal and disposal of water, in accordance with the applicable provisions of Section 31 20 00 Earth Moving and Section 31 50 00 Excavation Support and Protection unless modified herein.

PART 2 PRODUCTS

NOT USED

PART 3 EXECUTION

3.1 EXCAVATION

A. The trench excavation shall be located as shown on the Drawings or as specified. Under ordinary conditions, excavation shall be by open cut from the ground surface. Where the depth of trench and soil conditions permit, tunneling may be required beneath cross walks, curbs, gutters, pavements, trees, driveways, railroad tracks and other surface structures. No additional compensation will be allowed for such tunneling over the price bid for open cut excavation of equivalent depths below the ground surface unless such tunnel excavation is specifically provided for in the Bidding Documents.

B. Trenches shall be excavated to maintain the depths as shown on the Drawings or as specified for the type of pipe to be installed.

C. The alignment and depth shall be determined and maintained by the use of a string line installed on batter boards above the trench, a double string line installed along side of the trench or a laser beam system.

D. The minimum width of trench excavation shall be 12 inches on each side of the pipe hub.

E. Trenches shall not be opened for more than 300 feet in advance of pipe installation nor left unfilled for more than 100 feet in the rear of the installed pipe when work is in progress without the consent of the Engineer. Open trenches shall be protected and barricaded as required. No trench shall be left open over night unless an adequate road plan is provided.

F. Bridging across open trenches shall be constructed and maintained where required. Provide shop drawing of bridging or road plate system designed and stamped by NYS Licensed Professional Engineer.

3.2 SUBGRADE PREPARATION FOR PIPE

A. Where pipe is to be laid on undisturbed bottom of excavated trench, mechanical excavation shall not extend lower than the finished subgrade elevation at any point.

B. Where pipe is to be laid on special granular material the excavation below subgrade shall be to the depth specified or directed. The excavation below subgrade shall be refilled with special granular material as specified or directed, shall be deposited in layers not to exceed 6 inches and shall be thoroughly compacted prior to the preparation of pipe subgrade.

C. The subgrade shall be prepared by shaping with hand tools to the contour of the pipe barrel to allow for uniform and continuous bearing and support on solid undisturbed ground or embedment for the entire length of the pipe.

D. Pipe subgrade preparation shall be performed immediately prior to installing the pipe in the trench. Where bell holes are required they shall be made after the subgrade preparation is complete and shall be only of sufficient length to prevent any part of the bell from becoming in contact with the trench bottom and allowing space for joint assembly.

3.3 STORAGE OF MATERIALS

A. Traffic shall be maintained at all times in accordance with the applicable Highway Permits, Division 01 General Requirements, and Drawings.

B. Where conditions do not permit storage of materials adjacent to the trench, the material excavated from a length as may be required, shall be removed by the Contractor, at his cost and expense, as soon as excavated. The material subsequently excavated shall be used to refill the trench where the pipe had been built, provided it be of suitable character. The excess material shall be removed to locations selected and obtained by the Contractor.

1. The contractor shall, at his cost and expense, bring back adequate amounts of satisfactory excavated materials as may be required to properly refill the trenches.

C. If directed by the Engineer, the Contractor shall refill trenches with satisfactory soil materials or other suitable materials and excess excavated materials shall be disposed of offsite by the contractor.

3.4 REMOVAL OF WATER AND DRAINAGE

A. The Contractor shall at all times provide and maintain proper and satisfactory means and devices for the removal of all water entering the trench, and shall remove all such water as fast as it may collect, in such manner as shall not interfere with the prosecution of the work.

B. The removal of water shall be in accordance Section 01 50 00 Temporary Facilities and Controls.

3.5 PIPE EMBEDMENT

A. All pipe shall be protected from lateral displacement and possible damage resulting from superimposed backfill loads, impact or unbalanced loading during backfilling operations by being adequately embedded in suitable pipe embedment material. To ensure adequate lateral and vertical stability of the installed pipe during pipe jointing and embedment operations, a sufficient amount of the pipe embedment material to hold the pipe in rigid alignment shall be uniformly deposited and thoroughly compacted on each side, and back of the bell, of each pipe as laid.

B. Concrete cradle and encasement of the class specified shall be installed where and as shown on the Contract Drawings or ordered by the Engineer. Before any concrete is placed, the pipe shall be securely blocked and braced to prevent movement or flotation. The concrete cradle or encasement shall extend the full width of the trench as excavated unless otherwise authorized by the Engineer. Where concrete is to be placed in a sheeted trench it shall be poured directly against sheeting to be left in place or against a bond-breaker if the sheeting is to be removed.

C. Embedment materials placed above the centerline of the pipe or above the concrete cradle to a depth of 12 inches above the top of the pipe barrel shall be deposited in such manner as to not damage the pipe. Compaction shall be as required for the type of embedment being installed.

3.6 BACKFILL ABOVE EMBEDMENT

A. The remaining portion of the pipe trench above the embedment shall be refilled with suitable materials compacted as specified.

1. The trench shall be refilled in horizontal layers not more than 8 inches in thickness, and compacted per Section 31 20 00 Earth Moving.

2. Hand tamping shall be required around buried utility lines or other subsurface features that could be damaged by mechanical compaction equipment.

B. Backfilling of trenches beneath, across or adjacent to drainage ditches and water courses shall be done in such a manner that water will not accumulate in unfilled or partially filled trenches and the backfill shall be protected from surface erosion by adequate means.

1. Where trenches cross waterways, the backfill surface exposed on the bottom of slopes thereof shall be protected from surface erosion by adequate means.

C. All settlement of the backfill shall be refilled and compacted as it occurs.

D. Temporary pavement shall be placed as required by the Highway Work Permits and all Laws and Regulations.

END OF SECTION 31 23 33

SECTION 31 25 00 - EROSION AND SEDIMENT CONTROL

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

A. Drawings and general provisions of the Contract, including General and Supplementary Conditions apply to this Section.

B. New York State Department of Environmental Conservation SPDES General Permit for Stormwater Discharges from Construction Activity Permit No. GP-0-15-002.

1.2 SUMMARY

A. This section includes furnishing, installing, maintaining, and removing temporary erosion and sediment control measures as shown on the contract documents or as ordered by the Engineer throughout the life of the contract to control soil erosion, sediment and water pollution through the use of temporary swales, check dams, bales, sediment traps, and silt fences.

B. Related Sections include other Division 2 Sections.

1.3 REFERENCES

A. Materials installation, maintenance, inspection and removal shall be in accordance with the *New York Standards and Specifications for Erosion and Sediment Control*.

1.4 SUBMITTALS

A. Submittals shall be submitted in accordance with the provisions set forth in the General Specifications.

B. Submittal shall contain source and supplier of material showing its compliance with specifications and associated standards.

1. Samples of any kind shall be submitted upon Engineer’s request.

C. The Contractor shall submit schedules for the accomplishment of temporary sediment control work.

PART 2 - PRODUCTS

2.1 GENERAL

A. Products shall be as specified on the contract drawings and as stated in *New York Standards and Specifications for Erosion and Sediment Control*.

PART 3 - EXECUTION

3.1 INSTALLATION

A. In the event of conflict between these specification requirements and pollution control laws, rules or regulations by other federal, state or local government agencies, the more restrictive rules and regulations shall apply.

B. Temporary erosion and sediment control measures shall be inspected by the Contractor and maintained during the life of the project, and such maintenance and inspection shall continue until permanent stabilization measures are in place and the temporary control measures are ordered to be removed by the Engineer, and the disturbed area returned to its intended stabilized condition.

C. The Engineer has the authority to limit the surface area of erodible earth material exposed by excavation, borrow and fill operations and to direct the Contractor to provide immediate permanent or temporary erosion and sediment control measures to minimize damage to adjacent property.

D. The Contractor shall submit schedules for the accomplishment of temporary and permanent erosion and sediment control work to the Engineer for acceptance. All work done under this section shall be included as part of the construction schedule submitted by the Contractor.

E. Maintenance shall be performed as directed by the Engineer. All sediment deposits shall be considered unsuitable material and properly disposed of.

F. The Contractor shall immediately repair or replace defective or damaged portions of the erosion and sediment control facilities.

G. Erosion and sediment control measures shall be installed where necessary and shall remain in place until the area is permanently stabilized or the Engineer directs that it be removed. Upon removal, the Contractor shall remove and dispose of any sediment accumulations and restore the area as directed by the Engineer. The removed facilities and materials shall become the property of the Contractor and be removed from the site.

END OF SECTION 31 25 00

SECTION 31 50 00 - EXCAVATION SUPPORT AND PROTECTION

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

A. Drawings and Division 01 General Requirements apply to this Section.

1.2 SUMMARY

A. Section includes temporary excavation support and protection systems.

1.3 PERFORMANCE REQUIREMENTS

A. Design, provide, monitor, and maintain excavation support and protection system capable of supporting excavation sidewalls and of resisting soil and hydrostatic pressure and superimposed and construction loads.

1. Delegated Design: Design excavation support and protection system, including comprehensive engineering analysis by a qualified professional engineer, using performance requirements and design criteria indicated.
2. Prevent surface water from entering excavations per Division 01 General Requirements.
3. Install excavation support and protection systems without damaging existing buildings, structures, and site improvements adjacent to excavation.
4. Monitor vibrations, settlements, and movements.

1.4 SUBMITTALS

A. Shop Drawings: For excavation support and protection system.

B. Delegated-Design Submittal: For excavation support and protection system indicated to comply with performance requirements and design criteria, including analysis data signed and sealed by the qualified professional engineer responsible for their preparation.

C. Other Informational Submittals:

1. Existing Conditions: per Division 01 Requirements.
2. Record Drawings: Identifying and locating capped utilities and other subsurface structural, electrical, or mechanical conditions.

    a. Note locations and capping depth of wells and well points.

1.5 QUALITY ASSURANCE

A. Provide in accordance with Division 01 General Requirements.

B. Pre-installation Conference: Conduct a pre-installation conference per Division 01 General Requirements.

1. Review methods and procedures related to excavation support and protection system including, but not limited to, the following:

a. Geotechnical report.
b. Existing utilities and subsurface conditions.
c. Proposed excavations.
d. Proposed equipment.
e. Monitoring of excavation support and protection system.
f. Working area location and stability.
g. Coordination with waterproofing.
h. Abandonment or removal of excavation support and protection system.

1.6 PROJECT CONDITIONS

A. Interruption of Existing Utilities: Do not interrupt any utility serving facilities occupied by Owner or others unless permitted under the following conditions and then only after arranging to provide temporary utility according to requirements indicated:

1. Notify Engineer and Owner no fewer than two days in advance of proposed interruption of utility.
2. Do not proceed with interruption of utility without Owner's/Engineer's written permission.

B. Survey Work: Engage a qualified land surveyor or professional engineer to survey adjacent existing buildings, structures, and site improvements; establish exact elevations at fixed points to act as benchmarks. Clearly identify benchmarks and record existing elevations.

1. During installation of excavation support and protection systems, regularly resurvey benchmarks, maintaining an accurate log of surveyed elevations and positions for comparison with original elevations and positions. Promptly notify Engineer if changes in elevations or positions occur or if cracks, sags, or other damage is evident in adjacent construction.

PART 2 - PRODUCTS

2.1 MATERIALS

A. General: Provide materials that are either new or in serviceable condition.

B. Structural Steel: ASTM A 36/A 36M, ASTM A 690/A 690M, or ASTM A 992/A 992M.

C. Steel Sheet Piling: ASTM A 328/A 328M, ASTM A 572/A 572M, or ASTM A 690/A 690M; with continuous interlocks.

1. Corners: Site-fabricated mechanical interlock or Roll-formed corner shape with continuous interlock.

D. Reinforcing Bars: ASTM A 615/A 615M, Grade 60 (Grade 420), deformed.

E. Tiebacks: Steel bars, ASTM A 722/A 722M.

F. Tiebacks: Steel strand, ASTM A 416/A 416M.

PART 3 - EXECUTION

3.1 PREPARATION

A. Protect structures, utilities, sidewalks, pavements, and other facilities from damage caused by settlement, lateral movement, undermining, washout, and other hazards that could develop during excavation support and protection system operations.

1. Shore, support, and protect utilities encountered.

B. Install excavation support and protection systems to ensure minimum interference with roads, streets, walks, and other adjacent occupied and used facilities.

1. Do not close or obstruct streets, walks, or other adjacent occupied or used facilities without permission from Owner and authorities having jurisdiction. Provide alternate routes around closed or obstructed traffic ways if required by authorities having jurisdiction.

C. Locate excavation support and protection systems clear of permanent construction so that forming and finishing of concrete surfaces are not impeded.

D. Monitor excavation support and protection systems daily during excavation progress and for as long as excavation remains open. Promptly correct bulges, breakage, or other evidence of movement to ensure that excavation support and protection systems remain stable.

E. Promptly repair damages to adjacent facilities caused by installing excavation support and protection systems.

3.2 SOLDIER PILES AND LAGGING

A. Install steel soldier piles before starting excavation. Extend soldier piles below excavation grade level to depths adequate to prevent lateral movement. Space soldier

piles at regular intervals not to exceed allowable flexural strength of wood lagging. Accurately align exposed faces of flanges to vary not more than 2 inches (50 mm) from a horizontal line and not more than 1:120 out of vertical alignment.

B. Install wood lagging within flanges of soldier piles as excavation proceeds. Trim excavation as required to install lagging. Fill voids behind lagging with soil, and compact.

C. Install wales horizontally at locations indicated on Drawings and secure to soldier piles.

3.3 SHEET PILING

A. Before starting excavation, install one-piece sheet piling lengths and tightly interlock to form a continuous barrier. Accurately place the piling, using templates and guide frames unless otherwise recommended in writing by the sheet piling manufacturer. Limit vertical offset of adjacent sheet piling to 60 inches (1500 mm). Accurately align exposed faces of sheet piling to vary not more than 2 inches (50 mm) from a horizontal line and not more than 1:120 out of vertical alignment. Cut tops of sheet piling to uniform elevation at top of excavation.

3.4 TIEBACKS

A. Tiebacks: Drill, install, grout, and tension tiebacks. Test load-carrying capacity of each tieback and replace and retest deficient tiebacks.

1. Test loading shall be observed by a qualified professional engineer responsible for design of excavation support and protection system.
2. Maintain tiebacks in place until permanent construction is able to withstand lateral soil and hydrostatic pressures.

3.5 BRACING

A. Bracing: Locate bracing to clear columns, floor framing construction, and other permanent work. If necessary to move brace, install new bracing before removing original brace.

1. Do not place bracing where it will be cast into or included in permanent concrete work unless otherwise approved by Architect.
2. Install internal bracing, if required, to prevent spreading or distortion of braced frames.
3. Maintain bracing until structural elements are supported by other bracing or until permanent construction is able to withstand lateral earth and hydrostatic pressures.

3.6 REMOVAL AND REPAIRS

A. Remove excavation support and protection systems when construction has progressed sufficiently to support excavation and bear soil and hydrostatic pressures. Remove in stages to avoid disturbing underlying soils or damaging structures, pavements, facilities, and utilities.

1. Remove excavation support and protection systems to a minimum depth of 48 inches (1200 mm) below overlaying construction and abandon remainder.
2. Fill voids immediately with approved backfill compacted to density specified in Section 31 20 00 Earth Moving.
3. Repair or replace, as approved by Engineer, adjacent work damaged or displaced by removing excavation support and protection systems.

END OF SECTION 31 50 00

SECTION 32 12 16 - ASPHALT PAVING

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

A. Drawings and Division 01 General Requirements, Section 31 20 00 Earth Moving, apply to this Section.

B. This Section applies to all asphalt paving.

1.2 SUMMARY

A. This Section includes the following:

1. Hot-mix asphalt paving.
2. Hot-mix asphalt patching.

B. Scheduling of Asphalt Paving:

1. The contractor shall have substantially completed site work in the vicinity of paving and obtain the Engineer's approval prior to placement of the binder course of asphalt.
2. The contractor shall have substantially completed construction and obtain the Engineer's approval prior to placement of the top course of asphalt.

1.3 SYSTEM DESCRIPTION

A. Provide hot-mix asphalt paving according to materials, workmanship, and other applicable requirements of the standard specifications of the state or authorities having jurisdiction.

1. Standard Specification: New York State Department of Transportation.
2. Measurement and payment provisions and safety program submittals included in NYSDOT Standard Specifications do not apply to this Section.

1.4 SUBMITTALS

A. Product Data: For each product specified. Include technical data and tested physical and performance properties.

B. Job-Mix Designs: For each job mix proposed for the Work.

C. Material Test Reports: Indicate and interpret test results for compliance of materials with requirements indicated.

D. Material Certificates: Certificates signed by manufacturers certifying that each material complies with requirements.

1.5 QUALITY ASSURANCE

A. Provide in accordance with Division 01 General Requirements.

B. Installer Qualifications: Engage and experienced installer who has completed hot-mix asphalt paving similar in material, design, and extent to that indicated for this Project and with a record of successful in-service performance.

C. Manufacturer Qualifications: Engage a firm experienced in manufacturing hot-mix asphalt similar to that indicated for this Project and with a record of successful in-service performance.

1. Firm shall be a registered with and approved paving mix manufacturer with authorities having jurisdiction or the DOT of the state in which Project is located.

D. Regulatory Requirements: Conform to applicable standards of authorities having jurisdiction for asphalt paving work on public property.

E. Asphalt-Paving Publication: Comply with AI's , "The Asphalt Handbook," except where more stringent requirements are indicated.

F. Pre-installation Conference: Conduct Pre-installation conference at the Site per Division 01 General Requirements. Review methods and procedures related to hot-mix asphalt paving including, but not limited to, the following:

1. Review proposed sources of paving materials, including capabilities and location of plant that will manufacture hot-mix asphalt.
2. Review condition of substrate and preparatory work performed by other trades.
3. Review requirements for protecting paving work, including restriction of traffic during installation period and for remainder of construction period.
4. Review and finalize construction schedule for paving and related work. Verify availability of materials, paving Installer's personnel, and equipment required to execute the Work without delays.
5. Review inspection and testing requirements, governing regulations, and proposed installation procedures.
6. Review forcasted weather conditions and procedures for coping with unfavorable conditions.

1.6 PROJECT CONDITIONS

A. Environmental Limitations: Do not apply asphalt materials if substrate is wet or excessively damp or if the following conditions are not met:

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1. Asphalt Base Course: Minimum surface temperature of 40 deg F (4 deg C) and rising at time of placement.
2. Asphalt Surface Course: Minimum surface temperature of 60 deg F (15.5 deg C) at time of placement.

PART 2 - PRODUCTS

2.1 AGGREGATES

A. General: Use materials and gradations that have performed satisfactorily in previous installations.

B. Coarse Aggregate: Sound; angular crushed stone, crushed gravel, or properly cured, crushed blast-furnace slag; complying with ASTM D 692.

C. Fine Aggregate: Sharp-edged natural sand or sand prepared from stone, gravel, properly cured blast-furnace slag, or combinations thereof, complying with ASTM D 1073

1. For hot-mix asphalt, limit natural sand to a maximum of 20 percent by weight of the total aggregate mass.

D. Mineral Filler: Rock or slag dust, hydraulic cement, or other inert material complying with ASTM D 242.

2.2 ASPHALT MATERIALS

A. Asphalt Cement: ASTM D 3381 for viscosity-graded material

B. Undersealing Asphalt: ASTM D 3141, pumping consistency.

C. Water: Potable.

2.3 AUXILIARY MATERIALS

A. Herbicide: Commercial chemical for weed control, registered by the EPA. Provide in granular, liquid, or wettable powder form.

B. Sand: ASTM D 1073, Grade Nos. 2 or 3.

2.4 MIXES

A. Hot-Mix Asphalt: Provide dense, hot-laid, hot-mix asphalt plant mixes approved by authorities having jurisdiction**;** designed according to procedures in AI MS-2, "Mix

Design Methods for Asphalt Concrete and Other Hot-Mix Types"; and complying with the following requirements:

1. Provide mixes with a history of satisfactory performance in geographical area where Project is located.
2. Base Course: As indicated.
3. Surface Course: As indicated.

PART 3 - EXECUTION

3.1 EXAMINATION

A. Verify that subgrade is dry and in suitable condition to support paving and imposed loads.

B. Proof-roll subbase using heavy, pneumatic-tired rollers to locate areas that are unstable or that require further compaction.

C. Notify Engineer in writing of any unsatisfactory conditions. Do not begin paving installation until these conditions have been corrected.

3.2 PATCHING AND REPAIRS

A. Patching: Saw cut perimeter of patch and excavate existing pavement section to sound base. Recompact new subgrade. Excavate rectangular or trapezoidal patches, extending 12 inches (300 mm) into adjacent sound pavement, unless otherwise indicated. Cut excavation faces vertically.
   1. Tack coat faces of excavation and allow to cure before paving.
   2. Partially fill excavated pavements with hot-mix asphalt base mix and, while still hot, compact. Cover asphalt base course with compacted, hot-mix surface layer finished flush with adjacent surfaces.

B. Leveling Course: Install and compact leveling course consisting of dense-graded, hot-mix asphalt surface course to level sags and fill depressions deeper than 1 inch (25 mm) in existing pavements.

   1. Install leveling wedges in compacted lifts not exceeding 3 inches (75 mm) thick.

C. Crack and Joint Filling: Remove existing joint filler material from cracks or joints to a depth of 1/4 inch (6 mm). Refill with asphalt joint-filling material to restore watertight condition. Remove excess filler that has accumulated near cracks or joints.

D. Tack Coat: Apply uniformly to surfaces of existing pavement of previously constructed asphalt or portland cement concrete paving and to surfaces abutting or projecting into new, hot-mix asphalt pavement. Apply at a uniform rate of 0.05 to 0.15 gal./sq. yd. (0.2 to 0.7 L/sq. m) of surface.

1. Allow tack coat to cure undisturbed before applying hot-mix asphalt paving.
2. Avoid smearing or staining adjoining surfaces, appurtenances, and surroundings. Remove spillages and clean affected surfaces.

3.3 SURFACE PREPARATION

A. General: Immediately before placing asphalt materials, remove loose and deleterious material from substrate surfaces. Ensure that prepared subgrade is ready to receive paving.

1. Sweep loose granular particles from surface of unbound-aggregate base course. Do not dislodge or disturb aggregate embedded in compacted surface of base course.

B. Herbicide Treatment: Apply herbicide according to manufacturer's recommended rates and written application instructions. Apply to dry, prepared subgrade or surface of compacted-aggregate base before applying paving materials.

3.4 HOT-MIX ASPHALT PLACING

A. Machine place hot-mix asphalt on prepared surface, spread uniformly, and strike off. Place asphalt mix by hand to areas inaccessible to equipment in a manner that prevents segregation of mix. Place each course to required grade, cross section, and thickness when compacted.

1. Place hot-mix asphalt base course in number of lifts and thicknesses indicated.
2. Place hot-mix asphalt surface course in single lift.
3. Spread mix at minimum temperature of 250 deg F (121 deg C).
4. Begin applying mix along centerline of crown for crowned sections and on high side of one-way slopes, unless otherwise indicated.
5. Regulate paver machine speed to obtain smooth, continuous surface free of pulls and tears in asphalt-paving mat.

B. Place paving in consecutive strips not less than 10 feet (3 m) wide unless infill edge strips of a lesser width are required.

1. After first strip has been placed and rolled, place succeeding strips and extend rolling to overlap previous strips. Complete a section of asphalt base course before placing asphalt surface course.

C. Promptly correct surface irregularities in paving course behind paver. Use suitable hand tools to remove excess material forming high spots. Fill depressions with hot-mix asphalt to prevent segregation of mix; use suitable hand tools to smooth surface.

3.5 JOINTS

A. Construct joints to ensure a continuous bond between adjoining paving sections. Construct joints free of depressions with same texture and smoothness as other sections of hot-mix asphalt course.

1. Clean contact surfaces and apply tack coat to joints.
2. Offset longitudinal joints, in successive courses, a minimum of 6 inches (150 mm).
3. Offset transverse joints, in successive courses, a minimum of 24 inches (600 mm).
4. Construct transverse joints by bulkhead method or sawed vertical face method as described in AI's, "The Asphalt Handbook".
5. Compact joints as soon as hot-mix asphalt will bear roller weight without excessive displacement.
6. Compact asphalt at joints to a density within 2 percent of specified course density.

3.6 COMPACTION

A. General: Begin compaction as soon as placed hot-mix paving will bear roller weight without excessive displacement. Compact hot-mix paving with hot, hand tampers or vibratory-plate compactors in areas inaccessible to rollers.

1. Complete compaction before mix temperature cools to 185 deg F (85 deg C).

2. Use at minimum a 10-ton roller.

B. Breakdown Rolling: Complete breakdown or initial rolling immediately after rolling joints and outside edge. Examine surface immediately after breakdown rolling for indicated crown, grade, and smoothness. Correct laydown and rolling operations to comply with requirements.

C. Intermediate Rolling: Begin intermediate rolling immediately after breakdown rolling while hot-mix asphalt is still hot enough to achieve specified density. Continue rolling until hot-mix asphalt course has been uniformly compacted to the following density:

1. Average Density: 96 percent of reference laboratory density according to ASTM D 1559, but not less than 94 percent nor greater than 100 percent.

D. Finish Rolling: Finish roll paved surfaces to remove roller marks while hot-mix asphalt is still warm.

E. Edge Shaping: While surface is being compacted and finished, trim edges of pavement to proper alignment. Bevel edges while asphalt is still hot; compact thoroughly.

F. Repairs: Remove paved areas that are defective or contaminated with foreign materials and replace with fresh, hot-mix asphalt. Compact by rolling to specified density and surface smoothness.

G. Protection: After final rolling, do not permit vehicular traffic on pavement until it has cooled and hardened.

H. Erect barricades to protect paving from traffic until mixture has cooled enough not to become marked.

3.7 INSTALLATION TOLERANCES

A. Thickness: Compact each course to produce the thickness indicated within the following tolerances:

1. Base Course: Plus or minus 1/2 inch (13 mm).
2. Surface Course: Plus 1/4 inch (6 mm), no minus.

B. Surface Smoothness: Compact each course to produce a surface smoothness within the following tolerances as determined by using a 10-foot (3-m) straightedge applied transversely or longitudinally to paved areas:

1. Base Course: 1/4 inch (6 mm).
2. Surface Course: 1/8 inch (3 mm).
3. Crowned Surfaces: Test with crowned template centered and at right angle to crown. Maximum allowable variance from template is 1/4 inch (6 mm).

3.8 FIELD QUALITY CONTROL

A. Testing Agency: Contractor shall engage a qualified independent testing agency to perform field quality-control testing.

B. Thickness: In-place compacted thickness of hot-mix asphalt courses will be determined according to ASTM D 3549.

C. Surface Smoothness: Finished surface of each hot-mix asphalt course will be tested for compliance with smoothness tolerances.

D. Revise methods of verifying field compaction if using the Superpave mix design system. Consult state or local DOT for methods that have been successfully used.

E. Remove and replace or install additional hot-mix asphalt where test results or measurements indicate that it does not comply with specified requirements.

END OF SECTION 32 12 16

SECTION 32 1816.13
PLAYGROUND PROTECTIVE SURFACING

PART 1 GENERAL

1.01 SECTION INCLUDES

A. Removal of existing protective surfacing and correction of grades as necessary.

B. Protective surfacing for playground area.

1.02 REFERENCE STANDARDS

A. ASTM D2047 - Standard Test Method for Static Coefficient of Friction of Polish-Coated Flooring Surfaces as Measured by the James Machine 2017.

B. ASTM F1292 - Standard Specification for Impact Attenuation of Surfacing Materials Within the Use Zone of Playground Equipment 2018.

C. ASTM F1487 - Standard Consumer Safety Performance Specification for Playground Equipment for Public Use 2017.

D. CPSC Pub. No. 325 - Public Playground Safety Handbook 2010.

1.03 DEFINITIONS

A. Use Zone: The area beneath and immediately adjacent to a play structure or equipment (play event) that is designated for unrestricted circulation around equipment, and on whose surface it is predicted that a user would land when falling from or exiting the equipment.

B. Critical Fall Height: The maximum fall height at which the protective surfacing meets the requirements of ASTM F1292.

C. Fall Height: The vertical distance between the finished elevation of the designated play surface and the finished elevation of the protective surfacing beneath it as defined by ASTM F1487.

D. Protective Surfacing: Resilient ground surfacing. The characteristics of the protective surfacing are based on the fall height of the playground equipment. Changes in either the surfacing or the fall height, particularly reducing the resilience of the protective surfacing or increasing the fall height, will reduce safety-related performance.

E. Subbase: A layer under the resilient layer of the protective surfacing but over the subgrade; may be rigid, as in concrete or bituminous, or aggregate.

F. Subgrade: The surface of the ground on which the protective surfacing is installed.

1.04 SUBMITTALS

A. See Section 01 3000 - Administrative Requirements - Administrative Requirements, for submittal procedures.

B. Product Data: For all manufactured surfacing products, provide manufacturer's product data showing materials of construction, compliance with specified standards, installation procedures, and safety limitations.

C. Samples: For each product for which color must be selected provide color chart showing full range of colors.

D. Samples: Provide actual material samples for EPDM rubber.

1.05 DELIVERY, STORAGE, AND HANDLING

A. Deliver, handle, and store protective surfacing to project site in accordance with manufacturer's recommendations.

B. Store materials in a dry, covered area, elevated above grade.

1.06 WARRANTY

A. See Section 01 7800 - Closeout Submittals - Closeout Submittals, for additional warranty requirements.

B. Provide minimum 5 year warranty for playground surfacing.

PART 2 PRODUCTS

2.01 PERFORMANCE CRITERIA

A. Because the safety of the playground depends on strict compliance with the performance criteria, this information is provided for 's information.
   1. The top elevation of the protective surfacing is intended to be flush with adjacent grades.
   2. Use Zone: The protective surfacing has been designed to provide acceptable impact attenuation as defined in ASTM F1292 for Critical Height of 8 feet. Contractor to verify existing equipment height.

2.02 MATERIALS

A. Poured-In-Place Membrane Surfacing: Weather-resistant wear layer over impact attenuating substrate over rigid subbase.
   1. Wear Layer: Ethylene propylene diene monomer (EPDM) particles adhered with a ultraviolet-stabilized polyurethane binder to produce an even, uniformly colored surface.
   2. Wear Layer Thickness: 1/2" inch, minimum.
   3. Coefficient of Friction, when wet: .56, minimum, when tested in accordance with ASTM D2047.
   4. Wear Layer Color(s): As selected from manufacturer's full range of bright colors.
   5. Impact Attenuating Substrate: 100 percent recycled shredded styrene butadiene rubber (SBR) shreds or granules with 100 percent solids polyurethane binder to form a resilient material; do not use foam rubber.
   6. Resilient Depth: As required to achieve specified Critical Fall Height as defined in ASTM F1292 but not more than depth indicated; maintain top elevation flush with adjacent grades.
   7. Manufacturers:
      a. Pro-Techs Surfacing, LLC - Perma Play. www.pro-techssurfacing.com
      b. Substitutions: See Section 01 6000 - Product Requirements.

PART 3 EXECUTION

3.01 PREPARATION FOR REPLACEMENT OF EXISTING LOOSE FILL SURFACING

A. Remove existing loose fill.

B. Measure the location of all playground elements, including perimeter of existing protective surfacing, access and egress points, hard surfaces, walls, fences, and structures, and planting locations.

C. Stake the layout of the entire Use Zone perimeter before starting any work, based on Contract Documents.
   1. Verify that Use Zone perimeters do not overlap hard surfaces, whether currently installed or not.
   2. Do not proceed until revised drawings have been provided, showing corrected layout.

D. Inside Use Zones remove all obstructions that would extend into the resilient protective surfacing.

E. After subgrade is correct, mark intended depth of surfacing on the base supports of each item of playground equipment using paint or tape in a manner that will be easily verifiable during installation of surfacing.

F. Perform percolation test at the lowest elevation of the subgrade in the areas to be covered by protective surfacing.
   1. Report results to Architect.
   2. If percolation is less than 1 inch in a 3 hour period, do not proceed.

3.02 EXAMINATION

A. Playground equipment installer will perform playground layout prior to installation of footings; verify correctness of layout before starting this work.

B. Verify that playground equipment and site furnishings and irrigation system located within playground area are complete.

C. Verify location of underground utilities and facilities in the playground area. Damage to underground utilities and facilities will be repaired at 's expense.

D. Verify that subgrades are at proper elevations and that smooth grading is complete.

E. Verify that proper depth of surfacing is marked on base supports of playground equipment.

3.03 PREPARATION

A. Correct subgrade irregularities to ensure that required depth of protective surfacing can be installed, and subgrade elevation is in accordance with manufacturer's requirements.

B. Inside Use Zones remove all obstructions that would extend into the resilient protective surfacing.

C. Remove rocks, debris, and other similar items.

3.04 RESILIENT SURFACING LAYER

A. Install in accordance with CPSC Pub. No. 325, ASTM F1487, manufacturer's instructions, and requirements of authorities having jurisdiction (AHJ).

B. Install proper thickness throughout Use Zone(s).

C. Clean and dry surface of subbase.

D. Poured In Place Surfacing:
   1. Mix components mechanically on-site in accordance with manufacturer's directions; do not mix by hand.
   2. Install seamlessly; ensure complete bond to subbase.
   3. Cover footings and foundations and adhere tightly around penetrating elements.
   4. Maintain full thickness of resilient layers within Use Zone; cover or abut containment curbs as indicated on drawings; completely cover tapered transition edges.
   5. Hand trowel exposed surface to smooth, even finish.
   6. Impact Attenuation Layer: Install entire layer in one continuous pour on the same day.
   7. Wear Surface: Bond wear surface to substrate with adhesive. Apply adhesive in small quantities so that wear surface can be applied before adhesive dries.
      a. Install surfacing seamlessly. When wear surface is composed of different color patterns, pour surface continuously and seamlessly.
      b. When seams are required due to color change or field conditions, place adjacent wear surface as soon as possible, before initial pour has cured. Coat edge of initial pour with adhesive and apply wear surface mixture immediately.
      c. Add a minimum of 1/16 inch depth to specified surfacing depth to ensure required impact attenuation performance is met.
      d. Install wear surface to cover foundations and adhere tightly around elements penetrating the surface.

3.05 FIELD QUALITY CONTROL

A. Owner or Owner's representative will inspect playground surfacing after installation to verify that surfacing is of proper type and depth and that playground meets specified design safety and accessibility requirements.

B. Repair or replace rejected work until compliance is achieved.

END OF SECTION

SECTION 32 31 13 – CHAIN LINK FENCE

PART 1 GENERAL

1.1 SUMMARY

A. This Section includes fence framework, fabric, gates, steel posts and channels as shown on the Contract Drawings, complete with accessories.

1.2 REFERENCES

A. Materials and installation shall be in accordance with the latest revisions of the following codes, standards and specifications, except where more stringent requirements have been specified herein:

1. American Society for Testing and Materials (ASTM)

a. A90 Test Method for Weight of Coating on Zinc-Coated (Galvanized) Iron or Steel Articles

b. A121 Specification for Zinc-Coated (Galvanized) Steel Barbed Wire

c. A392 Specification for Zinc-Coated Steel Chain-Link Fence Fabric

d. A428 Test Method for Weight of Coating on Aluminum-Coated Iron or Steel Articles

e. A491 Specification for Aluminum-Coated Steel Chain-Link Fence Fabric

f. A569 Specification for Steel, Sheet and Strip, Carbon (0.15 Maximum Percent). Hot-Rolled, Commercial Quality

g. A585 Specification for Aluminum-Coated Steel Barbed Wire

h. A817 Specification for Metallic-Coated Steel Wire for Chain-Link Fence Fabric

i. A824 Specification for Metallic-Coated Steel Marcelled Tension Wire for Use with Chain-Link Fence

j. B117 Method of Salt Spray (Fog) Testing

k. C94 Ready-Mixed Concrete

l. F567 Standard Practice for Installation of Chain-Link Fence

m. F626 Specification for Fence Fittings

n. F669 Standard Specification for Strength Requirements of Metal Posts and Rails

o. F083 Standard Specification for Pipe, Steel and Hot Dipped Zinc Coated, Welded, for Fence Structures

1.3 SUBMITTALS

A. In addition to those submittals identified in the General Provisions, the following items shall be submitted:

1. Manufacturers certification that all materials furnished are in compliance with the applicable requirements of the referenced standards and this specification.

B. Samples of any material shall be submitted at the Engineers request.

PART 2 PRODUCTS

2.1 MANUFACTURERS

A. The following manufacturers are named to establish a standard of quality necessary for the Project.

1. Allied Tube & Conduit Corp.
2. Anchor Fence, Inc.
3. Page Aluminized Steel Corp.
4. Or equal

2.2 GENERAL

A. Framework: Type I or Type II Steel Pipe.

1. Type I - Schedule 40 steel pipe with 1.8 ounces of zinc coating per square foot of surface area conforming to Standard Specification ASTM F1083; or

2. Type II - pipe manufactured from steel conforming to ASTM A 569 or F 669, cold-formed, high frequency welded and having a minimum yield strength of 50,000 PSI. External surface triple coated with 1.0 ounce +- 0.1 ounce of zinc per square foot, 30 +- 15 micrograms of chromate per square inch and 0.5 +- 0.2 mils of clear, cross linked polyurethane. Internal surface coated, after welding, with a zinc-rich based organic coating having an 87% zinc powder loading capable of providing galvanic protection.

3. Pipe shall be straight, true to section and conform to the following weights:

Pipe Size Outside Diameter	Type I Weight Lbs./Ft.	Type II Weight Lbs./Ft.
1 5/8"	2.27	1.84
2"	2.72	2.28
2 1/2"	3.65	3.12
3"	5.79	4.64
3 1/2"	7.58	5.71
4"	9.11	6.56

4. Channel shall be Unistrut, model P1001A, 1 ⅝" x 3 ¼", 12 ga. galvanized steel channel, or approved equal.

B. Fittings:

1. Pressed steel or cast iron, galvanized with a minimum of 1.2 ounces of zinc per square foot of surface area, or cast aluminum alloy, all conforming to ASTM F 626.

2.3 CONCRETE MIX

A. ASTM C 94 Portland Cement concrete with maximum 3/4" aggregate having a minimum compressive strength of 2,500 PSI at 28 days.

2.4 MATERIALS AND CONSTRUCTION

A. Fence Posts

1. Fence posts shall be sized as follows:

Fabric Height	Line Post O.D.		Terminal Post O.D.	
	Type I	Type II	Type I	Type II
Under 6'	2"	2"	3"	2 1/2"
6' to 9'	2 1/2"	2 1/2"	3"	3"
9' to 12'	3"	3"	4"	3 1/2"

B. Gate and Electric Equipment Mounting Posts

1. Gate and electric equipment mounting posts shall be sized as follows:

Single Gate Width	Double Gate Width	Post O.D. Type I	Post O.D. Type II
Up to 6'	Up to 12’	4"	3”
7' to 12'	13' to 25'	4"	3.5"
13' to 18'	25' to 36'	6 5/8"	---
Electrical Equipment Mounting Span			
Up to 5'		4"	4"

C. Rails and Braces

1. Rails and braces shall be 1 5/8" O.D., Type I or Type II.

D. Fabric

1. Fabric shall be black vinyl-coated steel wire, 9 gage, woven in a 2-inch diamond mesh with top knuckled selvage twisted and barbed and bottom selvage knuckled. Fence heights up to 12 feet shall be one-piece widths.

E. Gates

1. Gates shall have frame assembly of 2 inches O.D., Type I or Type II pipe with welded joints. Weld areas repaired with zinc-rich coating applied per manufacturer's directions. Fabric shall match fence. Gate accessories, hinges, latches, center stops, keepers and necessary hardware shall be of quality required for industrial and commercial application. Latches shall permit padlocking of gate.

F. Channels

1. Channel shall be Unistrut, model P1001A, 1 ⅝” x 3 ¼”, 12 ga. galvanized steel channel, or approved equal.

G. Fittings

1. Post caps shall be pressed steel, cast iron or cast aluminum alloy designed to fit snugly over posts to exclude moisture. Supply cone type caps for terminal posts and loop type for line posts.

2. Rail and brace ends shall be pressed steel, cast iron or cast aluminum alloy, cup-shaped to receive rail and brace ends.

3. Top rail sleeves shall be tubular steel, 0.051 thickness by 7 inches long, expansion type.

4. Tension bars shall be steel strip, 5/8 inch wide by 3/16 inch thick.

5. Tension bands shall be pressed steel, 14 gage thickness by 2 inch wide.

6. Brace bands shall be pressed steel, 12 gage thickness by 2 inch wide.

7. Truss rods shall be steel rod, 3/8 inch diameter merchant quality with turnbuckle.

8. Channel mounting bolts shall be hot dip galvanized meeting ASTM F 1554, Grade 36, with nuts meeting ASTM A563 and flat washers.

G. Tension Wire

1. Tension wire shall be marcelled 7 gage steel wire with minimum coating of 0.80 ounces of zinc or 0.40 ounces of aluminum per square foot of wire surface and conforming to ASTM A 824.

H. Tie Wires

1. Tie wires shall be aluminum 9 gage, alloy 1100-H4, A58 self locking fabric bands or equal.

I. Hog Rings

1. Hog rings shall be steel wire, 11 gage with a minimum zinc coating of 0.80 ounces per square foot of wire surface.

PART 3 EXECUTION

3.1 INSTALLATION

A. Fence installation shall conform to requirements of ASTM F 567.

B. Provide fence heights as shown on Contract Drawings.

C. Space line posts at intervals not exceeding ten feet.

D. Set terminal, gate and line posts plumb in concrete footings as shown on Contract Drawings. Top of footing shall be 2 inches above grade and sloped to direct water away from posts.

E. Brace gate and terminal posts back to adjacent line posts with horizontal brace rails and diagonal truss rods.

F. Install top rail through line post loop caps connecting sections with sleeves to form a continuous rail between terminal posts. Fasten top rail to terminal posts.

G. Stretch bottom tension wire between terminal posts 6" above grade and fasten to outside of line posts with tie wires.

H. Pull fabric taut to provide a smooth uniform appearance, free from sag, with bottom selvage 2" above grade. Fasten to terminal posts with tension bars threaded through mesh and secured with tension bands at maximum 18" intervals. Tie to line posts and top rails with tie wires spaced at maximum 14" on posts and 24" on rails. Attach to bottom tension wire with hog rings at maximum 24" intervals.

I. Install gates plumb, level and secure for full opening without interference. Anchor center stops and keepers in concrete. Adjust and lubricate hardware for smooth operation.

J. Install nuts for fittings, bands and hardware bolts on inside of fence. Peen ends of bolts or score threads to prevent removal.

END OF SECTION 32 31 13

SECTION 32 92 00 - TURFS AND GRASSES

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

A. Drawings, Division 01 General Requirements and Section 01 50 00 Temporary Facilities and Controls apply to this Section.

1.2 SUMMARY

A. This Section includes the following:

1. Seeding.
2. Meadow grasses and wildflowers.

B. Related Sections include Section 01 50 00 Temporary Facilities and Controls for Temporary Seeding.

1.3 DEFINITIONS

A. Finish Grade: Elevation of finished surface of planting soil.

B. Planting Soil: Native or imported topsoil, manufactured topsoil, or surface soil modified to become topsoil; mixed with soil amendments.

C. Subgrade: Surface or elevation of subsoil remaining after completing excavation, or top surface of a fill or backfill immediately beneath planting soil.

1.4 SUBMITTALS

A. Certification of Grass Seed: From seed vendor for each grass-seed monostand or mixture stating the botanical and common name and percentage by weight of each species and variety, and percentage of purity, germination, and weed seed. Include the year of production and date of packaging.

B. Product Certificates: For soil amendments and fertilizers, signed by product manufacturer.

C. Qualification Data: For landscape Installer.

D. Planting Schedule: Indicating anticipated planting dates for each type of planting.

1.5 QUALITY ASSURANCE

A. Installer Qualifications: A qualified landscape installer whose work has resulted in successful lawn and meadow establishment.

1. Installer's Field Supervision: Require Installer to maintain an experienced full-time supervisor on Project site when planting is in progress.

B. Topsoil Analysis: Furnish soil analysis by a qualified soil-testing laboratory stating percentages of organic matter; gradation of sand, silt, and clay content; deleterious material; pH; and mineral and plant-nutrient content of topsoil.

1. Report suitability of topsoil for lawn growth. State recommended quantities of nitrogen, phosphorus, and potash nutrients and soil amendments to be added to produce a satisfactory topsoil.

C. Pre-installation Conference: Conduct pre-installation conference at the Site per Division 01 General Requirements.

1.6 DELIVERY, STORAGE, AND HANDLING

A. Seed: Deliver seed in original sealed, labeled, and undamaged containers.

1.7 SCHEDULING

A. Planting Restrictions: Plant during one of the following periods. Coordinate planting periods with maintenance periods to provide required maintenance from date of Substantial Completion.

1. Planting: April 1 to September 15 or as approved by Engineer.

B. Weather Limitations: Proceed with planting only when existing and forecasted weather conditions permit.

1.8 LAWN MAINTENANCE

A. Begin maintenance immediately after each area is planted and continue until acceptable lawn is established, but for not less than the following periods:

1. Seeded Lawns: 60 days from date of Substantial Completion.

a. When full maintenance period has not elapsed before end of planting season, or if lawn is not fully established, continue maintenance during next planting season.

B. Maintain and establish lawn by watering, fertilizing, weeding, mowing, trimming, replanting, and other operations. Roll, regrade, and replant bare or eroded areas and remulch to produce a uniformly smooth lawn.

1. In areas where mulch has been disturbed by wind or maintenance operations, add new mulch.

C. Watering: Provide and maintain temporary piping, hoses, and lawn-watering equipment to convey water from sources and to keep lawn uniformly moist to a depth of 4 inches (100 mm).

1. Water lawn at a minimum rate of 1 inch (25 mm) per week.

D. Mow lawn as soon as top growth is tall enough to cut. Repeat mowing to maintain specified height without cutting more than 40 percent of grass height. Remove no more than 40 percent of grass-leaf growth in initial or subsequent mowings. Do not delay mowing until grass blades bend over and become matted. Do not mow when grass is wet. Schedule initial and subsequent mowings to maintain the following grass height:
   1. Mow grass 1 to 2 inches (25 to 50 mm) high.

E. Lawn Post-fertilization: Apply fertilizer after initial mowing and when grass is dry.

   1. Use fertilizer that will provide actual nitrogen of at least 1 lb/1000 sq. ft. (0.45 kg/92.9 sq. m) to lawn area.

1.9 MEADOW MAINTENANCE

A. Begin maintenance immediately after each area is planted and continue until acceptable meadow is established, but for not less than 40 days from date of Substantial Completion.

B. Maintain and establish meadow by watering, weeding, mowing, trimming, replanting, and other operations. Roll, regrade, and replant bare or eroded areas and remulch.

C. Watering: Provide lawn-watering equipment to convey water from sources and to keep meadow uniformly moist.

   1. Schedule watering to prevent wilting, puddling, erosion, and displacement of seed or mulch.
   2. Water meadow at a minimum rate of 1/2 inch (13 mm) per week for 6 weeks after planting.

PART 2 - PRODUCTS

2.1 SEED

A. Seed Species:

   1. Seed Mix #1 (Lawn Areas)
      a. Provide seed mix at a rate of 100 pounds per acre containing the following mixture:
         1) Kentucky Bluegrass (20%).
         2) Creeping Red Fescue (40%).
         3) Perennial Ryegrass (20%).
         4) Annual Ryegrass (20%).
   2. Seed Mix #2 (Meadow Areas)
      a. Provide Showy Northeast Native Wildflower & Grass Mix (ERNMX-153) at a rate of 20 pounds per acre as provided by Ernst Conservation Sees, Inc. or approved equal.

2.2 TOPSOIL

A. Topsoil: ASTM D 5268, pH range of 5.5 to 7, a minimum of 4 percent organic material content; free of stones 1 inch (25 mm) or larger in any dimension and other extraneous materials harmful to plant growth.

1. Topsoil Source: Reuse surface soil stockpiled on-site. Verify suitability of stockpiled surface soil to produce topsoil. Clean surface soil of roots, plants, sod, stones, clay lumps, and other extraneous materials harmful to plant growth.

a. Supplement with imported or manufactured topsoil from off-site sources when quantities are insufficient. Obtain topsoil displaced from naturally well-drained construction or mining sites where topsoil occurs at least 4 inches (100 mm) deep; do not obtain from agricultural land, bogs or marshes.

2.3 INORGANIC SOIL AMENDMENTS

A. Lime: ASTM C 602, agricultural limestone containing a minimum 80 percent calcium carbonate equivalent and as follows:

1. Class: Class T, with a minimum 99 percent passing through No. 8 (2.36-mm) sieve and a minimum 75 percent passing through No. 60 (0.25-mm) sieve.

B. Sulfur: Granular, biodegradable, containing a minimum of 90 percent sulfur, with a minimum 99 percent passing through No. 6 (3.35-mm) sieve and a maximum 10 percent passing through No. 40 (0.425-mm) sieve.

C. Aluminum Sulfate: Commercial grade, unadulterated.

D. Perlite: Horticultural perlite, soil amendment grade.

E. Sand: Clean, washed, natural or manufactured, free of toxic materials.

2.4 ORGANIC SOIL AMENDMENTS

A. Compost: Well-composted, stable, and weed-free organic matter, pH range of 5.5 to 8; moisture content 35 to 55 percent by weight; 100 percent passing through [3/4-inch (19-mm)] sieve; soluble salt content of 5 to 10 decisiemens/m; not exceeding 0.5 percent inert contaminants and free of substances toxic to plantings; and as follows:

1. Organic Matter Content: 50 to 60 percent of dry weight.

B. Peat: Sphagnum peat moss, partially decomposed, finely divided or granular texture, with a pH range of 3.4 to 4.8.

C. Manure: Well-rotted, unleached, stable or cattle manure containing not more than 25 percent by volume of straw, sawdust, or other bedding materials; free of toxic substances, stones, sticks, soil, weed seed, and material harmful to plant growth.

2.5 PLANTING ACCESSORIES

A. Selective Herbicides: EPA registered and approved, of type recommended by manufacturer for application.

2.6 FERTILIZER

A. Bonemeal: Commercial, raw or steamed, finely ground; a minimum of 4 percent nitrogen and 20 percent phosphoric acid.

B. Superphosphate: Commercial, phosphate mixture, soluble; a minimum of 20 percent available phosphoric acid.

C. Commercial Fertilizer: Commercial-grade complete fertilizer of neutral character, consisting of fast- and slow-release nitrogen, 50 percent derived from natural organic sources of urea formaldehyde, phosphorous, and potassium in the following composition:
   1. Composition: Nitrogen, phosphorous, and potassium in amounts recommended in soil reports from a qualified soil-testing agency.

D. Slow-Release Fertilizer: Granular or pelleted fertilizer consisting of 50 percent water-insoluble nitrogen, phosphorus, and potassium in the following composition:
   1. Composition: Nitrogen, phosphorous, and potassium in amounts recommended in soil reports from a qualified soil-testing agency.

2.7 MULCHES

A. Straw Mulch: Provide air-dry, clean, mildew- and seed-free, salt hay or threshed straw of wheat, rye, oats, or barley.

2.8 EROSION-CONTROL MATERIALS

A. Erosion-Control Blankets: per Section 01 50 00 Temporary Facilities and Controls.

2.9 PLANTING SOIL MIX

A. Planting Soil Mix: Mix topsoil with soil amendments and fertilizers recommended by the qualified soil testing laboratory.

PART 3 - EXECUTION

3.1 EXAMINATION

A. Examine areas to receive lawns and grass for compliance with requirements and other conditions affecting performance. Proceed with installation only after unsatisfactory conditions have been corrected.

3.2 PREPARATION

A. Protect structures, utilities, sidewalks, pavements, and other facilities, trees, shrubs, and plantings from damage caused by planting operations.

1. Protect adjacent and adjoining areas from hydroseeding overspray.

B. Provide erosion-control measures to prevent erosion or displacement of soils and discharge of soil-bearing water runoff or airborne dust to adjacent properties and walkways.

3.3 LAWN PREPARATION

A. Limit lawn subgrade preparation to areas to be planted.

B. Newly Graded Subgrades: Loosen subgrade to a minimum depth of 6 inches (150 mm). Remove stones larger than 1 inch (25 mm) in any dimension and sticks, roots, rubbish, and other extraneous matter and legally dispose of them off Owner's property.

1. Thoroughly blend planting soil mix off-site before spreading or spread topsoil, apply soil amendments and fertilizer on surface, and thoroughly blend planting soil mix.

a. Delay mixing fertilizer with planting soil if planting will not proceed within a few days.

2. Spread planting soil mix to a depth of 4 inches but not less than required to meet finish grades after light rolling and natural settlement. Do not spread if planting soil or subgrade is frozen, muddy, or excessively wet.

C. Finish Grading: Grade planting areas to a smooth, uniform surface plane with loose, uniformly fine texture. Grade to within plus or minus 1/2 inch (13 mm) of finish elevation. Roll and rake, remove ridges, and fill depressions to meet finish grades. Limit fine grading to areas that can be planted in the immediate future.

D. Moisten prepared lawn areas before planting if soil is dry. Water thoroughly and allow surface to dry before planting. Do not create muddy soil.

E. Restore areas if eroded or otherwise disturbed after finish grading and before planting.

3.4 SEEDING

A. Sow seed with spreader or seeding machine. Do not broadcast or drop seed when wind velocity exceeds 5 mph (8 km/h). Evenly distribute seed by sowing equal quantities in two directions at right angles to each other.

1. Do not use wet seed or seed that is moldy or otherwise damaged.

B. Sow seed at the rate of 3 to 4 lb/1000 sq. ft. (1.4 to 1.8 kg/92.9 sq. m).

C. Rake seed lightly into top 1/8 inch (3 mm) of topsoil, roll lightly, and water with fine spray.

D. Protect seeded areas with slopes by spreading straw mulch. Spread uniformly at a minimum rate of 2 tons/acre (42 kg/92.9 sq. m) to form a continuous blanket 1-1/2 inches (38 mm) in loose depth over seeded areas. Spread by hand, blower, or other suitable equipment.

3.5 HYDROSEEDING

A. Hydroseeding: Mix specified seed, fertilizer, and fiber mulch in water, using equipment specifically designed for hydroseed application. Continue mixing until uniformly blended into homogeneous slurry suitable for hydraulic application.

1. Mix slurry with nonasphaltic tackifier.
2. Apply slurry uniformly to all areas to be seeded in a one-step process. Apply mulch at a minimum rate of 1500-lb/acre (15.3-kg/92.9 sq. m) dry weight but not less than the rate required to obtain specified seed-sowing rate.

3.6 SATISFACTORY LAWNS

A. Satisfactory Seeded Lawn: At end of maintenance period, a healthy, uniform, close stand of grass has been established, free of weeds and surface irregularities, with coverage exceeding 90 percent over any 10 sq. ft. (0.92 sq. m) and bare spots not exceeding 5 by 5 inches (125 by 125 mm).

B. Reestablish lawns that do not comply with requirements and continue maintenance until lawns are satisfactory.

3.7 MEADOW

A. Sow seed with spreader or seeding machine. Do not broadcast or drop seed when wind velocity exceeds 5 mph (8 km/h). Evenly distribute seed by sowing equal quantities in two directions at right angles to each other.

1. Do not use wet seed or seed that is moldy or otherwise damaged.

B. Sow seed at the net rate as recommended by manufacturer.

C. Brush seed into top 1/16 inch (1.6 mm) of topsoil, roll lightly, and water with fine spray.

D. Water newly planted areas and keep moist until meadow is established.

3.8 CLEANUP AND PROTECTION

A. Promptly remove soil and debris created by lawn work from paved areas. Clean wheels of vehicles before leaving site to avoid tracking soil onto roads, walks, or other paved areas.

B. Erect barricades and warning signs as required to protect newly planted areas from traffic. Maintain barricades throughout maintenance period and remove after lawn is established.

C. Remove erosion-control measures after grass establishment period.

END OF SECTION 32 92 00

SECTION 33 41 00 - STORM UTILITY DRAIN PIPING

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

A. Drawings, Division 01 General Requirements, Section 31 20 00 Earth Moving, Section 31 23 33 Trenching and Backfilling, and Section 31 50 00 Excavation Support and Protection.

1.2 SUMMARY

A. This Section includes storm drainage as shown on the project drawings.

1.3 DEFINITIONS

A. HDPE: High-Density Polyethylene plastic.

B. PVC: Polyvinyl chloride plastic.

1.4 SUBMITTALS

A. Shop Drawings: Include plans, elevations, details, and attachments for the following:

1. Precast concrete inlets, catch basins, and other structures, including frames, covers, and grates.

2. Drainage Piping.

1.5 DELIVERY, STORAGE, AND HANDLING

A. Provide in accordance with Division 01 Requirements.

B. Do not store plastic structures, pipe, and fittings in direct sunlight.

C. Protect pipe, pipe fittings, and seals from dirt and damage.

D. Handle precast concrete inlets and other structures according to manufacturer's written rigging instructions.

1.6 PROJECT CONDITIONS

A. Site Information: Perform site survey, research public utility records, and verify existing utility locations.

B. Locate existing structures and piping to be closed and abandoned.

PART 2 - PRODUCTS

2.1 PIPING MATERIALS

A. Refer to Part 3 "Piping Applications" Article for applications of pipe and fitting materials.

2.2 PIPES AND FITTINGS

A. Corrugated PE Drainage Tubing and Fittings: AASHTO M 252, Type S, with smooth waterway for coupling joints.

1. Soiltight Couplings: AASHTO M 252, corrugated, matching tube and fittings to form soiltight joints.

B. Corrugated PE Pipe and Fittings: AASHTO M 294, Type S, with smooth waterway for coupling joints.

1. Soiltight Couplings: AASHTO M 294, corrugated, matching pipe and fittings to form soiltight joints.

C. PVC Type PSM Solid and Perforated Piping:

1. Pipe: ASTM D 3034, SDR 35, PVC Type PSM sewer pipe with bell-and-spigot ends for gasketed joints.
2. Fittings: ASTM D 3034, PVC with bell ends
3. Gaskets: ASTM F 477, elastomeric seals
4. Perforations: ASTM F758 / AASHTO M278 Hole Pattern

2.3 STORMWATER INLETS

A. Yard Drain Inlets: Made with horizontal gutter opening, of materials and dimensions according to the project drawings. Include heavy-duty frames and grates.

B. Catch Basins: Made with vertical curb and horizontal gutter openings, of materials and dimensions according to project drawings. Include heavy-duty frames and grates.

C. Drain Inlets: Made with horizontal gutter opening, of materials and dimensions according to the project drawings. Include heavy-duty frames and grates.

D. Frames and Grates: Dimensions, opening pattern, free area, and other attributes as indicated on the project drawings.

1. Material: ASTM A 536, Grade 60-40-18 minimum, ductile-iron casting.

2.4 CONCRETE

A. Portland Cement Design Mix: 4000 psi (27.6 MPa) minimum, with 0.45 maximum water-cementitious ratio.

1. Reinforcement Fabric: ASTM A 185, steel, welded wire fabric, plain.

2. Reinforcement Bars: ASTM A 615/A 615M, Grade 60, (Grade 420) deformed steel.

PART 3 - EXECUTION

3.1 EARTHWORK

A. Excavating, trenching, and backfilling are specified in Section 31 20 00 Earth Moving and Section 31 23 33 Trenching and Backfilling.

3.2 PIPING APPLICATIONS

A. General: Include watertight, silttight, or soiltight joints.

B. Refer to Part 2 of this Section for detailed specifications for pipe and fitting products listed below. Use pipe, fittings, and joining methods according to applications indicated.

C. Gravity-Flow Piping: Use the following:

1. NPS 4 and NPS 6 (DN100 and DN150): Corrugated PE drainage tubing and fittings, silttight couplings, and coupled joints.
2. NPS 8 to NPS 15 (DN200 to DN375): Corrugated PE drainage tubing and fittings, soiltight couplings, and coupled joints in NPS 8 and NPS 10 (DN200 and DN250). Use corrugated PE pipe and fittings, soiltight couplings, and coupled joints in NPS 12 and NPS 15 (DN300 and DN375).

3.3 SPECIAL PIPE COUPLING AND FITTING APPLICATIONS

A. Special Pipe Couplings: Use where required to join piping and no other appropriate method is specified. Do not use instead of specified joining methods.

1. Use the following pipe couplings for nonpressure applications:

a. Sleeve type to join piping, of same size, or with small difference in OD.
b. Increaser/reducer-pattern, sleeve type to join piping of different sizes.

3.4 INSTALLATION, GENERAL

A. General Locations and Arrangements: Drawing plans and details indicate general location and arrangement of underground storm drainage piping. Location and arrangement of piping layout take design considerations into account. Install piping as indicated, to extent practical.

B. Install piping beginning at low point, true to grades and alignment indicated with unbroken continuity of invert. Place bell ends of piping facing upstream. Install gaskets, seals, sleeves, and couplings according to manufacturer's written instructions for use of lubricants, cements, and other installation requirements.

C. Use manholes for changes in direction, unless fittings are indicated. Use fittings for branch connections, unless direct tap into existing sewer is indicated.

D. Use proper size increasers, reducers, and couplings where different sizes or materials of pipes and fittings are connected. Reducing size of piping in direction of flow is prohibited.

E. Extend storm drainage piping and connect to building's storm drains, of sizes and in locations indicated. Terminate piping as indicated.

F. PE Pipe and Fittings: As follows:
1. Join Pipe, tubing, and fittings with couplings for soiltight joints according to manufacturer’s written instructions.
2. Install according to ASTM D 2321 and manufacturer’s written instructions.
3. Install corrugated piping according to the Corrugated Polyethylene Pipe Association’s “Recommended Installation Practices for Corrugated Polyethylene Pipe and Fittings”.

G. System Piping Joints: Make joints using system manufacturer’s couplings, unless otherwise indicated.

H. Join piping made of different materials or dimensions with couplings made for this application. Use couplings that are compatible with and that fit both systems’ materials and dimensions.

3.5 STORMWATER INLET INSTALLATION

A. Construct inlets to sizes and shapes indicated.

B. Set frames and grates to elevations indicated.

3.6 FIELD QUALITY CONTROL

A. Clear interior of piping and structures of dirt and superfluous material as work progresses.

1. Place plug in end of incomplete piping at end of day and when work stops.
2. Flush piping between inlets and other structures to remove collected debris, if required by authorities having jurisdiction.

B. Inspect interior of piping to determine whether line displacement or other damage has occurred. Inspect after approximately 24 inches (600 mm) of backfill is in place, and again at completion of Project.

1. Submit separate reports for each system inspection.
2. Defects requiring correction include the following:

    a. Alignment: Less than full diameter of inside of pipe is visible between structures.
    b. Deflection: Flexible piping with deflection that prevents passage of ball or cylinder of size not less than 92.5 percent of piping diameter.
    c. Crushed, broken, cracked, or otherwise damaged piping.
    d. Infiltration: Water leakage into piping.
    e. Exfiltration: Water leakage from or around piping.

3. Replace defective piping using new materials, and repeat inspections until defects are within allowances specified.
4. Reinspect and repeat procedure until results are satisfactory.

C. Test new piping systems, and parts of existing systems that have been altered, extended, or repaired, for leaks and defects.

1. Do not enclose, cover, or put into service before inspection and approval.
2. Test completed piping systems according to authorities having jurisdiction.
3. Schedule tests and inspections by authorities having jurisdiction with at least 24 hours' advance notice.
4. Submit separate reports for each test.

END OF SECTION 33 41 00