

SECTION 01 1000
SUMMARY AND CONTRACTS

PART 1 GENERAL

1.01 PROJECT

- A. Project Name: Yonkers YPS Martin Luther King School
- B. Owner's Name: Yonkers Public Schools.
- C. Engineer's Name: Eisenbach & Ruhnke Engineering, P.C.

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 the Drawings.
- C. The Project consists of the replacement of the following work:

1. GENERAL CONSTRUCTION

A. MAIN BUILDING

- 1. The work includes flooring, ceilings, painting, bathroom accessories, doors, walls, and other work. The work includes all asbestos abatement related to the flooring and the HVAC work.
- 2. The steel work and lintels for the new Roof top units is part of this contract.
- 3. The work will be coordinated with all other trades.
- 4. Demolition as indicated.

B. MODULAR BUILDING

- 1. No work in the Modular building.

2. HVAC

A. MAIN BUILDING

- 1. Provide new Roof Top Units and related work.
- 2. Provide curbs for new Roof Top Units.
- 3. Provide Air Conditioning Units for all rooms indicated.
- 4. Provide controls for new HVAC equipment and Air Conditioning Units.
- 5. Provide new Exhaust Fans and related work.
- 6. Demolition as indicated.

B. MODULAR BUILDING

- 1. No work in the Modular Building.

3. ELECTRICAL

A. MAIN BUILDING

- 1. Work related to HVAC work.
- 2. Interior and Exterior lighting and associated work.
- 3. Work related to the addition of power panels and power to new Air Conditioning Units, Roof Top Units and Exhaust Fans as indicated.
- 4. Security work.
- 5. Demolition as indicated.

B. MODULAR BUILDING

- 1. Security work.
- 2. Exterior Lighting and associated work.
- 3. The Electrical work for the Modular Building is a separate bid.

4. Demolition as indicated.

4. PLUMBING

A. MAIN BUILDING

1. Provide a new handicapped bathroom and plumbing accessories.
2. Demolition as indicated.

B. MODULAR BUILDING

1. No work in the Modular building

5. ROOFING

A. MAIN BUILDING

1. Replace the roof in its entirety.
2. Asbestos and PCB containing materials associated with Roof work.

B. MODULAR BUILDING

1. Replace the roof in its entirety.
2. Asbestos and PCB containing materials associated with Roof work.
3. The roof of the modular building is to be replaced as a separate bid.

1.03 DESCRIPTION OF ALTERATIONS WORK

- A. Scope defined above and indicated on drawings.
- B. The project is a renovation to the building.
- C. The schedule is to be coordinated with the YPS.

1.04 OWNER OCCUPANCY

- A. Owner intends to continue to occupy adjacent portions of the existing building during the entire construction period.
- B. Cooperate with Owner to minimize conflict and to facilitate Owner's operations.
- C. Schedule the Work to accommodate Owner occupancy.

1.05 CONTRACTOR USE OF SITE AND PREMISES

- A. Construction Operations: Limited to areas agreed upon with the Owner.
- B. Arrange use of site and premises to allow:
 1. Owner occupancy.
 2. Work by Others.
 3. Work by Owner.
- 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 a permit.
- D. Existing building spaces may not be used for storage unless authorized by Owner.
- E. Storage is limited on the site. Contractors should assume that storage will be in containers they provide.
- F. Contractors are not allowed to use any materials or equipment belonging to the District, including, but not limited to, ladders, carts, brooms, garbage cans, etc. Use of a District owned ladder will result in the worker being permanently removed from the site.
- G. Contractors are responsible for their own clean-up. Rooms are to be left as clean as found. If the District has to arrange for cleaning, the contractors will be back charged. During the summer, contractors can work as many hours as desired.
- H. Utility Outages and Shutdown:
 1. Limit disruption of utility services to the hours the building is unoccupied.
 2. Do not disrupt or shut down life safety systems, including but not limited to fire sprinklers and fire alarm system, without 7 days notice to Owner and authorities having jurisdiction.

3. Prevent accidental disruption of utility services to other facilities.

1.06 SECURITY

- A. All employees working on projects during the day shall be required to get security clearances from the district. All contractors shall be issued and wear a Photo Id badge at all times.

1.07 UTILITY OUTAGES AND SHUTDOWN

- A. Limit disruption of utility services to hours the building is unoccupied. Coordinate with Engineer and Construction Manager prior to shutdowns.
- B. Do not disrupt or shut down life safety systems, including but not limited to fire sprinklers and fire alarm system, without 7 days notice to Owner and authorities having jurisdiction.
- C. Prevent accidental disruption of utility services to other facilities.

1.08 WORK SEQUENCE

- A. Coordinate construction schedule and operations with Engineer and District.

1.09 EQUIVALENCY CLAUSE

- A. Where, in these specifications, certain kinds, types, brands, or manufacturers of material are named, they shall be regarded as the standard of quality. Where two or more are named, the Contractor may select one of those items, subject to meeting the requirements of the specified product. If the contractor desires to use any kind, type, brand, or manufacture of material other than those named in the specification, he shall indicate in writing, and prior to award of the contract, what kind, type, brand, or manufacture is included in the base bid for the specified items. Submit information describing in specific detail, wherein it differs from the quality and performance required by the base specifications, and such other information as may be required by the Owner. Contractor shall refer to Section 01 6000.

PART 2 PRODUCTS - NOT USED

PART 3 EXECUTION - NOT USED

END OF SECTION

SECTION 01 2100
ALLOWANCES

PART 1 GENERAL

1.01 SECTION INCLUDES

- A. Contingency allowance.
- B. Payment and modification procedures relating to allowances.

1.02 RELATED REQUIREMENTS

- A. Section 01 2000 - Price and Payment Procedures: Additional payment and modification procedures.

1.03 CONTINGENCY ALLOWANCE

- A. Contractor's costs for products, delivery, installation, labor, insurance, payroll, taxes, bonding, equipment rental, overhead and profit will be included in Change Orders authorizing expenditure of funds from this Contingency Allowance.
- B. Funds will be drawn from the Contingency Allowance only by Change Order.
- C. At closeout of Contract, funds remaining in Contingency Allowance will be credited to Owner by Change Order.

1.04 ALLOWANCES SCHEDULE

- A. AS SHOWN ON THE BID SCHEDULE OF PRICES
 - 1. Include an allowance for use according to the Owner' instructions.

PART 2 PRODUCTS - NOT USED

PART 3 EXECUTION - NOT USED

END OF SECTION

SECTION 01 2300

ALTERNATES

PART 1 - GENERAL

1.01 DESCRIPTION

- A. This Section identifies each Alternate by letter and number, and describes the basic changes to be incorporated into the Work, only when that Alternate is made part of the Work by specific provision in the Owner-Contractor Agreement.
- B. Reference sections of Specifications stipulate pertinent requirements for products and methods to achieve the Work stipulated under each Alternate.
- C. Coordinate pertinent related work and modify surrounding work as required to properly integrate the Work under each selected Alternate, and to provide the complete construction required by Contract Documents.

1.02 ALTERNATES

A. GENERAL CONTRACTOR

1. ALTERNATE GC1

- a. This alternate is for the abatement contractor remove the asbestos containing insulation on the exhaust hood ductwork, reinsulate the ductwork, and remove and replace the ceiling in the Kitchen.##
- b. This is a lump sum add alternate.

B. ELECTRICAL CONTRACTOR

1. ALTERNTE EC1

- a. This alternate is to remove all lights and other electrical devices mounted to the ceiling. The lights are to be replaced with the new lights indicated. All other electrical devices mounted to the ceiling are to be reinstalled in their previous location.
- b. This is a lump sum add alternate.

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SECTION 01 3000
ADMINISTRATIVE REQUIREMENTS

PART 1 GENERAL

1.01 SECTION INCLUDES

- A. Electronic document submittal service.
- B. Preconstruction meeting.
- C. Progress meetings.
- D. Construction progress schedule.
- E. Submittals for review, information, and project closeout.
- F. Number of copies of submittals.
- G. Submittal procedures.

1.02 RELATED REQUIREMENTS

- A. Section 01 1000 - Summary of Contracts
- B. Section 01 7000 - Execution and Closeout Requirements: Additional coordination requirements.
- C. Section 01 7800 - Closeout Submittals: Project record documents.

1.03 PROJECT COORDINATION

- A. Project Coordinator: Eisenbach & Ruhnke Engineering, P.C.
- B. During construction, coordinate use of site and facilities through the Project Coordinator.
- C. Comply with Project Coordinator's procedures for intra-project communications; submittals, reports and records, schedules, coordination drawings, and recommendations; and resolution of ambiguities and conflicts.
- D. Comply with instructions of the Project Coordinator for use of temporary utilities and construction facilities.
- E. Coordinate field engineering and layout work under instructions of the Project Coordinator.
- F. Make the following types of submittals to Engineer 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. Manufacturer's instructions and field reports.
 - 6. Applications for payment and change order requests.
 - 7. Progress schedules.
 - 8. Coordination drawings.
 - 9. Closeout submittals.

PART 2 PRODUCTS - NOT USED

PART 3 EXECUTION

3.01 ELECTRONIC DOCUMENT SUBMITTAL SERVICE

- A. All documents transmitted for purposes of administration of the contract are to be in electronic (PDF) format and transmitted via an Internet-based submittal service that receives, logs and stores documents, provides electronic stamping and signatures, and notifies addressees via email.
 - 1. Besides submittals for review, information, and closeout, this procedure applies to requests for information (RFIs), progress documentation, contract modification documents (e.g., supplementary instructions, change proposals, change orders), applications for payment, field reports and meeting minutes, and any other document any participant wishes to make part of the project record.
 - 2. Contractor and Engineer are required to use this service.
 - 3. It is Contractor's responsibility to submit documents in PDF format.

4. Subcontractors, suppliers, and Engineer's consultants are to be permitted to use the service at no extra charge.
 5. Users of the service need an email address, Internet access, and PDF review software that includes ability to mark up and apply electronic stamps (such as Adobe Acrobat, www.adobe.com, or Bluebeam PDF Revu, www.bluebeam.com), unless such software capability is provided by the service provider.
 6. Paper document transmittals will not be reviewed; emailed PDF documents will not be reviewed.
 7. All other specified submittal and document transmission procedures apply, except that electronic document requirements to not apply to samples or color selection charts.
- B. Submittal Service: The selected service is:
1. Submittal Exchange (Tel: 1-800-714-0024): www.submittalexchange.com
- C. Project Closeout: Engineer will determine when to terminate the service for the project and is responsible for obtaining archive copies of files for Yonkers Public School District.

3.02 PRECONSTRUCTION MEETING

- A. Eisenbach & Ruhnke Engineering, P.C. will schedule a meeting after Notice of Award.
- B. Attendance Required:
1. Yonkers Public School District.
 2. Engineer.
 3. Contractor.
- C. Agenda:
1. Execution of Yonkers Public School District- Contractor 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. Procedures and processing of field decisions, submittals, substitutions, applications for payments, proposal request, Change Orders, and Contract closeout procedures.
 6. Scheduling.
 7. Owner's requirements and occupancy prior to completion.
 8. Location of Personnel and waste decontamination unit.
 9. Location of dumpsters.
- D. Eisenbach & Ruhnke Engineering, P.C. will record minutes and distribute copies within 5 days after meeting to participants. Contractor shall distribute all entities of the Contractor affected by decisions made.

3.03 SITE MOBILIZATION MEETING

- A. Engineer will schedule a meeting at the Project site prior to Contractor occupancy.
- B. Attendance Required:
1. Contractor.
 2. Yonkers Public School District.
 3. Engineer.
 4. Contractor's Superintendent.
 5. Major Subcontractors.
- C. Agenda:
1. Use of premises by Yonkers Public School District and Contractor.
 2. Yonkers Public School District's requirements and occupancy prior to completion.
 3. Construction facilities and controls provided by Yonkers Public School District.
 4. Temporary utilities provided by Yonkers Public School District.
 5. Survey and building layout.
 6. Security and housekeeping procedures.
 7. Schedules.
 8. Application for payment procedures.
 9. Procedures for testing.

10. Procedures for maintaining record documents.
 11. Requirements for start-up of equipment.
 12. Inspection and acceptance of equipment put into service during construction period.
- D. Eisenbach & Ruhnke Engineering, P.C. will record minutes and distribute copies within 5 days after meeting to participants. Contractor shall distribute all entities of the Contractor affected by decisions made.

3.04 PROGRESS MEETINGS

- A. Schedule and administer meetings throughout progress of the Work at maximum monthly intervals.
- B. Engineer will make arrangements for meetings, prepare agenda with copies for participants, preside at meetings.
- C. Attendance Required: Job superintendent, major Subcontractors and suppliers, Yonkers Public School District, Engineer, 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 Engineer, Yonkers Public School District, participants, and those affected by decisions made.

3.05 CONSTRUCTION PROGRESS SCHEDULE

- A. Within 10 days after date of the Agreement, submit preliminary schedule defining planned operations for the first 60 days of Work, with a general outline for remainder of Work.
- B. If preliminary schedule requires revision after review, submit revised schedule within 10 days.
- C. 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.
- D. Within 10 days after joint review, submit complete schedule.
- E. Submit updated schedule with each Application for Payment.

3.06 SUBMITTALS FOR REVIEW

- A. When the following are specified in individual sections, submit them for review:
1. Product data.
 2. Shop drawings.
 3. Samples for selection.
 4. Samples for verification.
- B. Submit to Engineer for review for the limited purpose of checking for conformance with information given and the design concept expressed in the contract documents.
- C. The Engineer/Architect shall review and approve or take other appropriate action on the Contractor submittals, such as shop drawings, product data, samples and other data, which the Contractor is required to submit, but only for the limited purpose of checking for conformance with the design concept and the information shown in the Construction Documents. This review shall not include review of the accuracy

or completeness of details, such as quantities, dimensions, weights or gauges, fabrication processes, construction means or methods, coordination of the work with other trades or construction safety precautions, all of which are the sole responsibility of the Contractor. The Engineer/Architect's review shall be conducted with reasonable promptness while allowing sufficient time in the Engineer/Architect's judgment to permit adequate review. Review of a specific item shall not indicate that the Engineer/Architect has reviewed the entire assembly of which the item is a component. The Engineer/Architect shall not be responsible for any deviations from the Construction Documents not brought to the attention of the Engineer/Architect, in writing, by the Contractor. The Engineer/Architect shall not be required to review partial submissions or those for which submissions of correlated items have not been received.

- D. Initial Review: Allow 20 working days for initial review of each submittal. Allow additional time if processing must be delayed to permit coordination with subsequent submittals. Engineer/Architect will advise Contractor when a submittal being processed must be delayed for coordination.
- E. Allow 15 working days for processing each re-submittal.
- F. Engineer/Architect will review the original submittal and one (1) re-submittal. Additional reviews will be additional services provided to the Owner and charged accordingly. The Owner will back charge the contractor accordingly.
- G. Deviations: Highlight, encircle, or otherwise identify deviations from the Contract Documents on submittals.
- H. Engineer/Architect will review the original submittal and one (1) re-submittal. Additional reviews will be additional services provided to the Owner and charged accordingly. The Owner will back charge the contractor accordingly.
- I. No extension of the Contract Time will be authorized because of failure to transmit submittals enough in advance of the Work to permit processing.
- J. Marking or comments on shop drawings shall not be construed as relieving the Contractor from compliance with the contract project plans and specifications, nor departure therefrom. The contractor remains responsible for details and accuracy for conforming and correlating all quantities, verifying all dimensions, for selecting fabrication processes, for techniques of assembly and for performing their work satisfactorily and in a safe manner.
- K. Samples will be reviewed only for aesthetic, color, or finish selection.
- L. After review, provide copies and distribute in accordance with SUBMITTAL PROCEDURES article below and for record documents purposes described in Section 01 78 00 - CLOSEOUT SUBMITTALS.

3.07 SUBMITTALS FOR INFORMATION

- A. When the following are specified in individual sections, submit them for information:
 - 1. Design data.
 - 2. Certificates.
 - 3. Test reports.
 - 4. Inspection reports.
 - 5. Manufacturer's instructions.
 - 6. Manufacturer's field reports.
 - 7. Other types indicated.
- B. Submit for Engineer's knowledge as contract administrator or for Yonkers Public School District. No action will be taken.

3.08 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. Other types as indicated.

- B. Submit for Yonkers Public School District's benefit during and after project completion.

3.09 NUMBER OF COPIES OF SUBMITTALS

- A. Documents: Submit one electronic copy in PDF format; an electronically-marked up file will be returned. Create PDFs at native size and right-side up; illegible files will be rejected.
- B. Samples: Submit the number specified in individual specification sections; one of which will be retained by Engineer.
 - 1. After review, produce duplicates.
 - 2. Approved sample will be retained at the project site.
 - 3. Retained samples will not be returned to Contractor unless specifically so stated.

3.10 SUBMITTAL PROCEDURES

- A. Transmit each submittal with approved form.
- B. Shop drawings are the product and the property of the Contractor. The Owner, Owner's Representative, or Architect shall not be responsible for the contractor's construction means, methods or techniques: safety precautions or programs; Acts or admissions; or failure to carry out the work in accordance to the contract documents.
- C. Sequentially number the transmittal form. Revise submittals with original number and a sequential alphabetic suffix.
- D. Identify Project, Contractor, Subcontractor or supplier, pertinent drawing and detail number, and specification section number, as appropriate on each copy.
- E. Apply Contractor's stamp, signed or initialed certifying that review, approval, verification of Products required, field dimensions, adjacent construction Work, and coordination of information is in accordance with the requirements of the Work and Contract Documents.
 - 1. Contractor's submittal of shop drawings certifies that the contractor has reviewed and coordinated this shop drawing and they are in conformance to the plans, specifications, applicable codes and other provisions of the Contract Documents.
- F. Schedule submittals to expedite the Project, and coordinate submission of related items.
- G. For each submittal for review, allow 15 days excluding delivery time to and from the Contractor.
- H. Identify variations from Contract Documents and Product or system limitations that may be detrimental to successful performance of the completed Work.
- I. Provide space for Contractor and Engineer review stamps.
- J. When revised for resubmission, identify all changes made since previous submission.
- K. Distribute reviewed submittals as appropriate. Instruct parties to promptly report any inability to comply with requirements.
- L. Submittals not requested will not be recognized or processed.

3.11 ENGINEER'S/ARCHITECTS ACTION

- A. General: Engineer will not review submittals that do not bear Contractor's approval stamp and will return them without action.
- B. General: Except for submittals for the record and similar purposes, where action and return on submittals is required or requested, the Architect/Engineer will review each submittal, mark with appropriate "Action".
- C. Action Submittals: Engineer/Architect will review each submittal, make marks to indicate corrections or modifications required, and return it. Engineer/Architect will stamp each submittal with an action stamp and will mark stamp appropriately to indicate action taken, as follows:
- D. Final Unrestricted Release: Where the submittals are marked as follows, the work covered by the submittal may proceed provided it complies with the requirements of the contract documents; acceptance of the work will depend upon that compliance.
 - 1. Marking: "No Exceptions Taken"

- E. Final-But-Restricted Release: When the submittals are marked as follows, the work covered by the submittal may proceed provided it complies with both the Engineer's/Architect's notations or corrections on the submittal and with the requirements of the contract documents; acceptance of the work will depend on that compliance.
 - 1. Markings: "Make Correction Noted"
- F. Returned for re-submittal: When the When the submittal is marked as follows, do not proceed with the work covered by the submittal, including purchasing fabrication, delivery or other activity. Revise the submittal or prepare a new submittal in accordance with the Engineer's/Architect's notations stating the reasons for returning the submittal; resubmit the submittal without delay. Repeat if necessary to obtain a different action marking. Do not permit submittals with the following marking to be used at the project site, or elsewhere where work is in progress.
 - 1. Marking: "Revise and Resubmit"
- G. Marking: "Rejected"
- H. Other Action: Where the submittal is returned, marked with the Engineer's/Architect's explanation, for special processing or other Contractor activity, or is primarily for information or record purposes, the submittal will not be marked.

END OF SECTION

SECTION 01 3216
CONSTRUCTION PROGRESS SCHEDULE

PART 1 GENERAL

1.01 SECTION INCLUDES

- A. Preliminary schedule.
- B. Construction progress schedule, bar chart type.

1.02 RELATED SECTIONS

- A. Section 01 1000 - Summary of Contracts: Work sequence.

1.03 REFERENCES

- A. AGC (CPSM) - Construction Planning and Scheduling Manual; Associated General Contractors of America; 2004.

1.04 SUBMITTALS

- A. Within 10 days after date of Agreement, submit preliminary schedule defining planned operations for the first 60 days of Work, with a general outline for remainder of Work.
- B. If preliminary schedule requires revision after review, submit revised schedule within 10 days.
- C. Within 5 days after review of preliminary schedule, submit draft of proposed complete schedule for review.
- D. Within 10 days after joint review, submit complete schedule.
- E. Submit updated schedule with each Application for Payment.
- F. Submit under transmittal letter form specified in Section 01 3000.
- G. The Contractor is hereby notified that payment requisitions will not be processed by the Engineering and Owner's representative nor paid by the Owner until all schedules are reviewed and approved by the Contractor and the Engineer and Owner's Representative.

1.05 QUALITY ASSURANCE

- A. Scheduler: Contractor's personnel or specialist Consultant specializing in CPM scheduling with one year's minimum experience in scheduling construction work of a complexity comparable to this Project and having use of computer facilities capable of delivering a detailed graphic printout within 48 hours of request.
- B. Contractor's Administrative Personnel: 3 years minimum experience in using and monitoring CPM schedules on comparable projects.

1.06 SCHEDULE FORMAT

- A. Listings: In chronological order according to the start date for each activity. Identify each activity with the applicable specification section number.
- B. Submit schedule in electronic PDF format.
- C. Diagram Sheet Size: Maximum 22 x 17 inches or width required.
- D. Scale and Spacing: To allow for notations and revisions.

PART 2 PRODUCTS - NOT USED

PART 3 EXECUTION

3.01 PRELIMINARY SCHEDULE

- A. Prepare preliminary schedule in the form of a horizontal bar chart.

3.02 CONTENT

- A. Show complete sequence of construction by activity, with dates for beginning and completion of each element of construction.
- B. Identify each item by specification section number.

- C. Show accumulated percentage of completion of each item, and total percentage of Work completed, as of the first day of each month.
- D. Provide legend for symbols and abbreviations used.

3.03 BAR CHARTS

- A. Include a separate bar for each major portion of Work or operation.
- B. Identify the first workday of each week.

3.04 REVIEW AND EVALUATION OF SCHEDULE

- A. Participate in joint review and evaluation of schedule with Engineer at each submittal.
- B. Evaluate project status to determine work behind schedule and work ahead of schedule.
- C. After review, revise as necessary as result of review, and resubmit within 10 days.

3.05 UPDATING SCHEDULE

- A. Maintain schedules to record actual start and finish dates of completed activities.
- B. Indicate progress of each activity to date of revision, with projected completion date of each activity.
- C. Annotate diagrams to graphically depict current status of Work.
- D. Identify activities modified since previous submittal, major changes in Work, and other identifiable changes.
- E. Indicate changes required to maintain Date of Substantial Completion.
- F. Submit reports required to support recommended changes.

3.06 DISTRIBUTION OF SCHEDULE

- A. Distribute copies of updated schedules to Contractor's project site file, to Subcontractors, suppliers, Engineer, Yonkers Public School District, and other concerned parties.
- B. Instruct recipients to promptly report, in writing, problems anticipated by projections shown in schedules.

END OF SECTION

SECTION 01 3300
SED SPECIAL REQUIREMENTS

PART 1 - GENERAL

1.01 RELATED DOCUMENTS

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

1.02 SUMMARY

- A. This Section specifies special requirements of State Education Department, including Commissioner's Regulation Part 155.5, 155.7
 - 1. Copies of Commissioner's Regulation Part 155.5, 155.7 are available on the State Education Department's web site.

1.03 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.

1.04 GENERAL SAFETY AND SECURITY DURING CONSTRUCTION

- A. All construction materials shall be stored in a safe and secure manner.
 - 1. Fences around construction supplies or debris shall be maintained.
 - 2. Gates shall always be locked unless a worker is in attendance, to prevent unauthorized entry.
 - 3. 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.
 - 4. Workers shall be required to wear photo-identification badges at all times for identification and security purposes while working at occupied sites.

1.05 SEPARATION OF CONSTRUCTION

- A. Separation of construction areas from occupied spaces. Construction areas that are under the control of a contractor and therefore not occupied by district staff or students shall be separated from occupied areas. Provisions shall be made to prevent the passage of dust and contaminants into occupied parts of the building. Periodic inspection and repairs of the containment barriers must be made to prevent exposure to dust or contaminants. Metal stud and gypsum board (Type X) must be used in exit ways or other areas that require fire rated separation. Heavy duty plastic sheeting may be used only for a vapor, fine dust or air infiltration barrier, and shall not be used to separate occupied spaces from construction areas.
 - 1. A specific stairwell and/or elevator may be assigned for construction worker use during work hours, when approved by the Owner. Workers may not use corridors, stairs or elevators designated for students or school staff.
 - a. Large amounts of debris must be removed by using enclosed chutes or a similar sealed system. There shall be no movement of debris through halls of occupied spaces of the building. No material shall be dropped or thrown outside the walls of the building.
 - b. All occupied parts of the building affected by renovation activity shall be cleaned at the close of each work day. School buildings occupied during a construction project shall maintain required health, safety and educational capabilities at all times that classes are in session.

1.06 FIRE PREVENTION

- A. There is no smoking on school property for fire prevention and New York State Law.
- B. Any holes in floors or walls shall be sealed with a fire-resistant material.
- C. Contractor shall maintain existing fire extinguishers.
- D. Fire alarm and smoke detection systems shall remain in operation at all times.

1.07 CONSTRUCTION DIRECTIVES

- A. Construction Noise. Construction and maintenance operations shall not produce noise in excess of 60 dba in occupied spaces or shall be scheduled for times when the building or affected building spaces are not occupied or acoustical abatement measures shall be taken.

1. Construction Fume Control: Each Contractor shall be responsible for the control of chemical fumes, gases, and other contaminants produced by welding, gasoline or diesel engines, roofing, paving, painting, etc. to ensure they do not enter occupied portions of the building or air intakes.
2. Off-Gassing Control. Each Contractor shall be responsible to ensure that activities and materials which result in "off-gassing" of volatile organic compounds such as glues, paints, furniture, carpeting, wall covering, drapery, etc., are scheduled, cured or ventilated in accordance with manufacturer's recommendations before a space can be occupied.

1.08 ASBESTOS

- A. Asbestos/Lead Test Asbestos Letter. Indication that all school areas to be disturbed during renovation or demolition have been or will be tested for lead and asbestos.
- B. Asbestos Code Rule 56. Large and small asbestos abatement projects as defined by 8 NYCRR 155.5(k) shall not be performed while the building is occupied. Note: It is SED's interpretation that 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 noncombustible construction. The isolated portions (the occupied portion and the portion under construction) of the building must contain separate code compliant exits. The ventilation systems must be physically separated and sealed at the isolation barrier(s).
 1. Asbestos TEM. The asbestos abatement area shall be completely sealed off from the rest of the building and completely cleaned and tested by TEM prior to re-entry by the public.
 2. Lead Abatement Projects. A project that contains materials identified to be disturbed which tests positive for lead shall include that information in the Construction Documents. The Construction Documents must address the availability of lead testing data for the building and include a statement that the OSHA regulations be followed, and that cleanup and testing be done by HUD protocol.

1.09 VENTILATION

- A. The work, as scheduled in the existing building, is to be performed when the facility is unoccupied. In the event that work is required to be performed during times when the building is occupied, all existing ventilation system between areas of work and areas of occupancy shall be disconnected, separated and code complying ventilation requirements be provided the occupied area. Prior to such work commencing the contractor shall submit a plan, for review indicating procedure to be taken. Also see paragraph 1.5 above for additional requirements."

1.10 ELECTRICAL CERTIFICATION:

- A. The Contractor shall obtain UL Certification or Inspection from a Certified Electrical Organization for electrical installation if applicable.

1.11 EXITING

- A. Exiting: Work will be performed when school is not in session or after school hours. All exiting will be clear and usable at all times.
- B. All exits shall be clear and usable at all times.
- C. All modifications or changes to the exiting plan shall be approved by the Architect.

1.12 CONSTRUCTION WORKER IN OCCUPIED AREAS

- A. No worker shall be permitted in areas occupied by students. If access is required by the contractor's personnel, they will be supervised by District personnel. Contractor shall provide 24 hour notice to the Owner when such access will be required.

PART 2 - PRODUCTS (NOT USED)

PART 3 - EXECUTION (NOT USED)

END OF SECTION

SECTION 01 3323

SHOP DRAWINGS, SUBMITTALS, PRODUCT DATA, AND SAMPLES

PART 1 - GENERAL

1.01 DESCRIPTION

- A. Related Requirements Specified Elsewhere
 - 1. Section 01 3000 - Administrative Requirements
 - 2. Section 01 7800 - Closeout Submittals
 - 3. Section 02 8074 - Testing Laboratory Services
- B. Submit, to the Engineer, shop drawings, product data, and samples required by the specification sections.
- C. Attached is Submittal Cover Sheet that is to be filled out and returned to the Engineer (Section 01 3323.01) with each submittal.
- D. Make submittals to allow for checking, re-submittal, and rechecking, if required, without causing delay of the Construction Schedule.

1.02 PRODUCT DATA

- A. Manufacturer's catalog sheets, brochures, diagrams, schedules, performance charts, and other standard descriptive data.
 - 1. Modify product data to delete information that is not applicable to project.
 - 2. Supplement standard to provide additional information applicable to project.
 - 3. Clearly mark each copy to identify applicable materials, products, or models.
 - 4. Show dimensions and clearances required.
 - 5. Show performance characteristics and capacities.
 - 6. Show wiring or piping diagrams and controls.

1.03 CONTRACTOR RESPONSIBILITIES

- A. Review, approve, stamp, and sign shop drawings, submittals, product data, and samples prior to submission to Engineer.
- B. Verify:
 - 1. Field measurements.
 - 2. Field construction criteria.
 - 3. Catalog numbers and other data.
- C. Coordinate each submittal with requirements of Work and Contract Documents.
- D. Contractor's responsibility for errors and omissions in submittals is not relieved by Engineer's review of submittals.
- E. Contractor's responsibility for deviations in submittals from requirements of Contract Documents is not relieved by Engineer's review of submittals unless Engineer gives written acceptance of the specific deviations.
- F. Notify Engineer in writing, at time of submission, of deviations in submittals from requirements of Contract Documents.
- G. After Engineer's review, Contractor is to distribute copies of submittals to parties requiring same for co-ordination of work.
- H. Make required copies for distribution of shop drawings and product data that have been stamped and signed by the Engineer.

1.04 SUBMISSION REQUIREMENTS

- A. Submit number of copies of product data that will be required for distribution plus one copy that will be retained by Engineer.
- B. Accompany submittal with transmittal letter, containing:

1. Date.
 2. Engineer's project title and number.
 3. Contractor's name and address.
 4. Notification of deviations from Contract Documents.
 5. Additional pertinent data.
- C. Submittals shall include:
1. Date and revision dates.
 2. Engineer's project title and number.
 3. The names of:
 - a. Engineer.
 - b. Contractor.
 - c. Subcontractor.
 - d. Supplier.
 - e. Manufacturer.
 4. Identification of product.
 5. Relation to adjacent structure or materials.
 6. Field dimensions clearly identified as such.
 7. Technical Specification section number.
 8. Applicable standards.
 9. A blank space, 4 x 4 inches, for the Engineer's stamp.
 10. Identification of deviations from Contract Documents.
 11. Contractor's stamp, initialed or signed, certifying to review of submittal, verification of field measurements, and compliance with Contract Documents.
 - a. Submittals without Contractor's stamp will be returned without being reviewed.
- D. Shop Drawing Submittal Cover Sheet
1. Attach submittal cover sheet, with all blanks filled in for each shop drawing, product data, and sample.
- E. Prior to Commencement of Work, Owner will:
1. Notify occupants of work areas that may be disrupted by the abatement, of project dates and requirements for relocation.
 2. Submit to the Contractor results of pre-abatement air sampling including location of samples, equipment utilized, and method of analysis.
 3. Document that Owner's employees who will be required to enter the work area during abatement have received training equal to that detailed in Section 01560
 4. Provide to the Contractor information concerning access, shutdown, and protection requirements of certain equipment and systems in the work area.
 5. Submit to the Contractor results of bulk material analysis and air sampling data collected during the course of the abatement. These sample results are for information only. They serve only to monitor Contractor performance during the project and shall not release the Contractor from any responsibility to sample for OSHA compliance.
- F. Prior to Commencement of Work, Contractor shall:
1. NYS Department of Labor: Provide Owner with a copy of the notice to the Asbestos Control Program of the NYS Labor Department's Division of Safety and Health as per Part 56 of Title 12.
 2. Provide a copy of postings.
 3. NYSDEC: Submit to the Owner a copy of the annual "Industrial Waste Hauler Permit" specifically for asbestos-containing materials required pursuant to 6 NYCRR364. Submit certification that the proposed waste disposal site meets the requirements of 40 CFR 61.156 and any pertinent local and state regulations.
 4. Submit documentation satisfactory to the Owner that the Contractor's employees, including Superintendent, Foremen, Supervisors, and other company personnel or agents, who may be exposed to airborne asbestos fibers or who may be responsible for any aspects of abatement

- activities, have received adequate training. A copy of their Asbestos Handling Certificates will be provided. Foremen and Supervisors shall, at a minimum, meet the training requirements of a competent person as defined in 29 CFR 1926.1101. Copies of Asbestos Handling Certificates must be clear and legible, or they will be rejected.
5. With the Owner, inspect the premises wherein all abatement and abatement related activities will occur and prepare a statement signed by both agreeing on building and fixture conditions prior to the commencement of work.
 6. Submit manufacturer's certification that HEPA vacuums, negative pressure ventilation units, and other local exhaust ventilation equipment conform to ANSI Z9.2-79.
 7. Submit a copy of the firm's asbestos handling license.
- G. During abatement activities, Contractor shall:
1. Submit daily job progress reports detailing abatement activities. Include review of progress with respect to previously established milestones and schedules, major problems and actions taken, injury reports, equipment breakdown, and bulk material.
 2. Submit copies of all transport manifests, trip tickets, and disposal receipts for all asbestos waste materials removed from the work area during the abatement process. The documentation must show the entire chain of custody from the time the asbestos is removed.
 3. The Asbestos Project Monitor will maintain work site entry logbooks with information on worker and visitor access. Copies of Asbestos Handler and Supervisor Certificates will be provided to the Owner, Engineer, and Contractor.
 4. Submit logs documenting filter changes on respirators, HEPA vacuums, negative pressure ventilation units, and other engineering controls.
 5. Submit results of air sampling data collected during the abatement including OSHA compliance air monitoring results.
 6. Post in the clean room area of the worker decontamination enclosure a list containing the names, addresses, and telephone numbers of the Contractor, the Owner, the Engineer, the Asbestos Project Monitor, the General Superintendent, the Air Sampling Professional, the testing laboratory, the police department, the fire department, and any other personnel who may be required to assist during abatement activities (e.g., Safety Officer, Building Maintenance Supervisor, and Energy Conservation Officer).

1.05 RESUBMISSION REQUIREMENTS

- A. Product Data and Samples: Submit new data and samples as required for initial submittal.

1.06 CONTRACTOR'S DISTRIBUTION OF SUBMITTALS

- A. Distribute copies of shop drawings and product data that carry the Engineer stamp to:
1. Contractor's file.
 2. Job site file.
 3. Record Document file.
 4. Construction Manager.
 5. Owner
- B. Distribute samples as directed by Engineer.

1.07 ENGINEER

- A. Stamp and initial or sign certifying to review of submittal.
- B. Explanation of Engineer's Stamp:
1. NO EXCEPTION TAKEN: No corrections, no marks.
 2. MAKE CORRECTIONS NOTED: Minor number of corrections; all items can be fabricated at Contractor's risk without further correction; checking is complete, and all corrections are obvious without ambiguity.
 3. REVISE AND RESUBMIT: Minor number of corrections; noted items must not be fabricated without further correction; checking is not complete; details of items noted by checker are to be

further clarified; items not noted to be corrected can be fabricated at Contractor's risk under this stamp.

4. REJECTED: Drawings are rejected as not in accordance with the Contract, too many corrections, or other justifiable reason. The drawing must be corrected and resubmitted. No items are to be fabricated under this stamp.
5. SUBMIT SPECIFIED ITEM: Item is not as specified. Submit named manufacturer.

C. Return submittals to Contractor for distribution.

1.08 SUBMITTALS REQUIRED FOR REVIEW

- A. The following is the Submittal Cover Sheet for the required submittals. Contractor is responsible for reviewing each section to determine required submittals.

END OF SECTION

SUBMITTAL COVER SHEET



EISENBACH & RUHNKE ENGINEERING, P.C.
291 Genesee St., Utica, NY 13501 315-735-1916

The Contractor shall fill out lines 1 through 7 below and staple this cover sheet to submitted product data sheet, sample, shop drawing, or other items submitted to the Architect/Engineer. Each submittal shall have its own Submittal Cover Sheet.

Project Name: Yonkers Public Schools
Martin Luther King School
Roof, HVAC, Interior & Security
Upgrades – Part 3 of Roof, Heating Plant,
Window Replacement and Interior
Upgrades

Contractor:

E&R Project No.: Y19MLK01 YPS#10875

Project Manager:

Address:

Phone:

Architect/Engineer: Eisenbach and Ruhnke Engineering, P.C.

Owner:

Yonkers Public Schools
One Larkin Center
Yonkers, NY 10701

Project Manager: Jack Eisenbach
Address: 291 Genesee Street
Utica, NY 13501
Phone: 315-735-1916

1. Date: _____
2. Submittal Number: _____
3. Submitted Item: _____
4. Manufacturer: _____
5. Person Submitting: _____
6. Spec. Location: Section _____ Article _____ Paragraph _____ Subparagraph _____
7. And/Or Drawing Number: _____

Architect/Engineer's Notes: _____

Contractor's Stamp

Architect/Engineer's Stamp

- ☐ No exception taken.
- ☐ Make Corrections Noted. Do not resubmit. See Notes above.
- ☐ Submit Specified Item. Resubmit. See Notes above.
- ☐ Revise and Resubmit. Resubmit. See Notes above.
- ☐ Rejected. See Notes above.

Checking of submittals is only for general conformance with the design concept of the Project and general compliance with the information given in Contract Documents. Any action shown is subject to the requirements of the Drawings and Specifications. Contractor is responsible for dimensions to be confirmed and correlated at the job site, quantities, information that pertains solely to the fabrication processes or to techniques of construction, coordination of the work of all trades, and the satisfactory performance of his work.

By: _____ Date: _____

SECTION 01 4000
QUALITY REQUIREMENTS

PART 1 GENERAL

1.01 SECTION INCLUDES

- A. Submittals.
- B. References and standards.
- C. Testing and inspection agencies and services.
- D. Control of installation.
- E. Manufacturers' field services.
- F. Defect Assessment.

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 4216 - Definitions.
- D. Section 01 4219 - Reference Standards.
- E. Section 01 6000 - Product Requirements: Requirements for material and product quality.

1.03 REFERENCE STANDARDS

- A. 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; 2012a.
- B. ASTM E329 - Standard Specification for Agencies Engaged in Construction Inspection and/or Testing; 2014a.

1.03A CONFLICTING REQUIREMENTS

- A. Referenced Standards: If compliance with two or more standards is specified and the standards establish different or conflicting requirements for minimum quantities or quality levels, comply with the most stringent requirement. Refer conflicting requirements that are different, but apparently equal, to Engineer for a decision before proceeding.
- B. Minimum Quantity or Quality Levels: The quantity or quality level shown or specified shall be the minimum provided or performed. The actual installation may comply exactly with the minimum quantity or quality specified, or it may exceed the minimum within reasonable limits. To comply with these requirements, indicated numeric values are minimum or maximum, as appropriate, for the context of requirements. Refer uncertainties to Engineer for a decision before proceeding

1.04 SUBMITTALS

- A. See Section 01 3000 - Administrative Requirements, for submittal procedures.
- B. Design Data: Submit for Engineer's knowledge and action as contract administrator for the limited purpose of assessing conformance with information given and the design concept expressed in the contract documents, or for Owner's information.
 - 1. Include required product data and shop drawings.
- C. Test Reports: After each test/inspection, promptly submit two copies of report to Engineer and to Contractor.
 - 1. Include:
 - a. Date issued.
 - b. Project title and number.
 - c. Name of inspector.
 - d. Date and time of sampling or inspection.
 - e. Identification of product and specifications section.

- f. Location in the Project.
 - g. Type of test/inspection.
 - h. Date of test/inspection.
 - i. Results of test/inspection.
 - j. Conformance with Contract Documents.
 - k. When requested by Engineer, provide interpretation of results.
- 2. Test report submittals are for Engineer's knowledge as construction contract administrator for the limited purpose of assessing conformance with information given and the design concept expressed in the contract documents, or for Owner's information.
- D. Certificates: When specified in individual specification sections, submit certification by the manufacturer and Contractor or installation/application subcontractor to Engineer, in quantities specified for Product Data.
 - 1. Indicate material or product conforms to or exceeds specified requirements. Submit supporting reference data, affidavits, and certifications as appropriate.
 - 2. Certificates may be recent or previous test results on material or product, but must be acceptable to Engineer.
- E. Manufacturer's Instructions: When specified in individual specification sections, submit printed instructions for delivery, storage, assembly, installation, start-up, adjusting, and finishing, for the Owner's information. Indicate special procedures, perimeter conditions requiring special attention, and special environmental criteria required for application or installation.
- F. Manufacturer's Field Reports: Submit reports for Engineer's benefit as contract administrator or for Owner.
 - 1. Submit for information for the limited purpose of assessing conformance with information given and the design concept expressed in the Contract Documents.
- G. Erection Drawings: Submit drawings for Engineer's benefit as contract administrator or for Owner.
 - 1. Submit for information for the limited purpose of assessing conformance with information given and the design concept expressed in the contract documents.
 - 2. Data indicating inappropriate or unacceptable Work may be subject to action by Engineer or Owner.

1.05 REFERENCES AND STANDARDS

- A. Conform to reference standard of date of issue current on date of Contract Documents, except where a specific date is established by applicable code.
- B. Obtain copies of standards where required by product specification sections.
- C. Maintain copy at project site during submittals, planning, and progress of the specific work, until Substantial Completion.

1.06 TESTING AND INSPECTION AGENCIES AND SERVICES

- A. Employment of agency in no way relieves Contractor of obligation to perform Work in accordance with requirements of Contract Documents.
- B. Contractor Employed Agency:
 - 1. Inspection agency: Comply with requirements of ASTM D3740 and ASTM E329.
 - 2. Laboratory: Authorized to operate in the State in which the Project is located.
 - 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 Engineer 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 TESTING AND INSPECTION

- A. Testing Agency Duties:
 - 1. Provide qualified personnel at site. Cooperate with Engineer and Contractor in performance of services.
 - 2. Perform specified sampling and testing of products in accordance with specified standards.
 - 3. Ascertain compliance of materials and mixes with requirements of Contract Documents.
 - 4. Promptly notify Engineer and Contractor of observed irregularities or non-conformance of Work or products.
 - 5. Perform additional tests and inspections required by Engineer.
 - 6. Submit reports of all tests/inspections specified.
- B. 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 Contractor.
 - 4. Agency has no authority to stop the Work.
- C. Contractor 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 Engineer 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 Contractor beyond specified requirements.
 - 6. Arrange with Owner's agency and pay for additional samples, tests, and inspections required by Contractor beyond specified requirements.
- D. Re-testing required because of non-conformance to specified requirements shall be performed by the same agency on instructions by Engineer.
- E. Re-testing required because of non-conformance to specified requirements shall be paid for by Contractor.

3.03 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 equipment as applicable, and to initiate instructions when necessary.

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

3.04 DEFECT ASSESSMENT

- A. Replace work or portions of the work not conforming to specified requirements.

END OF SECTION

SECTION 01 4100
REGULATORY REQUIREMENTS

PART 1 GENERAL

1.01 SUMMARY

- A. Regulatory requirements applicable to this project are the following:
- B. 29 CFR 1910 - Occupational Safety and Health Standards; current edition; as a workplace.
- C. NFPA 101 - Life Safety Code, 2012.
- D. CODES, PERMITS, FEES, ETC.
 - 1. The Contractor shall furnish and pay for all permits, fees and other installation costs required for the various installations by governing authorities and utility companies: prepare and file drawings and diagrams required; arrange for inspections of any and all parts of the work required by the authorities and furnish all certificates necessary to the Engineer, Owner and Construction Manager as evidence that the work installed under this Section of the Specifications conforms with all applicable requirements of the Municipal and State Codes, National Board of Fire Underwriters, National Electric Code.
 - 2. Any items of work specified herein and shown on the drawings which conflict with aforementioned rules, regulations and requirements, shall be referred to the Engineer, Owner, and Construction Manager for decision, which decision shall be final and binding.
 - 3. The building is to be constructed under the following Rules and Regulations of the New York State Uniform Fire and Building Codes known as the "Building Codes of the State of New York" and consist of the following:
 - a. Building Code of New York State
 - b. State Education Department Planning Standards, including Commissioner's Regulation Part 155.5, 155.7
 - c. Energy Conservation Construction Code of New York State
 - d. Fire Code of New York State
 - e. Fuel Gas Code of New York State
 - f. Mechanical Code of New York State
 - g. Plumbing Code of New York State
 - 4. Classification of Construction: Type IIIA
 - 5. Occupancy Classification: Education E
 - 6. Electrical Certification: The Contractor shall obtain UL Certification or Inspection from a Certified Electrical Organization for electrical installation.
 - 7. State Education Department: Planning Standards is applicable to the work. Any conflicts between the Building Codes of New York and the State Education Department Planning Standards, the most restrictive shall apply. Copies of the Planning standards are available at the SED web site.
- E. OSHA Part 1926 Safety and Health Regulations for Construction.

1.02 MANDATORY OSHA CONSTRUCTION SAFETY AND HEALTH TRAINING

- A. Effective July 18, 2008 - Pursuant to NYS Labor Law §220-h - On all public work projects of at least \$250,000 all laborers, workers and mechanics working on the site are required to be certified as having successfully completed an OSHA construction safety and health course of at least 10 hours prior to performing any work on the project.

1.03 QUALITY ASSURANCE

- A. Designer Qualifications: Where delegated engineering design is to be performed under the construction contract, provide the direct supervision of a Professional Engineer experienced in design of this type of work and licensed in New York State.

PART 2 PRODUCTS - NOT USED

PART 3 EXECUTION - NOT USED

END OF SECTION

SECTION 01 5000

TEMPORARY FACILITIES AND CONTROLS

PART 1 GENERAL

EACH PRIME CONTRACTOR IS RESPONSIBLE FOR THE REQUIREMENTS IN THIS SECTION UNLESS OTHERWISE NOTED.

1.01 SECTION INCLUDES

- A. Temporary sanitary facilities.
- B. Temporary Controls: Barriers, enclosures, and fencing.
- C. Security requirements.
- D. Vehicular access and parking.
- E. Waste removal facilities and services.
- F. Project identification sign.

1.02 PROJECT IDENTIFICATION – Contract 1 General Construction

- A. Provide project identification sign of design and construction indicated on drawings.
- B. Erect on site at location indicated.
- C. No other signs are allowed without Owner permission except those required by law.

1.03 REMOVAL OF UTILITIES, FACILITIES, AND CONTROLS

- A. Remove temporary utilities, equipment, facilities, materials, prior to Date of Substantial Completion inspection.
- B. Clean and repair damage caused by installation or use of temporary work.
- C. Restore existing facilities used during construction to original condition.

1.04 QUALITY ASSURANCE

- A. Regulations: Each contractor shall comply with industry standards and with applicable laws and regulations of authorities having jurisdiction including, but not limited to, the following:
 - 1. Building code requirements.
 - 2. Health and safety regulations.
 - 3. Utility company regulations.
 - 4. Police, fire department and rescue squad rules.
 - 5. Environmental protection regulations
- B. Standards: Each contractor shall comply with NFPA 241 "Standard for Safeguarding Construction, Alterations, and Demolition Operations," ANSI-A10 Series standards for "Safety Requirements for Construction and Demolition," and NECA Electrical Design Library "Temporary Electrical Facilities."

1.05 PROJECT CONDITIONS

- A. General: Each contractor shall provide each temporary service and facility ready for use at each location, when first needed to avoid delays in performance of work. Maintain, expand as required, and modify as needed throughout the progress of the work. Do not remove until services or facilities are no longer needed or are replaced by the authorized use of completed permanent facilities.
 - 1. With the establishment of the job progress schedule, each contractor shall establish a schedule for implementation and termination of service for each temporary utility. At the earliest feasible time, and when acceptable to the Owner's representative and Engineer, change over from use of temporary utility service to use of the permanent service, to enable removal of temporary utilities and to eliminate possible interference with completion of the Work.
- B. Conditions of Use: Operate temporary services and facilities in a safe and efficient manner. Do not overload, and do not permit temporary services and facilities to interfere with the progress of work, or occupancy of existing facility by owner. Do not allow unsanitary conditions, public nuisances, or hazardous conditions to develop or persist on the site.

- C. Temporary Construction and Support Facilities: Maintain temporary facilities in a manner to prevent discomfort to users. Take necessary fire prevention measures. Maintain temporary facilities in a sanitary manner so as to avoid health problems.
- D. Security and Protection: Maintain site security and protection facilities in a safe, lawful, publicly acceptable manner. Take measures necessary to prevent site erosion.

1.06 TEMPORARY UTILITIES

- A. Warwick Valley CSD will provide the following:
 - 1. Electrical power and metering, consisting of connection to existing facilities.
 - 2. Water supply, consisting of connection to existing facilities.
- B. Provide and pay for all electrical power, lighting, water, heating and cooling, and ventilation required for construction purposes.
- C. Existing facilities may be used.
- D. New permanent facilities may be used.
- E. Use trigger-operated nozzles for water hoses, to avoid waste of water.

1.07 DIVISION OF RESPONSIBILITIES

- A. The contractor is responsible for the following:
 - 1. Installation, operation, maintenance, and removal of each temporary facility usually considered as its own normal construction activity, as well as the costs and use charges associated with each facility.
 - 2. Plug-in electric power cords and extension cords.
 - 3. Supplementary plug-in task lighting and special lighting necessary exclusively for its own activities.
 - 4. Special power requirements for installation of its own work such as welding or temporary elevator power.
 - 5. Its own field office complete with necessary furniture and utilities, and telephone service.
 - 6. Its own storage and fabrication sheds.
 - 7. All hoisting and scaffolding for its own work.
 - 8. Collection and disposal of its own hazardous, dangerous, unsanitary, or other harmful waste material.
 - 9. Collection and disposal of major equipment removed such as boilers, unit ventilators, and heaters.
 - 10. Collection of general waste and debris and disposing into containers provided by the General Construction.
 - 11. Secure lockup of its own tools, materials and equipment.
 - 12. Construction aids and miscellaneous services and facilities necessary exclusively for its own construction activities.
 - 13. Temporary toilets, including disposable supplies.
 - 14. Temporary wash facilities, including disposable supplies.
 - 15. Containerized bottled-water drinking-water units.
 - 16. First Aid Station and Supplies.
 - 17. Containers for non-hazardous waste and debris.
 - 18. Disposal of wastes containers.
 - 19. Barricades, warning signs, and lights.
 - 20. Temporary dust control.
- B. Water Service: The General Contractor shall provide and pay all costs for all contractors to install distribution piping of sizes and pressures adequate for construction.
 - 1. Provide backflow devices to prevent water from re-entering the potable system.
 - 2. Maintain hose connections and outlet valves in leak-proof condition. Where finish work below an outlet might be damaged by spillage or leakage, provide a drip pan of suitable size to minimize the possibility of water damage. Drain water promptly from drip pans as it accumulates.

3. Maintaining existing domestic hot and cold water systems, sanitary and storm systems, fire protection systems within the existing building operational at all times for Owner 's occupancy and during construction.
- C. Each Contractor shall provide all task lighting for his work.
- D. Each Contractor shall maintain all existing systems, including but not limited to, power, lighting, fire alarm, intercom, etc., within the existing building operational at all times for Owner occupancy and construction.

1.08 USE CHARGES

- A. General: Cost for temporary facilities are not chargeable to the Owner, Engineer, and Construction Manager. The Owner, Engineer, and Construction Manager will not accept a prime contractor's cost or use charges for temporary services or facilities as a basis of claim for an adjustment in the Contract Sum or the Contract Time.
 1. Water Service Use Charges: Water from the Owner's existing water system may be used without metering, and without payment for use charges.
 2. Electric Power Service Use Charges: Electric power from the Owner's existing system may be used without payment of use charges.
 3. Temporary Utility Services: Where Owner's existing services is inadequate or would disrupt owners use of the existing facility, contractor shall provide utility services for the temporary use at the project site from the utility company, and pay all costs, including use charges.

1.09 TELECOMMUNICATIONS SERVICES

- A. Telecommunications services shall include:
- B. Each contractor shall provide and pay for its own telephone service.
 1. Provide mobile phone service for all field superintendents and foreman.
 2. Post a list of important telephone numbers, including the following:
 - a. Local police and fire department.
 - b. Doctor.
 - c. Ambulance service.
 - d. Contractor's temporary and home office.
 - e. Owner's Representative temporary and home office
 - f. Construction Manager's home office.
 - g. Engineer's home office.
 - h. Owner's home office.
 - i. Principal subcontractors temporary and home office.

1.10 TEMPORARY SANITARY FACILITIES

- A. The Contractor shall provide and maintain temporary sanitary facilities and enclosures for all Contractors.
 1. Provide at time of project mobilization.
 2. After the completion date each Contractor shall be responsible and pay all costs required to provide temporary sanitary facilities for their own use.
- B. Provide and maintain required facilities and enclosures. Provide at time of project mobilization.
- C. Toilets: Use of the Owner's existing toilet facilities will not be permitted
- D. Maintain daily in clean and sanitary condition.
- E. At end of construction, return facilities to same or better condition as originally found.
- F. Sanitary Facilities: Sanitary facilities include temporary toilets, wash facilities and drinking water fixtures. Comply with governing regulations including safety and health codes for the type, number, location, operation and maintenance of fixtures and facilities; provide not less than specified requirements. Install in locations which will best serve the project's needs.
 1. Locate toilets and drinking water fixtures so that no one within the construction area will need to walk more than 2 stories vertically or 200 feet horizontally to reach these facilities.

2. Install self-contained toilets to the extent permitted by governing regulations.
3. Supply and maintain toilet tissue, paper towels, paper cups and other disposable materials as appropriate for each facility, including Owner's Representative's temporary offices. Provide covered waste containers for used material.

1.11 BARRIERS

- A. Responsibility: Construction barriers required for the project shall be the responsibility of the each contractor
- B. Barricades, Warning Signs and Lights: Comply with recognized standards and code requirements for erection of substantial, structurally adequate barricades where needed to prevent accidents and losses. Paint with appropriate colors, graphics and warning signs to inform personnel at the site and the public, of the hazard being protected against. Provide lighting where appropriate and needed for recognition of the facility, including flashing red lights where appropriate
- C. 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.
- D. Provide protection for plants designated to remain. Replace damaged plants.
- E. Protect non-owned vehicular traffic, stored materials, site, and structures from damage.

1.12 SECURITY - SEE SECTION 01 3553

1.13 VEHICULAR ACCESS AND PARKING

- A. Comply with regulations relating to use of streets and sidewalks, access to emergency facilities, and access for emergency vehicles.
- B. Coordinate access and haul routes with governing authorities and Warwick Valley CSD.
- C. Provide and maintain access to fire hydrants, free of obstructions.
- D. Existing parking areas may be used for construction parking. Specific areas for use by the Contractor will be determined by the Owner.
- E. Maintain access at all times to the boiler room entrance. Do not block loading dock area adjacent to the Boiler Room.

1.14 WASTE REMOVAL

- A. See Section 01 7419 - Construction Waste Management and Disposal, for additional requirements.
- B. The Contractor shall provide their own containers, at grade, sufficient for the depositing of non-hazardous/non-toxic waste materials and shall remove such waste materials from project site as required or directed by the Owner's representative.
 1. Provide specific containers for separation and storage of materials for recycling, salvage, reuse, return, and trash disposal, for use by all contractors and installers.
 2. Comply with requirements in NFPA 241 for removal of combustible waste materials and debris.
 3. Contractors shall not utilize the Owner's bins or dumpsters.
- C. The Contractor shall clean the work area at the end of each workday.
 1. If the contractor fails to clean areas at the end of each workday the Owner shall perform the cleaning and back charge the contractor accordingly.
- D. Provide waste removal facilities and services as required to maintain the site in clean and orderly condition.
- E. Provide containers with lids. Remove trash from site periodically.
- F. The contractor shall be responsible for daily cleaning up of spillage and debris resulting from its operations and shall be responsible for complete removal and disposition of hazardous and toxic waste materials.
 1. Remove liquid spills promptly.

- G. Burying or burning of waste materials on the site will not be permitted. Washing waste materials down sewers or into waterways will not be permitted.
- H. Site: The Contractor shall maintain Project site free of waste materials and debris.
- I. The Contractor is responsible to provide dust protection for their construction-related activities.
- J. If daily cleaning and dust protection is not provided the Contractor will be back charged for cleanup performed by employees of the Owner or a separate contractor retained by the Owner.

PART 2 PRODUCTS - NOT USED

PART 3 EXECUTION - NOT USED

END OF SECTION

SECTION 01 5060
SITE SAFETY

PART 1 - GENERAL

1.01 RELATED DOCUMENTS

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

1.02 SUMMARY:

- A. The purpose of this section is to specify the safety requirements, which must be followed by each Contractor during the execution of this contract.
- B. Each Contractor agrees that the work will be completed with the greatest degree of safety and:
 - 1. To conform to the requirements of the Occupational Safety and Health Act of 1970 (OSHA) and the Construction Safety Act of 1969, including all standards and regulations that have been or shall be promulgated by the governmental authorities which administer such acts, and shall hold the Owner, Owner's Representative, the Architect, and all their employees, consultants and representatives harmless from and against and shall indemnify each and every one of them for any and all claims, actions, liabilities, costs and expenses, including attorneys fees, which any of them may incur as a result of non-compliance.

1.03 DEFINITIONS

- A. Public shall mean anyone not involved with or employed by the contractor to perform the duties of this contract.
 - 1. Site shall mean the limits of the work area.
 - 2. Contractor shall mean the contractor, his/her subcontractors and any other person related to the contract execution.

1.04 REFERENCES:

- A. Code of Federal Regulations OSHA Safety and Health.

PART 2 - PRODUCTS

2.01 MATERIALS:

- A. Barriers shall be constructed of sturdy lumber having a minimum size of 2'x 4'.
- B. Signs shall be made of sturdy plywood of 1/2" minimum thickness and shall be made to legible at a distance of 50 feet.

PART 3 - EXECUTION

3.01 GENERAL

- A. In the performance of its contract, each Contractor shall exercise every precaution to prevent injury to workers and the public or damage to property.
 - 1. Each Contractor shall, at their own expense, provide temporary structures, place watchmen, design and erect barricades, fences and railings, give warnings, display such lights, signals and signs, exercise such precautions against fire, adopt and enforce such rules and regulations, and take such other precautions as may be necessary, desirable or proper or as may be directed.
 - 2. Each Contractor shall be responsible for initiating, maintaining and supervising all safety precautions and programs in connection with the work to be done under this contract. Each Contractor shall take all necessary precautions for the safety of, and shall provide the necessary protection to prevent damage, injury or loss including but not limited to:
 - a. All employees working in connection with this contract, and other persons who may be affected thereby.
 - b. All the work materials and equipment to be incorporated therein whether in storage on or off site; and including trees, shrubs, lawns, walks, pavements, facilities not designated for removal, relocation or replacement in the course of construction.

- B. Each Contractor's duties and responsibilities for the safety and protection of the work: shall continue until such time as all the work is completed and contractor has removed all workers, material and equipment from the site, or the issuance of the certificate of final completion, whichever shall occur last.
- C. Each Contractor shall use only machinery and equipment adapted to operate with the least possible noise, and shall so conduct his operations that annoyance to occupants of the site and nearby homes and facilities shall be reduced to a minimum
- D. It shall be the responsibility of each Contractor to insure that all employees of the contractor and all subcontractors, and any other persons associated with the performance of their contract shall comply with the provisions of this specification.
- E. Each Contractor shall clean up the site daily and keep the site free of debris, refuse, rubbish, and scrap materials. The site shall be kept in a neat and orderly fashion. Before the termination of the contract, each Contractor shall remove all surplus materials, falsework, temporary fences, temporary structures, including foundations thereof.
- F. Each Contractor shall follow all rules and regulations put forth in the Code of Federal Regulations (OSHA Safety and Health Standards).

END OF SECTION

SECTION 01 5100
TEMPORARY UTILITIES

PART 1 GENERAL

1.01 SECTION INCLUDES

- A. Temporary Utilities: Provision of electricity, lighting, ventilation, and water.

1.02 REFERENCE STANDARDS

- A. 29 CFR 1926 - U.S. Occupational Safety and Health Standards; current edition.

1.03 TEMPORARY ELECTRICITY

- A. Cost: By Contractor.
- B. Connect to Owner's existing power service.
 - 1. Do not disrupt Owner's need for continuous service.
 - 2. Exercise measures to conserve energy.
- C. Provide temporary electric feeder from existing building electrical service at location as directed.
- D. Complement existing power service capacity and characteristics as required.
- E. Provide power outlets for construction operations, with branch wiring and distribution boxes located at each floor. Provide flexible power cords as required.
- F. Permanent convenience receptacles may be utilized during construction.
- G. Provide adequate distribution equipment, wiring, and outlets to provide single phase branch circuits for power and lighting.

1.04 TEMPORARY LIGHTING FOR CONSTRUCTION PURPOSES

- A. Provide and maintain LED, compact fluorescent, or high-intensity discharge lighting as suitable for the application for construction operations in accordance with requirements of 29 CFR 1926 and authorities having jurisdiction.
- B. Provide branch wiring from power source to distribution boxes with lighting conductors, pigtails, and lamps as required.
- C. Maintain lighting and provide routine repairs.

1.05 TEMPORARY VENTILATION

- A. Existing ventilation equipment may not be used.

1.06 TEMPORARY WATER SERVICE

- A. Provide and maintain suitable quality water service for construction operations at time of project mobilization.

PART 2 PRODUCTS - NOT USED

PART 3 EXECUTION - NOT USED

END OF SECTION

SECTION 01 6000
PRODUCT REQUIREMENTS

PART 1 GENERAL

1.01 RELATED DOCUMENTS

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

1.02 SECTION INCLUDES

- A. General product requirements.
- B. Re-use of existing products.
- C. Transportation, handling, storage and protection.
- D. Product option requirements.
- E. Substitution limitations.
- F. Maintenance materials, including extra materials, spare parts, tools, and software.

1.03 SUBMITTALS

- A. Refer to Section 01 3000 - Administrative Requirements for additional requirements.
- B. 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.
- C. 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.
- D. 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.
- E. 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.

1.04 ASBESTOS

- A. Asbestos: All products, materials, etc., used in conjunction with this Project shall be Asbestos-Free.
 - 1. Contractor shall provide a letter to the Owner stating that no asbestos containing material has been used in this project.

PART 2 PRODUCTS

2.01 EXISTING PRODUCTS

- A. Do not use materials and equipment removed from existing premises unless specifically required or permitted by the Contract Documents.
- B. Existing materials and equipment indicated to be removed, but not to be re-used, relocated, reinstalled, delivered to the Warwick Valley Central School District, or otherwise indicated as to remain the property of the Warwick Valley Central School District, become the property of the Contractor; remove from site.

2.02 NEW PRODUCTS

- A. Provide new products unless specifically required or permitted by the Contract Documents.
- B. Use of products having any of the following characteristics is not permitted:
 - 1. Made outside the United States, its territories, Canada, or Mexico.
 - 2. Made using or containing CFC's or HCFC's.

- C. Where other criteria are met, Contractor shall give preference to products that:
 - 1. If used on interior, have lower emissions, as defined.
 - 2. If wet-applied, have lower VOC content, as defined.
 - 3. Have a published GreenScreen Chemical Hazard Analysis.

2.03 PRODUCT OPTIONS

- A. Products Specified by Reference Standards or by Description Only: Use any product meeting those standards or description.
- B. Products Specified by Naming One or More Manufacturers with a Provision for Substitutions: Submit a request for substitution for any manufacturer not named.

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. Eisenbach & Ruhnke Engineering, P.C. will consider requests for substitutions only within 15 days after date of Letter of Award.
- B. Substitutions will not be considered during the bidding phase.
- C. Document each request with complete data substantiating compliance of proposed substitution with Contract Documents.
- D. 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 Warwick Valley Central School District.
 - 4. Waives claims for additional costs or time extension that may subsequently become apparent.
- E. 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 require revision to the Contract Documents.
- F. Substitution Submittal Procedure (after contract award):
 - 1. Submit one copy of request for substitution for consideration. Limit each request to one proposed substitution.
 - 2. Submit shop drawings, product data, and certified test results attesting to the proposed product equivalence. Burden of proof is on proposer.
 - 3. Engineer will notify Contractor in writing of decision to accept or reject request.
 - 4. Samples, where applicable or requested.

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, and to minimize handling.
- 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. See Section 01 7419.
- B. Store and protect products in accordance with manufacturers' instructions.
- C. Store with seals and labels intact and legible.
- D. Store sensitive products in weathertight, climate-controlled enclosures in an environment favorable to product.
- E. For exterior storage of fabricated products, place on sloped supports above ground.
- F. Protect products from damage or deterioration due to construction operations, weather, precipitation, humidity, temperature, sunlight and ultraviolet light, dirt, dust, and other contaminants.
- G. Comply with manufacturer's warranty conditions, if any.
- H. Cover products subject to deterioration with impervious sheet covering. Provide ventilation to prevent condensation and degradation of products.
- I. Prevent contact with material that may cause corrosion, discoloration, or staining.
- J. Provide equipment and personnel to store products by methods to prevent soiling, disfigurement, or damage.
- K. 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 RELATED DOCUMENTS

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

1.02 SECTION INCLUDES

- A. Requirements for Indoor-Emissions-Restricted products.
- B. Requirements for VOC-Content-Restricted products.

1.03 RELATED REQUIREMENTS

- A. Section 01 3000 - Administrative Requirements: Submittal procedures.
- B. Section 01 4000 - Quality Requirements: Procedures for testing and certifications.
- C. Section 01 6000 - Product Requirements: Fundamental product requirements, substitutions and product options, delivery, storage, and handling.

1.04 DEFINITIONS

- A. Indoor-Emissions-Restricted Products: All products in the following product categories, whether specified or not:
 - 1. Interior paints and coatings.
 - 2. Interior adhesives and sealants, including flooring adhesives.
- B. VOC-Content-Restricted Products: All products in the following product categories, whether specified or not:
 - 1. Exterior and interior adhesives and sealants, including flooring adhesives.
- C. Adhesives: All gunnable, trowelable, liquid-applied, and aerosol adhesives, whether specified or not; including flooring adhesives, resilient base adhesives, and pipe jointing adhesives.
- D. Sealants: All gunnable, trowelable, and liquid-applied joint sealants and sealant primers, whether specified or not; including firestopping sealants and duct joint sealers.
- E. 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.

1.05 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 D3960 - Standard Practice for Determining Volatile Organic Compound (VOC) Content of Paints and Related Coatings; 2005 (Reapproved 2013).
- C. SCAQMD 1168 - South Coast Air Quality Management District Rule No.1168; current edition.

1.06 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.

1.07 QUALITY ASSURANCE

- A. 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.
- B. 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. 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.

PART 3 EXECUTION

3.01 FIELD QUALITY CONTROL

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

END OF SECTION

SECTION 01 7000
EXECUTION AND CLOSEOUT REQUIREMENTS

PART 1 GENERAL

1.01 RELATED DOCUMENTS

- A. Drawings and general provisions of the Contract apply to this Section.

1.02 SECTION INCLUDES

- A. Inspections prior to start of work.
- B. Examination, preparation, and general installation procedures.
- C. General installation of products.
- D. Progress cleaning.
- E. Protection of installed construction.
- F. Correction of Work.
- G. Requirements for alterations work, including selective demolition and asbestos abatement.
- H. Pre-installation meetings.
- I. Cutting and patching.
- J. Surveying for laying out the work.
- K. Cleaning and protection.
- L. Closeout procedures, except payment procedures.
- M. Final Cleaning.

1.03 RELATED REQUIREMENTS

- A. Section 01 1000 - Summary of Contracts: 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. Section 01 5000 - Temporary Facilities and Controls
- E. Section 01 5000 - Temporary Facilities and Controls: Temporary interior partitions.
- F. Section 01 7419 - Construction Waste Management and Disposal: Additional procedures for trash/waste removal, recycling, salvage, and reuse.
- G. Section 01 7800 - Closeout Submittals: Project record documents, operation and maintenance data, warranties and bonds.

1.04 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. Cutting and Patching: Submit written request in advance of cutting or alteration that affects:
 - 1. Structural integrity of any element of Project.
 - 2. Integrity of weather exposed or moisture resistant element.
 - 3. Efficiency, maintenance, or safety of any operational element.
 - 4. Visual qualities of sight exposed elements.
 - 5. Work of Yonkers Public School District or separate Contractor.

- D. Landfill Receipts: Submit copy of receipts issued by a landfill facility, licensed to accept hazardous materials, or hazardous waste disposal.

1.05 QUALIFICATIONS

- A. For demolition work, employ a firm specializing in the type of work required.
- B. For survey work, employ a land surveyor registered in the State in which the Project is located and acceptable to Engineer. Submit evidence of Surveyor's Errors and Omissions insurance coverage in the form of an Insurance Certificate.

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 Yonkers Public School District occupancy of premises, coordinate access to site for correction of defective work and work not in accordance with Contract Documents, to minimize disruption of Yonkers Public School District's activities.

1.07 CODES, PERMITS, FEES, ETC. REFER TO SECTION 01 41 00 REGULATORY REQUIREMENTS

- A. Refer to Owner Contractor Agreement for additional requirements.
- B. Any items of work specified herein and shown on the drawings which conflict with aforementioned rules, regulations and requirements, shall be referred to the Engineer, Owner, and Architect for decision, which decision shall be final and binding.
- C. The building is to be constructed under the following Rules and Regulations of the New York State Uniform Fire and Building Codes known as the "Building Codes of the State of New York" and consist of the following:
 - 1. Building Code of New York State
 - 2. State Education Department Planning Standards, including Commissioner's Regulation Part 155.5, 155.7
 - 3. Energy Conservation Construction Code of New York State
 - 4. Fire Code of New York State

1.08 MANDATORY OSHA CONSTRUCTION SAFETY AND HEALTH TRAINING

- A. Effective July 18, 2008 - Pursuant to NYS Labor Law §220-h - On all public work projects of at least \$250,000 all laborers, workers and mechanics working on the site are required to be certified as having successfully completed an OSHA construction safety and health course of at least 10 hours prior to performing any work on the project.

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. Examine and verify specific conditions described in individual specification sections.
- C. Take field measurements before confirming product orders or beginning fabrication, to minimize waste due to over-ordering or misfabrication.
- D. Verify that utility services are available, of the correct characteristics, and in the correct locations.
- E. 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 Engineer 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 Engineer, Yonkers Public School District, 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 Engineer of any discrepancies discovered.
- C. Protect survey control points prior to starting site work; preserve permanent reference points during construction.
- D. Promptly report to Engineer the loss or destruction of any reference point or relocation required because of changes in grades or other reasons.
- E. Replace dislocated survey control points based on original survey control. Make no changes without prior written notice to Engineer.
- F. Utilize recognized engineering survey practices.
- G. Periodically verify layouts by same means.
- H. Maintain a complete and accurate log of control and survey work as it progresses.

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 Engineer 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 50 00 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 systems or equipment are not active and Contract Documents require reactivation, put back into operational condition; repair supply, distribution, and equipment as required.
 - 3. 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. Provide temporary connections as required to maintain existing systems in service.
 - 4. Verify that abandoned services serve only abandoned facilities.
 - 5. 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; patch holes left by removal using materials specified for new construction.
- 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.
- 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 Engineer.
- 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 FIRE PREVENTION AND CONTROL

- A. Each Contractor shall abide by such rules and instructions as to fire prevention and control as required by the Owner, Owner's Representative, Engineer and Fire Department. The Contractor(s) shall take all necessary steps to prevent its employees from setting fires not required in the construction of the facility and shall be responsible for preventing the escape of fires set in connection with the construction and shall at all times provide the proper housekeeping to minimize potential fire hazards.
- B. Free access to fire hydrants and standpipe connections shall be maintained at all times during construction operations. Portable fire extinguishers shall be provided by the Construction Contractor and made conveniently available throughout the construction site. Contractor(s) shall notify their employees of the location of the nearest fire alarm box at all locations where work is in progress.

3.08 SECURITY SYSTEM

- A. The existing building contains a security alarm system maintained and operated by the Owner. Access into the existing building shall not be permitted unless the owner is notified and arrangements made to deactivate the system.

3.09 CUTTING AND PATCHING

- A. Whenever possible, execute the work by methods that avoid cutting or patching.
- B. 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 and replace defective and non-conforming work.
- C. 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.
- D. Employ original installer to perform cutting for weather exposed and moisture resistant elements, and sight exposed surfaces.
- E. Restore work with new products in accordance with requirements of Contract Documents.
- F. Fit work air tight to pipes, sleeves, ducts, conduit, and other penetrations through surfaces.
- G. 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.

3.10 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.

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

3.12 ADJUSTING

- A. Adjust operating products and equipment to ensure smooth and unhindered operation.

3.13 FINAL CLEANING

- A. Final cleaning shall be the responsibility of the General Construction and all costs for final cleaning shall be included in the Base Bid. Final cleaning responsibility shall be limited to all new additions and areas where renovations occur.
- B. Execute final cleaning prior to final project assessment.
 1. Clean areas to be occupied by Warwick Valley Central School District prior to final completion before Warwick Valley Central School District occupancy.
- C. Use cleaning materials that are nonhazardous.
- D. Clean interior and exterior glass, surfaces exposed to view; remove temporary labels, stains and foreign substances, polish transparent and glossy surfaces, vacuum carpeted and soft surfaces.
- E. Remove all labels that are not permanent. Do not paint or otherwise cover fire test labels or nameplates on mechanical and electrical equipment.
- F. Clean equipment and fixtures to a sanitary condition with cleaning materials appropriate to the surface and material being cleaned.
- G. Clean filters of operating equipment.
- H. Clean debris from roofs, gutters, downspouts, and drainage systems.
- I. Clean site; sweep paved areas, rake clean landscaped surfaces.
- J. Remove waste, surplus materials, trash/rubbish, and construction facilities from the site; dispose of in legal manner; do not burn or bury.
- K. General: Provide final cleaning. Conduct cleaning and waste-removal operations to comply with local laws and ordinances and Federal and local environmental and antipollution regulations.

- L. Cleaning: Employ experienced workers or professional cleaners for final cleaning. Clean each surface or unit to condition expected in an average commercial building cleaning and maintenance program. Comply with manufacturer's written instructions.
- M. Cleaning Agents: Use cleaning materials and agents recommended by the manufacturer or fabricator of the surface to be cleaned. Do not use cleaning agents that are potentially hazardous to health or property or that might damage finished surfaces.
- N. Clean exposed exterior and interior hard-surfaced finishes to a dirt-free condition, free of stains, films, and similar foreign substances. Avoid disturbing natural weathering of exterior surfaces. Restore reflective surfaces to their original condition.
- O. Wax all resilient flooring.
- P. Touch up and otherwise repair and restore marred, exposed finishes and surfaces evidence of repair or restoration. Replace finishes and surfaces that cannot be satisfactorily repaired or restored or that already show
- Q. Leave Project clean and ready for occupancy.
- R. Comply with safety standards for cleaning. Do not burn waste materials. Do not bury debris or excess materials on Owner's property. Do not discharge volatile, harmful, or dangerous materials into drainage systems. Remove waste materials from Project site and dispose of lawfully.

3.14 CLOSEOUT PROCEDURES

- A. Make submittals that are required by governing or other authorities.
- B. Notify Engineer when work is considered ready for Substantial Completion.
- C. 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 Engineer's review.
- D. Correct items of work listed in executed Certificates of Substantial Completion and comply with requirements for access to Yonkers Public School District-occupied areas.
- E. Notify Engineer when work is considered finally complete.
- F. Complete items of work determined by Engineer's final inspection.

END OF SECTION

SECTION 01 7329

CUTTING AND PATCHING

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

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

1.2 SUMMARY

- A. Whenever possible, execute the work by methods that avoid cutting or patching.
- B. This Section includes procedural requirements for cutting and patching.
 - 1. Refer to other Sections for specific requirements and limitations applicable to cutting and patching.
 - 2. Requirements of this Section apply to all contracts. Refer to various sections and divisions of these specifications for other requirements and limitations applicable to cutting and patching.
 - 3. Contractor acknowledges that the work involves renovation and alteration of existing improvements and, therefore, cutting and patching of the work is essential for the Project to be successfully completed. Contractor shall perform any cutting, altering, patching and fitting of the work necessary for the work and the existing improvements to be fully integrated and to present the visual appearance of an entire, completed, and unified project. In performing any work which requires cutting, fixing, or patching, Contractor shall use its best efforts to protect and preserve the visual appearance and aesthetics of the project to the reasonable satisfaction of both the Owner and the Architect.
 - 4. Each Contractor shall do all cutting, patching, repairing as necessary for their work. In all cases, the cutting, patching, repairing and finishing shall be performed by mechanics skilled in the particular trade required at no additional cost to the Owner.

1.3 RELATED SECTIONS

- A. Division 1 Section "Selective Removals" for demolition of selected portions of the building for alterations.
- B. Division 7 Section "Through-Penetration Firestop Systems" for patching fire-rated construction.
- C. Divisions 2 through 33 Sections for additional requirements and limitations applicable to cutting and patching individual parts of the Work.
- D. Requirements in this Section apply to general construction, HVAC, plumbing, and electrical installations. Refer to Divisions 22, 23, and 26 Sections for other requirements and limitations applicable to cutting and patching mechanical and electrical installations.

1.4 DEFINITIONS

- A. Cutting: Removal of existing construction necessary to permit installation or performance of other Work.
- B. Patching: Fitting and repair work required to restore surfaces to original conditions after installation of other Work.

1.5 SUBMITTALS

- A. Cutting and Patching Proposal: Submit a proposal describing procedures at least 10 days before the time cutting and patching will be performed, requesting approval to proceed. Include the following information:
 - 1. Extent: Describe cutting and patching; show how they will be performed, and indicate why they cannot be avoided.
 - 2. Changes to Existing Construction: Describe anticipated results. Include changes to structural elements and operating components as well as changes in building's appearance and other significant visual elements.
 - 3. Products: List products to be used and firms or entities that will perform the Work.
 - 4. Dates: Indicate when cutting and patching will be performed.

5. Utilities: List utilities that cutting and patching procedures will disturb or affect. List utilities that will be relocated and those that will be temporarily out of service. Indicate how long service will be disrupted.
6. Structural Elements: Where cutting and patching involve adding reinforcement to structural elements, submit details and engineering calculations showing integration of reinforcement with original structure.
7. Architect's Approval: Obtain approval of cutting and patching proposal before cutting and patching. Approval does not waive right to later require removal and replacement of unsatisfactory work.

1.6 QUALITY ASSURANCE

- A. Structural Elements: Do not cut and patch structural elements in a manner that could change their load-carrying capacity or load-deflection ratio.
- B. Operational Elements: Do not cut and patch the following operating elements and related components in a manner that results in reducing their capacity to perform as intended or that results in increased maintenance or decreased operational life or safety.
 1. Primary operational systems and equipment.
 - a. Air or smoke barriers.
 - b. Fire-protection systems.
 - c. Control systems.
 - d. Communication systems.
 - e. Conveying systems.
 - f. Electrical wiring systems.
 - g. Operating systems of special construction in Division 13 Sections.
- C. Miscellaneous Elements: Do not cut and patch the following elements or related components in a manner that could change their load-carrying capacity, that results in reducing their capacity to perform as intended, or that results in increased maintenance or decreased operational life or safety.
 1. Water, moisture, or vapor barriers.
 - a. Membranes and flashings.
 - b. Exterior curtain-wall construction.
 - c. Equipment supports.
 - d. Piping, ductwork, vessels, and equipment.
 - e. Noise- and vibration-control elements and systems.
- D. Visual Requirements: Do not cut and patch construction in a manner that results in visual evidence of cutting and patching. Do not cut and patch construction exposed on the exterior or in occupied spaces in a manner that would, in Architect's opinion, reduce the building's aesthetic qualities. Remove and replace construction that has been cut and patched in a visually unsatisfactory manner.
- E. If possible, retain original Installer or fabricator to cut and patch exposed Work listed below. If it is impossible to engage original Installer or fabricator, engage another recognized, experienced, and specialized firm.
 1. Processed concrete finishes.
 2. Stonework and stone masonry.
 3. Ornamental metal.
 4. Matched-veneer woodwork.
 5. Preformed metal panels.
 6. Roofing.
 7. Firestopping.
 8. Window wall system.
 9. Stucco and ornamental plaster.
 10. Terrazzo.
 11. Finished wood flooring.

12. Fluid-applied flooring.
 13. Aggregate wall coating.
 14. Wall covering.
 15. HVAC enclosures, cabinets, or covers.
- F. Cutting and Patching Conference: Before proceeding, meet at Project site with parties involved in cutting and patching, including mechanical and electrical trades. Review areas of potential interference and conflict. Coordinate procedures and resolve potential conflicts before proceeding.

1.7 WARRANTY

- A. Existing Warranties: Remove, replace, patch, and repair materials and surfaces cut or damaged during cutting and patching operations, by methods and with materials so as not to void existing warranties.
- B. Prior to cutting and patching verify with Warwick Valley Central School District all existing warranties in effect.

PART 2 - PRODUCTS

2.1 MATERIALS

- A. General: Comply with requirements specified in other Sections of these Specifications.
- B. Existing Materials: Use materials identical to existing materials. For exposed surfaces, use materials that visually match existing adjacent surfaces to the fullest extent possible.
 1. If identical materials are unavailable or cannot be used, use materials that, when installed, will match the visual and functional performance of existing materials.

PART 3 - EXECUTION

3.1 EXAMINATION

- A. Examine surfaces to be cut and patched and conditions under which cutting and patching are to be performed.
- B. Compatibility: Before patching, verify compatibility with and suitability of substrates, including compatibility with existing finishes or primers.
- C. Proceed with installation only after unsafe or unsatisfactory conditions have been corrected.

3.2 PREPARATION

- A. Temporary Support: Provide temporary support of Work to be cut.
- B. Protection: Protect existing construction during cutting and patching to prevent damage. Provide protection from adverse weather conditions for portions of Project that might be exposed during cutting and patching operations.
- C. Adjoining Areas: Avoid interference with use of adjoining areas or interruption of free passage to adjoining areas.
- D. Existing Services: Where existing services are required to be removed, relocated, or abandoned, bypass such services before cutting to avoid interruption of services to occupied areas.

3.3 PERFORMANCE

- A. General: Employ skilled workers to perform cutting and patching. Proceed with cutting and patching at the earliest feasible time, and complete without delay.
- B. Cut existing construction to provide for installation of other components or performance of other construction, and subsequently patch as required to restore surfaces to their original condition. A sufficient time in advance of the construction of new walls, floors, pavement, or roofing etc. Each Contractor shall be responsible for properly locating and providing in place all sleeves, inserts and forms required for work.
- C. Cutting: Cut existing construction by sawing, drilling, breaking, chipping, grinding, and similar operations, including excavation, using methods least likely to damage elements retained or adjoining construction. If possible, review proposed procedures with original Installer; comply with original Installer's written recommendations.

1. In general, use hand or small power tools designed for sawing and grinding, not hammering and chopping. Cut holes and slots as small as possible, neatly to size required, and with minimum disturbance of adjacent surfaces. Temporarily cover openings when not in use.
 2. Existing Finished Surfaces: Cut or drill from the exposed or finished side into concealed surfaces.
 3. Concrete/Masonry: Cut using a cutting machine, such as an abrasive saw or a diamond-core drill.
 4. Excavating and Backfilling: Comply with requirements in applicable Division 2 Sections where required by cutting and patching operations.
 5. Mechanical and Electrical Services: Cut off pipe or conduit in walls or partitions to be removed. Cap, valve, or plug and seal remaining portion of pipe or conduit to prevent entrance of moisture or other foreign matter after cutting.
- D. All cutting of holes in existing walls, existing floors, existing roofs, existing ceilings, etc. for the removal of any existing work (including, but not limited to ducts, fans, fixtures, motors, equipment, drains, wiring, conduit, etc.) or for the installation of any new work shall be done in a neat manner by each Contractor. Debris caused by such cutting or removals will be removed by each Contractor.
- E. Where sleeves, inserts or openings are required in existing walls, floors, roofs, vaults and pavements of existing buildings or structures, all necessary cutting, furnishing and installing of sleeves, inserts, lintels, etc., shall be done by each Contractor as required by his work.
- F. Contractor(s) are hereby notified that the existing walls in the existing building are of varying materials. . All new openings in existing masonry walls shall be provided with steel lintels, minimum 4" bearing each side x wall thickness concrete masonry units filled solid on each side of the opening for proper support. See drawings for additional details and requirements.
- G. Adequate blocking, fastening, etc., required to support equipment, casework, etc., from existing walls shall be included as required to complete work.
- H. All surfaces where existing items are removed from existing walls, floors, ceilings, roofs, vaults, etc. shall be patched to match existing surfaces.
1. All patching shall be provided with prime and finish paint or other material to match existing. In areas indicated to be completely painted/finished by the contractor for construction, other prime contractors shall be required only to patch existing surfaces to match as required to accept new finishes.
 2. Proceed with patching after construction operations requiring cutting are complete.
- I. Removals of selected portions of the building for alterations is included in Section "Selective Removals".
- J. Patching: Patch construction by filling, repairing, refinishing, closing up, and similar operations following performance of other Work. Patch with durable seams that are as invisible as possible. Provide materials and comply with installation requirements specified in other Sections of these Specifications.
1. Inspection: Where feasible, test and inspect patched areas after completion to demonstrate integrity of installation.
 2. Exposed Finishes: Restore exposed finishes of patched areas and extend finish restoration into retained adjoining construction in a manner that will eliminate evidence of patching and refinishing.
 3. Floors and Walls: Where walls or partitions that are removed extend one finished area into another, patch and repair floor and wall surfaces in the new space. Provide an even surface of uniform finish, color, texture, and appearance. Remove existing floor and wall coverings and replace with new materials, if necessary, to achieve uniform color and appearance.
 - a. Where patching occurs in a painted surface, apply primer and intermediate paint coats over the patch and apply final paint coat over entire unbroken surface containing the patch. Provide additional coats until patch blends with adjacent surfaces.
 4. Ceilings: Patch, repair, or rehang existing ceilings as necessary to provide an even-plane surface of uniform appearance.
 5. Exterior Building Enclosure: Patch components in a manner that restores enclosure to a weathertight condition.

3.4 CLEANING

- A. Clean areas and spaces where cutting and patching are performed. Completely remove paint, mortar, oils, putty, and similar items. Thoroughly clean piping, conduit, and similar features before applying paint or other finishing materials. Restore damaged pipe covering to its original condition.

END OF SECTION

SECTION 01 7419

CONSTRUCTION WASTE MANAGEMENT AND DISPOSAL

PART 1 GENERAL

1.01 WASTE MANAGEMENT REQUIREMENTS

- A. Yonkers Public School District requires that this project generate the least amount of trash and waste possible.
- B. Employ processes that ensure the generation of as little waste as possible due to error, poor planning, breakage, mishandling, contamination, or other factors.
- C. Minimize trash/waste disposal in landfills; reuse, salvage, or recycle as much waste as economically feasible.
- D. Contractor shall submit periodic Waste Disposal Reports; all landfill disposal, incineration, recycling, salvage, and reuse must be reported regardless of to whom the cost or savings accrues; use the same units of measure on all reports.
- E. Methods of trash/waste disposal that are not acceptable are:
 - 1. Burning on the project site.
 - 2. Burying on the project site.
 - 3. Dumping or burying on other property, public or private.
 - 4. Other illegal dumping or burying.
- F. Regulatory Requirements: Contractor is responsible for knowing and complying with regulatory requirements, including but not limited to Federal, state and local requirements, pertaining to legal disposal of all construction and demolition waste materials.

1.02 DEFINITIONS

- A. Clean: Untreated and unpainted; not contaminated with oils, solvents, caulk, or the like.
- B. Construction and Demolition Waste: Solid wastes typically including building materials, packaging, trash, debris, and rubble resulting from construction, remodeling, repair and demolition operations.
- C. Hazardous: Exhibiting the characteristics of hazardous substances, i.e., ignitibility, corrosivity, toxicity or reactivity.
- D. Nonhazardous: Exhibiting none of the characteristics of hazardous substances, i.e., ignitibility, corrosivity, toxicity, or reactivity.
- E. Nontoxic: Neither immediately poisonous to humans nor poisonous after a long period of exposure.
- F. Recyclable: The ability of a product or material to be recovered at the end of its life cycle and remanufactured into a new product for reuse by others.
- G. Recycle: To remove a waste material from the project site to another site for remanufacture into a new product for reuse by others.
- H. Recycling: The process of sorting, cleansing, treating and reconstituting solid waste and other discarded materials for the purpose of using the altered form. Recycling does not include burning, incinerating, or thermally destroying waste.
- I. Return: To give back reusable items or unused products to vendors for credit.
- J. Reuse: To reuse a construction waste material in some manner on the project site.
- K. Salvage: To remove a waste material from the project site to another site for resale or reuse by others.
- L. Sediment: Soil and other debris that has been eroded and transported by storm or well production run-off water.
- M. Source Separation: The act of keeping different types of waste materials separate beginning from the first time they become waste.
- N. Toxic: Poisonous to humans either immediately or after a long period of exposure.

- O. Trash: Any product or material unable to be reused, returned, recycled, or salvaged.
- P. Waste: Extra material or material that has reached the end of its useful life in its intended use. Waste includes salvageable, returnable, recyclable, and reusable material.

1.03 SUBMITTALS

- A. Waste Disposal Reports: Submit at specified intervals, with details of quantities of trash and waste, means of disposal or reuse, and costs; show both totals to date and since last report.
 - 1. Submit updated Report with each Application for Progress Payment; failure to submit Report will delay payment.
 - 2. Submit Report on a form acceptable to Yonkers Public School District.
 - 3. Landfill Disposal: Include the following information:
 - a. Identification of material.
 - b. Amount, in tons or cubic yards, of trash/waste material from the project disposed of in landfills.
 - c. State the identity of landfills, total amount of tipping fees paid to landfill, and total disposal cost.
 - d. Include manifests, weight tickets, receipts, and invoices as evidence of quantity and cost.
 - 4. Incinerator Disposal: Include the following information:
 - a. Identification of material.
 - b. Amount, in tons or cubic yards, of trash/waste material from the project delivered to incinerators.
 - c. State the identity of incinerators, total amount of fees paid to incinerator, and total disposal cost.
 - d. Include manifests, weight tickets, receipts, and invoices as evidence of quantity and cost.
 - 5. Recycled and Salvaged Materials: Include the following information for each:
 - a. Identification of material, including those retrieved by installer for use on other projects.
 - b. Amount, in tons or cubic yards, date removed from the project site, and receiving party.
 - c. Transportation cost, amount paid or received for the material, and the net total cost or savings of salvage or recycling each material.
 - d. Include manifests, weight tickets, receipts, and invoices as evidence of quantity and cost.
 - e. Certification by receiving party that materials will not be disposed of in landfills or by incineration.
 - 6. Material Reused on Project: Include the following information for each:
 - a. Identification of material and how it was used in the project.
 - b. Amount, in tons or cubic yards.
 - c. Include weight tickets as evidence of quantity.
 - 7. Other Disposal Methods: Include information similar to that described above, as appropriate to disposal method.

PART 3 EXECUTION

2.01 WASTE MANAGEMENT PLAN IMPLEMENTATION

- A. Manager: Designate an on-site person or persons responsible for instructing workers and overseeing and documenting results of the Waste Management Plan.
- B. Communication: Distribute copies of the Waste Management Plan to job site foreman, each subcontractor, Yonkers Public School District, and Engineer.
- C. Instruction: Provide on-site instruction of appropriate separation, handling, and recycling, salvage, reuse, and return methods to be used by all parties at the appropriate stages of the project.
- D. Meetings: Discuss trash/waste management goals and issues at project meetings.
 - 1. Pre-bid meeting.
 - 2. Pre-construction meeting.
 - 3. Regular job-site meetings.

- E. Facilities: Provide specific facilities for separation and storage of materials for recycling, salvage, reuse, return, and trash disposal, for use by all contractors and installers.
 - 1. Provide containers as required.
 - 2. Provide adequate space for pick-up and delivery and convenience to subcontractors.
 - 3. Keep recycling and trash/waste bin areas neat and clean and clearly marked in order to avoid contamination of materials.
- F. Hazardous Wastes: Separate, store, and dispose of hazardous wastes according to applicable regulations.
- G. Recycling: Separate, store, protect, and handle at the site identified recyclable waste products in order to prevent contamination of materials and to maximize recyclability of identified materials. Arrange for timely pickups from the site or deliveries to recycling facility in order to prevent contamination of recyclable materials.
- H. Reuse of Materials On-Site: Set aside, sort, and protect separated products in preparation for reuse.
- I. Salvage: Set aside, sort, and protect products to be salvaged for reuse off-site.

END OF SECTION

SECTION 01 7800
CLOSEOUT SUBMITTALS

PART 1 GENERAL

1.01 RELATED DOCUMENTS

- A. Drawings and general provisions of the Contract apply to work of this section.

1.02 SECTION INCLUDES

- A. Project Record Documents.
- B. Operation and Maintenance Data.
- C. Warranties and bonds.

1.03 RELATED REQUIREMENTS

- A. Section 01 3000 - Administrative Requirements: Submittals procedures, shop drawings, product data, and samples.
- B. Section 01 7000 - Execution and Closeout Requirements: Contract closeout procedures.
- C. Individual Product Sections: Warranties required for specific products or Work.

1.04 SUBSTANTIAL COMPLETION

- A. Preliminary Procedures: Before requesting inspection for determining date of Substantial Completion:
 - 1. Prepare a list of items to be completed and corrected, the value of items on the list, and reasons why the Work is not complete.
 - 2. Advise Owner's Representative, Engineer, and Architect of pending insurance changeover requirements.
 - 3. Obtain and submit releases permitting Owner's Representative, Engineer, and Architect unrestricted use of the Work and access to services and utilities. Include occupancy permits, operating certificates, and similar releases.
- B. Prior to issuance of the Certificate of Substantial Completion, submit, in writing, a request to the Owner's Representative, Engineer, and Architect a request to perform site inspection for the purpose of preparing a "punch list".
- C. On receipt of request Owner's Representative, Engineer, and Architect will prepare a punch list. Certificate of Substantial Completion after completion of all punch list items or will notify Contractor of items, either punch list or additional items identified by Architect that must be completed or corrected before certificate will be issued.
- D. Certificate of Substantial Completion will be issued after completion of all punch list items or Owner's Representative, Engineer, and Architect will notify Contractor of items, either punch list or additional items identified by Architect, that must be completed or corrected before certificate will be issued. After completion of "punch list" items submit the following:
 - 1. Application for Payment showing 100 percent completion for portion of the Work claimed as substantially completed the following:
 - 2. Warranties (guarantees).
 - 3. Maintenance Manuals and instructions.
 - 4. Final cleaning.
 - 5. List of incomplete Work, recognized as exceptions to Architect's "punch list"..
 - 6. Engineer/Architect's punch list certifying all punch list items have been completed and signed off by the Owner's Representative and Contractor.
 - 7. Removal of temporary facilities and services.
 - 8. Removal of surplus materials, rubbish and similar elements.
- E. Request re inspection when the Work identified in previous inspections as incomplete is completed or corrected.

1.05 FINAL COMPLETION

- A. Preliminary Procedures: Before requesting final inspection for determining date of Final Completion, complete the following:
 - 1. Inspection: Submit a written request for final inspection for acceptance. On receipt of request, Owner's Representative, Engineer, and Architect will either proceed with inspection or notify Contractor of unfulfilled requirements. Architect will not process a final Certificate for Payment until after the inspection or will notify Contractor of construction that must be completed or corrected before certificate will be issued.
- B. Following Final Inspection acceptance of work submit the following:
 - 1. Submit a final Application for Payment.
 - 2. Submit certified copy of Architect's Substantial Completion punch list items endorsed and dated Contractor and Owner's Representative certifying each item has been completed or otherwise resolved for acceptance.
 - 3. Release of liens from contractor and all entitles of contractor.
 - 4. AIA Document G707 Consent of Surety to Final Payment.
 - 5. Final Liquidated Damages settlement statement.
 - 6. Contractor's Affidavit of Release of Liens (AIA G706A).
 - 7. Contractors Affidavit of Payment of Debts and Claims (AIA G706)
 - 8. Certification of Payment of Prevailing Wage Rates.
 - 9. Contractor's certified statement that no asbestos containing material was incorporated into the project.

1.06 SUBMITTALS

- A. Contractor shall submit all documentation identified in this section within sixty (60) days from the time the Contractor submits the list of items to be corrected, as referred to in Article 14.4.1 of the General Conditions, "in addition to other rights of the Owner set forth elsewhere in the Contract Documents, to include but not limited to withholding of final payment." If the documentation has not been submitted within sixty 60 day period, the Owner will obtain such through whatever means necessary. The Contractor shall solely be responsible for all expenses incurred by the Owner, provided the Owner has advised the Contractor of this action thirty 30 days prior to the culmination date and again, seven 7 days prior to the culmination date by written notice.
- B. Project Record Documents: Submit documents to Engineer with claim for final Application for Payment.
- C. Warranties and Bonds:
 - 1. Make other submittals within 10 days after Date of Substantial Completion, prior to final Application for Payment.

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.
- B. Ensure entries are complete and accurate, enabling future reference by Yonkers Public School District.
- 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. Changes made by Addenda and modifications.

- F. Record Drawings and Shop Drawings: Legibly mark each item to record actual construction including:
 - 1. Field changes of dimension and detail.
 - 2. Details not on original Contract drawings.

3.02 RECORD DRAWINGS

- A. Record Prints: Maintain one set of blue- or black-line white prints of the Contract Drawings and approved Shop Drawings at the project site.
- B. The Contractor is responsible for marking up Sections that contain its own Work and for submitting the complete set of record Specifications as specified.
- C. Preparation: Mark Record Prints to show the actual installation where installation varies from that shown originally. Require individual or entity who obtained record data, whether individual or entity is Installer, subcontractor, or similar entity, to prepare the marked-up Record Prints.
 - 1. Accurately record information in an understandable drawing technique.
- D. Content: Types of items requiring marking include, but are not limited to, the following:
 - 1. Revisions to details shown on Drawings.
 - 2. Changes made by Change Order or Construction Change Directive.
 - 3. Changes made following Engineer/Architect's written orders.
 - 4. Details not on the original Contract Drawings.
- E. Mark the Contract Drawings or Shop Drawings, whichever is most capable of showing actual physical conditions, completely and accurately. If Shop Drawings are marked, show cross-reference on the Contract Drawings.
- F. Mark important additional information that was either shown schematically or omitted from original Drawings.
- G. Note Construction Change Directive numbers, alternate numbers, Change Order numbers, and similar identification, where applicable.

3.03 RECORD CAD DRAWINGS: IMMEDIATELY BEFORE INSPECTION FOR CERTIFICATE OF SUBSTANTIAL COMPLETION, REVIEW MARKED-UP RECORD PRINTS WITH ARCHITECT AND OWNER'S REPRESENTATIVE. WHEN AUTHORIZED, PREPARE A FULL SET OF CORRECTED CAD DRAWINGS OF THE CONTRACT DRAWINGS, AS FOLLOWS:

- A. Format: Same CAD program, version, and operating system as the original Contract Drawings.
- B. Incorporate changes and additional information previously marked on Record Prints. Delete, re draw, and add details and notations where applicable.
 - 1. Refer instances of uncertainty to Architect through Owner's Representative for resolution.
- C. Owner will furnish Contractor one set of CAD Drawings of the Contract Drawings for use in recording information.
 - 1. Architect makes no representations as to the accuracy or completeness of CAD Drawings as they relate to the Contract Drawings.
 - 2. CAD Software Program: The Contract Drawings are available in Auto CAD 2007.

3.04 FORMAT

- A. Identify and date each Record Drawing; include the designation "PROJECT RECORD DRAWING" in a prominent location. Contractor shall certify and sign.
- B. Record Prints: Organize Record Prints and newly prepared Record Drawings into manageable sets. Bind each set with durable paper cover sheets. Include identification on cover sheets.
- C. Record CAD Drawings: Organize CAD information into separate electronic files that correspond to each sheet of the Contract Drawings. Name each file with the sheet identification. Include identification in each CAD file.
- D. Identify Record Drawing as follows:
 - 1. Project name.
 - a. Date.
 - b. Designation "PROJECT RECORD DRAWINGS."
 - c. Name of Architect and Owner's Representative.

- d. Name of Contractor.
- e. Contractor shall certify and sign each drawing

3.05 MAINTENANCE OF RECORDS

- A. The Contractor shall maintain the records required in Title 29 CFR 1926.1101 (n) and Part 56 of Title 12 of the Official Compilation of Codes, Rules and Regulations of the State of New York.
- B. The Contractor shall provide the Owner and Engineer with two electronic copies (disk in pdf format) and Two (2) printed copies of all records.

3.06 OPERATION AND MAINTENANCE DATA FOR MATERIALS AND FINISHES

- A. For Each Product, Applied Material, and Finish:
- B. Instructions for Care and Maintenance: Manufacturer's recommendations for cleaning agents and methods, precautions against detrimental cleaning agents and methods, and recommended schedule for cleaning and maintenance.
- C. 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.

3.07 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 Yonkers Public School District'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.

END OF SECTION

SECTION 02 8070

SUMMARY OF WORK HAZARDOUS MATERIALS

PART 1 - GENERAL

1.01 WORK COVERED BY CONTRACT DOCUMENTS

- A. The Work of this Contract comprises of asbestos & PCB abatement located at Yonkers Public School District's Martin Luther King School.
- B. The Scope of Work is as defined on the HM Series Drawing(s).
- C. Asbestos & PCB containing materials to be removed include the Transite Duct, Duct Pin Mastic, Sound Damping Lining in Plenum Box, Roof Pitch Pocket Tar, Floor Tile/Mastic, Duct Insulation, Mudded Fittings and PCB Caulk on the Joints, Soffit, Panel and Louver.

1.02 CONTRACTS

- A. Division of Work
 - 1. Asbestos & PCB Abatement Contractor (Part of GC Bid)
 - a. Perform Work required and as specified in the following specification sections and divisions: Divisions 00 through 02.
 - b. Perform Work required and indicated on the following drawings: HM Series Drawings
 - 2. The above listing of drawings and specifications is intended as a guide and does not relieve the Contractors of the responsibility of reviewing all drawings and specifications for bidding and coordinating with others during the construction period. Review Contract Documents before submitting proposals.

1.03 WORK BY OTHERS

- A. Work on the project site which will be executed prior to the start of the Work of this Contract, and which is excluded from this Contract, is as follows:
 - 1. None
- B. Work on the project site which will be executed after completion of the Work of this Contract, and which is excluded from this Contract, is as follows:
 - 1. Renovation Work

1.04 DESCRIPTION OF WORK

- A. The Work specified herein shall be the removal of asbestos containing materials by competent persons trained, knowledgeable, and qualified in the techniques of abatement, handling, and disposal of asbestos containing and asbestos contaminated materials and the subsequent cleaning of contaminated areas, who comply with all applicable federal, state, and local regulations and are capable of and willing to perform the Work of this Contract.
- B. The Contractor shall supply labor, materials, services, insurance, permits, and equipment necessary to carry out the Work in accordance with all applicable federal, state, and local regulations and these specifications.
- C. The Contractor is responsible for restoring the Work area and auxiliary areas utilized during the abatement to conditions equal to or better than original. Damages caused during the performance of abatement activities shall be repaired by the Contractor (e.g., paint peeled off by barrier tape, nail holes, water damage, broken glass) at no additional expense to the Owner.

1.05 WORK SEQUENCE

- A. Construct Work in stages to accommodate the Owner's use of the premises during the construction period. Coordinate construction schedule with the Engineer.
- B. Construct Work in stages to provide for public convenience.

1.06 PARTIAL OWNER OCCUPANCY

- A. The Owner will occupy the existing building during the construction period and will maintain normal operations. The Owner will cooperate with the Contractor to facilitate the continuity and the progress of the Work. Cooperate with the Owner by minimizing the disturbance of the Owner's activities in spaces adjacent to the construction Work.

- B. Protect the occupants against hazards of the asbestos abatement and other construction operations and also provide access to Owner-occupied spaces. If elimination of access to any occupied space becomes necessary, it shall occur only after advance notice and special arrangements with the Owner.
- C. Provide necessary barricades, temporary partitions, other separations, and closures to protect the occupants of the building from harm or injury due to the construction operations, to restrict occupancy of construction areas to construction workers, and to prevent dust and debris caused by construction activities from entering Owner-occupied spaces.

1.07 COORDINATION

- A. The Contractor shall work with the others at the job site to maintain continuity of Work in accordance with the project schedule. The Contractor must cooperate to the maximum extent with the other Contractors to facilitate the execution of their Work. Timely notice of change in the Contractor's schedule shall be given to the others and to the Engineer so that all operations may be rescheduled or modified as required.
- B. In case of conflicts occurring because of failure to abide by the requirements of the above paragraph, the Engineer's decision will be final, and no extra compensation will be awarded for extra work caused by failure to follow the above requirements.
- C. The Owner or his representative shall have the right to stop the work immediately if the Contractor does not adhere to the specifications contained herein. Such notice can be verbal or in writing. If a verbal order is given, a written order must follow.

1.08 INTERPRETATION OF DRAWINGS AND SPECIFICATIONS

- A. The lists of equipment, tabulations of data measurements, and schedules appearing in the specifications or drawings are included only for the assistance and guidance of the Contractor in arriving at a more complete understanding of the intended installation. They are not intended, or to be construed, as relieving the responsibility of the Contractor in making his own takeoff.

1.09 ABBREVIATIONS AND SYMBOLS

- A. Contractor is expected to be familiar with the standard abbreviation symbols used in the Contract Documents. Inform the Engineer, in writing, of any unclear or unknown abbreviation or symbol prior to the Bid Date. Unless notified, the Engineer will assume that the Contractor is fully familiar with all such items and can execute his Work accordingly.

1.10 PROTECTION OF EXISTING BUILDING AND GROUNDS

- A. Provide protection to prevent damage to building, both interior and exterior, during construction operations.
- B. Repair damage to building and grounds to satisfaction of the Owner.

1.11 PROTECTION OF EQUIPMENT AND MATERIALS

- A. Assume full and complete responsibility for protection and safe-keeping of his products and equipment stored at project location.

1.12 PROTECTION OF UTILITIES

- A. Provide and maintain adequate protection for existing utilities. Repair such Work damaged during construction to the satisfaction of the Engineer.

1.13 ASBESTOS PROJECT MONITOR

- A. Perform work only when the Asbestos Project Monitor is on site unless otherwise instructed in writing by the Engineer.
- B. Perform work only during the hours of work established at the Pre-Construction Meeting or as approved in writing by the Engineer at least 24 hours in advance of the change. This will allow the Asbestos Project Monitor to monitor the Work in progress.

NOTE: THE CONTRACTORS ARE HEREBY NOTIFIED THAT IN THE EVENT THE CONTRACTORS, THEIR EMPLOYEES OR SUBCONTRACTORS ENCOUNTER A MATERIAL OR CONDITION WHICH IS UNKNOWN OR WHICH MAY BE SUSPECTED TO CONTAIN ASBESTOS OR OTHER HAZARDOUS MATERIAL, THE CONTRACTOR WILL NOT DISTURB THE MATERIAL, BUT SHALL STOP WORK IN THAT AREA AND NOTIFY THE OWNER IN WRITING IMMEDIATELY OF THE CONDITION OR MATERIAL.

END OF SECTION



Eisenbach & Ruhnke
ENGINEERING, P.C.

LIMITED ASBESTOS SURVEY

MARTIN LUTHER KING JR. ACADEMY
135 LOCUST AVENUE
YONKERS, NEW YORK 10701

E&R Project # Y19MLK01

Issued: September 2, 2021

Prepared For:

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Prepared By:

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Prepared By:

Matthew Inman Date: 9/2/21

Matthew Inman (New York State Accredited Inspector #AH 97-21978)
Manager of Environmental Services

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ASBESTOS SURVEY MARTIN LUTHER KING JR. ACADEMY

The following report is a summary of the asbestos testing performed by Eisenbach & Ruhnke Engineering, P.C. (E&R) at the Martin Luther King Jr. Academy located at 135 Locust Avenue, Yonkers, NY. The testing was performed to support proposed renovations.

The inspection was performed over the following dates:

Date	Inspector	Handler #
October 10, 2019	Matthew Inman	97-21978
November 20, 2019	Matthew Inman Brian Jones	97-21978 05-08079

This survey is for the purpose of identifying approximate locations and quantities of asbestos containing materials that would be potentially disturbed during renovations. The inspection included the sampling of all materials that were accessible during the time of the inspection. This survey is not intended for the purposes of planning the scope, timing, phasing, and/or remediation methods on any asbestos containing materials identified herein. The Owner and/or their representatives are responsible for verifying exact quantities, types, and locations prior to any renovation and demolition work.

2.0 ASBESTOS TESTING

Friable samples collected were read using Polarized Light Microscopy (PLM). Non-friable organically bound samples were analyzed utilizing gravimetric reduction with Polarized Light Microscopy (PLM) and Transmission Electron Microscopy (TEM) confirmation of all PLM negatives. AmeriSci Laboratories, Inc analyzed all samples.

Asbestos containing materials are those which were found to contain greater than 1% asbestos. Some materials were found to contain less than or equal to 1% asbestos and are known as "trace" concentration materials. Under Federal and New York State regulations and guidelines, trace materials are *not* defined as asbestos containing materials.

A summary of asbestos containing materials which were identified during the inspection are presented in Section 3.0. Refer to Appendix A for list (Bulk Sample Log) of all materials tested and the result of the analysis. Refer to Appendix B for the laboratory report of analysis, and Appendix C for drawings showing bulk sample locations and locations of identified asbestos containing materials. Refer to Appendix-D for certifications and accreditations.

3.0 FINDINGS

The following materials were found to contain greater than 1% asbestos by weight:

Surfacing Materials

None

Thermal Materials

Duct Insulation

Miscellaneous Materials

Pitch Pocket Tar

Sink Mastic – Black

Sink Mastic – Gray

Window Glaze

4.0 LOCATIONS AND QUANTITIES

The following materials were found to contain greater than 1% asbestos:

Material	Homo ID	Location	Estimated Quantity
Pitch pocket Tar	16	Annex Roof	5 SQFT
Sink Mastic – Black	34.1	Spaces 0003, 0004, 0005, 0007, 0008, 0009, 0010, 0108, 0118, 0119, 0121, 0123, 0201, 0202, 0203, 0204, 0206, 0207, 0208, 0209, 0252, and 0253	22 Sinks
Sink Mastic - Gray	34.2		
Window Glaze	68	Exterior	11,000 SQ FT
Duct Insulation	4	Space 0216	216 SQ FT

Appendix A

Bulk Sample Logs



Eisenbach & Ruhnke

ENGINEERING, P.C.

AmeriSci Job # 219102609

Yonkers Public Schools
Martin Luther King Academy
135 Locaust Hill Ave.
Yonkers, NY 10701

Project No. Y19MLK01

<i>SAMPLE #</i>	<i>PLM RESULTS</i>	<i>TEM RESULTS</i>	<i>HOMO ID#</i>	<i>MATERIAL SAMPLED</i>	<i>SAMPLE LOCATION</i>
001	NAD	NAD	1	Vapor Barrier	Concrete Deck Roof
002	NAD	NAD	1	Vapor Barrier	Concrete Deck Roof
003	NAD	NAD	2	Roof Tar	Metal Deck Roof
004	NAD	NAD	2	Roof Tar	Metal Deck Roof
005	NAD	NA	3	ISO Board	Main Roof
006	NAD	NA	3	ISO Board	Main Roof
007	NAD	NA	4	Perlite	Main Roof
008	NAD	NA	4	Perlite	Main Roof
009	NAD	NAD	5	Built-Up Roofing	Main Roof
010	NAD	NAD	5	Built-Up Roofing	Main Roof
011	NAD	NAD	6	Mechanical Flashing	Main Roof
012	NAD	NAD	6	Mechanical Flashing	Main Roof
013	NAD	NAD	7	Mechanical Flashing Tar	Main Roof
014	NAD	NAD	7	Mechanical Flashing Tar	Main Roof
015	NAD	NAD	8	Perimeter Flashing	Main Roof
016	NAD	NAD	8	Perimeter Flashing	Main Roof
017	NAD	NAD	9	Perimeter Flashing Tar	Main Roof
018	NAD	NAD	9	Perimeter Flashing Tar	Main Roof
019	NAD	NAD	10	Joint Pointing Tar	Main Roof
020	NAD	NAD	10	Joint Pointing Tar	Main Roof
021	Trace	Trace	11	Joint Caulk (Soffit)	Soffit
022	Trace	Trace	11	Joint Caulk (Soffit)	Soffit
023	NAD	NAD	12	Soffit Caulk	Soffit
024	NAD	NAD	12	Soffit Caulk	Soffit
025	NAD	NAD	13	Limestone Panel Caulk	Exterior
026	NAD	NAD	13	Limestone Panel Caulk	Exterior
027	NAD	NA	14	Fiberboard (on deck)	Annex Roof

LEGEND

ACM = Asbestos Containing Material - Contains Greater than 1% asbestos by weight.

Trace = Asbestos was NOT detected above the regulatory limit of 1% by weight.

NAD = No Asbestos Detected

NA/PS = Sample was not analyzed, but is grouped with another that tested positive for asbestos.

NA = Sample was not analyzed. Either a NOB sample that tested positive under PLM,

Samples Collected: 10.10.19

Samples Collected by: Matthew Inman

NYS Accredited Inspector #: 97-21978



Eisenbach & Ruhnke

ENGINEERING, P.C.

AmeriSci Job # 219102609

Yonkers Public Schools
Martin Luther King Academy
135 Locaust Hill Ave.
Yonkers, NY 10701

Project No. Y19MLK01

<i>SAMPLE #</i>	<i>PLM RESULTS</i>	<i>TEM RESULTS</i>	<i>HOMO ID#</i>	<i>MATERIAL SAMPLED</i>	<i>SAMPLE LOCATION</i>
028	NAD	NA	14	Fiberboard (on deck)	Annex Roof
029	NAD	NA	15	Fiberboard (on Elevator Shaft)	Annex Roof
030	NAD	NA	15	Fiberboard (on Elevator Shaft)	Annex Roof
031	3.4% ACM	NA	16	Pitch Pocket Tar	Annex Roof
032	NA/PS	NA	16	Pitch Pocket Tar	Annex Roof

LEGEND

ACM = Asbestos Containing Material - Contains Greater than 1% asbestos by weight.

Trace = Asbestos was NOT detected above the regulatory limit of 1% by weight.

NAD = No Asbestos Detected

NA/PS = Sample was not analyzed, but is grouped with another that tested positive for asbestos.

NA = Sample was not analyzed. Either a NOB sample that tested positive under PLM,
or a friable sample that is not analyzed by TEM.

Samples Collected: 10.10.19

Samples Collected by: Matthew Inman

NYS Accredited Inspector #: 97-21978

SAMPLE #	PLM RESULTS	TEM RESULTS	HOMO ID#	MATERIAL SAMPLED	SAMPLE LOCATION
033	14.8% ACM	NA	4	Duct Insulation	Space 0216
034	NA/PS	NA	4	Duct Insulation	Space 0216
035	NA/PS	NA	4	Duct Insulation	Space 0216
036	NAD	NA	59.1	Joint Compound (Skylight)	Space 0216
037	NAD	NA	59.1	Joint Compound (Skylight)	Space 0216
038	NAD	NA	59.2	Gypsum Wallboard (Skylight)	Space 0216
039	NAD	NA	59.2	Gypsum Wallboard (Skylight)	Space 0216
040	NAD	NAD	62	Laminate	Space 0202
041	NAD	NAD	62	Laminate	Space 0204
042	NAD	NAD	63	Divider Wall Fabric	Space 0202
043	NAD	NAD	63	Divider Wall Fabric	Space 0202
044	NAD	NAD	28	Old Covebase Mastic - Brown	Space 0201
045	NAD	NAD	28	Old Covebase Mastic - Brown	Space 0203
046	NAD	NAD	29	4" Dark Brown Covebase	Space 0201
047	NAD	NAD	29	4" Dark Brown Covebase	Space 0203
048	NAD	NA	34.1	Sink Mastic - Black	Space 0204
049	3.7% ACM	NA	34.1	Sink Mastic - Black	Space 0204
050	NAD	NA	20A	Ceramic Floor Mudset	Space 0211
051	NAD	NA	20A	Ceramic Floor Mudset	Space 0211
052	NAD	NA	19A	Ceramic Floor Grout	Space 0211
053	NAD	NA	19A	Ceramic Floor Grout	Space 0211
054	NAD	NA	19B	Ceramic Wall Grout	Space 0212
055	NAD	NA	19B	Ceramic Wall Grout	Space 0212
056	Trace	Trace	66	Interior Window Glaze	Space 0202
057	Trace	Trace	66	Interior Window Glaze	Space 0202
058	10.1% ACM	NA	34.2	Sink Mastic - Gray	Space 0119
059	NA/PS	NA	34.2	Sink Mastic - Gray	Space 0119

LEGEND**ACM** = Asbestos Containing Material - Contains Greater than 1% asbestos by weight.**Trace** = Asbestos was NOT detected above the regulatory limit of 1% by weight.**NAD**= No Asbestos Detected**NA/PS**= Sample was not analyzed, but is grouped with another that tested positive for asbestos.**NA**= Sample was not analyzed. Either a NOB sample that tested positive under PLM,
or a friable sample that is not analyzed by TEM.

Samples Collected: 11.20.19

Samples Collected by: Matthew Inman

NYS Accredited Inspector #: 97-21978

<i>SAMPLE #</i>	<i>PLM RESULTS</i>	<i>TEM RESULTS</i>	<i>HOMO ID#</i>	<i>MATERIAL SAMPLED</i>	<i>SAMPLE LOCATION</i>
060	NAD	NA	35.1	Gypsum Wallboard (Annex)	Annex Space 0135
061	NAD	NA	35.1	Gypsum Wallboard (Annex)	Annex Space 0134
062	NAD	NAD	42.1	2x2 Ceiling Tile	Annex Space 0134
063	NAD	NAD	42.1	2x2 Ceiling Tile	Annex Space 0135
064	NAD	NA	64	Soffitt	Exterior
065	NAD	NA	64	Soffitt	Exterior
066	NAD	NA	64	Soffitt	Exterior
067	Trace	Trace	65	Window Caulk	Exterior
068	Trace	Trace	65	Window Caulk	Exterior
069	NAD	NAD	67	Frame Caulk	Exterior
070	NAD	NAD	67	Frame Caulk	Exterior
071	Trace	NA	68	Window Glaze	Exterior
072	3.8% ACM	NA	68	Window Glaze	Exterior
073	Trace	Trace	69	Louver Caulk	Exterior
074	Trace	Trace	69	Louver Caulk	Exterior
075	NAD	NAD	70	Panel Caulk	Exterior
076	NAD	NAD	70	Panel Caulk	Exterior
077	NAD	NAD	71	Column Caulk	Exterior
078	Trace	Trace	71	Column Caulk	Exterior

LEGEND

ACM = Asbestos Containing Material - Contains Greater than 1% asbestos by weight.

Trace = Asbestos was NOT detected above the regulatory limit of 1% by weight.

NAD= No Asbestos Detected

NA/PS= Sample was not analyzed, but is grouped with another that tested positive for asbestos.

• **NA**= Sample was not analyzed. Either a NOB sample that tested positive under PLM,
 or a friable sample that is not analyzed by TEM.

Samples Collected: 11.20.19

Samples Collected by: Matthew Inman

NYS Accredited Inspector #: 97-21978

Appendix B

Laboratory Sample Analysis Results



Please Reply To:

AmeriSci New York

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

FACSIMILE TELECOPY TRANSMISSION

To: Jack Eisenbach
Eisenbach & Ruhnke Engineering, P.C.
Fax #: (315) 735-6365

Email: acorrell@erengpc.com,minman@erengpc.com

From: John P. Koubiadis
AmeriSci Job #: 219102609
Subject: ELAP-PLM/TEM 3 day Results
Client Project: Y19MLK01; Yonkers PS; MLK
Academy (NYS Dept. Of Labor
Certificate # 97-21978)

Date: Thursday, October 17, 2019

Time: 11:00:45

Comments:

Number of Pages: _____

(including cover sheet)

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PLM Bulk Asbestos Report

Eisenbach & Ruhnke Engineering, P.C.
Attn: Jack Eisenbach
291 Genesee Street
Utica, NY 13501

Date Received 10/14/19 **AmeriSci Job #** 219102609
Date Examined 10/15/19 **P.O. #**
ELAP # 11480 **Page** 1 of 6
RE: Y19MLK01; Yonkers PS; MLK Academy (NYS Dept. Of Labor
Certificate # 97-21978)

Client No. / HGA	Lab No.	Asbestos Present	Total % Asbestos
001 1 Location: Concrete Deck Roof - Vapor Barrier Analyst Description: Black, Homogeneous, Non-Fibrous, Bulk Material Asbestos Types: Other Material: Non-fibrous 0.5 %	219102609-01	No	NAD ¹ (by NYS ELAP 198.6) by Bo Sun on 10/15/19
002 1 Location: Concrete Deck Roof - Vapor Barrier Analyst Description: Black, Homogeneous, Non-Fibrous, Bulk Material Asbestos Types: Other Material: Non-fibrous 3.8 %	219102609-02	No	NAD (by NYS ELAP 198.6) by Bo Sun on 10/15/19
003 2 Location: Metal Deck Roof - Roof Tar Analyst Description: Black, Homogeneous, Non-Fibrous, Bulk Material Asbestos Types: Other Material: Non-fibrous 0.6 %	219102609-03	No	NAD (by NYS ELAP 198.6) by Bo Sun on 10/15/19
004 2 Location: Metal Deck Roof - Roof Tar Analyst Description: Black, Homogeneous, Non-Fibrous, Bulk Material Asbestos Types: Other Material: Non-fibrous 0.3 %	219102609-04	No	NAD (by NYS ELAP 198.6) by Bo Sun on 10/15/19
005 2 Location: Main Roof - ISO Board Analyst Description: Black/Yellow, Heterogeneous, Fibrous, Bulk Material Asbestos Types: Other Material: Cellulose 40 %, Fibrous glass 15 %, Non-fibrous 45 %	219102609-05	No	NAD (by NYS ELAP 198.1) by Bo Sun on 10/15/19

See Reporting notes on last page

PLM Bulk Asbestos ReportY19MLK01; Yonkers PS; MLK Academy (NYS Dept. Of Labor
Certificate # 97-21978)

Client No. / HGA	Lab No.	Asbestos Present	Total % Asbestos
006 2	219102609-06 Location: Main Roof - ISO Board	No	NAD (by NYS ELAP 198.1) by Bo Sun on 10/15/19
Analyst Description: Black/Yellow, Heterogeneous, Fibrous, Bulk Material Asbestos Types: Other Material: Cellulose 40 %, Fibrous glass 10 %, Non-fibrous 50 %			
007 2	219102609-07 Location: Main Roof - Perlite	No	NAD (by NYS ELAP 198.1) by Bo Sun on 10/15/19
Analyst Description: Brown, Homogeneous, Fibrous, Bulk Material Asbestos Types: Other Material: Cellulose 60 %, Non-fibrous 40 %			
008 2	219102609-08 Location: Main Roof - Perlite	No	NAD (by NYS ELAP 198.1) by Bo Sun on 10/15/19
Analyst Description: Brown, Homogeneous, Fibrous, Bulk Material Asbestos Types: Other Material: Cellulose 80 %, Non-fibrous 20 %			
009 2	219102609-09 Location: Main Roof - Built-Up Roofing	No	NAD (by NYS ELAP 198.6) by Bo Sun on 10/15/19
Analyst Description: Black, Homogeneous, Non-Fibrous, Bulk Material Asbestos Types: Other Material: Non-fibrous 13 %			
010 2	219102609-10 Location: Main Roof - Built-Up Roofing	No	NAD (by NYS ELAP 198.6) by Bo Sun on 10/15/19
Analyst Description: Black, Homogeneous, Non-Fibrous, Bulk Material Asbestos Types: Other Material: Non-fibrous 7 %			
011 3	219102609-11 Location: Main Roof - Mechanical Flashing	No	NAD (by NYS ELAP 198.6) by Bo Sun on 10/15/19
Analyst Description: Black, Homogeneous, Non-Fibrous, Bulk Material Asbestos Types: Other Material: Fibrous glass 10 %, Non-fibrous 8.4 %			

PLM Bulk Asbestos ReportY19MLK01; Yonkers PS; MLK Academy (NYS Dept. Of Labor
Certificate # 97-21978)

Client No. / HGA	Lab No.	Asbestos Present	Total % Asbestos
012 3	219102609-12 Location: Main Roof - Mechanical Flashing	No	NAD (by NYS ELAP 198.6) by Bo Sun on 10/15/19
Analyst Description: Black, Homogeneous, Non-Fibrous, Bulk Material Asbestos Types: Other Material: Fibrous glass 10 %, Non-fibrous 10.7 %			
013 3	219102609-13 Location: Main Roof - MF Tar	No	NAD (by NYS ELAP 198.6) by Bo Sun on 10/15/19
Analyst Description: Black, Homogeneous, Non-Fibrous, Bulk Material Asbestos Types: Other Material: Non-fibrous 10.8 %			
014 3	219102609-14 Location: Main Roof - MF Tar	No	NAD (by NYS ELAP 198.6) by Bo Sun on 10/15/19
Analyst Description: Black, Homogeneous, Non-Fibrous, Bulk Material Asbestos Types: Other Material: Non-fibrous 3.5 %			
015 2	219102609-15 Location: Main Roof - Perimeter Flashing	No	NAD (by NYS ELAP 198.6) by Bo Sun on 10/15/19
Analyst Description: Black, Homogeneous, Non-Fibrous, Bulk Material Asbestos Types: Other Material: Fibrous glass 10 %, Non-fibrous 9.8 %			
016 2	219102609-16 Location: Main Roof - Perimeter Flashing	No	NAD (by NYS ELAP 198.6) by Bo Sun on 10/15/19
Analyst Description: Black, Homogeneous, Non-Fibrous, Bulk Material Asbestos Types: Other Material: Non-fibrous 0.4 %			
017 2	219102609-17 Location: Main Roof - Perimeter Flashing Tar	No	NAD (by NYS ELAP 198.6) by Bo Sun on 10/15/19
Analyst Description: Black/Grey, Homogeneous, Non-Fibrous, Bulk Material Asbestos Types: Other Material: Non-fibrous 3.5 %			

PLM Bulk Asbestos ReportY19MLK01; Yonkers PS; MLK Academy (NYS Dept. Of Labor
Certificate # 97-21978)

Client No. / HGA	Lab No.	Asbestos Present	Total % Asbestos
018 2	219102609-18 Location: Main Roof - Perimeter Flashing Tar	No	NAD (by NYS ELAP 198.6) by Bo Sun on 10/15/19
Analyst Description: Black/Grey, Homogeneous, Non-Fibrous, Bulk Material Asbestos Types: Other Material: Non-fibrous 2.6 %			
019 2	219102609-19 Location: Main Roof - Joint Pointing Tar	No	NAD (by NYS ELAP 198.6) by Bo Sun on 10/15/19
Analyst Description: Black, Homogeneous, Non-Fibrous, Bulk Material Asbestos Types: Other Material: Non-fibrous 20 %			
020 2	219102609-20 Location: Main Roof - Joint Pointing Tar	No	NAD (by NYS ELAP 198.6) by Bo Sun on 10/15/19
Analyst Description: Black, Homogeneous, Non-Fibrous, Bulk Material Asbestos Types: Other Material: Non-fibrous 7.1 %			
021 4	219102609-21 Location: Soffit - Joint Caulk (Soffit)	Yes	Trace (<0.25 % pc) ² (EPA 400 PC) by Bo Sun on 10/15/19
Analyst Description: Grey, Homogeneous, Non-Fibrous, Bulk Material Asbestos Types: Chrysotile <0.25 % pc Other Material: Non-fibrous 4.1 %			
022 4	219102609-22 Location: Soffit - Joint Caulk (Soffit)	Yes	Trace (<0.25 % pc) ² (EPA 400 PC) by Bo Sun on 10/15/19
Analyst Description: Grey, Homogeneous, Non-Fibrous, Bulk Material Asbestos Types: Chrysotile <0.25 % pc Other Material: Non-fibrous 6.2 %			
023 5	219102609-23 Location: Soffit - Soffit Caulk	No	NAD (by NYS ELAP 198.6) by Bo Sun on 10/15/19
Analyst Description: Grey, Homogeneous, Non-Fibrous, Bulk Material Asbestos Types: Other Material: Non-fibrous 10.6 %			

Client Name: Eisenbach & Ruhnke Engineering, P.C.

PLM Bulk Asbestos ReportY19MLK01; Yonkers PS; MLK Academy (NYS Dept. Of Labor
Certificate # 97-21978)

Client No. / HGA	Lab No.	Asbestos Present	Total % Asbestos
024 5	219102609-24 Location: Soffit - Soffit Caulk	No	NAD (by NYS ELAP 198.6) by Bo Sun on 10/15/19
Analyst Description: Grey, Homogeneous, Non-Fibrous, Bulk Material Asbestos Types: Other Material: Non-fibrous 7 %			
025 6	219102609-25 Location: Exterior - Limestone Panel Caulk	No	NAD (by NYS ELAP 198.6) by Bo Sun on 10/15/19
Analyst Description: Grey, Homogeneous, Non-Fibrous, Bulk Material Asbestos Types: Other Material: Non-fibrous 56.8 %			
026 6	219102609-26 Location: Exterior - Limestone Panel Caulk	No	NAD (by NYS ELAP 198.6) by Bo Sun on 10/15/19
Analyst Description: Grey, Homogeneous, Non-Fibrous, Bulk Material Asbestos Types: Other Material: Non-fibrous 56.7 %			
027 7	219102609-27 Location: Annex Roof - Fiberboard On Deck	No	NAD (by NYS ELAP 198.1) by Bo Sun on 10/15/19
Analyst Description: Brown, Homogeneous, Fibrous, Bulk Material Asbestos Types: Other Material: Cellulose 95 %, Non-fibrous 5 %			
028 7	219102609-28 Location: Annex Roof - Fiberboard On Deck	No	NAD (by NYS ELAP 198.1) by Bo Sun on 10/15/19
Analyst Description: Brown, Homogeneous, Fibrous, Bulk Material Asbestos Types: Other Material: Cellulose 95 %, Non-fibrous 5 %			
029 7	219102609-29 Location: Annex Roof - Fiberboard On Elevator Shaft	No	NAD (by NYS ELAP 198.1) by Bo Sun on 10/15/19
Analyst Description: Grey, Homogeneous, Fibrous, Bulk Material Asbestos Types: Other Material: Cellulose 97 %, Non-fibrous 3 %			

Client Name: Eisenbach & Ruhnke Engineering, P.C.

PLM Bulk Asbestos ReportY19MLK01; Yonkers PS; MLK Academy (NYS Dept. Of Labor
Certificate # 97-21978)

Client No. / HGA	Lab No.	Asbestos Present	Total % Asbestos
030 7	219102609-30 Location: Annex Roof - Fiberboard On Elevator Shaft	No	NAD (by NYS ELAP 198.1) by Bo Sun on 10/15/19
Analyst Description: Grey, Homogeneous, Fibrous, Bulk Material Asbestos Types: Other Material: Cellulose 97 %, Non-fibrous 3 %			
031 7	219102609-31 Location: Annex Roof - Pitch Pocket Tar	Yes	3.4 % (by NYS ELAP 198.6) by Bo Sun on 10/15/19
Analyst Description: Black, Homogeneous, Non-Fibrous, Bulk Material Asbestos Types: Chrysotile 3.4 % Other Material: Non-fibrous 5 %			
032 7	219102609-32 Location: Annex Roof - Pitch Pocket Tar		NA/PS
Analyst Description: Bulk Material Asbestos Types: Other Material:			

Reporting Notes:

- (1) This job was - Analyzed using Motic BA310 Pol Scope S/N 1190000538
- (2) Sample prepared for analysis by ELAP 198.6 method

Analyzed by: Bo Sun Bo Sun

*NAD/NSD =no asbestos detected; NA =not analyzed; NA/PS=not analyzed/positive stop, (SOF-V) = Sprayed On Fireproofing containing Vermiculite; (SM-V) = Surfacing Material containing Vermiculite; PLM Bulk Asbestos Analysis by Appd E to Subpt E, 40 CFR 763 (NVLAP 200546-0), ELAP PLM Method 198.1 for NY friable samples, which includes the identification and quantitation of vermiculite or 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: John Ruhnke

END OF REPORT

Client Name: Eisenbach & Ruhnke Engineering, P.C.

Table 1

Summary of Bulk Asbestos Analysis Results

Y19MLK01; Yonkers PS; MLK Academy (NYS Dept. Of Labor Certificate # 97-21978)

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	001	1	0.218	96.3	3.2	0.5	NAD	NAD
Location:	Concrete Deck Roof - Vapor Barrier							
02	002	1	0.345	95.9	0.3	3.8	NAD	NAD
Location:	Concrete Deck Roof - Vapor Barrier							
03	003	2	0.160	98.8	0.6	0.6	NAD	NAD
Location:	Metal Deck Roof - Roof Tar							
04	004	2	0.340	99.4	0.3	0.3	NAD	NAD
Location:	Metal Deck Roof - Roof Tar							
05	005	2	---	---	---	---	NAD	NA
Location:	Main Roof - ISO Board							
06	006	2	---	---	---	---	NAD	NA
Location:	Main Roof - ISO Board							
07	007	2	---	---	---	---	NAD	NA
Location:	Main Roof - Perlite							
08	008	2	---	---	---	---	NAD	NA
Location:	Main Roof - Perlite							
09	009	2	0.270	64.4	22.6	13.0	NAD	NAD
Location:	Main Roof - Built-Up Roofing							
10	010	2	0.315	86.7	6.3	7.0	NAD	NAD
Location:	Main Roof - Built-Up Roofing							
11	011	3	0.342	57.0	24.6	18.4	NAD	NAD
Location:	Main Roof - Mechanical Flashing							
12	012	3	0.333	57.4	21.9	20.7	NAD	NAD
Location:	Main Roof - Mechanical Flashing							
13	013	3	0.195	83.1	6.2	10.8	NAD	NAD
Location:	Main Roof - MF Tar							
14	014	3	0.231	93.5	3.0	3.5	NAD	NAD
Location:	Main Roof - MF Tar							
15	015	2	0.359	61.8	18.4	19.8	NAD	NAD
Location:	Main Roof - Perimeter Flashing							
16	016	2	0.239	93.7	5.9	0.4	NAD	NAD
Location:	Main Roof - Perimeter Flashing							

See Reporting notes on last page

Table I

Summary of Bulk Asbestos Analysis Results

Y19MLK01; Yonkers PS; MLK Academy (NYS Dept. Of Labor Certificate # 97-21978)

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	017	2	0.347	72.3	24.2	3.5	NAD	NAD
Location:	Main Roof - Perimeter Flashing Tar							
18	018	2	0.346	77.7	19.7	2.6	NAD	NAD
Location:	Main Roof - Perimeter Flashing Tar							
19	019	2	0.190	75.3	4.7	20.0	NAD	NAD
Location:	Main Roof - Joint Pointing Tar							
20	020	2	0.169	88.8	4.1	7.1	NAD	NAD
Location:	Main Roof - Joint Pointing Tar							
21	021	4	0.196	41.8	54.1	3.9	Chrysotile <0.25	Chrysotile <1.0
Location:	Soffit - Joint Caulk (Soffit)							
22	022	4	0.258	41.9	51.9	6.0	Chrysotile <0.25	Chrysotile <1.0
Location:	Soffit - Joint Caulk (Soffit)							
23	023	5	0.179	67.0	22.3	10.6	NAD	NAD
Location:	Soffit - Soffit Caulk							
24	024	5	0.199	70.4	22.6	7.0	NAD	NAD
Location:	Soffit - Soffit Caulk							
25	025	6	0.278	32.0	11.2	56.8	NAD	NAD
Location:	Exterior - Limestone Panel Caulk							
26	026	6	0.194	35.6	7.7	56.7	NAD	NAD
Location:	Exterior - Limestone Panel Caulk							
27	027	7	---	---	---	---	NAD	NA
Location:	Annex Roof - Fiberboard On Deck							
28	028	7	---	---	---	---	NAD	NA
Location:	Annex Roof - Fiberboard On Deck							
29	029	7	---	---	---	---	NAD	NA
Location:	Annex Roof - Fiberboard On Elevator Shaft							
30	030	7	---	---	---	---	NAD	NA
Location:	Annex Roof - Fiberboard On Elevator Shaft							
31	031	7	0.215	84.7	7.0	5.0	Chrysotile 3.4	NA
Location:	Annex Roof - Pitch Pocket Tar							
32	032	7	0.187	58.8	28.3	12.8	NA/PS	NA
Location:	Annex Roof - Pitch Pocket Tar							

See Reporting notes on last page

Client Name: Eisenbach & Ruhnke Engineering, P.C.

Table I

Summary of Bulk Asbestos Analysis Results


Y19MLK01; Yonkers PS; MLK Academy (NYS Dept. Of Labor Certificate # 97-21978)

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

Analyzed by: John P. Koubiadis  Date Analyzed 10/17/2019

**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 heterogeneous materials).

Reviewed By: 



EISENBACH & RUHNKE ENGINEERING, P.C.
291 GENESEE STREET, UTICA, NEW YORK 13501
315-735-1916 · FAX 315-735-6365 · E-MAIL info@ereng.com

BULK SAMPLE LOG
ASBESTOS

Log No: _____ of _____

CLIENT: <u>Yonkers PS</u>		ANALYSIS: <input type="checkbox"/> PLM Only <input type="checkbox"/> TEM Only <input checked="" type="checkbox"/> PLM/TEM as required by ELAP <input type="checkbox"/> Other _____
PROJECT NAME/LOCATION: <u>MLK Academy</u>		
SAMPLES COLLECTED BY: <u>Matt Inman</u>		
NYS DEPT OF LABOR CERTIFICATE NO. <u>97-21978</u>		TURNAROUND TIME: <input type="checkbox"/> RUSH <input type="checkbox"/> 12 Hour <input type="checkbox"/> 24 HOUR <input type="checkbox"/> 48 Hour <input checked="" type="checkbox"/> 72 Hour <input type="checkbox"/> Other _____
DATE SAMPLED: <u>10/10/19</u>	PROJECT#: <u>Y19MLK01</u>	

NOTES:

SAMPLE NUMBER	HOMO ID #	MATERIAL SAMPLED	LOCATION	ANALYZE ONLY IF SAMPLE TO THE LEFT IS NEGATIVE BY PLM/TEM
001		Vapor Barrier	Concrete Deck Roof	002
002		↓ ↓	↓ ↓ ↓	
003		Roof Tar	Metal Deck Roof	004-020
004		↓ ↓	↓ ↓	005-020
005		Iso Board	Main Roof	006-020
006		↓ ↓	↓	007-020
007		Pertite	Main Roof	008-020
008		↓	↓	009-020
009		Built Up Roofing	↓	010-020
010		↓ ↓ ↓	↓	011-020
011		Mechanical Flash.	↓	012-014
012		↓ ↓	↓	013, 014
013		MF tar	↓	014
014		↓	↓	
015		Perimeter Flashing	↓	016-020
016		↓ ↓	↓	017-020
017		Perimeter Flashing Tar	↓	018-020
018		↓ ↓ ↓	↓	019, 020
019		Joint Pointing Tar	↓	020

	PRINTED NAME	SIGNATURE	COMPANY	DATE	# OF SAMPLES
Remitted by:	<u>Matt Inman</u>	<u>[Signature]</u>	<u>ETR</u>	<u>11/11/19</u>	<u>19</u>
Received by:	<u>Katherine Byrne</u>	<u>[Signature]</u>	<u>Americus</u>	<u>10/14/19</u>	<u>12/2</u>
PLEASE EMAIL RESULTS TO <u>Minman</u> @ <u>erengpc.com</u> ATTN: <u>Matt</u>					
PLEASE FAX RESULTS TO () - ATTN: <u>#219102609</u>					



EISENBACH & RUHNKE ENGINEERING, P.C.
291 GENESEE STREET, UTICA, NEW YORK 13501
315-735-1916 · FAX 315-735-6365 · E-MAIL info@ereng.com

BULK SAMPLE LOG
ASBESTOS
Log No: ____ of ____

CLIENT: Yonkers Ps		ANALYSIS: <input type="checkbox"/> PLM Only <input type="checkbox"/> TEM Only <input checked="" type="checkbox"/> PLM/TEM as required by ELAP <input type="checkbox"/> Other _____
PROJECT NAME/LOCATION: MLK Academy		
SAMPLES COLLECTED BY: Matt Inman		
NYS DEPT OF LABOR CERTIFICATE NO. 97-21978		TURNAROUND TIME: <input type="checkbox"/> RUSH <input type="checkbox"/> 12 Hour <input type="checkbox"/> 24 HOUR <input type="checkbox"/> 48 Hour <input checked="" type="checkbox"/> 72 Hour <input type="checkbox"/> Other _____
DATE SAMPLED: 10/10/19	PROJECT#: Y19 MLK 01	

NOTES:

SAMPLE NUMBER	HOMO ID #	MATERIAL SAMPLED	LOCATION	ANALYZE ONLY IF SAMPLE TO THE LEFT IS NEGATIVE BY PLM/TEM
020		Joint Pointing Tar	Main Roof	
021		Joint Caulk (Soffit)	Soffit	021
022		↓ ↓ ↓	↓	
023		Soffit Caulk	↓	024
024		↓ ↓	↓	
025		Limestone Panel Caulk	Exterior	026
026		↓ ↓ ↓	↓	
027		Fiber board on Deck	Annex Roof	028-032
028		↓ ↓ ↓	↓ ↓	029-032
029		Fiberboard on Elevator shaft	↓ ↓	030, 032
030		↓ ↓ ↓	↓ ↓	031-032
031		Pitch Pocket Tar	↓ ↓	032
032		↓ ↓ ↓	↓ ↓	
033				
034				
035				
036				
037				
038				
039				

	PRINTED NAME	SIGNATURE	COMPANY	DATE	# OF SAMPLES
Remitted by:	Matt Inman		ETR	10/11/19	13
Received by:	Karlign Byrne		Amerisu	10/14/19	12/2
PLEASE EMAIL RESULTS TO minman@erengpc.com ATTN: Matt					
PLEASE FAX RESULTS TO () - ATTN: #219102609					



Please Reply To:

AmeriSci New York

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

LABORATORY ELECTRONIC TRANSMITTAL

To: Jack Eisenbach
Eisenbach & Ruhnke Engineering, P.C.
Fax #:
Email: acorrell@erengpc.com,minman@erengpc.com

From: Jared C. Clarke
AmeriSci Job #: 219113822
Subject: ELAP-PLM/TEM 3 day Results
Client Project: Y19MLK01; Yonkers PS; MLK Academy

Date: Sunday, December 01, 2019

Time: 02:37:46

Comments:

Number of Pages: 17

(including cover sheet)

NOTE: Attached report is to be considered preliminary until final review with accompanying analysis summary letter is issued.

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PLM Bulk Asbestos Report

Eisenbach & Ruhnke Engineering, P.C.
Attn: Jack Eisenbach
291 Genesee Street

Utica, NY 13501

Date Received 11/27/19 **AmeriSci Job #** 219113822
Date Examined 11/30/19 **P.O. #**
ELAP # 11480 **Page** 1 **of** 9
RE: Y19MLK01; Yonkers PS; MLK Academy

Client No. / HGA	Lab No.	Asbestos Present	Total % Asbestos
033 4 Location: Space 0216 - Duct Insulation	219113822-01	Yes	14.8 % ¹ (by NYS ELAP 198.1) by Jared C. Clarke on 11/30/19
Analyst Description: OffWhite, Homogeneous, Fibrous, Bulk Material Asbestos Types: Chrysotile 3.7 %, Amosite 11.1 % Other Material: Non-fibrous 85.2 %			
034 4 Location: Space 0216 - Duct Insulation	219113822-02		NA/PS
Analyst Description: Bulk Material Asbestos Types: Other Material:			
035 4 Location: Space 0216 - Duct Insulation	219113822-03		NA/PS
Analyst Description: Bulk Material Asbestos Types: Other Material:			
036 59.1 Location: Space 0216 - Joint Compound (Skylight)	219113822-04	No	NAD (by NYS ELAP 198.1) by Jared C. Clarke on 11/30/19
Analyst Description: White, Homogeneous, Non-Fibrous, Bulk Material Asbestos Types: Other Material: Non-fibrous 100 %			
037 59.1 Location: Space 0216 - Joint Compound (Skylight)	219113822-05	No	NAD (by NYS ELAP 198.1) by Jared C. Clarke on 11/30/19
Analyst Description: White, Homogeneous, Non-Fibrous, Bulk Material Asbestos Types: Other Material: Non-fibrous 100 %			

Client Name: Eisenbach & Ruhnke Engineering, P.C.

PLM Bulk Asbestos Report

Y19MLK01; Yonkers PS; MLK Academy

Client No. / HGA	Lab No.	Asbestos Present	Total % Asbestos
038 59.2	219113822-06 Location: Space 0216 - Gypsum Wallboard (Skylight)	No	NAD (by NYS ELAP 198.1) by Jared C. Clarke on 11/30/19
Analyst Description: OffWhite/Brown, Homogeneous, Non-Fibrous, Bulk Material Asbestos Types: Other Material: Cellulose 2 %, Non-fibrous 98 %			
039 59.2	219113822-07 Location: Space 0216 - Gypsum Wallboard (Skylight)	No	NAD (by NYS ELAP 198.1) by Jared C. Clarke on 11/30/19
Analyst Description: Grey/Brown, Homogeneous, Non-Fibrous, Bulk Material Asbestos Types: Other Material: Cellulose 3 %, Non-fibrous 97 %			
040 62	219113822-08 Location: Space 0202 - Laminate	No	NAD (by NYS ELAP 198.6) by Jared C. Clarke on 11/30/19
Analyst Description: Tan, Homogeneous, Non-Fibrous, Bulk Material Asbestos Types: Other Material: Non-fibrous 1.2 %			
041 62	219113822-09 Location: Space 0204 - Laminate	No	NAD (by NYS ELAP 198.6) by Jared C. Clarke on 11/30/19
Analyst Description: Tan, Homogeneous, Non-Fibrous, Bulk Material Asbestos Types: Other Material: Non-fibrous 1.8 %			
042 63	219113822-10 Location: Space 0202 - Divider Wall Fabric	No	NAD (by NYS ELAP 198.6) by Jared C. Clarke on 11/30/19
Analyst Description: Tan, Homogeneous, Fibrous, Bulk Material Asbestos Types: Other Material: Non-fibrous 2.4 %			
043 63	219113822-11 Location: Space 0202 - Divider Wall Fabric	No	NAD (by NYS ELAP 198.6) by Jared C. Clarke on 11/30/19
Analyst Description: Tan, Homogeneous, Fibrous, Bulk Material Asbestos Types: Other Material: Non-fibrous 3.8 %			

PLM Bulk Asbestos Report

Y19MLK01; Yonkers PS; MLK Academy

Client No. / HGA	Lab No.	Asbestos Present	Total % Asbestos
044 28	219113822-12 Location: Space 0201 -Old Cove Base Mastic - Brown	No	NAD (by NYS ELAP 198.6) by Jared C. Clarke on 11/30/19
Analyst Description: Yellow/Brown, Homogeneous, Non-Fibrous, Bulk Material Asbestos Types: Other Material: Non-fibrous 5.6 %			
045 28	219113822-13 Location: Space 0203 -Old Cove Base Mastic - Brown	No	NAD (by NYS ELAP 198.6) by Jared C. Clarke on 11/30/19
Analyst Description: Brown, Homogeneous, Non-Fibrous, Bulk Material Asbestos Types: Other Material: Non-fibrous 45.9 %			
046 29	219113822-14 Location: Space 0201 - 4" Dark Brown Cove Base	No	NAD (by NYS ELAP 198.6) by Jared C. Clarke on 11/30/19
Analyst Description: Black, Homogeneous, Non-Fibrous, Bulk Material Asbestos Types: Other Material: Non-fibrous 2.8 %			
047 29	219113822-15 Location: Space 0203 - 4" Dark Brown Cove Base	No	NAD (by NYS ELAP 198.6) by Jared C. Clarke on 11/30/19
Analyst Description: Brown, Homogeneous, Non-Fibrous, Bulk Material Asbestos Types: Other Material: Non-fibrous 7 %			
048 34.1	219113822-16 Location: Space 0204 - Sink Mastic - Black	No	NAD (by NYS ELAP 198.6) by Jared C. Clarke on 11/30/19
Analyst Description: Black, Homogeneous, Non-Fibrous, Bulk Material Asbestos Types: Other Material: Non-fibrous 29.7 %			
049 34.1	219113822-17 Location: Space 0204 - Sink Mastic - Black	Yes	3.7 % (by NYS ELAP 198.6) by Jared C. Clarke on 11/30/19
Analyst Description: Black, Homogeneous, Non-Fibrous, Bulk Material Asbestos Types: Chrysotile 3.7 % Other Material: Non-fibrous 28.9 %			

Client Name: Eisenbach & Ruhnke Engineering, P.C.

PLM Bulk Asbestos Report

Y19MLK01; Yonkers PS; MLK Academy

Client No. / HGA	Lab No.	Asbestos Present	Total % Asbestos
050 20A	219113822-18 Location: Space 0211 - Ceramic Floor Mudset	No	NAD (by NYS ELAP 198.1) by Jared C. Clarke on 11/30/19
Analyst Description: Grey/Brown, Homogeneous, Non-Fibrous, Cementitious, Bulk Material Asbestos Types: Other Material: Non-fibrous 100 %			
051 20A	219113822-19 Location: Space 0211 - Ceramic Floor Mudset	No	NAD (by NYS ELAP 198.1) by Jared C. Clarke on 11/30/19
Analyst Description: Grey, Homogeneous, Non-Fibrous, Cementitious, Bulk Material Asbestos Types: Other Material: Non-fibrous 100 %			
052 19A	219113822-20 Location: Space 0211 - Ceramic Floor Grout	No	NAD (by NYS ELAP 198.1) by Jared C. Clarke on 11/30/19
Analyst Description: Grey, Homogeneous, Non-Fibrous, Cementitious, Bulk Material Asbestos Types: Other Material: Non-fibrous 100 %			
053 19A	219113822-21 Location: Space 0211 - Ceramic Floor Grout	No	NAD (by NYS ELAP 198.1) by Jared C. Clarke on 11/30/19
Analyst Description: Grey, Homogeneous, Non-Fibrous, Cementitious, Bulk Material Asbestos Types: Other Material: Non-fibrous 100 %			
054 19B	219113822-22 Location: Space 0212 - Ceramic Wall Grout	No	NAD (by NYS ELAP 198.1) by Jared C. Clarke on 11/30/19
Analyst Description: White, Homogeneous, Non-Fibrous, Bulk Material Asbestos Types: Other Material: Non-fibrous 100 %			
055 19B	219113822-23 Location: Space 0212 - Ceramic Wall Grout	No	NAD (by NYS ELAP 198.1) by Jared C. Clarke on 11/30/19
Analyst Description: White, Homogeneous, Non-Fibrous, Bulk Material Asbestos Types: Other Material: Non-fibrous 100 %			

See Reporting notes on last page

PLM Bulk Asbestos Report

Y19MLK01; Yonkers PS; MLK Academy

Client No. / HGA	Lab No.	Asbestos Present	Total % Asbestos
056 66 Location: Space 0202 - Int. Window Glaze	219113822-24	Yes	Trace (<0.25 % pc) ² (EPA 400 PC) by Jared C. Clarke on 11/30/19
Analyst Description: Grey, Homogeneous, Non-Fibrous, Bulk Material Asbestos Types: Chrysotile <0.25 % pc Other Material: Non-fibrous 2.3 %			
057 66 Location: Space 0202 - Int. Window Glaze	219113822-25	Yes	Trace (<0.25 % pc) ² (EPA 400 PC) by Jared C. Clarke on 11/30/19
Analyst Description: Grey, Homogeneous, Non-Fibrous, Bulk Material Asbestos Types: Chrysotile <0.25 % pc Other Material: Non-fibrous 17.5 %			
058 34.2 Location: Space 0119 - Sink Mastic - Grey	219113822-26	Yes	10.1 % (by NYS ELAP 198.6) by Jared C. Clarke on 11/30/19
Analyst Description: Grey, Homogeneous, Non-Fibrous, Bulk Material Asbestos Types: Chrysotile 10.1 % Other Material: Non-fibrous 42.9 %			
059 34.2 Location: Space 0119 - Sink Mastic - Grey	219113822-27		NA/PS
Analyst Description: Bulk Material Asbestos Types: Other Material:			
060 35.1 Location: Annex - Space 0135 - Gypsum Wallboard	219113822-28	No	NAD (by NYS ELAP 198.1) by Jared C. Clarke on 11/30/19
Analyst Description: Grey, Homogeneous, Non-Fibrous, Bulk Material Asbestos Types: Other Material: Cellulose Trace, Non-fibrous 100 %			
061 35.1 Location: Annex - Space 0134 - Gypsum Wallboard	219113822-29	No	NAD (by NYS ELAP 198.1) by Jared C. Clarke on 11/30/19
Analyst Description: Grey, Homogeneous, Non-Fibrous, Bulk Material Asbestos Types: Other Material: Cellulose Trace, Non-fibrous 100 %			

Client Name: Eisenbach & Ruhnke Engineering, P.C.

PLM Bulk Asbestos Report

Y19MLK01; Yonkers PS; MLK Academy

Client No. / HGA	Lab No.	Asbestos Present	Total % Asbestos
062 42.1	219113822-30 Location: Annex - Space 0134 - 2 X 2 Ceiling Tile	No	NAD (by NYS ELAP 198.6) by Jared C. Clarke on 11/30/19
Analyst Description: Grey, Homogeneous, Non-Fibrous, Bulk Material Asbestos Types: Other Material: Non-fibrous 52 %			
063 42.1	219113822-31 Location: Annex - Space 0135 - 2 X 2 Ceiling Tile	No	NAD (by NYS ELAP 198.6) by Jared C. Clarke on 11/30/19
Analyst Description: Grey, Homogeneous, Non-Fibrous, Bulk Material Asbestos Types: Other Material: Non-fibrous 53.6 %			
064 64	219113822-32 Location: Exterior - Soffit	No	NAD (by NYS ELAP 198.1) by Jared C. Clarke on 11/30/19
Analyst Description: Grey, Homogeneous, Non-Fibrous, Cementitious, Bulk Material Asbestos Types: Other Material: Non-fibrous 100 %			
065 64	219113822-33 Location: Exterior - Soffit	No	NAD (by NYS ELAP 198.1) by Jared C. Clarke on 11/30/19
Analyst Description: Grey, Homogeneous, Non-Fibrous, Cementitious, Bulk Material Asbestos Types: Other Material: Non-fibrous 100 %			
066 64	219113822-34 Location: Exterior - Soffit	No	NAD (by NYS ELAP 198.1) by Jared C. Clarke on 11/30/19
Analyst Description: Grey, Homogeneous, Non-Fibrous, Cementitious, Bulk Material Asbestos Types: Other Material: Non-fibrous 100 %			
067 65	219113822-35 Location: Exterior - Window Caulk	Yes	Trace (<0.25 % pc) ² (EPA 400 PC) by Jared C. Clarke on 11/30/19
Analyst Description: Grey, Homogeneous, Non-Fibrous, Bulk Material Asbestos Types: Chrysotile <0.25 % pc Other Material: Non-fibrous 12.3 %			

PLM Bulk Asbestos Report

Y19MLK01; Yonkers PS; MLK Academy

Client No. / HGA	Lab No.	Asbestos Present	Total % Asbestos
068 65	219113822-36 Location: Exterior - Window Caulk	Yes	Trace (<0.25 % pc) ² (EPA 400 PC) by Jared C. Clarke on 11/30/19
Analyst Description: Grey, Homogeneous, Non-Fibrous, Bulk Material Asbestos Types: Chrysotile <0.25 % pc Other Material: Non-fibrous 4 %			
069 67	219113822-37 Location: Exterior - Frame Caulk	No	NAD (by NYS ELAP 198.6) by Jared C. Clarke on 11/30/19
Analyst Description: Grey, Homogeneous, Non-Fibrous, Bulk Material Asbestos Types: Other Material: Non-fibrous 1.5 %			
070 67	219113822-38 Location: Exterior - Frame Caulk	No	NAD (by NYS ELAP 198.6) by Jared C. Clarke on 11/30/19
Analyst Description: Grey, Homogeneous, Non-Fibrous, Bulk Material Asbestos Types: Other Material: Non-fibrous 6 %			
071 68	219113822-39 Location: Exterior - Window Glaze	Yes	Trace (<0.25 % pc) ² (EPA 400 PC) by Jared C. Clarke on 11/30/19
Analyst Description: Grey, Homogeneous, Non-Fibrous, Bulk Material Asbestos Types: Chrysotile <0.25 % pc, Anthophyllite <0.25 % pc Other Material: Fibrous Talc Trace, Non-fibrous 17 %			
072 68	219113822-40 Location: Exterior - Window Glaze	Yes	3.8 % (by NYS ELAP 198.6) by Jared C. Clarke on 11/30/19
Analyst Description: Grey, Homogeneous, Non-Fibrous, Bulk Material Asbestos Types: Chrysotile 3.8 % Other Material: Non-fibrous 25.5 %			
073 69	219113822-41 Location: Exterior - Louver Caulk	Yes	Trace (<0.25 % pc) ² (EPA 400 PC) by Jared C. Clarke on 11/30/19
Analyst Description: Grey, Homogeneous, Non-Fibrous, Bulk Material Asbestos Types: Chrysotile <0.25 % pc Other Material: Non-fibrous 8 %			

Client Name: Eisenbach & Ruhnke Engineering, P.C.

PLM Bulk Asbestos Report

Y19MLK01; Yonkers PS; MLK Academy

Client No. / HGA	Lab No.	Asbestos Present	Total % Asbestos
074 69	219113822-42 Location: Exterior - Louver Caulk	Yes	Trace (<0.25 % pc) ² (EPA 400 PC) by Jared C. Clarke on 11/30/19
Analyst Description: Grey, Homogeneous, Non-Fibrous, Bulk Material Asbestos Types: Chrysotile <0.25 % pc Other Material: Non-fibrous 8.1 %			
075 70	219113822-43 Location: Exterior - Panel Caulk	No	NAD (by NYS ELAP 198.6) by Jared C. Clarke on 11/30/19
Analyst Description: Grey/Green, Homogeneous, Non-Fibrous, Bulk Material Asbestos Types: Other Material: Non-fibrous 15.8 %			
076 70	219113822-44 Location: Exterior - Panel Caulk	No	NAD (by NYS ELAP 198.6) by Jared C. Clarke on 11/30/19
Analyst Description: Grey/Green, Homogeneous, Non-Fibrous, Bulk Material Asbestos Types: Other Material: Non-fibrous 19 %			
077 71	219113822-45 Location: Exterior - Column Caulk	No	NAD (by NYS ELAP 198.6) by Jared C. Clarke on 11/30/19
Analyst Description: OffWhite, Homogeneous, Non-Fibrous, Bulk Material Asbestos Types: Other Material: Non-fibrous 65.8 %			
078 71	219113822-46 Location: Exterior - Column Caulk	Yes	Trace (<0.25 % pc) ² (EPA 400 PC) by Jared C. Clarke on 11/30/19
Analyst Description: Grey, Homogeneous, Non-Fibrous, Bulk Material Asbestos Types: Chrysotile <0.25 % pc Other Material: Non-fibrous 21.2 %			

Client Name: Eisenbach & Ruhnke Engineering, P.C.

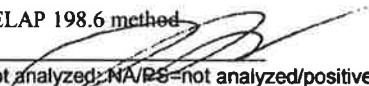
PLM Bulk Asbestos Report

Y19MLK01; Yonkers PS; MLK Academy

Reporting Notes:

(1) This job was - Analyzed using Motic BA310 Pol Scope S/N 1190000326

(2) Sample prepared for analysis by ELAP 198.6 method

Analyzed by: Jared C. Clarke 

*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 _____

Table I
Summary of Bulk Asbestos Analysis Results
 Y19MLK01; Yonkers PS; MLK Academy

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	033	4	---	---	---	---	Chrysotile 3.7	NA
Location:	Space 0216 - Duct Insulation						Amosite 11.1	
02	034	4	---	---	---	---	NA/PS	NA
Location:	Space 0216 - Duct Insulation							
03	035	4	---	---	---	---	NA/PS	NA
Location:	Space 0216 - Duct Insulation							
04	036	59.1	---	---	---	---	NAD	NA
Location:	Space 0216 - Joint Compound (Skylight)							
05	037	59.1	---	---	---	---	NAD	NA
Location:	Space 0216 - Joint Compound (Skylight)							
06	038	59.2	---	---	---	---	NAD	NA
Location:	Space 0216 - Gypsum Wallboard (Skylight)							
07	039	59.2	---	---	---	---	NAD	NA
Location:	Space 0216 - Gypsum Wallboard (Skylight)							
08	040	62	0.168	91.1	7.7	1.2	NAD	NAD
Location:	Space 0202 - Laminare							
09	041	62	0.170	92.4	5.9	1.8	NAD	NAD
Location:	Space 0204 - Laminare							
10	042	63	0.126	92.1	5.6	2.4	NAD	NAD
Location:	Space 0202 - Divider Wall Fabric							
11	043	63	0.156	84.6	11.5	3.8	NAD	NAD
Location:	Space 0202 - Divider Wall Fabric							
12	044	28	0.304	68.4	26.0	5.6	NAD	NAD
Location:	Space 0201 -Old Cove Base Mastic - Brown							
13	045	28	0.229	45.9	8.3	45.9	NAD	NAD
Location:	Space 0203 -Old Cove Base Mastic - Brown							
14	046	29	0.212	31.6	65.6	2.8	NAD	NAD
Location:	Space 0201 - 4" Dark Brown Cove Base							
15	047	29	0.172	30.2	62.8	7.0	NAD	NAD
Location:	Space 0203 - 4" Dark Brown Cove Base							
16	048	34.1	0.263	31.6	38.8	29.7	NAD	NA
Location:	Space 0204 - Sink Mastic - Black							

See Reporting notes on last page

Table I
Summary of Bulk Asbestos Analysis Results
 Y19MLK01; Yonkers PS; MLK Academy

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	049	34.1	0.221	17.2	50.2	28.9	Chrysotile 3.7	NA
Location:	Space 0204 - Sink Mastic - Black							
18	050	20A	---	---	---	---	NAD	NA
Location:	Space 0211 - Ceramic Floor Mudset							
19	051	20A	---	---	---	---	NAD	NA
Location:	Space 0211 - Ceramic Floor Mudset							
20	052	19A	---	---	---	---	NAD	NA
Location:	Space 0211 - Ceramic Floor Grout							
21	053	19A	---	---	---	---	NAD	NA
Location:	Space 0211 - Ceramic Floor Grout							
22	054	19B	---	---	---	---	NAD	NA
Location:	Space 0212 - Ceramic Wall Grout							
23	055	19B	---	---	---	---	NAD	NA
Location:	Space 0212 - Ceramic Wall Grout							
24	056	66	0.300	8.3	89.3	2.1	Chrysotile <0.25	Chrysotile <1.0
Location:	Space 0202 - Int. Window Glaze							
25	057	66	0.332	9.6	72.9	17.3	Chrysotile <0.25	Chrysotile <1.0
Location:	Space 0202 - Int. Window Glaze							
26	058	34.2	0.217	12.9	34.1	42.9	Chrysotile 10.1	NA
Location:	Space 0119 - Sink Mastic - Grey							
27	059	34.2	0.247	8.1	32.4	59.5	NA/PS	NA
Location:	Space 0119 - Sink Mastic - Grey							
28	060	35.1	---	---	---	---	NAD	NA
Location:	Annex - Space 0135 - Gypsum Wallboard							
29	061	35.1	---	---	---	---	NAD	NA
Location:	Annex - Space 0134 - Gypsum Wallboard							
30	062	42.1	0.152	25.0	23.0	52.0	NAD	NAD
Location:	Annex - Space 0134 - 2 X 2 Ceiling Tile							
31	063	42.1	0.151	25.2	21.2	53.6	NAD	NAD
Location:	Annex - Space 0135 - 2 X 2 Ceiling Tile							
32	064	64	---	---	---	---	NAD	NA
Location:	Exterior - Soffit							

See Reporting notes on last page

Client Name: Eisenbach & Ruhnke Engineering, P.C.

Table I
Summary of Bulk Asbestos Analysis Results
 Y19MLK01; Yonkers PS; MLK Academy

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	065	64	---	---	---	---	NAD	NA
Location: Exterior - Soffit								
34	066	64	---	---	---	---	NAD	NA
Location: Exterior - Soffit								
35	067	65	0.211	39.3	48.3	12.1	Chrysotile <0.25	Chrysotile <1.0
Location: Exterior - Window Caulk								
36	068	65	0.202	41.1	55.0	3.8	Chrysotile <0.25	Chrysotile <1.0
Location: Exterior - Window Caulk								
37	069	67	0.066	84.8	13.6	1.5	NAD	NAD
Location: Exterior - Frame Caulk								
38	070	67	0.050	78.0	16.0	6.0	NAD	NAD
Location: Exterior - Frame Caulk								
39	071	68	0.264	12.5	70.5	17.0	Chrysotile <0.25	NA
Location: Exterior - Window Glaze							Anthophyllite <0.25	
40	072	68	0.242	16.1	54.5	25.5	Chrysotile 3.8	NA
Location: Exterior - Window Glaze								
41	073	69	0.225	41.3	50.7	7.8	Chrysotile <0.25	Chrysotile <1.0
Location: Exterior - Louver Caulk								
42	074	69	0.172	40.7	51.2	7.9	Chrysotile <0.25	Chrysotile <1.0
Location: Exterior - Louver Caulk								
43	075	70	0.215	39.5	44.7	15.8	NAD	NAD
Location: Exterior - Panel Caulk								
44	076	70	0.242	40.1	40.9	19.0	NAD	NAD
Location: Exterior - Panel Caulk								
45	077	71	0.278	27.3	6.8	65.8	NAD	NAD
Location: Exterior - Column Caulk								
46	078	71	0.241	34.0	44.8	21.0	Chrysotile <0.25	Chrysotile <1.0
Location: Exterior - Column Caulk								

See Reporting notes on last page

Table I
Summary of Bulk Asbestos Analysis Results
 Y19MLK01; Yonkers PS; MLK Academy

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
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Analyzed by: Khaalid W. Perine  Date Analyzed 12/1/2019

**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 heterogeneous materials).

Reviewed By: _____



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315-735-1916 · FAX 315-735-6365 · E-MAIL info@ereng.com

BULK SAMPLE LOG
ASBESTOS

Log No: ____ of ____

CLIENT: <u>Yonkers PS</u>		ANALYSIS: <input type="checkbox"/> PLM Only <input type="checkbox"/> TEM Only	
PROJECT NAME/LOCATION: <u>MLK Academy</u>		<input checked="" type="checkbox"/> PLM/TEM as required by ELAP	
SAMPLES COLLECTED BY: <u>Matt Inman/Brian Jones</u>		<input type="checkbox"/> Other _____	
NYS DEPT OF LABOR CERTIFICATE NO. <u>97-21978 / 05-88079</u>		TURNAROUND TIME:	
DATE SAMPLED: <u>11/20/19</u>		<input type="checkbox"/> RUSH <input type="checkbox"/> 12 Hour <input type="checkbox"/> 24 HOUR	
PROJECT#: <u>Y19 MLK01</u>		<input type="checkbox"/> 48 Hour <input checked="" type="checkbox"/> 72 Hour <input type="checkbox"/> Other _____	

NOTES:

219113822

SAMPLE NUMBER	HOMO ID #	MATERIAL SAMPLED	LOCATION	ANALYZE ONLY IF SAMPLE TO THE LEFT IS NEGATIVE BY PLM/TEM
033 004	4	Duct Insulation	Space 0216	034, 035
034 002	↓	↓	↓	035
035 002	↓	↓	↓	
036	59.1	Joint Compound (skylight)	Space 0216	037-039
037	↓	↓	↓	038, 039
038	59.2	Gypsum Wallboard (skylight)	↓	039
039	59.2	↓	↓	
040	62	Laminate	Space 0202	041
041	↓	↓	↓ 0204	
042	63	Divider Wall fabric	Space 0202	043
043	63	↓	↓	
044	28	old Covebase Mastic	Space 0201	045
045	28	↓	↓ 0203	
046	29	4" Dark Brown Cove	Space 0201	047
047	29	↓ BASE	↓ 0203	
048	034 34.1	Sink Mastic - BLK	Space 0204	049
049	034 34.1	↓	↓	
050	20A	Ceramic Floor Mosaic	Space 0211	051-053
051	20A	↓	↓	052-053

	PRINTED NAME	SIGNATURE	COMPANY	DATE	# OF SAMPLES
Remitted by:	<u>Matt Inman</u>	<u>[Signature]</u>	<u>ETR</u>	<u>11/26/19</u>	<u>19</u>
Received by:	<u>Madeleine Speria</u>	<u>[Signature]</u>	<u>America, NY</u>	<u>11/27/19 12:25</u>	<u>19</u>
PLEASE EMAIL RESULTS TO <u>minman</u> @ <u>erengpc.com</u> ATTN: <u>Matt</u>					
PLEASE FAX RESULTS TO () -			ATTN:		



EISENBACH & RUHNKE ENGINEERING, P.C.
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315-735-1916 · FAX 315-735-6365 · E-MAIL info@ereng.com

BULK SAMPLE LOG
ASBESTOS

Log No: _____ of _____

CLIENT: Yonkers PS		ANALYSIS: <input type="checkbox"/> PLM Only <input type="checkbox"/> TEM Only <input checked="" type="checkbox"/> PLM/TEM as required by ELAP <input type="checkbox"/> Other _____
PROJECT NAME/LOCATION: MLK Academy		
SAMPLES COLLECTED BY: Matt Imman/Brian Jones		
NYS DEPT OF LABOR CERTIFICATE NO.: 97-21978 - 0508079		TURNAROUND TIME: <input type="checkbox"/> RUSH <input type="checkbox"/> 12 Hour <input type="checkbox"/> 24 HOUR <input type="checkbox"/> 48 Hour <input checked="" type="checkbox"/> 72 Hour <input type="checkbox"/> Other _____
DATE SAMPLED: 11/20/19	PROJECT#: Y19MLK01	

NOTES:

219113822

SAMPLE NUMBER	HOMO ID #	MATERIAL SAMPLED	LOCATION	ANALYZE ONLY IF SAMPLE TO THE LEFT IS NEGATIVE BY PLM/TEM
OS2	19A	ceramic floor Grout	Space 0211	OS3
OS3	19A	↓ ↓ ↓	↓ ↓	
OS4	19B	ceramic Wall Grout	Space 0212	OS5
OS5	19B	↓ ↓ ↓	↓ ↓	
OS6	66	Int. Win. Glaze	SP 0202	OS7
OS7	66	↓ ↓ ↓	↓	
OS8	34.1 66	Sink Mastic - Grey	SP0119 0201	OS9
OS9	34.1 66	↓ ↓ ↓	↓	
060	35.1	Gypsum wallboard	Annex SP0135	061
061	35.1	↓ ↓	SP0134	
062	42.1	2x2 ceiling Tile	↓ SP0134	063
063	42.1	↓ ↓ ↓	↓ SP0135	
064	64	Soffit	Exterior	065, 066
065	64	↓	↓	066
066	64	↓	↓	
067	65	Window Caulk	↓	068
068	65	↓ ↓	↓	
069	67	Frame Caulk	↓	070
070	67	↓ ↓	↓	

	PRINTED NAME	SIGNATURE	COMPANY	DATE	# OF SAMPLES
Remitted by:	Matt Imman		ETR	11/26/19	
Received by:	Madeline Sperzica		America NY	11/27/19 (2.25)	19
PLEASE EMAIL RESULTS TO Minman @ ereng pc com			ATTN: Matt		
PLEASE FAX RESULTS TO ()			ATTN:		

BULK SAMPLE LOG

ASBESTOS



Log No: _____ of _____

CLIENT: <u>Yonkers PS</u>		ANALYSIS: <input type="checkbox"/> PLM Only <input type="checkbox"/> TEM Only <input checked="" type="checkbox"/> PLM/TEM as required by ELAP <input type="checkbox"/> Other _____
PROJECT NAME/LOCATION: <u>MLK Academy</u>		
SAMPLES COLLECTED BY: <u>Matt Irman / Brian Jones</u>		
NYS DEPT OF LABOR CERTIFICATE NO. <u>97-21978 / OS-08029</u>		TURNAROUND TIME:
DATE SAMPLED: <u>11/20/19</u>	PROJECT#: <u>Y19MLK01</u>	<input type="checkbox"/> RUSH <input type="checkbox"/> 12 Hour <input type="checkbox"/> 24 HOUR <input type="checkbox"/> 48 Hour <input checked="" type="checkbox"/> 72 Hour <input type="checkbox"/> Other _____

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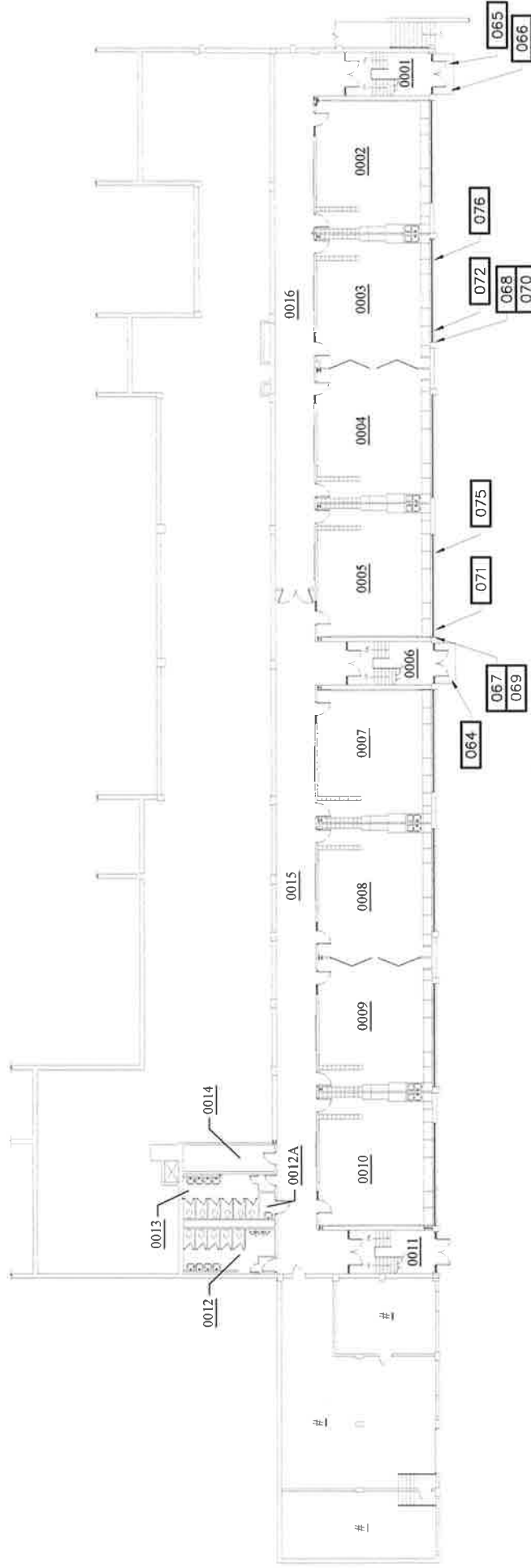
219113822

[illegible]

	PRINTED NAME	SIGNATURE	COMPANY	DATE	# OF SAMPLES
Remitted by:	Math Inman		EHR	11/26/19	8
Received by:	Madeline Speride		America's NY	11/27/19 12:25	8
PLEASE EMAIL RESULTS TO Minman @ erengpc.com ATTN: Math					
PLEASE FAX RESULTS TO ()			ATTN:		

Appendix C

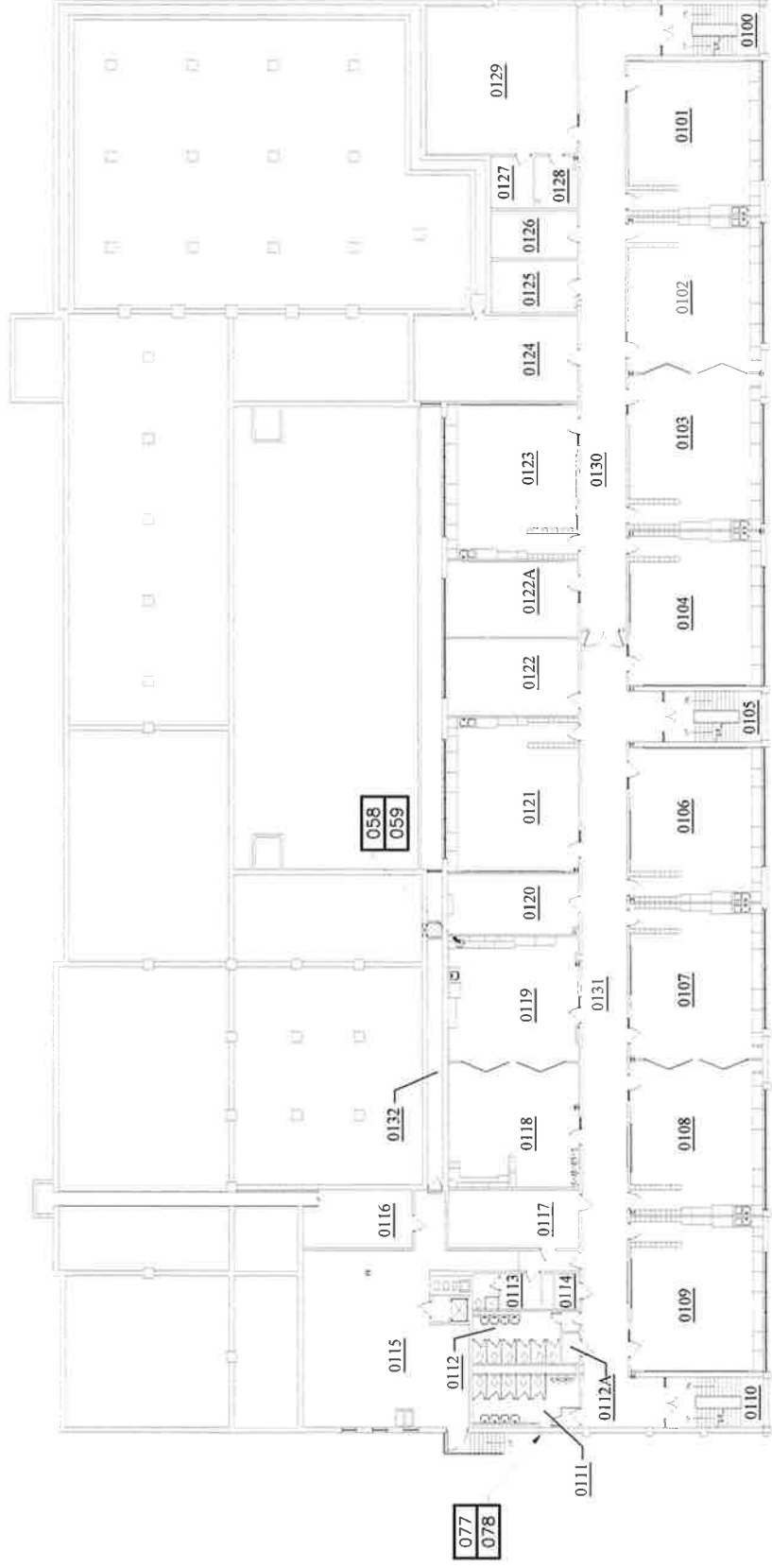
Drawings Showing Sample Locations



KEY
 SAMPLE LOCATION
 SPACE ID

FILE PATH - N:\1 - PROJECT DIRECTORIES\Yonkers Public Schools\Martin Luther King School\Y19MLK01 CIP# 10875 YPS MLK Roof, Boiler, Window, & Select Interior Upgrades\Sample Results\Y19MLK01 MLK Bulk Sample Drawing.dwg

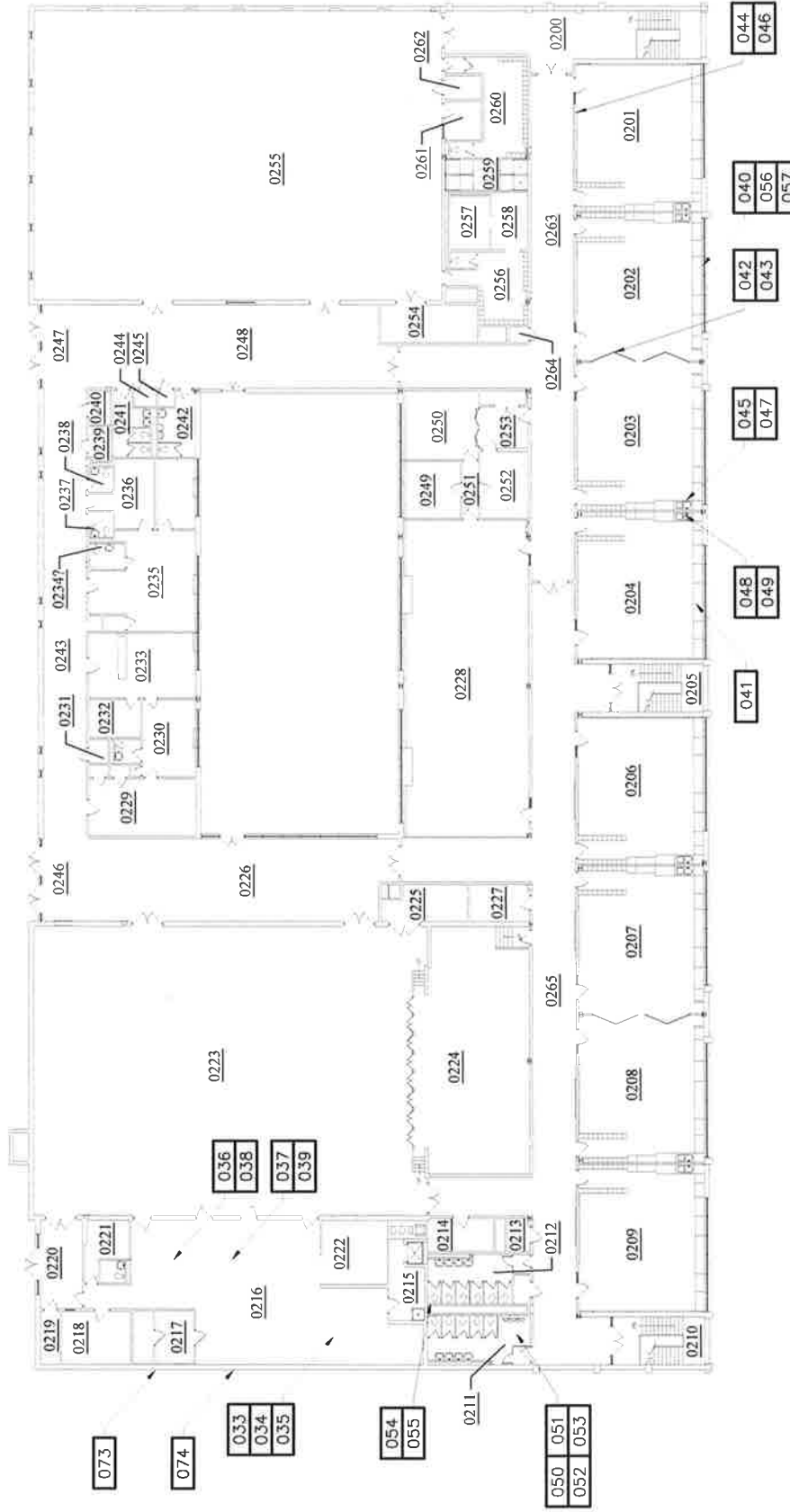
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<p>DATE: 12.19.19 SCALE: N.T.S. PROJECT NO: Y19MLK01 DRAWN BY: ER</p>		<p>Eisenbach & Ruhnke Engineering, P.C. 291 Genesee Street - Utica, NY 13501 Ph. 315-735-1916 Fax: 315-735-6365 www.erengpc.com</p>	



KEY	SAMPLE LOCATION	SPACE ID
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FILE PATH - N:\1 - PROJECT DIRECTORIES\Yonkers Public Schools\Martin Luther King School\Y19MLK01 CIP# 10875 YPS MLK Roof, Boiler, Window, & Select Interior Upgrades\Sample Results\Y19MLK01 MLK Bulk Sample Drawing.dwg

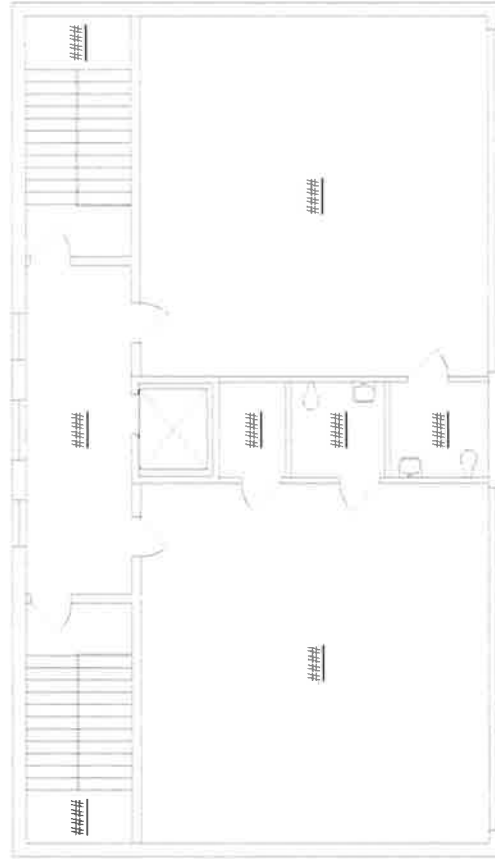
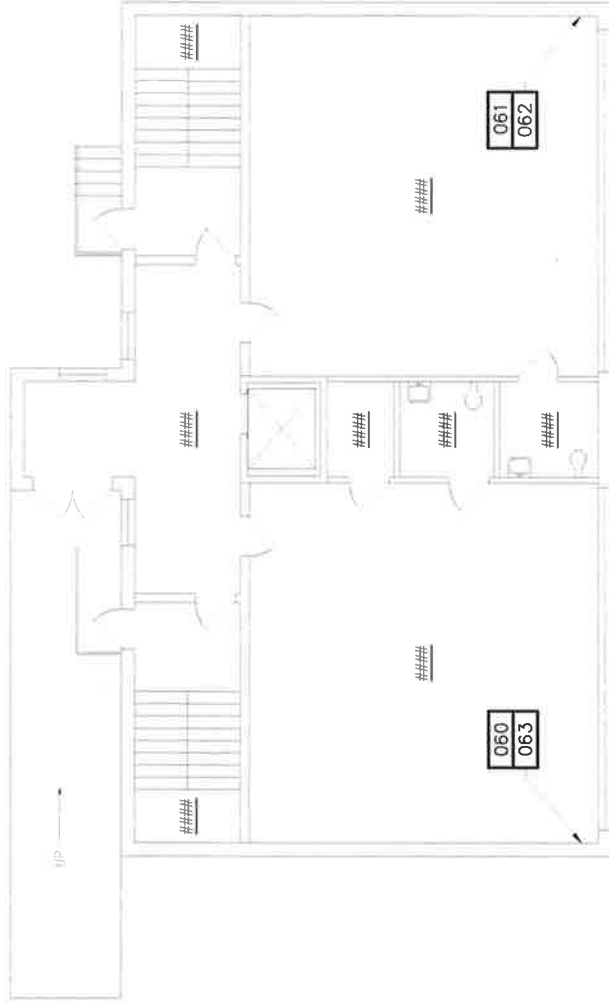
YONKERS PUBLIC SCHOOLS MARTIN LUTHER KING, JR. ACADEMY SAMPLE LOCATION PLAN - FIRST FLOOR		SHEET NO: A-2
 Eisenbach & Ruhnke Engineering, P.C. 291 Genesee Street - Utica, NY 13501 Ph: 315-735-1916 Fax: 315-735-6365 www.erengpc.com		DATE: 12.19.19 SCALE: N.T.S. PROJECT NO: Y19MLK01 DRAWN BY: ER



KEY	SAMPLE LOCATION
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FILE PATH - N:\1 - PROJECT DIRECTORIES\Yonkers Public Schools\Martin Luther King School\Y19MLK01 CIP# 10875 YPS MLK Roof, Boiler, Window, & Select Interior Upgrades\Sample Results\Y19MLK01 MLK Bulk Sample Drawing.dwg

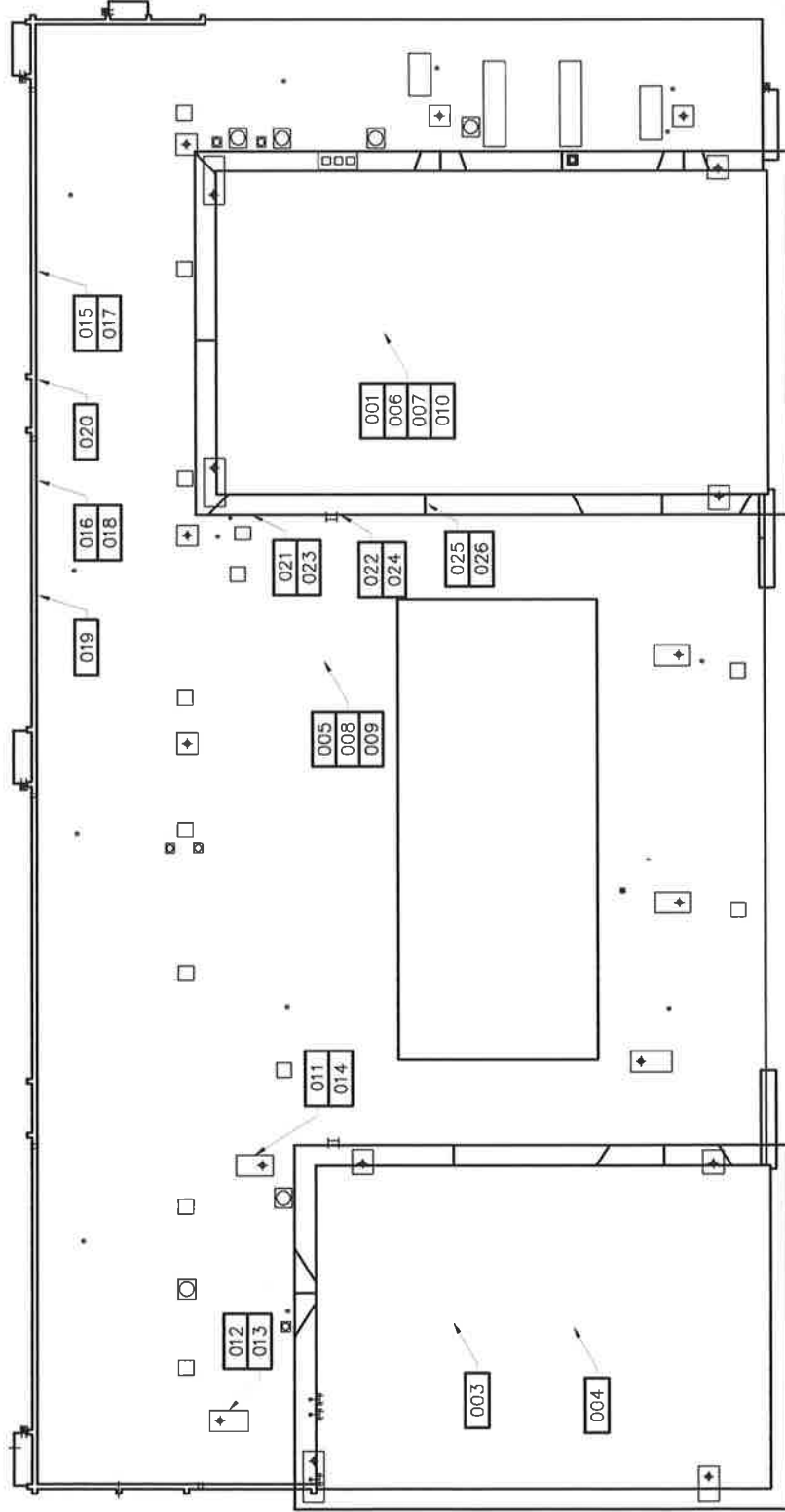
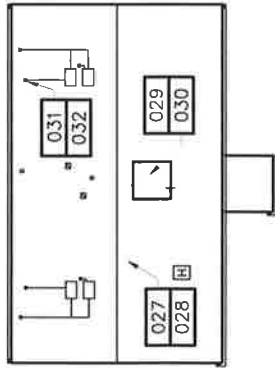
		YONKERS PUBLIC SCHOOLS MARTIN LUTHER KING, JR. ACADEMY SAMPLE LOCATION PLAN - SECOND FLOOR		SHEET NO: A-3
Eisenbach & Ruhne Engineering, P.C. 291 Genesee Street - Utica, NY 13501 Ph: 315-735-1916 Fax: 315-735-6365 www.ereengpc.com		DATE: 12.19.19	SCALE: N.T.S.	PROJECT NO: Y19MLK01
		DRAWN BY: ER		



KEY
 ### SAMPLE LOCATION
 ### SPACE ID

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 <p>Eisenbach & Ruhke Engineering, P.C. 291 Genesee Street - Utica, NY 13501 PH: 315-735-1916 Fax: 315-735-6365 www.erengpc.com</p>		DATE: 12.19.19 SCALE: N.T.S. PROJECT NO: Y19MLK01 DRAWN BY: ER	SHEET NO: A-4
YONKERS PUBLIC SCHOOLS MARTIN LUTHER KING, JR. ACADEMY - ANNEX BUILDING SAMPLE LOCATION PLAN - SECOND FLOOR			



KEY
 ### SAMPLE LOCATION
 ### SPACE ID

FILE PATH - N:\1 - PROJECT DIRECTORIES\Yonkers Public Schools\Martin Luther King School\Y19MLK01 CIP# 10875 YPS MLK Roof, Boiler, Window, & Select Interior Upgrades\Sample Results\Y19MLK01 MLK Bulk Sample Drawing.dwg

		YONKERS PUBLIC SCHOOLS MARTIN LUTHER KING, JR. ACADEMY SAMPLE LOCATION PLAN - ROOF		SHEET NO: A-5
Eisenbach & Ruhke Engineering, P.C. 291 Genesee Street - Utica, NY 13501 Ph: 315-735-1916 Fax: 315-735-6365 www.arenegpc.com		DATE: 10.10.19	SCALE: N.T.S.	PROJECT NO: Y19MLK01
		DRAWN BY: ER		

Appendix D

Accreditations/Licensing

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

Eisenbach and Ruhne Engineering, P.C.
291 Genesee Street
Utica, NY 13501

FILE NUMBER: 99-0709
LICENSE NUMBER: 29318
LICENSE CLASS: RESTRICTED
DATE OF ISSUE: 11/27/2020
EXPIRATION DATE: 11/30/2021

Duly Authorized Representative – Jack Eisenbach:

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

NEW YORK STATE DEPARTMENT OF HEALTH
WADSWORTH CENTER



Expires 12:01 AM April 01, 2022
Issued April 01, 2021

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.: 63000

Property of the New York State Department of Health. Certificates are valid only at the address shown, must be conspicuously posted, and are printed on secure paper. Continued accreditation depends on successful ongoing participation in the Program. Consumers are urged to call (516) 485-6570 to verify the laboratory's accreditation status.

STATE OF NEW YORK - DEPARTMENT OF LABOR
ASBESTOS CERTIFICATE



MATTHEW C. INMAN
CLASS(EXPIRES)
C ATEC(11/21) D INSP(11/21)
H PM (11/21)

CERT# 97-21978
DMV# 693350254

MUST BE CARRIED ON ASBESTOS PROJECTS

REPRODUCTION PROHIBITED



01213 005845684 95

EYES BRO

HAIR BRO

HGT 6' 00"

IF FOUND RETURN TO:

NYSBOL - L&C UNIT

ROOM 161A BUILDING 12

STATE OFFICE CAMPUS

ALBANY NY 12240

STATE OF NEW YORK - DEPARTMENT OF LABOR
ASBESTOS CERTIFICATE



BRIAN C JONES
CLASS(EXPIRES)
C ATEC(04/20) D INSP(04/20)
M PM (04/20) I PD (04/20)

CERT# 05-08079
DMV# 973242077

MUST BE CARRIED ON ASBESTOS PROJECTS



01213 005003557 53

EYES HAZ
HAIR BAL
HGT 6' 01"

IF FOUND RETURN TO:
NYS DOL - L&C UNIT
ROOM 161A BUILDING 12
STATE OFFICE CAMPUS
ALBANY NY 12240

SECTION 02 8071

ASBESTOS REGULATORY REQUIREMENTS

PART 1 - GENERAL

1.01 GENERAL REQUIREMENTS

- A. All Work under this Contract shall be done in strict accordance with all applicable federal, state, and local regulations, standards, and codes governing asbestos abatement and any other trade work done in conjunction with the abatement.
- B. The most recent edition of any relevant regulation, standard, document, or code shall be applicable to the Work. Where conflict among the requirements or with these specifications exists, the most stringent requirements are applicable.
- C. Copies of all standards, regulations, codes, and other applicable documents and subsequent amendments thereto, listed in this section and including this specification, shall be available at the work site in the clean change area of the worker decontamination system.

PART 2 - SPECIFIC REQUIREMENTS

2.01 OCCUPATIONAL SAFETY AND HEALTH ADMINISTRATION (OSHA)

- A. OSHA regulations governing asbestos abatement include, but are not limited to:
 - 1. Title 29 CFR 1926.1101, Occupational Exposure to Asbestos Construction Standard.
 - 2. Title 29 CFR 1910.1001, General Industry Standard for Asbestos.
 - 3. Title 29 CFR Section 1910.134, General Industry Standard for Respiratory Protection.
 - 4. Title 29 CFR Section 1910.20, Access to Employee Exposure and Medical Records.
 - 5. Title 29 CFR Section 1910.1200, Hazard Communication.
 - 6. Title 29 CFR Section 1910.145, Specifications for Accident Prevention Signs and Tags.
 - 7. Title 29 CFR Section 1910.95, Noise Regulation.

2.02 ENVIRONMENTAL PROTECTION AGENCY (EPA)

- A. EPA regulations governing asbestos abatement include, but are not limited to:
 - 1. Title 40 CFR Part 61, Subparts A and M, National Emission Standard for Asbestos.
 - 2. Title 40 CFR Part 763, Subpart G, Asbestos Abatement Project.
 - 3. Title 40 CFR Part 763, Asbestos-Containing Materials in Schools, Final Rule and Notice.

2.03 AMERICAN NATIONAL STANDARDS INSTITUTE (ANSI)

- A. ANSI standards governing asbestos abatement include, but are not limited to:
 - 1. Fundamentals Governing the Design and Operation of Local Exhaust Systems, Publication 29.2-79.
 - 2. Practices for Respiratory Protection, Publication Z88.2-80.

2.04 COMPRESSED GAS ASSOCIATION (CGA)

- A. Pamphlet G-7, "Compressed Air for Human Respiration" and Specification G-7.1, "Commodity Specification for Air."

2.05 MINE SAFETY AND HEALTH ADMINISTRATION (MSHA)

- A. Certification of respirators as per 30 CFR Part 11.

2.06 NATIONAL INSTITUTE FOR OCCUPATIONAL SAFETY AND HEALTH (NIOSH)

- A. NIOSH regulations governing asbestos abatement include, but are not limited to:
 - 1. A guide to respiratory protection for the asbestos abatement industry.
 - 2. Approval of respirators as per 30 CFR Part 11.
 - 3. Standards for analysis of air samples.

2.07 CANADIAN STANDARD ASSOCIATION

- A. Standard Z180.1-1978, "Compressed Breathing Air."

2.08 AMERICAN SOCIETY FOR TESTING AND MATERIALS (ASTM)

- A. Standard Guide for Visual Inspection of Asbestos Abatement Projects.

2.09 NEW YORK STATE REQUIREMENTS

- A. State regulations governing asbestos abatement include, but are not limited to:
 - 1. New York State Department of Environmental Conservation (NYSDEC), Title 6 NYCRR, Part 360 and 364, The New York State Hazardous Waste Management Regulations.
- B. Part 56 of Title 12 of the Official Compilation of Codes, Rules and Regulations.
- C. Chapter II: Title 10, Part 73 of the New York Code of Rules and Regulations: Asbestos Safety Program Requirements.
- D. New York State Education Department regulations effective September 30, 1999.

2.10 LICENSES

- A. Maintain current licenses as required by applicable state or local jurisdictions for the removal, transportation, disposal, or other regulated activity relative to the Work of this Contract.

2.11 NEW AND AMENDED REGULATIONS

- A. Any and all new or amended federal, state, or local regulations becoming effective during this project and not listed are to be considered as part of this specification.

2.12 NOTICES

- A. USEPA: Send written notification in accordance with 40 CFR Part 61.146 to the Regional Asbestos Contact responsible for the enforcement of the National Emission Standard for Asbestos at least ten (10) days prior to the commencement of any on-site project activity. Send notification to the following address:

Region 2
Asbestos NESHAPS Contact
Air and Waste Management Division
USEPA
26 Federal Plaza
New York, New York 10007

- B. NYS Department of Labor: Send written notification in accordance with Part 56 of Title 12 to the Asbestos Control Bureau of the NYS Department of Labor's Division of Safety and Health. Use forms provided by the Department of Labor.

END OF SECTION

SECTION 02 8073
HAZARDOUS MATERIALS SUBMITTALS

PART L - GENERAL

1.01 DESCRIPTION

- A. Schedule submittals to be presented at the pre-construction meeting. Indicate items where additional time is needed and on what dates they will be submitted. The dates indicated for each submittal shall take into account the lead time required for ordering and fabricating of the various items.

1.02 SUBMISSION REQUIREMENTS

- A. Pre-contract Submittals. Within three days after bids are opened, the three apparent low bidders shall be required to submit the following documentation:
1. Resume: Shall include the following:
 - a. Contractor license issued by New York State Department of Labor.
 - b. The number of years engaged in asbestos removal.
 - c. Provide a list of projects performed within the past two years and include the dollar value of all projects. Provide project references to include owner, consultant, and air monitoring firms' name, contact person, address, and phone number.
 - d. A list of owned equipment available to be used in the performance of the project.
 - e. An outline of the worker training course and medical surveillance program conducted by the contractor.
 - f. A standard operating procedures manual describing work practices and procedures, equipment, type of decontamination facilities, respirator program, special removal techniques, etc.
 - g. Documentation to the satisfaction of the Owner attesting to the contractor's financial resources available to perform the project. Such data shall minimally include the firm's balance sheet for the last fiscal year.
 2. Citations/Violations/Legal Proceedings
 - a. Submit a notarized statement describing any citations, violations, criminal charges, or legal proceedings undertaken or issued by any law enforcement, regulatory agency, or consultant concerning performance on previous abatement contracts. Briefly describe the circumstances citing the project and involved persons and agencies as well as the outcome of any actions.
 - b. Answer the question: "Has your firm or its agents been issued a Stop Work Order on any project within the last two years?" If "Yes", provide details as discussed above.
 - c. Answer the question: "Are you now, or have you been in the past, a party to any litigation or arbitration arising out of your performance on asbestos abatement contracts?" If "Yes", provide details as discussed above.
 - d. Describe any liquidated damages assessed within the last two years.
 3. Preliminary Schedule
 - a. Provide an estimate of manpower to be utilized and the time required for completion of each major work area. Include the size and number of crews and work shifts.
- B. Prior to Commencement of Work, Owner will:
1. Submit to the Contractor results of pre-abatement air sampling (if conducted) including location of samples, names of the Air Sampling Professional, equipment utilized, and method of analysis.
 2. Document that Owner's employees who will be required to enter the work area during abatement have received required training.
- C. Prior to Commencement of Work, Contractor shall:
1. US EPA: Provide Owner with a copy of the notice to the Asbestos NESHAPS Contact of the EPA as per Section 02 8071.
 2. NYS Department of Labor: Provide Owner with a copy of the notice to the Asbestos Control Program of the NYS Labor Department's Division of Safety and Health as per Part 56 of Title 12.
 3. NYSDEC: Submit to the Owner a copy of the annual "Industrial Waste Hauler Permit" specifically for asbestos-containing materials required pursuant to 6 NYCRR364. Submit certification that the proposed waste disposal site meets the requirements of 40 CFR 61.156 and any pertinent local and

- state regulations. Provide Owner with a copy of the notice to the Asbestos Enforcement Division of the NYSDEC.
4. Submit documentation satisfactory to the Owner that the Contractor's employees, including Superintendent, Foremen, Supervisors, and other company personnel or agents, who may be exposed to airborne asbestos fibers or who may be responsible for any aspects of abatement activities, have received adequate training. A copy of their Asbestos Handling Certificates will be provided. Foremen and Supervisors shall, at a minimum, meet the training requirements of a competent person as defined in 29 CFR 1926.1101.
 5. Submit to the Owner shop drawings for layout and construction of decontamination enclosure systems and barriers for isolation of the work area as detailed in Section 028081 of this specification and required by applicable regulations.
 6. With the Owner, inspect the premises wherein all abatement and abatement related activities will occur and prepare a statement signed by both agreeing on building and fixture conditions prior to the commencement of work.
 7. Submit manufacturer's certification that HEPA vacuums, negative pressure ventilation units, and other local exhaust ventilation equipment conform to ANSI Z9.2-79.
 8. When rental equipment is to be used in abatement areas or to transport asbestos-contaminated waste, a written notification concerning intended use of the rental equipment must be provided to the rental agency with a copy submitted to the Owner.
 9. Provide a copy of the respiratory program required in 29 CFR 1910.134 (b), (d), (e), and (f). Include manufacturer certification of HEPA filtration capabilities for all cartridges and filters.
 10. Submit a copy of the firm's asbestos handling license.
 11. Submit the name, address, contact person and the ELAP approval number for the laboratory utilized for the analysis of the Contractor's OSHA monitoring.
 12. Progress Schedule:
 - a. Show the complete sequence of construction by activity and the sequencing of work within each building or section of the work.
 - 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.
 - c. Show projected percentage of completion for each item, as of the first day of each month.
 - d. Show final inspection dates.
 13. Abatement Work Plan: Provide plans which clearly indicate all work areas (numbered sequentially) including the locations and types of all decontamination chambers, entrances and exits to the work area, type of abatement activity/technique, number and location of negative air units and exhaust including calculations, and the proposed location and construction of storage facilities and field office.
 14. Samples: Submit samples of warning notices to be posted, catalog descriptions of protective clothing, replacement materials, etc.
 15. Worker Training and Medical Surveillance: The Contractor shall submit a list of the persons who will be employed by him and his subcontractors in the removal work. Present evidence that workers have received proper training required by the regulations and the medical examinations required by OSHA 29 CFR 1926.1101.
 16. Logs: Specimen copies of daily progress log, visitor's log, and disposal log.
 17. Material List: A complete materials list of all items proposed to be furnished and used under this contract.
 18. Subcontractors List: The prime contractor shall submit a list of all subcontractors to be used on the project.
 19. Material Safety Data Sheets (MSDS): Submit copies of MSDS for each chemical or material used for the project (encapsulant, surfactant, mastic remover, etc.)
 20. Project Supervisor: Submit the resume of the proposed Project Supervisor.
 21. Worker's Acknowledgments: Submit statements signed by each employee that the employee has received training in the proper handling of asbestos containing materials; understands the health implications and risks involved; and understands the use and limitations of the respiratory equipment to be used.

- D. During abatement activities, Contractor shall:
1. Submit copies of all transport manifests, trip tickets, and disposal receipts for all asbestos waste materials removed from the work area during the abatement process. The documentation must show the entire chain of custody from the time the asbestos is removed.
 2. The Contractor will maintain worksite entry log books with information on worker and visitor access. The Asbestos Handling Certificates for all workers will be kept at the entrance to the work site or the certificates will be checked upon each entry by the Contractor. Copies will be provided to the Owner, Engineer, and Contractor.
 3. Submit logs documenting filter changes on respirators, HEPA vacuums, negative pressure ventilation units, and other engineering controls.
 4. Submit results of bulk material analysis and air sampling data collected during the course of the abatement including OSHA compliance air monitoring results.
 5. Submit results of materials testing conducted during the abatement for purposes of utilization during abatement activities (e.g., testing of encapsulant for depth of penetration and testing of substitute materials for adherence to encapsulated surfaces).
 6. Post in the clean room area of the worker decontamination enclosure a list containing the names, addresses, and telephone numbers of the Contractor, the Owner, the Engineer, the Asbestos Project Monitor, the General Superintendent, the Air Sampling Professional, the testing laboratory, the police department, the fire department, and any other personnel who may be required to assist during abatement activities (e.g., Safety Officer, Building Maintenance Supervisor, and Energy Conservation Officer).
- E. Project Closeout Submissions:
1. Submit copies of all waste disposal manifests, seals, and disposal logs.
 2. Submit OSHA compliance air monitoring records conducted during the work.
 3. Submit copies of the daily progress log.
 4. Submit copies of the Visitor's log.
 5. Submit Certificate of Visual Inspection.
 6. Submit copies of any required Employee Statements such as Medical Examination Statement, Certificate of Worker's Release, or Employee Training Statement.

END OF SECTION

SECTION 02 8073.01
HAZARDOUS MATERIALS SUBMITTAL COVER SHEET

1.01 EISENBACH & RUHNKE ENGINEERING, P.C.

291 GENESEE ST., UTICA, NY 13501 PHONE:315-735-1916 EMAIL: MINMAN@ERENGPC.COM

1.02 NAME OF PROJECT: MARTIN LUTHER KING – ROOF REPLACEMENT AND SELECT INTERIOR UPGRADES

E&R PROJ NUMBER: Y19MLK01 CIP#10875 CLIENT'S PROJ NUMBER: _____

1.03 CONTRACTOR/SUBCONTRACTOR: _____

DATE OF SUBMITTAL: _____

SUBMITTAL TITLE: _____

SHOP DRAWING TITLE: _____

SUBMITTAL NUMBER: _____ REVISION NUMBER: _____ DATE: _____

PRODUCT DATA, TESTS, SCHEDULES: _____

SAMPLES: _____

MANUFACTURER: _____

SPECIFICATION SECTION(S): _____

CONTRACT DRAWING(S): _____

<p>ENGINEER'S STAMP:</p> <p><input type="checkbox"/> NO EXCEPTION TAKEN <input type="checkbox"/> REJECTED</p> <p><input type="checkbox"/> MAKE CORRECTIONS NOTED <input type="checkbox"/> REVISE AND RESUBMIT</p> <p><input type="checkbox"/> SUBMIT SPECIFIED ITEM</p> <p>CHECKING IS ONLY FOR GENERAL CONFORMANCE WITH THE DESIGN CONCEPT OF THE PROJECT AND GENERAL COMPLIANCE WITH THE INFORMATION GIVEN IN THE CONTRACT DOCUMENTS. NOTATIONS ARE SUBJECT TO THE REQUIREMENTS OF THE PLANS AND SPECIFICATIONS. THE CONTRACTOR IS RESPONSIBLE FOR DIMENSIONS WHICH SHALL BE CONFIRMED AND CORRELATED AT THE JOB SITE: FABRICATION PROCESSES AND TECHNIQUES OF CONSTRUCTION, COORDINATION OF THE WORK WITH THAT OF ALL OTHER TRADES AND THE SATISFACTORY PERFORMANCE OF THE WORK.</p> <p>EISENBACH & RUHNKE ENGINEERING, PC</p> <p>DATE: _____ BY: _____</p>	<p>COMMENTS:</p>
---	-------------------------

END OF SECTION

SECTION 02 8074
ASBESTOS TESTING QUALITY CONTROL

PART 1 - GENERAL

1.01 DESCRIPTION

- A. Related Requirements Specified Elsewhere
 - 1. Asbestos Abatement Submittals: Section 02 8073
 - 2. The Owner will obtain the services of a Project Monitor and analysis laboratory to constantly monitor airborne concentrations of asbestos throughout the course of the abatement project.
 - 3. Laboratory services, obtained by the Owner for bulk sampling, area air sampling, and clearance sampling, are to ensure that Contract provisions are met.
 - a. Results of Owner-procured tests will be made available to the Contractor. This act shall not be construed as relieving the Contractor of his obligations to provide materials and workmanship in accordance with pertinent regulations.
 - 4. Laboratory services obtained by the Contractor for personnel sampling shall comply with all pertinent regulations.
 - a. Forward copies of test results to the Owner as indicated in Section 02 8073.
 - 5. The air sampling to be done will be in accordance with an air sampling plan to be prepared by the Project Monitor and this specification. The plan will be approved by the Owner.

1.02 QUALITY ASSURANCE

- A. Pre-Work Airborne Fiber Counts
 - 1. The Owner will monitor the baseline fiber counts or those prevalent in the area before work begins using the NIOSH 7400 analytical procedure.
- B. Work Area Airborne Fiber Counts
 - 1. The Owner will monitor airborne fiber counts in the work area during the progress of the work through reviewing the personnel monitoring done by the contractor. The purpose of this air sampling will be to detect airborne fiber counts which may significantly challenge the ability of the work area isolation procedures to protect the balance of the building or outside of the building from contamination by airborne fibers.
- C. Work Area Clearance
 - 1. To determine if the elevated airborne fiber counts encountered during abatement operations have been reduced to an acceptable level, the Owner will sample and analyze air as per this Section using either Phase Contrast Microscopy (PCM) and/or Transmission Electron Microscopy (TEM).
- D. The Owner will be conducting air sampling throughout the course of the project.
- E. Fibers Counted
 - 1. PCM: "Airborne Fibers" referred to above include all fibers regardless of composition as counted in the NIOSH 7400 procedure.
 - 2. TEM: "Airborne Fibers" referred to above and to be analyzed using the method defined in 40 CFR Part 763.
- F. The laboratory utilized for analyzing air samples shall be satisfactory participants in the AIHA Proficiency Analytical Testing (PAT) program for asbestos analysis and shall be NYSDOH (New York State Department of Health) ELAP accredited.
- G. Laboratories used for bulk material identification shall be satisfactory participants in the EPA quality assurance program for bulk asbestos analysis and shall be NYSDOH ELAP accredited.
- H. The Project Monitor shall have a current Project Monitor certificate.

PART 2 - PRODUCTS - NOT APPLICABLE

PART 3 - EXECUTION

3.01 TESTING LABORATORY SERVICES

- A. The Owner will obtain air and bulk sampling laboratory services by separate Contract. The laboratory will be independent of the abatement contractor.
- B. Personal Air Monitoring
 - 1. 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 utilized.
 - 2. Results of the air monitoring shall be returned to the site, at least verbally, and posted no later than 24 hours following the time the sample was collected. Written results shall be returned to the site and posted no more than five days after the monitoring was performed.
 - 3. Personal air samples shall be analyzed by a laboratory which holds certification by the New York State Department of Health's Environmental Laboratory Approval Program. The asbestos consultant must approve the laboratory the contractor intends to use.

3.02 RESPONSIBILITIES AND DUTIES OF CONTRACTOR

- A. To facilitate testing services, the Contractor shall:
 - 1. Furnish to the laboratory such samples of materials as may be necessary for testing purposes.
 - 2. Advise the testing agency sufficiently in advance of operations to allow for completion of tests and for the assignment of personnel.
 - 3. Ensure the cooperation of the employees and superintendent with the Project Monitor.

3.03 ANALYTICAL METHODS

- A. The following methods may be used by the testing laboratory in analyzing filters used to collect air samples:
 - 1. Cellulose ester filters will be analyzed using the NIOSH 7400 Method accounting rules.
 - 2. OR
 - 3. Polycarbonate filters with a pore size less than or equal to 0.4 microns or mixed cellulose ester having a pore size less than or equal to 0.45 microns will be analyzed using the method defined in 40 CFR Part 763, Appendix A to Subpart E.

3.04 SAMPLE VOLUMES

- A. General: The number and volume of air samples taken by the Owner will be in accordance with the following schedule. Sample volumes given may vary depending upon the analytical method used.
- B. Before the Start of Work
 - 1. The Owner will secure the following air samples to establish a base line before the start of work.

LOCATION SAMPLED	MINIMUM NUMBER OF SAMPLES	FILTER MEDIA	DETECTION LIMIT (FIBERS/C.C.)	MINIMUM VOLUME (LITERS)	RATE LPM
EACH WORK AREA	5	CELLULOSE ESTER	0.01	1500	2-10
OUTSIDE EACH WORK AREA	5	CELLULOSE ESTER	0.01	1500	2-10
OUTSIDE BUILDING	2	CELLULOSE ESTER	0.01	1500	2-10
AT JOB SITE	2	CELLULOSE ESTER	0.01	0	0

- A. Base line is an action level by sample location and expressed in fibers per cubic centimeter which is the largest of the following:
1. Actual fiber concentration of the samples collected on cellulose ester filters for each work area.
 2. 0.01 fibers per cubic centimeter.
- B. Daily During Preparation

LOCATION SAMPLED	MINIMUM NUMBER OF SAMPLES	FILTER MEDIA	DETECTION LIMIT (FIBERS/C.C.)	MINIMUM VOLUME (LITERS)	RATE LPM
EACH WORK AREA	5	CELLULOSE ESTER	0.01	1500	2-10
OUTSIDE EACH WORK AREA	5	CELLULOSE ESTER	0.01	1500	2-10
OUTSIDE BUILDING	2	CELLULOSE ESTER	0.01	1500	2-10
AT JOB SITE	2	CELLULOSE ESTER	0.01	0	0

- A. Daily During Abatement
1. From the start of work building temporary enclosures until ready for clearance air monitoring, the laboratory will take the following samples on a daily basis.

LOCATION SAMPLED	MINIMUM NUMBER OF SAMPLES	FILTER MEDIA	DETECTION LIMIT (FIBERS/C.C.)	MINIMUM VOLUME (LITERS)	RATE LPM
OUTSIDE EACH WORK AREA *	4	CELLULOSE ESTER	0.01	1500	2-10
OUTSIDE BUILDING	1	CELLULOSE ESTER	0.01	1500	2-10
OUTPUT NEGATIVE PRESSURE SYSTEM		CELLULOSE ESTER	0.01	1500	2-10
AT JOB SITE		CELLULOSE ESTER	0.01	0	0

*** TWO (2) SAMPLES OUTSIDE THE WORK AREA BUT WITHIN TEN (10) FEET OF ISOLATION BARRIERS. TWO (2) SAMPLES AT LOCATION WITHIN TEN (10) FEET OF AND WITHIN THE ACTUAL ENVIRONMENT OF THE ENTRANCE EXIT OF THE PERSONNEL AND WASTE DECONTAMINATION ENCLOSURES.**

- A. If airborne fiber counts exceed allowed limits additional samples will be taken as necessary to monitor fiber levels.
- B. Clearance Air Monitoring
1. Air sample locations shall be the same as the locations of the samples collected before the start of work.
 2. All air samples will be taken using aggressive sampling techniques as follows:

- a. There are no standards available for flow rate of leaf blowers or large fans. However, this information is not critical to the success of the procedure.
- b. Before sampling pumps are started, the exhaust from forced air equipment (leaf blower with at least 1 horsepower electric motor) will be swept against all walls, ceilings, floors, ledges and other surfaces in the room. This procedure will be continued for five minutes per 1,000 cubic feet of floor.
- c. One 20 inch diameter fan per 10,000 cubic feet of room volume will be mounted in a central location at approximately 2 meters above floor, directed toward ceiling, and operated at low speed for the entire period of sample collection.
- d. Air samples will be collected in areas subject to normal air circulation away from room corners, obstructed locations, and sites near windows, door, or vents.
- e. After air sampling pumps have been shut off, fans will be shut off.
3. Schedule of Air Samples
 - a. General: The number and volume of air samples taken and analytical methods used by the Owner will be in accordance with the following schedule. Sample volumes given may vary depending upon the analytical instruments used.
4. Phase/Contrast Microscopy
 - a. In each homogeneous work area after completion of all cleaning work, a minimum of 13 samples will be taken and analyzed as follows:

LOCATION SAMPLED	MINIMUM NUMBER OF SAMPLES	FILTER MEDIA	DETECTION LIMIT (FIBERS/C.C.)	MINIMUM VOLUME (LITERS)	RATE LPM
Each Work Area	5	CELLULOSE ESTER	0.01	1500	2-10
Outside Work Area	5	CELLULOSE ESTER	0.01	1500	2-10
At Job Site	2	CELLULOSE ESTER	0.01	0	0
At Laboratory	1	CELLULOSE ESTER	0.01	0	0

- a. Analysis: Fibers on each filter will be measured using the NIOSH 7400 procedure accounting rules.
- b. Split Sample: One work area sample will be split and both halves analyzed separately for duplicate analysis.
- c. Satisfactory Clearance Air Monitoring Results: PCM clearance air monitoring is considered to be satisfactory only when every sample is <.01 f/cc unless otherwise directed by the Engineer.
5. Transmission Electron Microscopy
 - a. In each homogeneous work area after completion of all cleaning work, a minimum of 13 samples will be taken and analyzed as follows:

LOCATION SAMPLED	MINIMUM NUMBER OF SAMPLES	FILTER MEDIA	DETECTION LIMIT (FIBERS/C.C.)	MINIMUM VOLUME (LITERS)	RATE LPM
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EACH WORK AREA	5	POLYCARBONAT E (0.4 MICRONS) (37 MM) MIXED CELLULOSE ESTER (0.45 MICRONS) (25 MM)	0.05	2799	2-10
				1199	
OUTSIDE WORK AREA	5	POLYCARBONAT E (0.4 MICRONS) (37 MM) MIXED CELLULOSE ESTER (0.45 MICRONS) (25 MM)	0.005	2799	2-10
				1199	
AT JOB SITE	3*	POLYCARBONAT E (0.4 MICRONS) (37 MM) MIXED CELLULOSE ESTER (0.45 MICRONS) (25 MM)	0.005	0	0

3.05 LABORATORY TESTING

A. Phase Contrast Microscopy

1. The services of a testing laboratory will be employed by the Owner to perform laboratory analysis of the air samples. Samples will be sent daily by overnight mail so that verbal reports on air samples can be obtained within 24 hours. A complete record, certified by the testing laboratory, of all air monitoring tests and results, will be furnished to the Owner's Representative, the Owner, and the Contractor.
 - a. Written reports of all monitoring tests will be posted at the job site on a daily basis.
2. The personnel monitoring done by the Contractor will be conducted in accordance with the standards outline in sub-paragraph 1 above.

B. Transmission Electron Microscopy

1. Samples will be sent by overnight courier for analysis by transmission electron microscopy. Verbal results will be available within one working day after receipt of sample by the laboratory. The laboratory must be capable of analyzing 13 such samples from this project at any one time. A complete record, certified by the testing laboratory, of all transmission elec-tron microscopy results will be furnished to the Owner's Repre-sentative, the Owner, and the Contractor.

3.06 ADDITIONAL TESTING

- A. The Contractor may conduct his own air monitoring and laboratory testing. If he elects to do this, the cost shall be included in the Contract sum.
- B. If it is necessary to resample work areas for clearance testing because the area does not meet the release criteria, the Abatement Contractor will bear all costs for this additional sampling.

- C. If the Contractor does not adhere to the schedule and the Owner incurs additional air monitoring costs as a result, the additional costs will be paid by the Contractor. This will not apply if the project is delayed because of an Owner caused delay.

3.07 DATA SUBMITTAL

- A. The Project Monitor will submit all clearance air monitoring data to the NYSDOL in accordance with Industrial Code Rule 56.

END OF SECTION

SECTION 02 8075

HAZARDOUS MATERIALS TEMPORARY FACILITIES

PART 1 - GENERAL

1.01 DESCRIPTION

- A. The Contractor shall:
 - 1. Provide temporary facilities throughout the construction period, unless otherwise indicated.
 - 2. Pay costs for providing, maintaining, moving, and removing temporary facilities, unless otherwise indicated.

PART 2 - FACILITIES

2.01 TEMPORARY SANITARY FACILITIES

- A. Provide and maintain sanitary facilities for all personnel on the project.
 - 1. The number of sanitary facilities required shall be based on the total number of workmen employed on the project and shall be in accordance with the provisions of the applicable codes.
- B. Maintain in a sanitary and clean condition at all times.

2.02 TEMPORARY WATER

- A. The Owner will provide water.
 - 1. Contractor is to provide and maintain temporary connections to the designated outlet for construction water. Provide and maintain hoses, piping, and valves as required for obtaining construction water.
 - 2. Provide and maintain temporary connections to the designated outlet for cold shower water in the decontamination unit. Provide and maintain a hot water heater of sufficient capacity to provide hot water for showers for all workers.
 - 3. Provide anti-siphon prevention valves on each connection to Owner's outlet.
- B. All care must be exercised in the use of water furnished by the Owner.

2.03 FIRE PROTECTION

- A. Provide and maintain portable fire extinguishers on each floor level and building area. Number to conform to applicable codes.
- B. Fire Extinguishers: Multipurpose (ABC) dry chemical both inside and outside the work area.
- C. UL labeled.

2.04 STORAGE

- A. Storage space is limited and will be permitted in areas designated by the Engineer.

2.05 TEMPORARY POWER

- A. Electrical service will be provided by the Owner at no cost.
- B. Contractor shall be responsible for extending the service to provide lighting and power required to complete the Work of this Contract.
- C. Comply with the National Electrical Code, OSHA requirements, and applicable local codes and utility regulations.
- D. Maintain continuous service and provide safe working conditions.
- E. Do not overload circuits. Verify capacity of circuit prior to use.
- F. Provide ground fault protection for all temporary power sources.
- G. Temporary power and lighting cords will be elevated to keep them away from water on the floor and damage from foot traffic and scaffolds.

2.06 TEMPORARY PHONE

- A. Provide a phone and service at the job site.

PART 3 - EXECUTION

3.01 GENERAL

- A. Install temporary facilities in accordance with applicable codes.
- B. Maintain temporary facilities throughout the construction period.
- C. Remove temporary facilities when they are no longer required or when directed by the Engineer.
- D. Repair damage to the project site caused by the installation of temporary facilities.

END OF SECTION

SECTION 02 8078

HAZARDOUS MATERIALS SITE SECURITY

PART 1 - GENERAL

1.01 DESCRIPTION

- A. Related Requirements Specified Elsewhere
 - 1. Submittals: Section 02 8073
- B. The Contractor shall provide all controls required to comply with all pertinent regulations and the Contract Documents including, but not limited to, those described in this section.

PART 2 - CONTROLS

2.01 SITE SECURITY

- A. The Work area is to be restricted to authorized, trained, and protected personnel. These may include the Contractor's employees, employees of subcontractors, Owner employees and representatives, state and local inspectors, and any other designated individuals. A list of authorized personnel shall be established prior to job start and posted in the clean room of the worker decontamination facility.
- B. Entry into the Work area by unauthorized individuals shall be reported immediately to the Owner by the Contractor.
- C. A log book shall be maintained by the Contractor in the clean room area of the worker decontamination system. Anyone who enters the Work area must record name, affiliation, time in, and time out for each entry. The asbestos handlers shall show their certification card or have a copy on file at the entrance upon their first entry of the day.
- D. Access to the Work area shall be through a single worker decontamination system. All other means of access (doors, windows, hallways, etc.) shall be blocked or locked so as to prevent entry to or exit from the Work area. The only exceptions for this rule are the waste pass-out air-lock which shall be sealed except during the removal of containerized asbestos waste from the Work area, and emergency exits in case of fire or accident. Emergency exits shall not be locked from the inside; however, they shall be sealed with polyethylene sheeting and tape until needed.
- E. The Project Monitor should have control of site security during abatement operations whenever possible, in order to protect Work efforts and equipment.
- F. Contractor will have Owner's assistance in notifying building occupants of impending activity and enforcement of restricted access by Owner's employees.
- G. If the decontamination chamber or the waste pass-out chamber is located outside the building, provide a security guard 24 hours a day and a fence around the site.

END OF SECTION

SECTION 02 8079

HAZARDOUS MATERIALS EMERGENCY PLANNING

PART 1 - GENERAL

1.01 DESCRIPTION

- A. Related Requirements Specified Elsewhere
 - 1. Submittals: Section 02 8073
- B. The Contractor shall prepare an emergency preparedness plan detailing at least the information required in this section and in any pertinent federal, state, or local regulations.

PART 2 - DETAILS OF PLAN

2.01 EMERGENCY PLANNING

- A. Emergency planning shall be developed prior to abatement initiation and agreed to by Contractor and Owner.
- B. Emergency procedures shall be in written form and prominently posted in the clean change area and equipment room of the worker decontamination area. Everyone, prior to entering the work area, must read and sign these procedures to acknowledge receipt and understanding of work site layout, location of emergency exits, and emergency procedures.
- C. Emergency planning shall include written notification of police, fire and emergency medical personnel of planned abatement activities, work schedule and layout of work area, particularly barriers that may affect response capabilities.
- D. Emergency planning shall include considerations of fire, power failure, explosion, toxic atmospheres, electrical hazards, slips, trips and falls, confined spaces, and heat related injury. Written procedures shall be developed and employee training in procedures shall be provided.
- E. Employees shall be trained in evacuation procedures in the event of workplace emergencies.
 - 1. For Non-Life-Threatening Situations: Employees injured or otherwise incapacitated shall decontaminate following normal procedures with assistance from fellow workers, if necessary, before exiting the workplace to obtain proper medical treatment.
 - 2. For Life-Threatening Injury or Illness: Worker decontamination shall take least priority. After measures to stabilize the injured worker, remove him from the workplace and secure proper medical treatment.
- F. Telephone numbers of all emergency response personnel shall be prominently posted in the clean change area and equipment room, along with the location of the nearest telephone.

END OF SECTION

SECTION 02 8084

HAZARDOUS MATERIALS MAINTENANCE OF RECORDS

PART 1 - GENERAL

1.01 DESCRIPTION

- A. The Contractor shall maintain the records required in Title 29 CFR 1926.1101 (n) and Part 56 of Title 12 of the Official Compilation of Codes, Rules and Regulations of the State of New York.
- B. The Contractor shall provide the Owner and Engineer with three (3) electronic and two (2) hard copies of all records.
- C. Related Requirements Specified Elsewhere
 - 1. Submittals: Section 02 8073

END OF SECTION

SECTION 02 8086

ASBESTOS WASTE DISPOSAL PROCEDURES

PART 1 - GENERAL

1.01 DESCRIPTION

- A. As the work progresses, to prevent exceeding available storage capacity on site, sealed and labeled containers of asbestos-containing waste shall be removed and transported to the pre-arranged disposal location.
- B. All containers of asbestos-containing waste shall be labeled with the name of the waste generator and the location at which the waste was generated.
- C. Disposal of all regulated asbestos-containing material must occur at an authorized site in accordance with regulatory requirements of NESHAP 40 CFR 61.156, NYSDEC 6NYCRR364, and local guidelines and regulations.
- D. All dump receipts; trip tickets, transportation manifests, or other documentation of disposal shall be delivered to the Owner for his records.
 - 1. A record keeping format utilizing a chain of custody form which includes the names and addresses of the Generator (Owner), Contractor, pickup site, disposal site, the estimated quantity of the asbestos waste, and the type of containers used.
 - 2. The form should be signed by the Generator, the Contractor, the truck drivers, and the disposal site operator, as the responsibility for the material changes hands.
 - 3. If a separate hauler is employed, his name, address, telephone number, and signature should also appear on the form.

PART 2 - PRODUCTS - NOT APPLICABLE

PART 3 - EXECUTION

3.01 TRANSPORTATION TO THE LANDFILL - (REGULATED ASBESTOS CONTAINING MATERIAL)

- A. Once drums, bags, and wrapped components have been removed from the work area, they shall be loaded into an enclosed, hardbody, lockable truck for transportation.
- B. When moving containers, utilize hand trucks, carts, and proper lifting techniques to avoid back injuries. Trucks with lift gates are helpful for raising drums during truck loading.
- C. The enclosed cargo area of the truck shall be free of debris and lined with 2 layers of 6 mil polyethylene sheeting to prevent contamination from leaking or spilled containers. Floor sheeting shall be installed first and extend up the sidewalls. Ceiling and wall sheeting shall be overlapped and taped into place.
- D. Drums shall be placed on level surfaces in the cargo area and packed tightly together to prevent shifting and tipping. Large structural components shall be secured to prevent shifting and have bags placed on top. Do not throw containers into truck cargo area.
- E. Personnel loading asbestos-containing waste shall be protected by disposable clothing including head, body, and foot protection, and at a minimum, half-face piece, air-purifying, dual cartridge respirators equipped with high efficiency filters.
- F. Any debris or residue observed on containers or surfaces outside of the work area resulting from clean-up or disposal activities shall be immediately cleaned up using HEPA filtered vacuum equipment and/or wet methods as appropriate.
- G. Large metal dumpsters are sometimes used for asbestos waste disposal. These should have doors or tops that can be closed and locked to prevent vandalism or other disturbance of the bagged asbestos debris and wind dispersion of asbestos fibers. Unbagged material shall not be placed in these containers, nor shall they be used for non-asbestos waste. Bags shall be placed, not thrown, into these containers to avoid splitting.
- H. The waste hauler shall provide a copy of his "Industrial Waste Hauler Permit" specifically for asbestos-containing material required pursuant to NYSDEC regulation 6 NYCRR364.

3.02 DISPOSAL AT THE LANDFILL - (REGULATED ASBESTOS CONTAINING MATERIA)

- A. Upon reaching the landfill, trucks are to approach the dump location as closely as possible for unloading of the asbestos-containing waste.
- B. Bags, drums, and components shall be inspected as they are off-loaded at the disposal site. Material in damaged containers shall be repacked in empty drums or bags as necessary. (Local requirements may not allow the disposal of asbestos waste in drums. Check with appropriate agency and institute appropriate alternative procedures.)
- C. Waste containers shall be placed on the ground at the disposal site, not pushed or thrown out of trucks (weight of wet material could rupture containers).
- D. Personnel off-loading containers at the disposal site shall wear protective equipment consisting of disposable head, body, and foot protection and, at a minimum, half-face piece, air-purifying, dual cartridge respirators equipped with high efficiency filters.
- E. Following the removal of all containerized waste, the truck cargo area shall be decontaminated using HEPA vacuums and/or wet methods to meet the no-visible residue criteria. Polyethylene sheeting shall be removed and discarded along with contaminated cleaning materials and protective clothing, in bags or drums at the disposal site.
- F. If landfill personnel have not been provided with personal protective equipment for the compaction operation by the land-fill operator, Contractor shall supply protective clothing and respiratory protection for the duration of this operation.

END OF SECTION

SECTION 02 8087

HAZARDOUS MATERIALS RESTORING THE WORK AREA

PART 1 - GENERAL

1.01 DESCRIPTION

- A. Related Requirements Specified Elsewhere
 - 1. Cleaning Up: Section 02 8090
- B. Restoring of the work area to pre-abatement condition shall only occur following the completion of clean-up procedures and after clearance air monitoring has been performed and documented to the satisfaction of the Owner.

PART 2 - PRODUCTS - NOT APPLICABLE

PART 3 - EXECUTION

3.01 REESTABLISHMENT PROCEDURES

- A. The Contractor and Owner shall visually inspect the work area for any remaining visible residue. Evidence of contamination will necessitate additional cleaning.
- B. Additional air monitoring shall be performed if additional clean-up is necessary.
- C. Following satisfactory clearance of the work area, remaining polyethylene barriers may be removed and disposed of as asbestos-contaminated waste.
- D. At the discretion of the Owner, mandatory requirements for personal protective equipment may be waived following the removal of all barriers.
- E. Re-secure mounted objects removed from their former positions during area preparation activities.
- F. Relocate objects that were removed to temporary locations back to their original positions.
- G. Repair areas of damage that occurred as a result of abatement activities and as indicated.

END OF SECTION

SECTION 02 8090
HAZARDOUS MATERIALS CLEANING UP

PART 1 - GENERAL

1.01 DESCRIPTION

- A. Related Requirements Specified Elsewhere
 - 1. Regulatory Requirements: Section 02 8071
 - 2. Restoring the Work Area and Systems: Section 02 8087
 - 3. Cleaning for Specific Products or Work: The respective sections of the specifications.
- B. Maintain premises and public properties free from accumulations of waste, debris, and rubbish caused by operations.
- C. At completion of Work, remove waste materials, rubbish, tools, equipment, machinery, and surplus materials, and clean all sight-exposed surfaces; leave project clean and ready for occupancy.

1.02 SAFETY REQUIREMENTS

- A. Standards: Maintain project in accordance with safety and insurance standards and the specifications contained herein.
- B. Hazards Control
 - 1. Remove asbestos waste from premises daily.
 - 2. Prevent accumulation of wastes which create hazardous conditions.
 - 3. Provide adequate ventilation.
- C. Conduct cleaning and disposal operations to comply with federal, state, and local ordinances.

PART 2 - PRODUCTS

2.01 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.

PART 3 - EXECUTION

3.01 DURING CONSTRUCTION

- A. Clean the Worker Decontamination Unit at least once each shift.
- B. Clean the area near the Waste Decontamination Unit and the Worker Decontamination Unit at least once each shift.

3.02 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, fingerprints, and other foreign materials from sight-exposed interior and exterior finished surfaces; polish surfaces so designated to shine finish.
- D. Repair, patch, and touch up marred surfaces to specified finish, to match adjacent surfaces.
- E. Broom clean paved surfaces; rake clean other surfaces of grounds.
- F. Maintain cleaning until project, or portion thereof, is occupied by Owner.

END OF SECTION

SECTION 02 8400

PCB REMEDIATION – SEALANTS

PART 1 - GENERAL

1.01 RELATED DOCUMENTS

DRAWINGS AND GENERAL PROVISIONS OF THE CONTRACT, INCLUDING GENERAL AND SUPPLEMENTARY CONDITIONS AND DIVISION 1 SPECIFICATION SECTIONS, APPLY TO THIS SECTION.

1.02 DESCRIPTION

- A. This section describes the procedures and requirements to be followed by the Contractor for removal and disposal of building sealants (including caulking and glazings) which contain Polychlorinated Biphenyls (PCB's) classified as PCB Bulk Product Waste, and procedures for PCB decontaminating and encapsulation of building surfaces that were in contact with the sealants at levels of 50ppm or more. PCB containing sealants require special handling during removal to prevent worker and building occupant exposures.
- B. The worker training and disposal procedures are determined by the PCB concentration in the sealants. Sealants that contain 50 parts per million (ppm) or more are classified by the USEPA as a PCB Bulk Product Waste, and by NYSDEC as regulated hazardous waste. Handling these materials require worker training, managing and disposal as such (Refer to Part 3.01, B - for details). Sealants that contain levels less than 50 parts per million (ppm) but more than 1 ppm are unregulated by the USEPA and are classified as a non-hazardous, regulated solid waste in New York. These materials require worker training, management and disposal as such (see Part 3.01, A for details).

1.03 WORKER TRAINING

- A. All persons performing removal or handling of PCB containing materials shall be trained at a minimum on the health hazards of PCBs, symptoms of exposure, medical surveillance, work methods and engineering controls to prevent workplace exposure and release into the environment, use of personal protective equipment, waste handling, disposal requirements, and hazardous communications.
- B. All persons performing removal or handling of PCB containing materials with concentrations of 50 parts per million (ppm) or greater shall be performed by persons trained and in accordance with O.S.H.A. Hazardous Waste Operations, as determined by O.S.H.A. 1910.120.
- C. All persons performing removal or handling of PCB containing materials with concentrations less than 50 ppm, but more than 1 ppm shall be performed by persons trained and in accordance with O.S.H.A. 8 – hour awareness training including, at a minimum, the topics listed in Section 1.02, A.

1.04 O.S.H.A. EXPOSURE MONITORING

- A. During removal or handling of PCB containing materials, worker airborne exposure shall be monitored by the Contractor. This monitoring shall be done in accordance with Occupational Safety and Health Administration personal/occupational exposure monitoring requirements. Results of monitoring shall be submitted to the Engineer.

1.05 PERSONAL PROTECTIVE EQUIPMENT (P.P.E.)

- A. During removal or handling of PCB containing materials, and products used in the process, workers shall wear suitable skin, hand, eye and respiratory protection. At a minimum, gloves and skin protection for chemical resistance, and P100 rating half face respiratory protection shall be worn. P.P.E. shall be modified as necessary based on exposure monitoring and hazards present. The specifics of the required P.P.E. shall be defined by the Contractors O.S.H.A. health and safety program. Any P.P.E. proposed that does not meet the minimum requirements specified must be approved in writing by the Engineer.

1.06 REGULATORY REQUIREMENTS

- A. In addition to the requirements outlined in this specification, the Contractor shall comply with the U.S. Toxic Substance Control Act (TSCA), U.S. Environmental Protection Agency 40 CFR Part 761, New York State Department of Environmental Conservation 6NYCRR 370 -376, and Federal Occupational Safety and Health Administration (O.S.H.A.) 29CFR 1926 & 1910 and all other relevant federal, state and local regulations.

PART 2 – PRODUCTS

2.01 EQUIPMENT

- A. Special Clothing (PPE): Work clothes shall consist of personal protective equipment (PPE) as required by 29CFR1926.28 and Subpart E; 29 CFR 1910.132-138; including, but not limited to, the following:
 - 1. Disposable coveralls.
 - 2. Gloves (Disposable rubber gloves may be worn under these).
 - 3. Disposable foot covers (polyethylene).
 - 4. Chemical safety goggles.
 - 5. Half mask cartridge respirator.
- B. Special Clothing for Owner's Personnel Required to Enter Control Areas: Provide PPE same as specified for workers.
- C. Caution Signs: Comply with 29CFR 1926.200-203 & 29 CFR 1910.145.
 - 1. Provide signs at approaches to Control Areas.
 - 2. Locate signs at such a distance that personnel may read the sign and take the necessary precautions before entering the control area.
- D. CAPSUR® PCB Extraction System, manufactured by Integrated Chemicals, Inc. (ph. 651-426-3224), or equal.
 - 1. Model T Jr. Foamer- Decontamination Foam Cleaning System.
 - 2. Air Compressor 80 PSI @ 8CFM minimum.
 - 3. Compressed Air Line: Air supply hose with a connection for an industrial 1/4" interchange quick disconnect nipple.
 - 4. Industrial Wet Vacuum, HEPA exhaust equipped:
 - 5. > 100 cfm with shielded (spark proof) motor, grounded at plug.
 - 6. Water Supply: Used for dilution of product and rinsing between applications.
- E. Use scrubbers and absorbent pads that are not dissolved by the solvents or cleaners used, and that do not shred, crumble, or leave visible fragments on the surface.

PART 3 – EXECUTION

3.01 WORK AREA PREPARATION, SEALANT REMOVAL, SURFACE TREATMENT, CLEANUP AND ENCAPSULATION FOR WORK AREAS WHERE PCB SEALANT CONCENTRATIONS ARE GREATER THAN OR EQUAL TO 50 PPM

- A. **Work Area Preparation**- Isolate Controlled Area by physical boundaries to prevent unauthorized entry of personnel (Barrier Tape); do not permit food, drink, or smoking materials in areas where toxic substances are handled or stored. Precautions shall be taken to contain the sealants during removal and prevent the sealant from being released into the environment. A drop cloth shall be placed below the work area and shall extend five feet out from the work area and additional 5 feet in every direction for every story above the 1st floor (20 ft maximum), or as determined necessary. Any caulking/sealant identified in the soil adjacent to the building will be the Contractors responsibility to remove from the soil and dispose of properly. The interior of the windows shall be covered and sealed with one layer of six millimeter, fire-retardant plastic to prevent migration of dust into the building.
- B. **Sealant Removal** - Precautions shall be taken to contain the caulking during removal. The sealant shall be scraped using manual methods. No visible emissions will be allowed. Dust must be kept to a minimum and wetting or misting of the sealants may be required to control dust. No electric grinders or brushes shall be utilized. Any proposed electric equipment to be used in the removal must be approved by the Engineer and at a minimum be equipped with dust shroud, and vacuum containing a HEPA Filter. The Contractor will propose to the Engineer the methods to be used to contain all dust. If methods produce visible dust, then an isolation enclosure ("tent") shall be required. Any contamination resulting from the removal process shall be the contractor's responsibility to remediate the impacted areas to EPA standards for high occupancy use areas. All sealants shall be removed from the building substrate completely and substrate shall be decontaminated per Section 3.01, (C). Building materials removed that contain PCB sealants, or in were in direct contact with sealants, shall be disposed of with the PCBs sealants. Any removed building components (i.e., metal, or wood frames and sashes, or other materials),

that were in direct contact with the sealants and are to be recycled or reused, must be cleaned free of PCBs sealants and residuals. Cleaning includes removing any residuals and verifying cleanup as clean per 40CFR 760 if to be recycled. Reuse or recycling requires Owner/Engineer approval. Note: testing of the building surface that shall remain and is to be encapsulated is not required.

- C. **Building Surface Decontamination** – This applies to all areas where PCBs are being removed with concentrations over 50ppm: After removal of all sealants from surfaces are complete, the Contractor shall vacuum all surfaces within five feet of work area using a HEPA vacuum starting from the highest point down, to ground level. The work area where PCB concentrations were over 50ppm must then be treated with CAPSUR® PCB Extraction System, manufactured by Integrated Chemicals, Inc.(ph. 651-426-3224), or equal. The CAPSUR shall be applied to the areas in of the building that are remaining and that were in direct contact with the PCB sealants. The application method shall be per manufactures recommendations (i.e. applying in liquid form using a chemical sprayer or foam form using foam applicator). After allowable extraction time, the CAPSUR shall then be removed from the surfaces using a wet vacuum that is equipped with a HEPA filtration. The surfaces must then be rinsed with clean water by applying water and removed using wet vacuum that is equipped with a HEPA filtration. The rinse process shall be repeated three times. The Contractor must provide a written procedure for application, removal and rinsing procedures to the Engineer for approval prior to start of work.
1. A surface decontamination and wash procedure test will need to be performed on an area identified by the architect to determine impact on surface discoloring. These tests must be done prior to completing work and shall be witnessed by architect and signed off on. If a contractor proceeds to wash/decontaminate without performing the test and receiving the sign off from the architect then the contractor takes the responsibility and costs of any discoloration and repairs that may be needed to correct the problem.
- D. **Work Area Cleanup** – After the PCB surface decontamination is complete in the areas of sealant containing 50 ppm or greater, the plastic on the exterior shall be cleaned free of any residual debris and wiped cleaned prior to removal. Inside the building, the plastic barrier shall be removed and the surfaces within the work area shall be HEPA vacuumed and wiped from highest point down to the ground using disposable wipes (Sentinel 805 Envirowash distributed by SECI 800-543-4592 or equal). Note: the interior plastic may need to be left in place to protect the interior of the building when the new window blocking and/ or receivers are installed, non-asbestos project only. This is to be coordinated with window contractor. All work areas shall be cleared based on a visual inspection by the Contractor and a representative of Owner. Inspection results shall be included in the Contractors daily log. Inspection shall pass when no visible residue of sealant or residual dust is present.
- E. **Surface Encapsulation** - Upon completion of the cleanup procedure and visual inspection, the surfaces that where in direct contact with sealants containing PCBs at levels greater than 50ppm shall be encapsulated by a two layer, two color barrier system or enclosed per Section 3.01,F (note: enclosures locations shall be specified on drawings). If no enclosure is specified then the encapsulation methods shall be used. The encapsulation barrier shall consist of Sikagard 62 ® High-build, protective, solvent-free colored epoxy coating (10-mil thick), or equal. The areas to be encapsulated shall be the areas in direct contact with the sealants and extending out to the edge of the rough openings. The details and extent of application shall be coordinated with the Engineer/Architect. The two-layer coating system is for the purpose to identify wear on the outer layer. The colors of the coating shall be submitted to the Architect for approval prior to application. The product shall be applied in accordance with the manufactures recommendations and architects approval.
- F. **Surface Enclosure** - Upon completion of the cleanup procedure and visual inspection, the surfaces that where in direct contact with sealants containing PCBs at levels greater than 50ppm shall be enclosed encapsulated per Section 3.01,E, or enclosed with a solid barrier (i.e. aluminum sheeting or rubber membrane) per this section. Whenever a enclosure is required its location and type of enclosure shall be specified on the drawings. If drawings do not identify enclosure method than encapsulation per Section 3.01, E shall be required.
- G. **Asbestos and PCB containing Sealants** – Where sealants contain both PCBs and asbestos, follow the asbestos abatement procedures for work area prep, removal and clean up. The Contractor shall also follow Part 3.01, Section A, B, C, D, and E of this specification section.

3.02 WORK AREA PREPARATION, SEALANT REMOVAL AND CLEANUP FOR WORK AREAS WHERE PCB SEALANT CONCENTRATIONS ARE LESS THAN 50 PPM

- A. **Work Area Preparation** - Isolate Control Area by physical boundaries to prevent unauthorized entry of personnel (Barrier Tape); do not permit food, drink, or smoking materials in areas where toxic substances are handled or stored. Precautions shall be taken to contain the sealants during removal and prevent the sealant from being released into the environment. A drop cloth shall be placed below the work area and shall extend five feet out (minimum) from the work area and an additional 5 feet in every direction for every story above the 1st floor, or as determined necessary. Any caulking/sealant identified in the soil adjacent to the building will be the Contractors responsibility to remove from the soil and dispose of properly. The interior of the windows shall be covered and sealed with one layer of six millimeter, fire-retardant plastic to prevent migration of dust into the building.
- B. **Removal** - Precautions shall be taken to contain the caulking during removal. The sealant shall be scraped using manual methods. No visible emissions will be allowed. Dust must be kept to a minimum and wetting or misting of the sealants may be required to control dust. No electric grinders or brushes shall be utilized. Any proposed electric equipment to be used in the removal must be approved by the Engineer and at a minimum be equipped with dust shroud, and vacuum containing a HEPA Filter. The Contractor will propose to the Engineer the methods to be used to contain all dust. All sealant shall be removed from the substrate completely. Any metal or other materials that were in direct contact with the sealant must be cleaned free of PCBs sealants and residuals.
- C. **Work Area Cleanup** – After removals are complete, the Contractor shall vacuum all surfaces within five feet of work area using a HEPA vacuum starting from the highest point down, to ground level. The work area must then be wiped from highest point down to the ground using disposable wipes (Sentinel 805 Envirowash distributed by SECI 800-543-4592 or equal). Inside the building, the plastic barrier shall be removed and the surfaces within the work area shall be HEPA vacuumed and wiped from highest point down to floor level. Note: the interior plastic may need to be left in place to protect interior of the building when the new window blocking and/or receivers are installed, non-asbestos project only. This is to be coordinated with window contractor, see Section 2.03). All work areas shall be cleared based on a visual inspection by the Contractor and a representative of Owner. Inspection results shall be included in the Contractors daily log. Inspection shall pass when no visible residue of sealant or residual dust is present.
- D. **Asbestos and PCB containing Sealants** – Where sealants contain both PCBs and asbestos, follow the asbestos abatement procedures for work area prep, removal and clean up. The Contractor will also follow Part 2.02, Sections A, B and C of this specification section.

3.03 DISTURBANCE OF ENCAPSULATED BUILDING SURFACES

- A. If encapsulated surfaces are disturbed (i.e., drilling or cutting) the following training and procedures shall apply:
 - 1. Any worker shall be trained in accordance with O.S.H.A. requirements in Section 1.02 of this specification.
 - 2. Dust barriers shall be provided to protect the interior of the building from dust (i.e. the interior dust barrier for the sealant removal project may be left in place until new windows blocking and of receivers are installed, non-asbestos project only.)
 - 3. Work methods used shall control dust, (i.e. wet drilling and cutting).
 - 4. All power tools used shall be equipped with a dust shroud and H.E.P.A. vacuum.
 - 5. All dust cleanup and inspections shall be in accordance with Section 2.02, C.
 - 6. The Contractor must provide and ensure that workers use washing facilities.

3.04 HYGIENE FACILITIES

- A. The Contractor must provide and ensure that workers use washing facilities.
- B. Washing facilities shall be provided for employees. Such facilities shall be in near proximity to the work site and provided with water, soap, and clean towels to enable employees to remove contamination from their skin.
- C. Washing facilities must include Change Areas equipped with storage street clothes and separate area with facilities for removal and storage of contaminated protective work clothing and equipment. Change

Areas are to be used for taking off street clothes, suiting up in clean working clothes (protective Clothing), donning respirators prior to beginning work, and dressing in street clothes after work. No contaminated items should enter this clean area.

- D. Work clothing must not be worn away from the job site. Under no circumstances should contaminated work clothes be laundered at home or taken from the work site, except to be laundered professionally or properly disposed of following applicable regulations.
- E. Showers shall be provided when there is potential for extensive contamination of employee's skin, hair and protective clothing. Shower facilities must be provided if feasible so that exposed employees can wash lead from their skin and hair prior to leaving the work site. Where showers are provided, employees must change out of their work clothes and shower before changing into their street clothes and leaving site.

PART 4 – DISPOSAL

4.01 DISPOSAL

- A. **PCB levels 50 ppm or greater** - All PCB containing caulking and sealants shall be removed, containerized and disposed of as a TOSCA "PCB Bulk Product Waste" and in New York as a RCRA Regulated Hazardous, TOXIC-PCB containing waste. All waste shall be placed in Department of Transportation (DOT) approved waste containers and labeled "Hazardous Waste -TOXIC PCB Containing". In addition, the following information shall be placed on the container: Date container was filled; Generator/Owner name and address; DOT Shipping Name (i.e. Hazardous Waste Solid N.O.S.); EPA ID number of generator if applicable, waste code B001, and the manifest number the container is shipped under. Storage of this waste must be in a secured area and labeled "Hazardous Waste Storage"
- B. **PCBs levels Less than <50 ppm** - All PCB containing caulking and sealants shall be removed, containerized and disposed of as a non-hazardous PCB regulated waste. All waste shall be placed in appropriate containers and labeled as "PCB Containing Waste". All waste shall be manifested with a Non-Hazardous, Regulated Waste Manifest and disposed of at a Landfill permitted to accept PCB containing wastes.
- C. **PCB and Asbestos Containing** - When the sealants are PCB and asbestos containing, the waste must be managed for both waste streams, including labeling, manifesting, transportation and disposal.
- D. **Building Debris with PCB sealants removed** - Building materials removed that contain PCB sealants, or were in direct contact with sealants, shall be disposed of with the PCBs sealants. Any removed building components (i.e., metal, or wood frames and sashes, or other materials), that were in direct contact with the sealants and are to be recycled or reused, must be cleaned free of PCBs sealants and residuals. Cleaning includes removing any residuals and verifying cleanup as clean per 40CFR 760 if to be recycled. Reuse or recycling requires Owner/Engineer approval. Note: testing of the building surface that shall remain and is to be encapsulated is not required.

PART 5 – SUBMITTALS

5.01 SUBMITTALS

- A. Prior to Commencement of Work:
 - 1. The Contractor shall submit a list of the persons who will be employed by him and his subcontractors in the removal work. Present evidence that workers have received proper training required by the regulations and the medical examinations required by OSHA 29 CFR 1910.134.
 - 2. Project Supervisor: Submit the resume of the proposed Project Supervisor.
 - 3. Submit copy of Health and Safety program.
 - 4. Submit Material Safety Data Sheets (MSDS) for all chemical and products to be used.
 - 5. Submit copies of waste hauler and disposal facility permits.
 - 6. Submit copy of Non-hazardous Regulated Waste Manifest and Regulated Hazardous Waste Manifests to be used.
 - 7. Submit information on waste containers to be used for Hazardous and non-hazardous wastes.
 - 8. Submit copies of labels to be used on both non-hazardous and hazardous waste containers.
 - 9. Submit written plan for application, removal and cleanup procedures for CAPSUR PCB Decontamination process.

10. Submit color choices and application procedures for Sikagard 62 ® High-build, protective, solvent-free colored epoxy coating (10-mils thick) encapsulant.
11. During abatement activities, Contractor shall:
 - a. Submit copies of all waste manifests for all waste materials re-moved from the site.
 - b. The Contractor will maintain worksite log books with information on the work being completed, number of workers, dates, amounts, quantities, sub-contractors, inspections results and waste shipments.
 - c. Submit results of bulk material analysis, waste sample classification and OSHA compliance air monitoring results.
12. Project Closeout Submissions:
 - a. Submit copies of all waste disposal manifests and a copy certificate of disposal for each hazardous waste container.
 - b. Submit OSHA compliance air monitoring records conducted during the work.
 - c. Submit copies of waste classification testing.
 - d. Submit copies of contractors daily logs.

END OF SECTION



April 6, 2020

Lee Pavone, P.E.
Yonkers Public Schools
1 Larkin Plaza
Yonkers, NY 10701

Re: Limited PCB Testing, MLK Academy, Yonkers PS

Dear Mr. Pavone:

Attached are the results for Polychlorinated Biphenyl (PCB) testing of exterior sealants at the MLK Academy located at 135 Locust Avenue, in Yonkers NY. The sealants were tested for the PCB's in preparation for proposed renovations.

PCBs are a regulated toxic substance that has been found in caulk, sealants and glazing compounds. New York State Education Department (NYSED) and NYS Department of Health (NYSDOH) recommends for any school buildings constructed or renovated between 1950 and 1977, and undergoing current renovation or demolition, that the building(s) be evaluated to determine whether they contain caulk that is contaminated with PCBs. If so, a plan should be developed to address potential environmental and public health concerns about potential PCB exposure.

Attached are the PCB Testing Summary Table, Laboratory Report Analysis, and Sample Location Plan.

Based on the results and the classification, E&R has included a plan to address these materials in the 2020 Capital Project. These materials will be removed and disposed of in accordance with regulations and good hygiene practices.

Sincerely,

A handwritten signature in blue ink that reads "Matthew Inman".

Matthew Inman
Manager of Environmental Services

C-Y19MLK01A

Attachments:

PCB Testing Results Summary Table
Sample Location Plan
Laboratory Report of Analysis
PCBs in Caulk Q&A



MLK Academy

LIMITED PCB TESTING
YONKERS PS
135 LOCUST AVE.
YONKERS, NEW YORK 10701

Project # Y19MLK01

PCB Testing Result Summary Table

Sample-ID	Material	Results (mg/Kg)	Aroclor	Classification
021	Joint Caulk	8.9 ppm	PCB-1254	NYSDEC PCB Containing Solid Waste
023	Soffit Caulk	1.7 ppm	PCB-1254	NYSDEC PCB Containing Solid Waste
025	Panel Caulk	60,000 ppm	PCB-1254	EPA PCB Bulk Product
067	Window Caulk	5.2 ppm	PCB-1254	NYSDEC PCB Containing Solid Waste
070	Frame Caulk	18 ppm	PCB-1254/1260	NYSDEC PCB Containing Solid Waste
073	Louver Caulk	15 ppm	PCB-1254	NYSDEC PCB Containing Solid Waste
075	Panel Caulk	18,000 ppm	PCB-1254/1260	EPA PCB Bulk Product
077	Column Caulk	65,000 ppm	PCB-1254	EPA PCB Bulk Product

EPA PCB Bulk Product per 40 CFR Part 761-PCB's Greater than 50 ppm are classified as a PCB Bulk product waste and are not authorized for use
NYSDEC Products with PCB's at levels less than 50 ppm are not classified by the EPA but are classified as a PCB containing solid waste by NYSDEC



Monday, October 21, 2019

**Attn: Mr Matt Inman
Eisenbach & Ruhnke Engineering, P.C.
291 Genesee Street
Utica NY 13501**

**Project ID: MLK ACADEMY
SDG ID: GCE41488
Sample ID#s: CE41488 - CE41490**

This laboratory is in compliance with the NELAC requirements of procedures used except where indicated.

This report contains results for the parameters tested, under the sampling conditions described on the Chain Of Custody, as received by the laboratory. This report is incomplete unless all pages indicated in the pagination at the bottom of the page are included.

All soils, solids and sludges are reported on a dry weight basis unless otherwise noted in the sample comments.

A scanned version of the COC form accompanies the analytical report and is an exact duplicate of the original.

If you are the client above and have any questions concerning this testing, please do not hesitate to contact Phoenix Client Services at ext.200. The contents of this report cannot be discussed with anyone other than the client listed above without their written consent.

Sincerely yours,


Phyllis Shiller
Laboratory Director

**NELAC - #NY11301
CT Lab Registration #PH-0618
MA Lab Registration #M-CT007
ME Lab Registration #CT-007
NH Lab Registration #213693-A,B**

**NJ Lab Registration #CT-003
NY Lab Registration #11301
PA Lab Registration #68-03530
RI Lab Registration #63
UT Lab Registration #CT00007
VT Lab Registration #VT11301**



Environmental Laboratories, Inc.
587 East Middle Turnpike, P.O.Box 370, Manchester, CT 06045
Tel. (860) 645-1102 Fax (860) 645-0823



Sample Id Cross Reference

October 21, 2019

SDG I.D.: GCE41488

Project ID: MLK ACADEMY

Client Id	Lab Id	Matrix
021 JOINT CAULK	CE41488	CAULK
023 SOFFIT CAULK	CE41489	CAULK
025 PANEL CAULK	CE41490	CAULK



Environmental Laboratories, Inc.
587 East Middle Turnpike, P.O.Box 370, Manchester, CT 06045
Tel. (860) 645-1102 Fax (860) 645-0823



Analysis Report

October 21, 2019

FOR: Attn: Mr Matt Inman
Eisenbach & Ruhnke Engineering, P.C.
291 Genesee Street
Utica NY 13501

Sample Information

Matrix: CAULK
Location Code: EISENB-PCB
Rush Request: Standard
P.O.#:

Custody Information

Collected by: MI
Received by: CP
Analyzed by: see "By" below

Date	Time
10/10/19	11:30
10/16/19	10:30

Laboratory Data

SDG ID: GCE41488
Phoenix ID: CE41488

Project ID: MLK ACADEMY
Client ID: 021 JOINT CAULK

Parameter	Result	RL/ PQL	Units	Dilution	Date/Time	By	Reference
Caulk Extraction for PCB	Completed				10/16/19	XX/VT	SW3540C

PCB (Soxhlet SW3540C)

PCB-1016	ND	1.7	mg/Kg	10	10/17/19	AW	SW8082A
PCB-1221	ND	1.7	mg/Kg	10	10/17/19	AW	SW8082A
PCB-1232	ND	1.7	mg/Kg	10	10/17/19	AW	SW8082A
PCB-1242	ND	1.7	mg/Kg	10	10/17/19	AW	SW8082A
PCB-1248	ND	1.7	mg/Kg	10	10/17/19	AW	SW8082A
PCB-1254	8.9	1.7	mg/Kg	10	10/17/19	AW	SW8082A
PCB-1260	ND	1.7	mg/Kg	10	10/17/19	AW	SW8082A
PCB-1262	ND	1.7	mg/Kg	10	10/17/19	AW	SW8082A
PCB-1268	ND	1.7	mg/Kg	10	10/17/19	AW	SW8082A

QA/QC Surrogates

% DCBP	53		%	10	10/17/19	AW	30 - 150 %
% DCBP (Confirmation)	53		%	10	10/17/19	AW	30 - 150 %
% TCMX	46		%	10	10/17/19	AW	30 - 150 %
% TCMX (Confirmation)	47		%	10	10/17/19	AW	30 - 150 %

Project ID: MLK ACADEMY
Client ID: 021 JOINT CAULK

Phoenix I.D.: CE41488

Parameter	Result	RL/ PQL	Units	Dilution	Date/Time	By	Reference
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RL/PQL=Reporting/Practical Quantitation Level (Equivalent to NELAC LOQ, Limit of Quantitation) ND=Not Detected at RL/PQL

BRL=Below Reporting Level L=Biased Low

QA/QC Surrogates: Surrogates are compounds (preceded with a %) added by the lab to determine analysis efficiency. Surrogate results(%) listed in the report are not "detected" compounds.

Comments:

Results are reported on an ``as received`` basis, and are not corrected for dry weight.

All soils, solids and sludges are reported on a dry weight basis unless otherwise noted in the sample comments.

If you are the client above and have any questions concerning this testing, please do not hesitate to contact Phoenix Client Services at ext.200.
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Phyllis Shiller, Laboratory Director

October 21, 2019

Reviewed and Released by: Rashmi Makol, Project Manager



Environmental Laboratories, Inc.
587 East Middle Turnpike, P.O.Box 370, Manchester, CT 06045
Tel. (860) 645-1102 Fax (860) 645-0823



Analysis Report

October 21, 2019

FOR: Attn: Mr Matt Inman
Eisenbach & Ruhnke Engineering, P.C.
291 Genesee Street
Utica NY 13501

Sample Information

Matrix: CAULK
Location Code: EISENB-PCB
Rush Request: Standard
P.O.#:

Custody Information

Collected by: MI
Received by: CP
Analyzed by: see "By" below

Date	Time
10/10/19	11:40
10/16/19	10:30

Laboratory Data

SDG ID: GCE41488
Phoenix ID: CE41489

Project ID: MLK ACADEMY
Client ID: 023 SOFFIT CAULK

Parameter	Result	RL/ PQL	Units	Dilution	Date/Time	By	Reference
Caulk Extraction for PCB	Completed				10/16/19	XX/VT	SW3540C

PCB (Soxhlet SW3540C)

PCB-1016	ND	0.32	mg/Kg	2	10/17/19	AW	SW8082A
PCB-1221	ND	0.32	mg/Kg	2	10/17/19	AW	SW8082A
PCB-1232	ND	0.32	mg/Kg	2	10/17/19	AW	SW8082A
PCB-1242	ND	0.32	mg/Kg	2	10/17/19	AW	SW8082A
PCB-1248	ND	0.32	mg/Kg	2	10/17/19	AW	SW8082A
PCB-1254	1.7	0.32	mg/Kg	2	10/17/19	AW	SW8082A
PCB-1260	ND	0.32	mg/Kg	2	10/17/19	AW	SW8082A
PCB-1262	ND	0.32	mg/Kg	2	10/17/19	AW	SW8082A
PCB-1268	ND	0.32	mg/Kg	2	10/17/19	AW	SW8082A

QA/QC Surrogates

% DCBP	55	%	2	10/17/19	AW	30 - 150 %
% DCBP (Confirmation)	52	%	2	10/17/19	AW	30 - 150 %
% TCMX	43	%	2	10/17/19	AW	30 - 150 %
% TCMX (Confirmation)	46	%	2	10/17/19	AW	30 - 150 %

Parameter	Result	RL/ PQL	Units	Dilution	Date/Time	By	Reference
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RL/PQL=Reporting/Practical Quantitation Level (Equivalent to NELAC LOQ, Limit of Quantitation) ND=Not Detected at RL/PQL

BRL=Below Reporting Level L=Biased Low

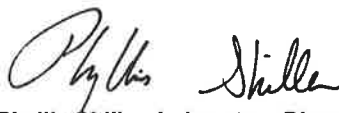
QA/QC Surrogates: Surrogates are compounds (preceeded with a %) added by the lab to determine analysis efficiency. Surrogate results(%) listed in the report are not "detected" compounds.

Comments:

Results are reported on an ``as received`` basis, and are not corrected for dry weight.

All soils, solids and sludges are reported on a dry weight basis unless otherwise noted in the sample comments.

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Phyllis Shiller, Laboratory Director

October 21, 2019

Reviewed and Released by: Rashmi Makol, Project Manager



Environmental Laboratories, Inc.
587 East Middle Turnpike, P.O.Box 370, Manchester, CT 06045
Tel. (860) 645-1102 Fax (860) 645-0823



Analysis Report

October 21, 2019

FOR: Attn: Mr Matt Inman
Eisenbach & Ruhnke Engineering, P.C.
291 Genesee Street
Utica NY 13501

Sample Information

Matrix: CAULK
Location Code: EISENB-PCB
Rush Request: Standard
P.O.#:

Custody Information

Collected by: MI
Received by: CP
Analyzed by: see "By" below

Date Time

10/10/19 12:30
10/16/19 10:30

Laboratory Data

SDG ID: GCE41488
Phoenix ID: CE41490

Project ID: MLK ACADEMY
Client ID: 025 PANEL CAULK

Parameter	Result	RL/ PQL	Units	Dilution	Date/Time	By	Reference
Caulk Extraction for PCB	Completed				10/16/19	XX/VT	SW3540C

PCB (Soxhlet SW3540C)

PCB-1016	ND	8000	mg/Kg	50000	10/19/19	SC	SW8082A
PCB-1221	ND	8000	mg/Kg	50000	10/19/19	SC	SW8082A
PCB-1232	ND	8000	mg/Kg	50000	10/19/19	SC	SW8082A
PCB-1242	ND	8000	mg/Kg	50000	10/19/19	SC	SW8082A
PCB-1248	ND	8000	mg/Kg	50000	10/19/19	SC	SW8082A
PCB-1254	60000	8000	mg/Kg	50000	10/19/19	SC	SW8082A
PCB-1260	ND	8000	mg/Kg	50000	10/19/19	SC	SW8082A
PCB-1262	ND	8000	mg/Kg	50000	10/19/19	SC	SW8082A
PCB-1268	ND	8000	mg/Kg	50000	10/19/19	SC	SW8082A

QA/QC Surrogates

% DCBP	Diluted Out		%	50000	10/19/19	SC	30 - 150 %
% DCBP (Confirmation)	Diluted Out		%	50000	10/19/19	SC	30 - 150 %
% TCMX	Diluted Out		%	50000	10/19/19	SC	30 - 150 %
% TCMX (Confirmation)	Diluted Out		%	50000	10/19/19	SC	30 - 150 %

Parameter	Result	RL/ PQL	Units	Dilution	Date/Time	By	Reference
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RL/PQL=Reporting/Practical Quantitation Level (Equivalent to NELAC LOQ, Limit of Quantitation) ND=Not Detected at RL/PQL
BRL=Below Reporting Level L=Biased Low
QA/QC Surrogates: Surrogates are compounds (preceded with a %) added by the lab to determine analysis efficiency. Surrogate results(%) listed in the report are not "detected" compounds.

Comments:

Results are reported on an ``as received`` basis, and are not corrected for dry weight.

All soils, solids and sludges are reported on a dry weight basis unless otherwise noted in the sample comments.

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Phyllis Shiller, Laboratory Director

October 21, 2019

Reviewed and Released by: Rashmi Makol, Project Manager



Environmental Laboratories, Inc.

587 East Middle Turnpike, P.O.Box 370, Manchester, CT 06045

Tel. (860) 645-1102

Fax (860) 645-0823



QA/QC Report

October 21, 2019

QA/QC Data

SDG I.D.: GCE41488

Parameter	Blank	Blk RL	LCS %	LCSD %	LCS RPD	MS %	MSD %	MS RPD	% Rec Limits	% RPD Limits
QA/QC Batch 501880 (mg/Kg), QC Sample No: CE40550 10X (CE41488, CE41489, CE41490)										
<u>Polychlorinated Biphenyls</u>										
PCB-1016	ND	0.17	82	72	13.0				40 - 140	30
PCB-1221	ND	0.17							40 - 140	30
PCB-1232	ND	0.17							40 - 140	30
PCB-1242	ND	0.17							40 - 140	30
PCB-1248	ND	0.17							40 - 140	30
PCB-1254	ND	0.17							40 - 140	30
PCB-1260	ND	0.17	81	81	0.0				40 - 140	30
PCB-1262	ND	0.17							40 - 140	30
PCB-1268	ND	0.17							40 - 140	30
% DCBP (Surrogate Rec)	89	%	94	72	26.5				30 - 150	30
% DCBP (Surrogate Rec) (Confirm)	86	%	103	86	18.0				30 - 150	30
% TCMX (Surrogate Rec)	94	%	94	81	14.9				30 - 150	30
% TCMX (Surrogate Rec) (Confirm)	94	%	99	84	16.4				30 - 150	30

Comment:

A LCS and LCS Duplicate were performed instead of a matrix spike and matrix spike duplicate.

If there are any questions regarding this data, please call Phoenix Client Services at extension 200.

RPD - Relative Percent Difference

LCS - Laboratory Control Sample

LCSD - Laboratory Control Sample Duplicate

MS - Matrix Spike

MS Dup - Matrix Spike Duplicate

NC - No Criteria

Intf - Interference

Phyllis Shiller, Laboratory Director

October 21, 2019

Monday, October 21, 2019

Criteria: None

State: NY

Sample Criteria Exceedances Report

GCE41488 - EISENB-PCB

SampNo	Acode	Phoenix Analyte	Criteria	Result	RL	Criteria	RL Criteria	Analysis Units
CE41488	\$PCB_SOXR	PCB-1268	NY / Requested PCB RL /	ND	1700	1000	1000	ug/Kg
CE41488	\$PCB_SOXR	PCB-1221	NY / Requested PCB RL /	ND	1700	1000	1000	ug/Kg
CE41488	\$PCB_SOXR	PCB-1232	NY / Requested PCB RL /	ND	1700	1000	1000	ug/Kg
CE41488	\$PCB_SOXR	PCB-1242	NY / Requested PCB RL /	ND	1700	1000	1000	ug/Kg
CE41488	\$PCB_SOXR	PCB-1248	NY / Requested PCB RL /	ND	1700	1000	1000	ug/Kg
CE41488	\$PCB_SOXR	PCB-1254	NY / Requested PCB RL /	8900	1700	1000	1000	ug/Kg
CE41488	\$PCB_SOXR	PCB-1260	NY / Requested PCB RL /	ND	1700	1000	1000	ug/Kg
CE41488	\$PCB_SOXR	PCB-1262	NY / Requested PCB RL /	ND	1700	1000	1000	ug/Kg
CE41488	\$PCB_SOXR	PCB-1016	NY / Requested PCB RL /	ND	1700	1000	1000	ug/Kg
CE41489	\$PCB_SOXR	PCB-1254	NY / Requested PCB RL /	1700	320	1000	1000	ug/Kg
CE41490	\$PCB_SOXR	PCB-1268	NY / Requested PCB RL /	ND	8000000	1000	1000	ug/Kg
CE41490	\$PCB_SOXR	PCB-1221	NY / Requested PCB RL /	ND	8000000	1000	1000	ug/Kg
CE41490	\$PCB_SOXR	PCB-1232	NY / Requested PCB RL /	ND	8000000	1000	1000	ug/Kg
CE41490	\$PCB_SOXR	PCB-1242	NY / Requested PCB RL /	ND	8000000	1000	1000	ug/Kg
CE41490	\$PCB_SOXR	PCB-1248	NY / Requested PCB RL /	ND	8000000	1000	1000	ug/Kg
CE41490	\$PCB_SOXR	PCB-1254	NY / Requested PCB RL /	60000000	8000000	1000	1000	ug/Kg
CE41490	\$PCB_SOXR	PCB-1260	NY / Requested PCB RL /	ND	8000000	1000	1000	ug/Kg
CE41490	\$PCB_SOXR	PCB-1262	NY / Requested PCB RL /	ND	8000000	1000	1000	ug/Kg
CE41490	\$PCB_SOXR	PCB-1016	NY / Requested PCB RL /	ND	8000000	1000	1000	ug/Kg

Phoenix Laboratories does not assume responsibility for the data contained in this exceedance report. It is provided as an additional tool to identify requested criteria exceedances. All efforts are made to ensure the accuracy of the data (obtained from appropriate agencies). A lack of exceedance information does not necessarily suggest conformance to the criteria. It is ultimately the site professional's responsibility to determine appropriate compliance.



Environmental Laboratories, Inc.
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Analysis Comments

October 21, 2019

SDG I.D.: GCE41488

The following analysis comments are made regarding exceptions to criteria not already noted in the Analysis Report or QA/QC Report: None.



Environmental Laboratories, Inc.

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NY Temperature Narration

October 21, 2019

SDG I.D.: GCE41488

The samples in this delivery group were received at 20.1°C.

(Note acceptance criteria for relevant matrices is above freezing up to 6°C)



Thursday, December 05, 2019

Attn: Mr Matt Inman
Eisenbach & Ruhnke Engineering, P.C.
291 Genesee Street
Utica NY 13501

Project ID: Y19MLK01
SDG ID: GCE68825
Sample ID#s: CE68825 - CE68829

This laboratory is in compliance with the NELAC requirements of procedures used except where indicated.

This report contains results for the parameters tested, under the sampling conditions described on the Chain Of Custody, as received by the laboratory. This report is incomplete unless all pages indicated in the pagination at the bottom of the page are included.

All soils, solids and sludges are reported on a dry weight basis unless otherwise noted in the sample comments.

A scanned version of the COC form accompanies the analytical report and is an exact duplicate of the original.

If you are the client above and have any questions concerning this testing, please do not hesitate to contact Phoenix Client Services at ext.200. The contents of this report cannot be discussed with anyone other than the client listed above without their written consent.

Sincerely yours,

A handwritten signature in cursive script that reads "Phyllis Shiller".

Phyllis/Shiller

Laboratory Director

NELAC - #NY11301
CT Lab Registration #PH-0618
MA Lab Registration #M-CT007
ME Lab Registration #CT-007
NH Lab Registration #213693-A,B

NJ Lab Registration #CT-003
NY Lab Registration #11301
PA Lab Registration #68-03530
RI Lab Registration #63
UT Lab Registration #CT00007
VT Lab Registration #VT11301



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Sample Id Cross Reference

December 05, 2019

SDG I.D.: GCE68825

Project ID: Y19MLK01

Client Id	Lab Id	Matrix
067 WIN CAULK	CE68825	CAULK
070 FRAME CAULK	CE68826	CAULK
073 LOUVER CAULK	CE68827	CAULK
075 PANEL CAULK	CE68828	CAULK
077 COLUMN CAULK	CE68829	CAULK



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Analysis Report

December 05, 2019

FOR: Attn: Mr Matt Inman
Eisenbach & Ruhnke Engineering, P.C.
291 Genesee Street
Utica NY 13501

Sample Information

Matrix: CAULK
Location Code: EISENB-PCB
Rush Request: Standard
P.O.#:

Custody Information

Collected by: MI
Received by: LB
Analyzed by: see "By" below

Date Time

11/20/19 22:00
11/27/19 10:29

Laboratory Data

SDG ID: GCE68825
Phoenix ID: CE68825

Project ID: Y19MLK01
Client ID: 067 WIN CAULK

Parameter	Result	RL/ PQL	Units	Dilution	Date/Time	By	Reference
Caulk Extraction for PCB	Completed				12/03/19	XX/KL/VT	SW3540C

PCB (Soxhlet SW3540C)

PCB-1016	ND	4.1	mg/Kg	25	12/04/19	SC	SW8082A
PCB-1221	ND	4.1	mg/Kg	25	12/04/19	SC	SW8082A
PCB-1232	ND	4.1	mg/Kg	25	12/04/19	SC	SW8082A
PCB-1242	ND	4.1	mg/Kg	25	12/04/19	SC	SW8082A
PCB-1248	ND	4.1	mg/Kg	25	12/04/19	SC	SW8082A
PCB-1254	5.2	4.1	mg/Kg	25	12/04/19	SC	SW8082A
PCB-1260	ND	4.1	mg/Kg	25	12/04/19	SC	SW8082A
PCB-1262	ND	4.1	mg/Kg	25	12/04/19	SC	SW8082A
PCB-1268	ND	4.1	mg/Kg	25	12/04/19	SC	SW8082A

QA/QC Surrogates

% DCBP	Diluted Out		%	25	12/04/19	SC	30 - 150 %
% DCBP (Confirmation)	Diluted Out		%	25	12/04/19	SC	30 - 150 %
% TCMX	Diluted Out		%	25	12/04/19	SC	30 - 150 %
% TCMX (Confirmation)	Diluted Out		%	25	12/04/19	SC	30 - 150 %

Project ID: Y19MLK01
Client ID: 067 WIN CAULK

Phoenix I.D.: CE68825

Parameter	Result	RL/ PQL	Units	Dilution	Date/Time	By	Reference
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RL/PQL=Reporting/Practical Quantitation Level (Equivalent to NELAC LOQ, Limit of Quantitation) ND=Not Detected at RL/PQL
BRL=Below Reporting Level L=Biased Low

QA/QC Surrogates: Surrogates are compounds (preceded with a %) added by the lab to determine analysis efficiency. Surrogate results(%) listed in the report are not "detected" compounds.

Comments:

Results are reported on an ``as received`` basis, and are not corrected for dry weight.

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Phyllis Shiller, Laboratory Director

December 05, 2019

Reviewed and Released by: Rashmi Makol, Project Manager



Environmental Laboratories, Inc.
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Analysis Report

December 05, 2019

FOR: Attn: Mr Matt Inman
Eisenbach & Ruhnke Engineering, P.C.
291 Genesee Street
Utica NY 13501

Sample Information

Matrix: CAULK
Location Code: EISENB-PCB
Rush Request: Standard
P.O.#:

Custody Information

Collected by: MI
Received by: LB
Analyzed by: see "By" below

Date

11/20/19 22:05
11/27/19 10:29

Time

Laboratory Data

SDG ID: GCE68825
Phoenix ID: CE68826

Project ID: Y19MLK01
Client ID: 070 FRAME CAULK

Parameter	Result	RL/ PQL	Units	Dilution	Date/Time	By	Reference
Caulk Extraction for PCB	Completed				11/27/19	R/X/KL/VT	SW3540C

PCB (Soxhlet SW3540C)

PCB-1016	ND	3.2	mg/Kg	5	12/03/19	SC	SW8082A
PCB-1221	ND	3.2	mg/Kg	5	12/03/19	SC	SW8082A
PCB-1232	ND	3.2	mg/Kg	5	12/03/19	SC	SW8082A
PCB-1242	ND	3.2	mg/Kg	5	12/03/19	SC	SW8082A
PCB-1248	ND	3.2	mg/Kg	5	12/03/19	SC	SW8082A
PCB-1254	18	* 3.2	mg/Kg	5	12/03/19	SC	SW8082A
PCB-1260	*	* 3.2	mg/Kg	5	12/03/19	SC	SW8082A
PCB-1262	ND	3.2	mg/Kg	5	12/03/19	SC	SW8082A
PCB-1268	ND	3.2	mg/Kg	5	12/03/19	SC	SW8082A

QA/QC Surrogates

% DCBP	97		%	5	12/03/19	SC	30 - 150 %
% DCBP (Confirmation)	92		%	5	12/03/19	SC	30 - 150 %
% TCMX	101		%	5	12/03/19	SC	30 - 150 %
% TCMX (Confirmation)	93		%	5	12/03/19	SC	30 - 150 %

Project ID: Y19MLK01
Client ID: 070 FRAME CAULK

Phoenix I.D.: CE68826

Parameter	Result	RL/ PQL	Units	Dilution	Date/Time	By	Reference
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RL/PQL=Reporting/Practical Quantitation Level (Equivalent to NELAC LOQ, Limit of Quantitation) ND=Not Detected at RL/PQL

BRL=Below Reporting Level L=Biased Low

QA/QC Surrogates: Surrogates are compounds (preceded with a %) added by the lab to determine analysis efficiency. Surrogate results(%) listed in the report are not "detected" compounds.

Comments:

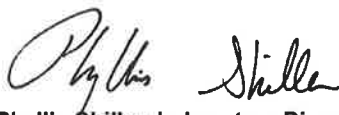
Results are reported on an ``as received`` basis, and are not corrected for dry weight.

PCB Comment:

* For PCBs, as per section 11.9.3 of SW846 method 8082, when multiple Aroclor's of PCBs are present and the aroclor is no longer recognizable, quantitation may be performed by comparing the total area of the PCB pattern to that of the aroclor it mostly resembles. The PCB pattern did not resemble any of the standards, but most closely resembles a mixture of the Aroclors 1254 and 1260. The PCB is quantitated as a timed group and is reported as the Aroclor 1254.

All soils, solids and sludges are reported on a dry weight basis unless otherwise noted in the sample comments.

If you are the client above and have any questions concerning this testing, please do not hesitate to contact Phoenix Client Services at ext.200. The contents of this report cannot be discussed with anyone other than the client listed above without their written consent.



Phyllis Shiller, Laboratory Director

December 05, 2019

Reviewed and Released by: Rashmi Makol, Project Manager



Environmental Laboratories, Inc.
587 East Middle Turnpike, P.O.Box 370, Manchester, CT 06045
Tel. (860) 645-1102 Fax (860) 645-0823



Analysis Report

December 05, 2019

FOR: Attn: Mr Matt Inman
Eisenbach & Ruhnke Engineering, P.C.
291 Genesee Street
Utica NY 13501

Sample Information

Matrix: CAULK
Location Code: EISENB-PCB
Rush Request: Standard
P.O.#:

Custody Information

Collected by: MI
Received by: LB
Analyzed by: see "By" below

Date Time

11/20/19 22:20
11/27/19 10:29

Laboratory Data

SDG ID: GCE68825
Phoenix ID: CE68827

Project ID: Y19MLK01
Client ID: 073 LOUVER CAULK

Parameter	Result	RL/ PQL	Units	Dilution	Date/Time	By	Reference
Caulk Extraction for PCB	Completed				11/27/19	R/X/KL/VT	SW3540C

PCB (Soxhlet SW3540C)

PCB-1016	ND	4.2	mg/Kg	25	12/03/19	SC	SW8082A
PCB-1221	ND	4.2	mg/Kg	25	12/03/19	SC	SW8082A
PCB-1232	ND	4.2	mg/Kg	25	12/03/19	SC	SW8082A
PCB-1242	ND	4.2	mg/Kg	25	12/03/19	SC	SW8082A
PCB-1248	ND	4.2	mg/Kg	25	12/03/19	SC	SW8082A
PCB-1254	15	4.2	mg/Kg	25	12/03/19	SC	SW8082A
PCB-1260	ND	4.2	mg/Kg	25	12/03/19	SC	SW8082A
PCB-1262	ND	4.2	mg/Kg	25	12/03/19	SC	SW8082A
PCB-1268	ND	4.2	mg/Kg	25	12/03/19	SC	SW8082A

QA/QC Surrogates

% DCBP	48	%	25	12/03/19	SC	30 - 150 %
% DCBP (Confirmation)	48	%	25	12/03/19	SC	30 - 150 %
% TCMX	45	%	25	12/03/19	SC	30 - 150 %
% TCMX (Confirmation)	46	%	25	12/03/19	SC	30 - 150 %

Project ID: Y19MLK01
Client ID: 073 LOUVER CAULK

Phoenix I.D.: CE68827

Parameter	Result	RL/ PQL	Units	Dilution	Date/Time	By	Reference
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RL/PQL=Reporting/Practical Quantitation Level (Equivalent to NELAC LOQ, Limit of Quantitation) ND=Not Detected at RL/PQL
BRL=Below Reporting Level L=Biased Low
QA/QC Surrogates: Surrogates are compounds (preceded with a %) added by the lab to determine analysis efficiency. Surrogate results(%) listed in the report are not "detected" compounds.

Comments:

Results are reported on an ``as received`` basis, and are not corrected for dry weight.

All soils, solids and sludges are reported on a dry weight basis unless otherwise noted in the sample comments.

If you are the client above and have any questions concerning this testing, please do not hesitate to contact Phoenix Client Services at ext.200.
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Phyllis Shiller, Laboratory Director

December 05, 2019

Reviewed and Released by: Rashmi Makol, Project Manager



Environmental Laboratories, Inc.
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Tel. (860) 645-1102 Fax (860) 645-0823



Analysis Report

December 05, 2019

FOR: Attn: Mr Matt Inman
Eisenbach & Ruhnke Engineering, P.C.
291 Genesee Street
Utica NY 13501

Sample Information

Matrix: CAULK
Location Code: EISENB-PCB
Rush Request: Standard
P.O.#:

Custody Information

Collected by: MI
Received by: LB
Analyzed by: see "By" below

Date Time

11/20/19 22:25
11/27/19 10:29

Laboratory Data

SDG ID: GCE68825
Phoenix ID: CE68828

Project ID: Y19MLK01
Client ID: 075 PANEL CAULK

Parameter	Result	RL/ PQL	Units	Dilution	Date/Time	By	Reference
Caulk Extraction for PCB	Completed				11/27/19	B/X/KL/VT	SW3540C

PCB (Soxhlet SW3540C)

PCB-1016	ND	2100	mg/Kg	10000	12/03/19	SC	SW8082A
PCB-1221	ND	2100	mg/Kg	10000	12/03/19	SC	SW8082A
PCB-1232	ND	2100	mg/Kg	10000	12/03/19	SC	SW8082A
PCB-1242	ND	2100	mg/Kg	10000	12/03/19	SC	SW8082A
PCB-1248	ND	2100	mg/Kg	10000	12/03/19	SC	SW8082A
PCB-1254	18000	* 2100	mg/Kg	10000	12/03/19	SC	SW8082A
PCB-1260	*	* 2100	mg/Kg	10000	12/03/19	SC	SW8082A
PCB-1262	ND	2100	mg/Kg	10000	12/03/19	SC	SW8082A
PCB-1268	ND	2100	mg/Kg	10000	12/03/19	SC	SW8082A

QA/QC Surrogates

% DCBP	Diluted Out	%	10000	12/03/19	SC	30 - 150 %
% DCBP (Confirmation)	Diluted Out	%	10000	12/03/19	SC	30 - 150 %
% TCMX	Diluted Out	%	10000	12/03/19	SC	30 - 150 %
% TCMX (Confirmation)	Diluted Out	%	10000	12/03/19	SC	30 - 150 %

Parameter	Result	RL/ PQL	Units	Dilution	Date/Time	By	Reference
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RL/PQL=Reporting/Practical Quantitation Level (Equivalent to NELAC LOQ, Limit of Quantitation) ND=Not Detected at RL/PQL
BRL=Below Reporting Level L=Biased Low

QA/QC Surrogates: Surrogates are compounds (preceeded with a %) added by the lab to determine analysis efficiency. Surrogate results(%) listed in the report are not "detected" compounds.

Comments:

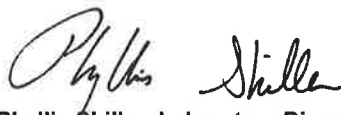
Results are reported on an ``as received`` basis, and are not corrected for dry weight.

PCB Comment:

* For PCBs, as per section 11.9.3 of SW846 method 8082, when multiple Aroclor's of PCBs are present and the aroclor is no longer recognizable, quantitation may be performed by comparing the total area of the PCB pattern to that of the aroclor it mostly resembles. The PCB pattern did not resemble any of the standards, but most closely resembles a mixture of the Aroclors 1254 and 1260. The PCB is quantitated as a timed group and is reported as the Aroclor 1254.

All soils, solids and sludges are reported on a dry weight basis unless otherwise noted in the sample comments.

If you are the client above and have any questions concerning this testing, please do not hesitate to contact Phoenix Client Services at ext.200.
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Phyllis Shiller, Laboratory Director

December 05, 2019

Reviewed and Released by: Rashmi Makol, Project Manager



Environmental Laboratories, Inc.
587 East Middle Turnpike, P.O.Box 370, Manchester, CT 06045
Tel. (860) 645-1102 Fax (860) 645-0823



Analysis Report

December 05, 2019

FOR: Attn: Mr Matt Inman
Eisenbach & Ruhnke Engineering, P.C.
291 Genesee Street
Utica NY 13501

Sample Information

Matrix: CAULK
Location Code: EISENB-PCB
Rush Request: Standard
P.O.#:

Custody Information

Collected by: MI
Received by: LB
Analyzed by: see "By" below

Date Time

11/20/19 22:30
11/27/19 10:29

Laboratory Data

SDG ID: GCE68825
Phoenix ID: CE68829

Project ID: Y19MLK01
Client ID: 077 COLUMN CAULK

Parameter	Result	RL/ PQL	Units	Dilution	Date/Time	By	Reference
Caulk Extraction for PCB	Completed				12/02/19	XX/KL/VT	SW3540C

PCB (Soxhlet SW3540C)

PCB-1016	ND	8100	mg/Kg	50000	12/04/19	SC	SW8082A
PCB-1221	ND	8100	mg/Kg	50000	12/04/19	SC	SW8082A
PCB-1232	ND	8100	mg/Kg	50000	12/04/19	SC	SW8082A
PCB-1242	ND	8100	mg/Kg	50000	12/04/19	SC	SW8082A
PCB-1248	ND	8100	mg/Kg	50000	12/04/19	SC	SW8082A
PCB-1254	65000	8100	mg/Kg	50000	12/04/19	SC	SW8082A
PCB-1260	ND	8100	mg/Kg	50000	12/04/19	SC	SW8082A
PCB-1262	ND	8100	mg/Kg	50000	12/04/19	SC	SW8082A
PCB-1268	ND	8100	mg/Kg	50000	12/04/19	SC	SW8082A

QA/QC Surrogates

% DCBP	Diluted Out	%	50000	12/04/19	SC	30 - 150 %
% DCBP (Confirmation)	Diluted Out	%	50000	12/04/19	SC	30 - 150 %
% TCMX	Diluted Out	%	50000	12/04/19	SC	30 - 150 %
% TCMX (Confirmation)	Diluted Out	%	50000	12/04/19	SC	30 - 150 %

Project ID: Y19MLK01
Client ID: 077 COLUMN CAULK

Phoenix I.D.: CE68829

Parameter	Result	RL/ PQL	Units	Dilution	Date/Time	By	Reference
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RL/PQL=Reporting/Practical Quantitation Level (Equivalent to NELAC LOQ, Limit of Quantitation) ND=Not Detected at RL/PQL
BRL=Below Reporting Level L=Biased Low
QA/QC Surrogates: Surrogates are compounds (preceded with a %) added by the lab to determine analysis efficiency. Surrogate results(%) listed in the report are not "detected" compounds.

Comments:

Results are reported on an ``as received`` basis, and are not corrected for dry weight.

All soils, solids and sludges are reported on a dry weight basis unless otherwise noted in the sample comments.

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Phyllis Shiller, Laboratory Director

December 05, 2019

Reviewed and Released by: Rashmi Makol, Project Manager



Environmental Laboratories, Inc.

587 East Middle Turnpike, P.O.Box 370, Manchester, CT 06045

Tel. (860) 645-1102

Fax (860) 645-0823



QA/QC Report

December 05, 2019

QA/QC Data

SDG I.D.: GCE68825

Parameter	Blank	Blk RL	LCS %	LCSD %	LCS RPD	MS %	MSD %	MS RPD	% Rec Limits	% RPD Limits
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QA/QC Batch 508236 (mg/Kg), QC Sample No: CE68515 10X (CE68826, CE68827)

Polychlorinated Biphenyls

PCB-1016	ND	0.17	91	91	0.0				40 - 140	30
PCB-1221	ND	0.17							40 - 140	30
PCB-1232	ND	0.17							40 - 140	30
PCB-1242	ND	0.17							40 - 140	30
PCB-1248	ND	0.17							40 - 140	30
PCB-1254	ND	0.17							40 - 140	30
PCB-1260	ND	0.17	86	86	0.0				40 - 140	30
PCB-1262	ND	0.17							40 - 140	30
PCB-1268	ND	0.17							40 - 140	30
% DCBP (Surrogate Rec)	98	%	95	89	6.5				30 - 150	30
% DCBP (Surrogate Rec) (Confirm)	90	%	93	86	7.8				30 - 150	30
% TCMX (Surrogate Rec)	96	%	98	92	6.3				30 - 150	30
% TCMX (Surrogate Rec) (Confirm)	88	%	93	87	6.7				30 - 150	30

Comment:

A LCS and LCS Duplicate were performed instead of a matrix spike and matrix spike duplicate.

QA/QC Batch 508556 (mg/Kg), QC Sample No: CE68516 10X (CE68825)

Polychlorinated Biphenyls

PCB-1016	ND	0.17	87	98	11.9				40 - 140	30
PCB-1221	ND	0.17							40 - 140	30
PCB-1232	ND	0.17							40 - 140	30
PCB-1242	ND	0.17							40 - 140	30
PCB-1248	ND	0.17							40 - 140	30
PCB-1254	ND	0.17							40 - 140	30
PCB-1260	ND	0.17	98	108	9.7				40 - 140	30
PCB-1262	ND	0.17							40 - 140	30
PCB-1268	ND	0.17							40 - 140	30
% DCBP (Surrogate Rec)	115	%	115	125	8.3				30 - 150	30
% DCBP (Surrogate Rec) (Confirm)	121	%	120	135	11.8				30 - 150	30
% TCMX (Surrogate Rec)	96	%	96	103	7.0				30 - 150	30
% TCMX (Surrogate Rec) (Confirm)	100	%	101	110	8.5				30 - 150	30

Comment:

A LCS and LCS Duplicate were performed instead of a matrix spike and matrix spike duplicate.

QA/QC Batch 508269 (mg/Kg), QC Sample No: CE68828 10X (CE68828)

Polychlorinated Biphenyls

PCB-1016	ND	0.17	96	91	5.3				40 - 140	30
PCB-1221	ND	0.17							40 - 140	30
PCB-1232	ND	0.17							40 - 140	30
PCB-1242	ND	0.17							40 - 140	30
PCB-1248	ND	0.17							40 - 140	30
PCB-1254	ND	0.17							40 - 140	30

QA/QC Data

SDG I.D.: GCE68825

Parameter	Blank	Blk RL	LCS %	LCSD %	LCS RPD	MS %	MSD %	MS RPD	% Rec Limits	% RPD Limits
PCB-1260	ND	0.17	99	92	7.3				40 - 140	30
PCB-1262	ND	0.17							40 - 140	30
PCB-1268	ND	0.17							40 - 140	30
% DCBP (Surrogate Rec)	96	%	107	94	12.9				30 - 150	30
% DCBP (Surrogate Rec) (Confirm	90	%	101	88	13.8				30 - 150	30
% TCMX (Surrogate Rec)	78	%	97	84	14.4				30 - 150	30
% TCMX (Surrogate Rec) (Confirm	80	%	102	87	15.9				30 - 150	30

Comment:

A LCS and LCS Duplicate were performed instead of a matrix spike and matrix spike duplicate.

QA/QC Batch 508446 (mg/Kg), QC Sample No: CE68829 10X (CE68829)

Polychlorinated Biphenyls

PCB-1016	ND	0.17	91	84	8.0				40 - 140	30
PCB-1221	ND	0.17							40 - 140	30
PCB-1232	ND	0.17							40 - 140	30
PCB-1242	ND	0.17							40 - 140	30
PCB-1248	ND	0.17							40 - 140	30
PCB-1254	ND	0.17							40 - 140	30
PCB-1260	ND	0.17	90	87	3.4				40 - 140	30
PCB-1262	ND	0.17							40 - 140	30
PCB-1268	ND	0.17							40 - 140	30
% DCBP (Surrogate Rec)	98	%	95	92	3.2				30 - 150	30
% DCBP (Surrogate Rec) (Confirm	107	%	105	103	1.9				30 - 150	30
% TCMX (Surrogate Rec)	94	%	94	91	3.2				30 - 150	30
% TCMX (Surrogate Rec) (Confirm	95	%	98	97	1.0				30 - 150	30

Comment:

A LCS and LCS Duplicate were performed instead of a matrix spike and matrix spike duplicate.

If there are any questions regarding this data, please call Phoenix Client Services at extension 200.

RPD - Relative Percent Difference

LCS - Laboratory Control Sample

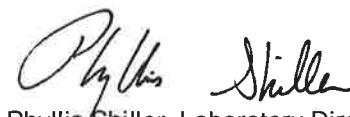
LCSD - Laboratory Control Sample Duplicate

MS - Matrix Spike

MS Dup - Matrix Spike Duplicate

NC - No Criteria

Intf - Interference


Phyllis Shiller, Laboratory Director
December 05, 2019

Thursday, December 05, 2019

Criteria: None

State: NY

Sample Criteria Exceedances Report

GCE68825 - EISENB-PCB

SampNo	Acode	Phoenix Analyte	Criteria	Result	RL	Criteria	RL Criteria	Analysis Units
CE68825	\$PCB_SOXR	PCB-1221	NY / Requested PCB RL /	ND	4100	1000	1000	ug/Kg
CE68825	\$PCB_SOXR	PCB-1232	NY / Requested PCB RL /	ND	4100	1000	1000	ug/Kg
CE68825	\$PCB_SOXR	PCB-1242	NY / Requested PCB RL /	ND	4100	1000	1000	ug/Kg
CE68825	\$PCB_SOXR	PCB-1248	NY / Requested PCB RL /	ND	4100	1000	1000	ug/Kg
CE68825	\$PCB_SOXR	PCB-1254	NY / Requested PCB RL /	5200	4100	1000	1000	ug/Kg
CE68825	\$PCB_SOXR	PCB-1260	NY / Requested PCB RL /	ND	4100	1000	1000	ug/Kg
CE68825	\$PCB_SOXR	PCB-1262	NY / Requested PCB RL /	ND	4100	1000	1000	ug/Kg
CE68825	\$PCB_SOXR	PCB-1268	NY / Requested PCB RL /	ND	4100	1000	1000	ug/Kg
CE68825	\$PCB_SOXR	PCB-1016	NY / Requested PCB RL /	ND	4100	1000	1000	ug/Kg
CE68826	\$PCB_SOXR	PCB-1221	NY / Requested PCB RL /	ND	3200	1000	1000	ug/Kg
CE68826	\$PCB_SOXR	PCB-1268	NY / Requested PCB RL /	ND	3200	1000	1000	ug/Kg
CE68826	\$PCB_SOXR	PCB-1262	NY / Requested PCB RL /	ND	3200	1000	1000	ug/Kg
CE68826	\$PCB_SOXR	PCB-1260	NY / Requested PCB RL /	*	3200	1000	1000	ug/Kg
CE68826	\$PCB_SOXR	PCB-1254	NY / Requested PCB RL /	18000	3200	1000	1000	ug/Kg
CE68826	\$PCB_SOXR	PCB-1248	NY / Requested PCB RL /	ND	3200	1000	1000	ug/Kg
CE68826	\$PCB_SOXR	PCB-1232	NY / Requested PCB RL /	ND	3200	1000	1000	ug/Kg
CE68826	\$PCB_SOXR	PCB-1016	NY / Requested PCB RL /	ND	3200	1000	1000	ug/Kg
CE68826	\$PCB_SOXR	PCB-1242	NY / Requested PCB RL /	ND	3200	1000	1000	ug/Kg
CE68827	\$PCB_SOXR	PCB-1254	NY / Requested PCB RL /	15000	4200	1000	1000	ug/Kg
CE68827	\$PCB_SOXR	PCB-1016	NY / Requested PCB RL /	ND	4200	1000	1000	ug/Kg
CE68827	\$PCB_SOXR	PCB-1221	NY / Requested PCB RL /	ND	4200	1000	1000	ug/Kg
CE68827	\$PCB_SOXR	PCB-1232	NY / Requested PCB RL /	ND	4200	1000	1000	ug/Kg
CE68827	\$PCB_SOXR	PCB-1260	NY / Requested PCB RL /	ND	4200	1000	1000	ug/Kg
CE68827	\$PCB_SOXR	PCB-1262	NY / Requested PCB RL /	ND	4200	1000	1000	ug/Kg
CE68827	\$PCB_SOXR	PCB-1268	NY / Requested PCB RL /	ND	4200	1000	1000	ug/Kg
CE68827	\$PCB_SOXR	PCB-1242	NY / Requested PCB RL /	ND	4200	1000	1000	ug/Kg
CE68827	\$PCB_SOXR	PCB-1248	NY / Requested PCB RL /	ND	4200	1000	1000	ug/Kg
CE68828	\$PCB_SOXR	PCB-1254	NY / Requested PCB RL /	18000000	2100000	1000	1000	ug/Kg
CE68828	\$PCB_SOXR	PCB-1268	NY / Requested PCB RL /	ND	2100000	1000	1000	ug/Kg
CE68828	\$PCB_SOXR	PCB-1260	NY / Requested PCB RL /	*	2100000	1000	1000	ug/Kg
CE68828	\$PCB_SOXR	PCB-1248	NY / Requested PCB RL /	ND	2100000	1000	1000	ug/Kg
CE68828	\$PCB_SOXR	PCB-1242	NY / Requested PCB RL /	ND	2100000	1000	1000	ug/Kg
CE68828	\$PCB_SOXR	PCB-1232	NY / Requested PCB RL /	ND	2100000	1000	1000	ug/Kg
CE68828	\$PCB_SOXR	PCB-1221	NY / Requested PCB RL /	ND	2100000	1000	1000	ug/Kg
CE68828	\$PCB_SOXR	PCB-1016	NY / Requested PCB RL /	ND	2100000	1000	1000	ug/Kg
CE68828	\$PCB_SOXR	PCB-1262	NY / Requested PCB RL /	ND	2100000	1000	1000	ug/Kg
CE68829	\$PCB_SOXR	PCB-1268	NY / Requested PCB RL /	ND	8100000	1000	1000	ug/Kg
CE68829	\$PCB_SOXR	PCB-1016	NY / Requested PCB RL /	ND	8100000	1000	1000	ug/Kg
CE68829	\$PCB_SOXR	PCB-1221	NY / Requested PCB RL /	ND	8100000	1000	1000	ug/Kg

Thursday, December 05, 2019

Criteria: None

State: NY

Sample Criteria Exceedances Report

GCE68825 - EISENB-PCB

SampNo	Acode	Phoenix Analyte	Criteria	Result	RL	Criteria	RL Criteria	Analysis Units
CE68829	\$PCB_SOXR	PCB-1232	NY / Requested PCB RL /	ND	8100000	1000	1000	ug/Kg
CE68829	\$PCB_SOXR	PCB-1242	NY / Requested PCB RL /	ND	8100000	1000	1000	ug/Kg
CE68829	\$PCB_SOXR	PCB-1248	NY / Requested PCB RL /	ND	8100000	1000	1000	ug/Kg
CE68829	\$PCB_SOXR	PCB-1254	NY / Requested PCB RL /	65000000	8100000	1000	1000	ug/Kg
CE68829	\$PCB_SOXR	PCB-1260	NY / Requested PCB RL /	ND	8100000	1000	1000	ug/Kg
CE68829	\$PCB_SOXR	PCB-1262	NY / Requested PCB RL /	ND	8100000	1000	1000	ug/Kg

Phoenix Laboratories does not assume responsibility for the data contained in this exceedance report. It is provided as an additional tool to identify requested criteria exceedances. All efforts are made to ensure the accuracy of the data (obtained from appropriate agencies). A lack of exceedance information does not necessarily suggest conformance to the criteria. It is ultimately the site professional's responsibility to determine appropriate compliance.



Environmental Laboratories, Inc.
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Tel. (860) 645-1102 Fax (860) 645-0823



Analysis Comments

December 05, 2019

SDG I.D.: GCE68825

The following analysis comments are made regarding exceptions to criteria not already noted in the Analysis Report or QA/QC Report: None.



Environmental Laboratories, Inc.

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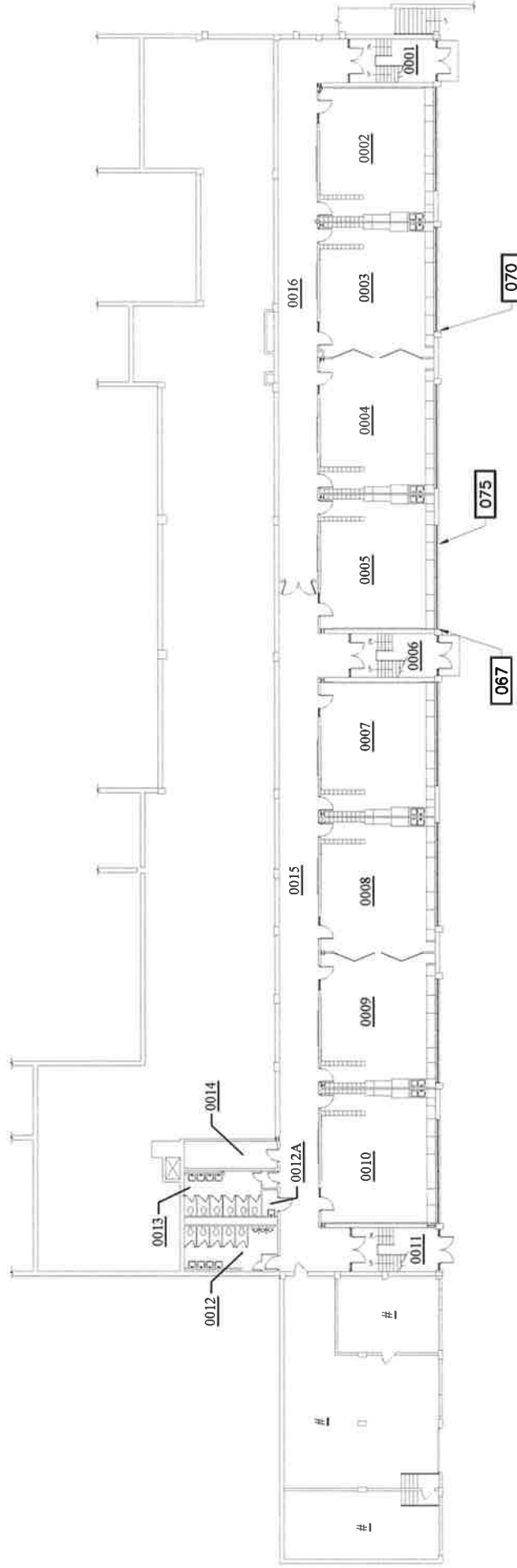


NY Temperature Narration

December 05, 2019

SDG I.D.: GCE68825

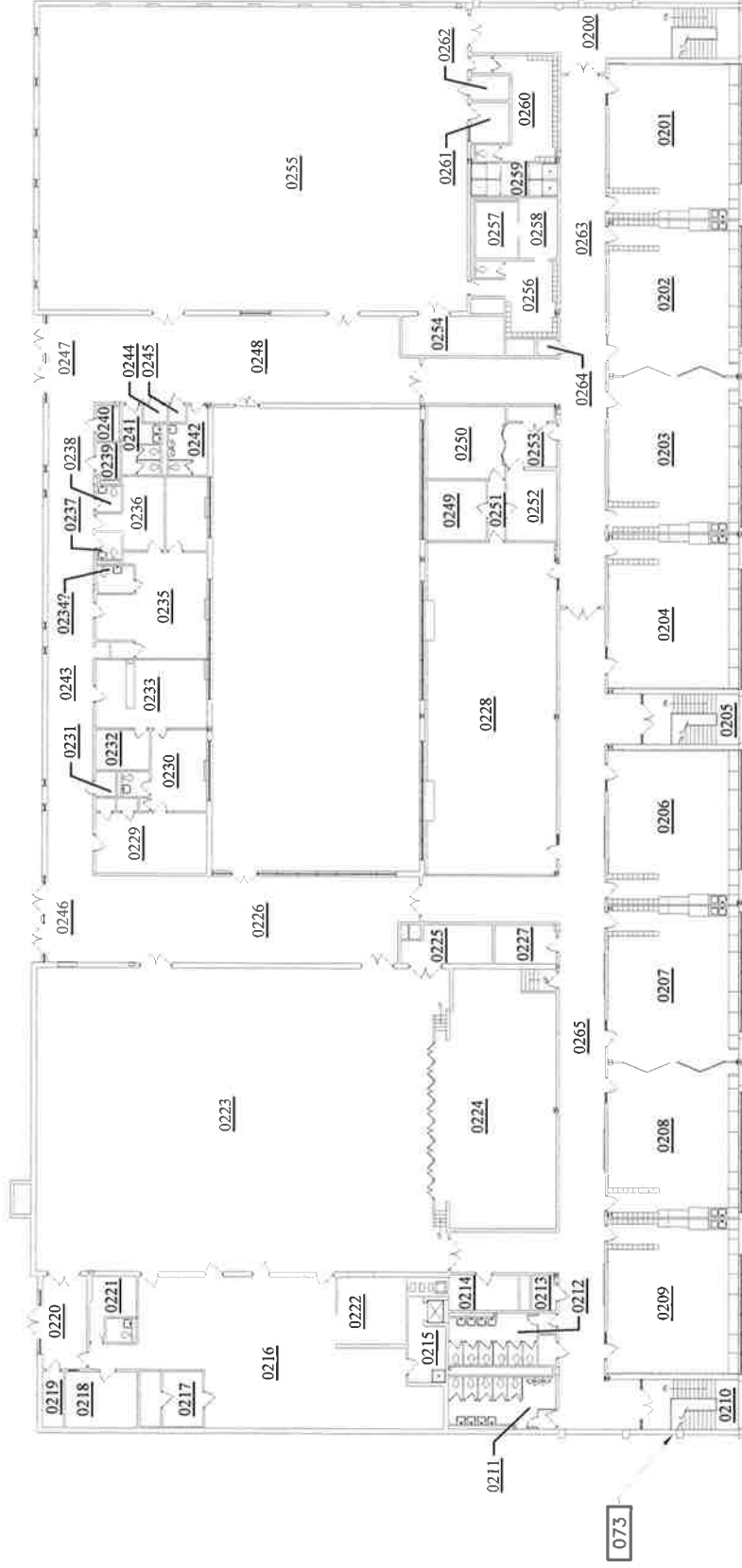
The samples in this delivery group were received at 17.8°C.
(Note acceptance criteria for relevant matrices is above freezing up to 6°C)



KEY
 ### PCB SAMPLE LOCATION
 ### SPACE ID

FILE PATH - F:\Y19MLK01 PCB Report\Y19MLK01 MLK Bulk Sample Drawing.dwg

YONKERS PUBLIC SCHOOLS MARTIN LUTHER KING, JR. ACADEMY PCB SAMPLE LOCATION PLAN - BASEMENT		PCB-1	
Eisenbach & Ruhnke Engineering, P.C. 291 Genesee Street - Utica, NY 13501 Ph: 315-735-1916 Fax: 315-735-6365 www.earengpc.com	DATE: 12.19.19 SCALE: N.T.S. PROJECT NO: Y19MLK01 DRAWN BY: ER	SHEET NO:	



KEY
[Solid Box] PCB SAMPLE LOCATION
[Dashed Box] SPACE ID

FILE PATH - F:\Y19MLK01 PCB Report\Y19MLK01 MLK Bulk Sample Drawing.dwg

DATE: 12.19.19

SCALE: N.T.S.

PROJECT NO: Y19MLK01

DRAWN BY: ER



Eisenbach & Ruhnke Engineering, P.C.

281 Genesee Street - Utica, NY 13501 Ph: 315-735-1916

Fax: 315-735-6365 www.eraengr.com

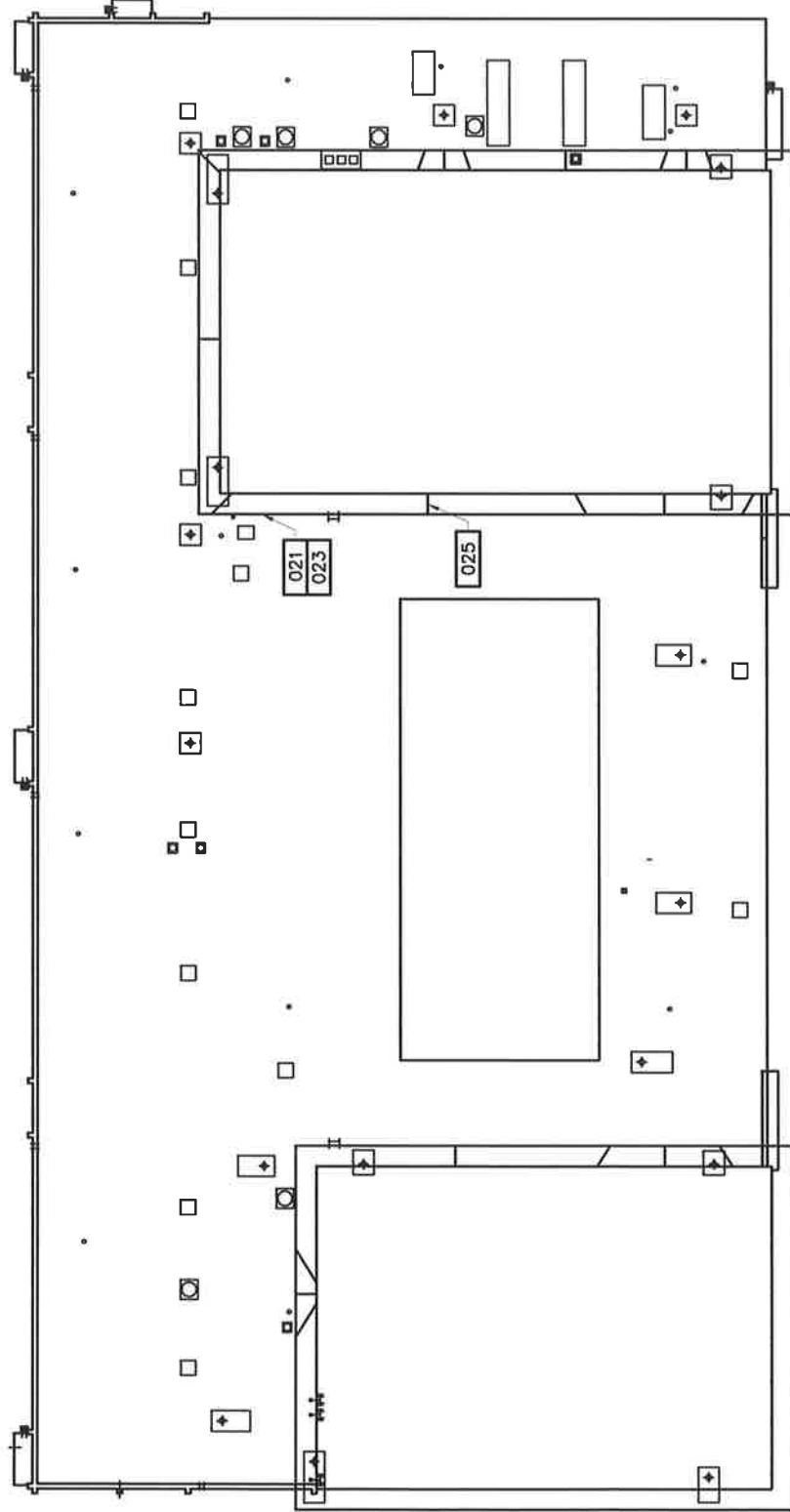
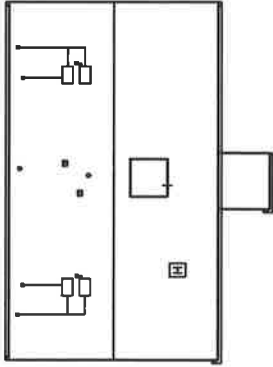
YONKERS PUBLIC SCHOOLS

MARTIN LUTHER KING, JR. ACADEMY

PCB SAMPLE LOCATION PLAN - SECOND FLOOR

SHEET NO:

PCB-2



KEY
 ### PCB SAMPLE LOCATION
 #### SPACE ID

FILE PATH - F:\Y19MLK01 PCB Report\Y19MLK01 MLK Bulk Sample Drawing.dwg

	DATE:	10.10.19
	SCALE:	N.T.S.
	PROJECT NO:	Y19MLK01
291 Genesee Street - Utica, NY 13501 Ph: 315-735-1916 Fax: 315-735-6365 www.earengpc.com		DRAWN BY: ER

YONKERS PUBLIC SCHOOLS
 MARTIN LUTHER KING, JR. ACADEMY
 PCB SAMPLE LOCATION PLAN - ROOF

PCBs in Caulk—Q&A

Background on PCB Exposure and Risk

1. What are PCBs?

Polychlorinated biphenyls, PCBs, are persistent manmade chemicals that were widely used in construction material and electrical products before 1979. In 1976, Congress banned the manufacture and use of PCBs because of concern about their health and environmental effects and they were phased out except for certain limited uses in 1979. The use and disposal of PCBs before the phase-out resulted in their widespread presence in our soil, air, water and food. Despite the federal ban, they remain present today in caulking and sealants used in the construction or renovation of older buildings before 1979.

2. What are the potential health effects of PCBs?

PCBs build up in our bodies over time, and PCB exposure over a long period of time can be harmful to our health.

Short term exposure to large amounts of PCBs can lead to skin conditions such as acne and rashes, decreased liver function, neurological effects, and gastrointestinal effects. These types of acute toxic effects due to high levels of exposure are generally rare. Chronic exposure to lower levels of PCBs may also cause health effects. In animal studies, PCBs have been shown to cause effects on the immune, reproductive, nervous and endocrine systems. PCBs have also been shown to cause cancer in animals. Some studies in humans provide supportive evidence for these health effects. Studies also show that PCBs in pregnant women can have an impact on their children's birth weight, short-term memory, and learning.

3. How are people exposed to PCBs?

Though PCBs were banned from production in 1979 they still typically exist in low-levels in our environment – in the food we eat, the air we breathe and in dirt and dust – and they build up in our bodies over many years. This long-term build-up of PCBs is what potentially causes harm. The levels of PCBs in our environment and in the bodies of people in this country have decreased significantly over time.

Food is a major source of exposure to PCBs. Fish (especially fish caught in polluted waters) contains small amounts of PCBs, as do meat and dairy products. People can also be exposed to PCBs by handling products that contain them, or by breathing in contaminated air or dust in areas where a product containing PCBs was disturbed or disposed. Workers whose jobs involve repairing or dismantling PCB-containing products are at the highest risk for exposure in this way. Indoor air and dust may also be a significant source of PCB exposure from PCB-contaminated caulk, electrical products, other building materials or products that contain PCBs.

4. What do we know about dietary ingestion of PCBs?

PCB concentrations in U.S. foods are generally decreasing. However, despite significant reductions, the dietary ingestion of PCBs remains a major source of PCBs for most members of the U.S. population. Fish, dairy products and meat, generally contribute the most to the total dietary intake of PCBs.

5. How do PCBs persist in the environment and bioaccumulate in people?

PCBs continue to be present indoors in buildings, and outdoors in cities and even remote wilderness locations more than thirty years after their production was banned in the United States. PCBs are stored in the fat of animals and humans, which means that humans may be exposed to PCBs through their diet when eating fish, dairy products or meat.

6. Although there are multiple sources of exposure to PCBs, isn't food the highest exposure?

Generally, this is true. However, PCBs are widespread in the environment and people are potentially exposed through multiple pathways. Levels in air, water, sediment, soil, and food vary over several orders of magnitude, often depending on proximity to a source of release into the environment. Estimates of average daily intake via diet vary widely depending on geographic area and eating habits. People whose diet is high in some types of fish, game animals, or products of animals contaminated through the food chain will have higher exposures to PCBs. People exposed to elevated air or dust levels may also have higher levels, although research to determine the relationship between these routes of exposure and PCB levels in human blood and tissue is lacking.

7. Should I be concerned about PCB exposures?

Though this is a serious issue, the potential presence of PCBs in buildings should not be a cause for alarm – there are steps building owners can take to protect students, teachers and others, as described in EPA's Fact Sheet and later in these Q&As.

PCB-Containing Caulk in Schools and other Buildings

8. What is known about use of PCBs in caulk?

PCBs were used widely in caulking and elastic sealant materials, particularly from 1950 through the 1970s. These materials were primarily used in windows, door frames, stairways, masonry columns, and other masonry building materials. PCBs were used in these building materials because of its properties as a plasticizer.

9. What PCB levels have been detected in caulk from this time period?

PCBs have been detected in caulk in buildings, including schools, with concentrations ranging from as low as 50 ppm to as high as 440,000 ppm. In many cases, PCBs were used in caulk with a concentration as high as 30%.

10. What percentage of schools and other buildings constructed between 1950 and 1979 contain PCB-contaminated caulk?

No national survey of PCBs in caulk has been conducted so EPA does not have precise information on the prevalence of PCB-containing caulk in schools and other buildings. Based on the small number of test samples gathered from different parts of the country and because of its excellent properties as a plasticizer, EPA believes that the presence of such caulk in schools and other buildings built or renovated in this period could be widespread. This is why EPA is alerting the public to this issue and providing information on how to address this concern.

11. What about caulk in single-family houses or other places?

EPA has found PCBs in large scale apartment complexes and public buildings. To date, EPA has not found PCBs in caulk in single-family houses, although the use of PCB contaminated building materials in residences is not well-documented. There is a limited published literature indicating that PCBs may be found in single-family homes, but generally at air concentrations below the public health exposure levels developed by EPA and noted in this announcement.

12. Aren't there reports that PCB-containing caulk may have been used in public drinking water systems?

Yes, PCBs have been found in public drinking water basins in California and Colorado. In each case, the caulk was removed and replaced. The water in these basins is also being regularly tested to make sure that there is no residual PCB contamination.

Exposure to PCBs from Caulk in Schools and other Buildings

13. What are potential sources of PCBs in schools and buildings?

Potential sources of PCBs in buildings built or renovated between about 1950 and 1979 include caulking used around windows, door frames, masonry columns and other building materials. This caulk may be present inside and on the exterior of the building as well as surrounding surfaces. PCBs may also have been used in building expansion joints, mastics and other adhesives and in the manufacture of some ceiling tiles and other acoustic boards. Many old lighting systems contain ballasts manufactured with PCBs. These PCBs can get into the air if the ballast fails or ruptures. PCB-containing building materials such as caulk; and light ballasts are considered by EPA to be potential primary sources of PCBs in buildings and schools. PCBs

from primary sources can lead to elevated concentrations of PCBs in indoor air that later adsorb or leach onto other surfaces, which then become secondary sources of PCBs. These secondary sources can cause elevated indoor concentrations even when primary sources have been removed.

14. Why is the Caulk a Potential Source of Exposure?

If caulk contains PCBs, the PCBs may be released to air from intact, undisturbed caulk through off-gassing, although the mechanism for such release is not well-understood. There have also been reports of school buildings where exterior caulk has peeled off and contaminated the surrounding soil, and the soil was removed to protect children from unsafe exposure.

15. What do we know about PCB concentrations in the indoor air in those schools constructed or renovated using PCB contaminated building materials?

Although we do not have extensive data on indoor air concentrations in schools and buildings, elevated levels of PCBs in air have been measured inside schools and in laboratory experiments and other buildings. The measurements from reported studies indicate that PCB indoor air concentrations are highly variable from school to school, and from room to room within the same school. Measured air concentrations depend upon many factors including the source or sources of PCBs, the age and condition of building materials, and building ventilation rates. Measured values range from a few nanograms (one nanogram = one billionth of a gram) per cubic meter to several thousand nanograms per cubic meter.

16. Are PCB Air Levels in Schools a Significant Exposure Source?

This depends on the levels present. The highest levels that have been measured would exceed the health levels that EPA has developed to define a prudent level of health protection. It is important, however, to recognize that we lack extensive data on the presence and levels of PCBs in indoor air in schools and other buildings.

17. What do we know about PCB concentrations in indoor dust in those schools constructed or renovated using PCB contaminated building materials?

Indoor dust is a potential source of non-dietary ingestion of PCBs and is, therefore, a potentially important route of human exposure to PCBs. While PCBs have been measured in the dust inside schools and buildings constructed or renovated using PCB contaminated building materials, the levels are not well documented. The measurements that we do have indicate that PCB concentrations in dust are highly variable from school to school, and from room to room within the same school. Indoor dusts are composed of multiple types of materials, potentially including crumbling building materials, outside soils tracked into buildings, and various kinds of organic matter. Measured values range from less than 1 to 100 micrograms (one millionth of a gram) of PCBs per gram of dust. Touching PCB-contaminated caulk may result in short-term exposure to PCBs. Although EPA has not yet determined what the long term effects may be from these exposures, touching caulk should be avoided as much as possible and minimizing indoor dust should be encouraged.

18. What do we know about PCB concentrations in the soils surrounding schools constructed or renovated using PCB-contaminated building materials?

The soils surrounding schools can be contaminated with PCBs originating from building materials. Soils contaminated with PCBs from building materials are not well understood. Generally, we would expect that higher concentrations of PCB contaminated soils would be closer to school buildings.

Research Studies

19. What research has EPA conducted?

EPA research on PCBs in schools was designed to identify and evaluate potential sources of PCBs in order to better understand exposures to children, teachers, and other school workers, and to improve risk management decisions. EPA has investigated PCB-contaminated caulk, as well as other potential sources of PCBs in schools. Specifically, EPA's Office of Research and Development has:

- characterized potential sources of PCB exposures in schools (caulk, coatings, adhesives light ballasts, etc.)
- investigated the relationship of these sources to PCB concentrations in air, dust, and soil
- evaluated methods to reduce exposures to PCBs in caulk and other sources.

Measures to reduce PCB exposure in Schools or Other Buildings

20. Are my children in danger if my school or building has PCB-containing caulk?

PCBs may cause serious harm when exposure occurs over a long period of time. That is why EPA has recommended a goal of minimizing students' and teachers' exposure to PCBs. It should be recognized that exceeding EPA's levels for a school exposure does not mean that adverse effects will necessarily occur. Because PCBs accumulate over such long averaging times, short term exceedances of the levels will likely cause only small changes to human blood concentrations, and these can be offset by other periods of exposure to lower air levels. Comparing total exposure from all sources to the levels is a conservative, health protective estimate, as it assumes that most of the inhaled PCB is absorbed and none exhaled.

21. What are the best near-term actions to reduce PCB exposures in buildings with PCB-containing caulk?

It is important to minimize exposure to PCBs from caulk and its residues through inhalation, skin contact or ingestion. Where schools or other buildings were built or renovated between 1950 and 1979 an important step that can be done is to minimize the potential for PCBs to be present

in the indoor air. Indoor air levels of PCBs can be reduced by ensuring that the ventilation system is operating as designed, and to repair or improve the system if it is not.

Other actions to minimize exposure include:

- Clean frequently to reduce dust and residue inside buildings
- Use a wet or damp cloth or mop to clean surfaces
- Using vacuums with high efficiency particulate air filters
- Do not sweep with dry brooms; minimize the use of dusters near areas with caulk
- Wash children's hands with soap and water often, particularly before eating• Wash children's toys often
- Wash hands with soap and water after cleaning, and before eating or drinking.

22. Should air be tested for the presence of PCBs in schools and buildings?

School administrators and building owners should also consider testing to determine if PCB levels in the air exceed EPA's suggested public health levels. If testing reveals PCBs in the air above these levels, schools should be especially vigilant in implementing and monitoring practices to minimize exposures. EPA has calculated prudent public health levels that maintain PCB exposures below the "reference dose" – the amount of PCB exposure that EPA does not believe will cause harm. Further explanation of this dose and EPA's public health levels is included further down in this document in the "Suggested Concentrations of Indoor Air" section. In short, EPA developed a reference dose (RfD) of 20 ng PCB/kg body weight per day. Maximum values are based upon EPA's understanding of average exposure to PCBs from all other major sources. Maximum concentration values were developed for all ages of children from toddlers in day-care to adolescents in high school as well as for adult school employees.

23. What do I do if PCBs are found in air?

If PCBs are found in the air at levels above maximum concentration values, EPA will work with school administrators or building owners to develop a plan to minimize exposures including, where necessary, plans to remove the PCB contaminated caulk.

If elevated air levels of PCBs are found, schools should also have the ventilation system evaluated to determine if it is contaminated with PCBs. Although the ventilation system is unlikely to be an original source of PCB contamination, it may have been contaminated before other sources of PCBs were removed from the school and may be contributing to elevated air levels. Contaminated ventilation systems should be carefully cleaned. Ideally, such cleaning should be planned in concert with removal of any sources of PCBs that are found to avoid re-contamination of the system.

Building owners or managers should also consider air monitoring after they have removed the caulk or taken other remedial actions to determine if inhalation exposure is still a concern. If the

air monitoring shows elevated levels remain, there may be another source of PCBs other than in the caulk that may need to be investigated.

24. Does deteriorating caulk require special attention?

Not necessarily. EPA research has found high levels of PCBs in caulk that is largely intact and still somewhat flexible and not deteriorating. It is the caulk with high PCB concentration that have the highest potential for release of PCBs into the air through direct emissions.

25. Should students and teachers be removed from buildings with elevated levels of PCBs in the air?

EPA does not believe evacuation is generally necessary. Since possible health effects are the result of cumulative exposure over long periods, elevated exposures for brief periods should be acceptable. If PCBs are found in air at levels above EPA's public health targets, the number one priority should be to reduce exposures as soon as possible.

26. Should PCBs be removed during building repair and renovation activities?

Yes. Where schools or other buildings were constructed or renovated between 1950 and 1979, EPA recommends that PCB-containing caulk be removed during planned renovations and repairs (when replacing windows, doors, roofs, ventilation, etc.). EPA recommends testing caulk that is going to be removed as the first step in order to determine what protections are needed during removal. Where testing confirms the presence of PCBs, it is critically important to ensure that they are not released to air during replacement or repair of caulk in affected buildings. EPA is recommending simple, commonsense work practices to prevent the release of PCBs during these operations.

27. What special procedures are needed when doing repairs that may disturb PCB-containing caulk?

When PCB-containing caulk is removed and disposed of, it can contaminate surrounding surfaces. If repairs are necessary in areas that may contain PCBs, schools should test the caulk to determine whether it contains PCBs at or greater than the regulatory threshold. Repairs that disturb PCB-containing caulk, such as window removal and replacement, should be conducted by trained workers who use safe work practices to minimize dust and contain contaminated waste. Once the window replacements have been completed, the area should be thoroughly cleaned using recommended methods. EPA has developed guidance for minimizing exposures when conducting remediation and renovation activities.

Steps contractors should take include:

- Ensure workers are properly trained and are using gloves, eye goggles, skin protection and approved particulate breathing masks,.
- In dusty work areas, have showers available and separate changing areas so that dust on clothing is not brought home.
- If working with solvents, provide respirators.
- Cover work areas with plastic.
- Use heavy plastic sheeting to cover floors and other fixed surfaces like large appliances in the work area.
- Close and seal vents in the work area and, if necessary, turn off forced-air heating and air-conditioning systems.
- Regularly clean the work area with industrial (HEPA) vacuum and wet mopping.
- Properly dispose of personal protective equipment and cleaning material.

EPA is aware of situations in which PCBs have moved or leached from the old caulk into the surrounding building materials. Based on EPA's Office of Research and Development's laboratory research, encapsulation was found to be most effective for interior surfaces that contain low levels of PCBs (i.e. several hundred parts per million). Depending on the PCB reduction goal, the performance of the encapsulant, and the conditions of the building, the upper limit of the PCB concentration for successful encapsulation may vary. Therefore, post-encapsulation monitoring is an essential part of the encapsulation process. Building owners should consult EPA's research on this issue for more specifics (see [link to ORD report](#)). Encapsulation may be useful for the reduction of emissions from secondary sources such as contaminated building materials under and around PCB-containing caulk or paint that has been removed. Encapsulation was not found to be effective in reducing emissions from sources that have a high PCB content (for example caulk) for more than a short period of time. Because each site will present unique circumstances, please consult your EPA PCB Regional Coordinator ([insert link to webpage](#)) regarding the application of encapsulation measures on a case by case basis.

Additional details about EPA's research findings may be found at:

<http://www.epa.gov/pcbsincaulk/caulkresearch.htm>

27. Why shouldn't all schools be testing all caulk to determine whether it contains PCBs?

The regulations do not require testing for PCBs. While testing the caulk to determine whether PCBs are present is useful in some instances, EPA at this time recommends air testing as the next step for schools that are concerned about potential risks and wish to supplement the protections provided by EPA's recommended best practices. As EPA gains new information from ongoing research, it will make further recommendations regarding testing and removal of

PCB-containing caulk. School administrators and building owners should consider testing to determine if PCB levels in the air exceed EPA's suggested public health levels. It is possible that PCBs may be released to air from intact, undisturbed caulk through off-gassing, although the mechanism for such release is not well-understood.

28. How will the results of research affect EPA's recommendations?

Research conducted by EPA and others has helped to clarify three issues: 1) potential sources of PCB exposures in schools (caulk, coatings, mastics and adhesives, light ballasts, etc.); 2) the relationship of these sources to PCB concentrations in air, dust, and soil; and, 3) methods to reduce exposures to PCBs in caulk and other sources. Read about the results of this [research](#).

29. What procedures should I use if my school or building will be conducting air testing?

For determining the presence of PCBs in indoor air, EPA has two approved methods: Compendium of Methods for the Determination of Toxic Organic Compounds in Ambient Air – Compendium Method TO-4A (high air volume) and Compendium Method TO-10A (low air volume). These two methods can be found respectively at:

www.epa.gov/ttnamti1/files/ambient/airtox/to-4ar2r.pdf
and www.epa.gov/ttnamti1/files/ambient/airtox/to-10ar.pdf

30. If I decide to test the caulk itself for the presence of PCBs, how should I do it?

There are several methods for determining the presence of PCBs in caulk. You can have a sample of the caulk tested by an analytical lab. The lab should follow the recommended approach referenced in EPA's PCB regulations, such as method 3500B/3540C from EPA's SW-846, Test Methods for Evaluating Solid Waste; or an alternative method validated under subpart Q, for chemical extraction of PCBs. For analyzing extracts, Method 8082 from EPA's SW-846 or a method validated under Subpart Q is appropriate.

31. Shouldn't contaminated caulk simply be encapsulated to prevent the release of PCBs?

EPA has looked at the effectiveness of encapsulation techniques to prevent the release of PCBs. Based on EPA's Office of Research and Development's laboratory research, encapsulation was found to be most effective for interior surfaces that contain low levels of PCBs (i.e. several hundred parts per million). Depending on the PCB reduction goal, the performance of the encapsulant, and the conditions of the building, the upper limit of the PCB concentration for successful encapsulation may vary. Therefore, post-encapsulation monitoring is an essential part of the encapsulation process. Building owners should consult EPA's research on this issue for more specifics (see [link to ORD report](#)). Encapsulation may be useful for the reduction of emissions from secondary sources such as contaminated building materials

under and around PCB-containing caulk or paint that has been removed. Encapsulation was not found to be effective in reducing emissions from sources that have a high PCB content (for example caulk) for more than a short period of time. Because each site will present unique circumstances, please consult your EPA PCB Regional Coordinator (insert link to webpage) regarding the application of encapsulation measures on a case by case basis. Additional details about EPA's research findings may be found at:
<http://www.epa.gov/pcbsincaulk/caulkresearch.htm>

32. Why should my school system spend money on removing PCBs when we have limited funds for educational needs and we may also have lead-based paint and asbestos in our schools, which may be worse?

EPA understands that school districts have constrained resources and must balance several needs. Our recommendations are designed to be flexible and cost-effective so that schools can focus limited resources on those problems that pose the greatest risks to human health.

Nonetheless, because our bodies can be exposed to PCBs from numerous sources outside of the school (such as through the consumption of fish or meat and inhalation of non-school air), and because they accumulate in our bodies over time, EPA believes it is prudent to reduce potentially significant exposure to PCBs in schools. In addition, on-going use of PCBs is prohibited by Federal law. EPA encourages managers of schools and other buildings to be aware of not only PCBs but the range of chemicals that may be present in facilities of a certain age and take steps to identify whether or not they are present in specific facilities. Each of these substances are addressed through similar approaches, including identification, containment, minimizing contact, and remediation. Ideally, strategies can be developed for simultaneously addressing PCBs, lead, asbestos, and other environmental substances during maintenance, repair or remodeling activities. Through these actions, coupled with production and use restrictions and various bans, we have seen remarkable overall PCB exposure reductions in recent decades.

33. Why has EPA not addressed this previously?

Although EPA has been dealing with PCB-contaminated building materials for several years, more data have become available recently demonstrating the high levels at which PCBs can be found in caulk, their occurrence in a number of schools and other buildings, and their potential to migrate to the air, surrounding masonry, soil and dust. EPA believes this is an important public health issue which should be addressed.

34. Does EPA provide any financial help to assist in the testing or removal of the caulk?

EPA does not have any specific financial assistance, loan or grant programs available for addressing PCBs in caulk; however, EPA is working with the Department of Energy to encourage the use of weatherization stimulus funds for the proper removal of PCB-contaminated windows.

Suggested Concentrations of Indoor Air

EPA PCB Exposure Estimates

35. What are EPA's PCB exposure estimates for the general U.S. population? How does exposure compare to the reference dose?

For background, uncontaminated air, dusts and soils, EPA estimates that average total PCB exposure ranges from approximately 2 ng PCB per kg body weight per day for adults to 8 ng/kg/day for children 1 to <2 years old. Younger children are generally more exposed per body weight due to activities that place them in greater contact with potentially contaminated dust, soils, and surfaces, and higher dietary and inhalation rates per bodyweight. At average, or background, uncontaminated concentrations, all age groups have exposures below the RfD.

36. What routes of exposure were considered in EPA's exposure evaluations?

The exposure routes considered included several exposure sources that can occur away from school: inhalation (indoor and outdoor), indoor dust ingestion, outdoor soil ingestion, indoor dust/soil contact, and total dietary ingestion. EPA also considered several kinds of exposures that can occur at a school: school building inhalation (indoor and outdoor), indoor dust ingestion, outdoor soil ingestion, and indoor dust/soil contact. EPA did not include direct ingestion of, or direct contact with, potentially contaminated building materials because this happens infrequently and exposure estimates were developed for averages over the course of a year.

37. What are the largest sources of exposure for the general population?

A major source of PCB exposure for most individuals in uncontaminated buildings is diet, which contributes about 40% of to total PCB exposure in adults and about 30% of total PCB exposure in children. Typical indoor and outdoor air contains a small amount of PCBs and inhalation exposure accounts for another 40 to 50% of total exposure. Together, these non-school sources of PCBs generally result in exposures that are significantly below the reference dose. It is worth noting that the PCB concentrations in food have been decreasing.

38. Using EPA reference values, what air exposure levels does EPA consider to be health protective for different age groups?

EPA advises that total exposure to PCBs from all sources be kept below the reference dose of 20 ng/kg-day. Based upon a background scenario limiting total exposure to the RfD, EPA has developed maximum values for the concentrations of PCBs in indoor air in schools that would result in total PCB exposures below the EPA's public health target. For a typical school day, these values range from a low of 70 ng/m³ for toddlers age 1 to <2, to a high of 600 ng/m³ for high school students, age 15 to <19. Details for each age group are provided in the table below.

Maximum Concentrations of PCBs in School Indoor Air (ng/m³) (considering other school and non-school background pathways)						
Assuming all other school exposure concentrations (e.g., dust, soil, outdoor air) are the same as non-school background concentrations, these concentrations should keep total exposure below the reference dose of 20 ng/kg-day.						
Age 1-<2 yr	Age 2-<3 yr	Age 3-<6 yr	Age 6-<12 yr Elementary School	Age 12-<15 yr Middle School	Age 15-<19 yr High School	Age 19+ yr Adult
70	70	100	300	450	600	450

39. For exposure estimates, what assumptions is EPA making about the amount of time children spend in school?

EPA assumed typical values for the number of days per year and the number of hours per day children spend at school. Depending upon age, these values were 180 to 185 days per year, and 6.5 to 8 hours per day at school. However, exposure assessments can also be made with other values that reflect school-specific activities.

Again, school administrators and building owners should also consider testing to determine if PCB levels in the air exceed EPA's suggested those levels. If testing reveals PCBs in the air above these levels, schools should be especially vigilant in implementing and monitoring practices to minimize exposures. Schools are encouraged to retest to determine whether these practices are reducing the potential for PCB exposures. Should these practices not reduce exposure, caulk and other known sources of PCBs should be removed as soon as practicable.

40. What are the limitations of EPA's exposure estimates?

EPA exposure values are estimates based upon PCB concentrations in environmental media (air, dust, soils) and average contact rates. Because PCB concentrations in environmental media are not well understood and may be variable, depending upon school-specific conditions, exposure estimates should be used with an appreciation of the uncertainty surrounding the estimates. The values do not consider the direct ingestion of, or contact with, PCB contaminated building materials; this route would generally be infrequent and would be an activity not shared by many individuals. These values should not be used to estimate occupational exposure associated with building or site clean-ups.

EPA's Enforcement Approach for PCB-Contaminated Caulk

41. Don't the regulations prohibit caulk containing PCBs above 50 ppm? Will EPA require all such caulk to be removed?

EPA regulations implementing the Toxic Substances Control Act (TSCA) prohibit the use of PCBs at levels above 50 ppm, including continued use in caulk that is already in place. While TSCA regulations do not require building owners to test caulk for PCBs, if testing shows PCB concentrations above the regulatory limit, then the regulations require the removal of those PCBs. Schools that are planning renovations or repairs should take the opportunity to test for PCBs and remove caulk found above the regulatory limit.

42. Does EPA intend to enforce the requirement that caulk above 50 ppm be removed?

Although EPA does have enforcement tools which it can use as appropriate where the PCB concentration in the caulk is above the regulatory limit, EPA is most interested in ensuring that schools undertake the recommended steps it has announced today. EPA believes that enforcement may not be the most effective tool to reduce health risks where schools are following these recommendations. Thus, such schools will in most cases be a low priority for enforcement. Nonetheless, EPA will not hesitate to act in situations where there are significant risks to public health.

43. Should schools speak with EPA about their potential enforcement exposure?

A school's top priority should be to implement the best practices described elsewhere in this announcement to minimize exposure as soon as possible. Schools do not need to enter into an agreement with EPA to implement the majority of these actions, except where noted. For school administrators or others who want to formalize their actions, EPA will make available a streamlined model administrative consent order confirming the school's commitment to implement the current EPA recommendations.

44. If the 50 ppm regulatory standard applies to PCB levels as contained in the caulk, why are you telling people to test the air?

Where schools or building owners are concerned about PCB exposure and want to supplement EPA's best management practices, testing the air is the most meaningful way of assessing the potential for exposure and risk.

45. Does EPA have authority to require testing for PCBs – in caulk or air?

EPA regulations do not require schools to test for PCBs in caulk or air, although it encourages testing in certain circumstances as noted above. EPA retains authority to obtain an order to address situations presenting an imminent hazard.

46. What will EPA do if schools don't test? Or if they test and find PCBs well above 50 ppm in the caulk or above EPA's risk thresholds in the air?

EPA regulations do not require schools to test for PCBs, but EPA encourages schools to conduct air testing where PCB use is suspected and to take action to reduce exposure where EPA's public health levels are exceeded. Although EPA does have enforcement tools which it can use as appropriate where the PCB concentration in the caulk is above the regulatory limit, EPA is most interested in ensuring that schools undertake the recommended best management practices. EPA believes that enforcement is generally not the most effective tool to reduce health risks where schools are following these recommendations. However, EPA will consider its enforcement options where PCBs in schools or other buildings present serious risks to public health that are not being addressed.

SECTION 03 0100
MAINTENANCE OF CONCRETE

PART 1 GENERAL

1.1 RELATED DOCUMENTS

- A. Drawings and general provisions of the Contract, including School Facilities Management Contract Manual and Specifications and Division 1 Specification Sections, apply to this Section.
- B. In the event of discrepancies between the specifications and School Facilities Management Contract Manual and Specifications the School Facilities Management Contract Manual and Specifications shall prevail.

1.2 SECTION INCLUDES

- A. Cleaning of existing concrete surfaces.
- B. Repair of exposed structural, shrinkage, and settlement cracks.
- C. Resurfacing of concrete surfaces having spalled areas and other damage.
- D. Repair of deteriorated concrete.
- E. Repair of internal concrete reinforcement.

1.3 RELATED REQUIREMENTS

- A. Section 03 3000 - Cast-in-Place Concrete: Finishing of concrete surface to tolerance; floating, troweling, and similar operations; curing.

1.4 PRICE AND PAYMENT PROCEDURES

- A. See Section 01 2200 - Unit Prices, for additional unit price requirements.
- B. See 01 2100 - Allowances for allowance requirements.
- C. Repair Surface: By the square foot. Includes surface preparation, repair, finishing.

1.5 REFERENCE STANDARDS

- A. ASTM A775/A775M - Standard Specification for Epoxy-Coated Steel Reinforcing Bars; 2022.
- B. ASTM C33/C33M - Standard Specification for Concrete Aggregates; 2023.
- C. ASTM C928/C928M - Standard Specification for Packaged, Dry, Rapid-Hardening Cementitious Materials for Concrete Repairs; 2020a.
- D. ASTM C1260 - Non-reactive Aggregate
- E. ICRI 310.2R - Selecting and Specifying Concrete Surface Preparation for Sealers, Coatings, Polymer Overlays, and Concrete Repair; 2013.

1.6 SUBMITTALS

- A. See Section 01 3000 - Administrative Requirements, for submittal procedures.
- B. Product Data: Indicate product standards, physical and chemical characteristics, technical specifications, limitations, maintenance instructions, and general recommendations regarding each material.
- C. Manufacturer's Qualification Statement.

1.7 QUALITY ASSURANCE

- A. Manufacturer Qualifications: Company specializing in manufacturing products specified in this section, with not less than ten (10) years of documented experience.

1.8 MOCK-UP(S)

- A. Test each type of maintenance procedure required on each type of existing construction, to determine the most appropriate procedures to use and as a record of expected results.

- B. Vertical Surface Repair: Total of 5 foot square area, demonstrating each type of repair.
- C. Where color or texture matching is required, first prepare a small size sample on cementitious board.
- D. Locate mock-up(s) where directed by the Architect and Construction Manager
- E. Re-work mock-up(s) until satisfactory to Architect.
- F. Satisfactory mock-up(s) may remain as part of the work.

1.9 DELIVERY, STORAGE, AND HANDLING

- A. Comply with manufacturers' instructions for storage, shelf life limitations, and handling of products.

PART 2 PRODUCTS

2.1 CLEANING MATERIALS

- A. Degreaser:
 - 1. Manufacturers:
 - a. SpecChem, LLC; Orange Peel-Citrus Cleaner: www.specchemllc.com/#sle.
 - b. W. R. Meadows, Inc: www.wrmeadows.com/#sle.
 - c. Substitutions: Refer to Section 01 2500 Substitution Procedures.
- B. Detergent: Non-ionic detergent.

2.2 CEMENTITIOUS PATCHING AND REPAIR MATERIALS

- A. Manufacturers:
 - 1. Sika Corporation, Lyndhurst, NJ 07071, 800.933.7452.
 - 2. Substitutions: Refer to Section 01 2500 Substitution Procedures.
- B. Cementitious Repair Mortar, Horizontal/Slope: One component, factory-mixed, polymer-modified cementitious mortar.
 - 1. In-place material resistant to freeze/thaw conditions.
 - 2. Mixed with water in proportions as recommended by manufacturer.
 - 3. Dry Material: Complies with ASTM C928/C928M.
 - 4. Manufacturers:
 - a. Sika Corporation, Lyndhurst, NJ 07071, 800.933.7452, SikaQuick EZ Patch .
- C. Cementitious Repair Mortar, Horizontal/Slope: One component, factory-mixed, polymer-modified cementitious mortar.
 - 1. Product: SikaQuick VOH.

2.3 ACCESSORIES

- A. Bonding Primer and Reinforcement Corrosion Protection:
 - 1. Cementitious epoxy resin compensated 3-component, solvent-free, coating material with corrosion inhibitor, used as bonding primer and reinforcement corrosion protection.
 - 2. Product: Sika® Armatec®-110 EpoCem.
 - 3. Substitutions: 01 6000 - Product Requirements
- B. Water: Clean and potable.

PART 3 EXECUTION

3.1 EXAMINATION

- A. Verify that surfaces are ready to receive work.
- B. Beginning of installation means acceptance of substrate.

3.2 PREPARATION

- A. Prepare concrete surfaces to be repaired according to manufacturer's application instructions..

3.3 CLEANING EXISTING CONCRETE

- A. Surface must be clean and sound. Remove all deteriorated concrete, dirt, oil, grease, and other bond-inhibiting materials from the area to be repaired.
- B. Preparation work should be done by high pressure water blast, scabbler, or other appropriate mechanical means. Obtain an exposed aggregate surface with a minimum surface profile of $\pm 1/8"$ (3 mm) (CSP-6) on clean, sound concrete.
- C. To ensure optimum repair results, the effectiveness of decontamination and preparation should be assessed by a pull-off test.

3.4 CONCRETE STRUCTURAL MEMBER REPAIR

- A. Remove broken and soft concrete at least 1/4 inch deep and exposing all sides of reinforcement,
- B. Remove corrosion from steel and clean mechanically to bare metal.
- C. Follow repair product manufacturer's written installation instructions.
- D. Cover exposed steel reinforcement with epoxy mortar.

3.5 CONCRETE SURFACE REPAIR USING CEMENTITIOUS MATERIALS

- A. Clean concrete surfaces, cracks, and joints of dirt, laitance, corrosion, and other contamination using method(s) specified above and allow to dry.
- B. Remove all loose or deteriorated concrete.
- C. Provide minimum 1/2" deep shoulder cut at perimeter of all patch areas.
- D. Coat any exposed reinforcing as noted above.
- E. Substrate should be Saturated Surface Dry (SSD) with clean water prior to application. No standing water should remain during application
- F. Follow bonding agent and repair mortar manufacturer's written installation instructions.
- G. Apply coating of bonding agent to entire concrete surface to be repaired.
- H. Priming
 - 1. Reinforcing steel: Steel reinforcement should be thoroughly prepared by mechanical cleaning to remove all traces of rust. Where corrosion has occurred due to the presence of chlorides, the steel should be high pressure washed with clean water after mechanical cleaning. Steel shall be fully exposed and have all corrosion removed. Prime the reinforcement with a stiff bristle brush or spray. coat all steel surfaces, allow to dry and then apply a second coat at same coverage
 - 2. Concrete Substrate: Prime the prepared substrate with a stiff bristle brush or spray. Primer must be applied well into substrate, filling all pores and ensure complete coverage of all surface irregularities.

3.6 APPLICATION

- A. The prepared mortar must be scrubbed into the substrate, filling all pores and voids. Force material against edge of repair, working toward center.
- B. After filling repair, consolidate, then screed.
- C. Allow mortar to set to desired stiffness, then finish.
- D. Mixing, placing and finishing should not exceed 45 minutes

3.7 CURING TREATMENT

- A. Moist cure with wet burlap and polyethylene, or a fine mist of water.
- B. Moist curing should commence immediately after finishing. Protect freshly applied mortar from direct sunlight, wind, rain and frost

END OF SECTION

SECTION 04 0100
MASONRY MAINTENANCE

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. All plant, labor, materials, equipment, testing and services necessary to complete the work shown on the drawings, schedules, and keynotes, as specified herein, and as may be required by conditions and authorities having jurisdiction, including, but not limited to, the following:

1. Remove and restore exterior masonry where new cap flashings are being installed.
2. Prepare and repoint mortar joints.
3. Clean and prepare the joints, and then install new sealant in masonry facade joints.
4. Install clear water repellant on masonry that is repointed.
5. Remove and reset loose bricks and concrete masonry units under roof edge blocking.
6. Fill hollow core masonry units under roof edge blocking with mortar prior to installing the blocking. The blocking is specified elsewhere.
7. Remove a portion of the brick masonry facade to create new openings for the ducts at ERU-1; install steel lintels to support masonry that remains in place above the new openings. Refer to the structural drawings.

B. Related Requirements

- | | |
|---------------------------------------|-------------------|
| 1. Roof Carpentry | - Section 06 1010 |
| 2. EPDM Roofing | - Section 07 5323 |
| 3. Sheet Metal Flashing & Specialties | - Section 07 6200 |
| 4. Roof Accessories | - Section 07 7200 |

1.03 QUALITY ASSURANCE

A. Installer Qualifications:

1. A firm (Installer) with at least 5 continuous years experience performing work similar to that required for this project, employing personnel skilled in the work specified.
 - a. The Installer shall directly employ the personnel performing the work of this section.
 - b. The Installer shall have a supervisor in the work area when work is in progress. The Supervisor shall have a minimum of 5 years experience with work similar in nature and scope to this project, and speak fluent English.
 1. Submit the Supervisor's resume upon request.

2. The Installer shall provide a reference list of at least three previously completed projects of comparable size and similar design, within fifty miles of this project, which may be observed by representatives of the Owner:
 - a. The reference list shall include at a minimum, the completion date, a description of the work performed, the Owner's name - contact person - phone number and address and the Architect's name - contact person and phone number.
 - b. Submit the reference list upon request.
- B. Material Quality: Obtain each type of material from a single source to ensure consistent quality, color, pattern, and texture.
- C. Pre-construction conference: Attend the pre-construction meeting and discuss the following:
 1. How and when masonry work will be performed.
 2. How the masonry work will be coordinated with other work.
 3. How roof & building surfaces will be protected, and how the building will be kept watertight as masonry work progresses.
 4. Weather to anticipate during construction.
 5. The availability of materials, personnel, equipment and facilities needed to proceed and complete the work on schedule.
 6. A schedule for Manufacturer and Architect inspections.

1.04 SUBMITTALS

- A. Submit the following items far enough in advance to obtain approval prior to performing any other work on site:
 1. A pre-work site and building inspection report with photos, to document conditions before any other work starts on site.
 2. Manufacturer's technical literature for all materials.
 3. Test reports and certifications substantiating compliance with specification requirements if requested by the Architect.
 4. Samples to show sizes, grade and color, prior to mock-up erection, of each new exposed masonry material. Include the full range of colors and textures needed in the samples.
 - a. Bricks: four samples of solid colors, twelve samples of blended colors.
 - b. Mortar: four 6 inch long 1/2 inch wide strips set in metal or plastic channels.
 - c. Anchors: four pieces of each type of anchor.
- B. Simultaneously provide all technical submittals needed for this project, for all technical sections, collated by section. Incomplete submittals will not be reviewed.
 1. Submittals shall be prepared and made by the firm that will perform the actual work.
 2. Provide electronic submittals via an on-line submittal exchange program if one is established for this project; if an on-line program is not established, provide the submittals on portable USB drives in pdf format, organized in folders by Section.
 - a. Do not make submittals via email
 - b. Do not include Safety Data Sheets with the technical submittals.

- C. Safety Data Sheets: Simultaneously provide all Safety Data Sheets needed for this project, for all specification sections - collated by section, in three ring binders. Provide two binders.
- D. Payment requisitions will not be processed until all submittals are received and approved.

1.05 JOB MOCK UPS

- A. Prepare mock-ups of masonry work in actual job locations.
 - 1. For brick rebuilding - provide 4 foot long mockups.
 - 2. For repointing - provide 2 foot square mockups to show how the joints will be cut, and 2 foot square mockups to show new pointing.
 - 3. For sealant joints - provide 2 foot long mockups to show how the joints will be prepared, and 2 foot long mockups to show new backer rod and sealant.
- B. Construct each mock up with its associated roof and wall flashings, to show the following:
 - 1. The color, size and type of each masonry unit and mortar used to set it.
 - 2. Workmanship quality.
 - 3. The size and spacing of weep inserts.
 - 4. Flashings built into the masonry.
 - 5. Related materials and their installation techniques to fully establish a quality standard for the work.
- C. Mock-ups shall be constructed to establish the minimum acceptable standard of materials and workmanship, and to assure that completed work which matches the mock ups will be fully functional and serve the purpose for which it was designed.
- D. Approved mock-ups may be left in place and incorporated into the permanent installation. Rejected mock-ups shall be removed and replaced until an acceptable mock up is approved.
- E. Do not proceed with masonry work until mock-ups are installed, inspected and approved in writing.

1.06 DELIVERY, STORAGE AND HANDLING

- A. Carefully pack, handle, and ship masonry units and accessories in suitable packs or pallets or in heavy cartons.
- B. Deliver material to the site in the Manufacturer's original and unopened containers and packaging, bearing labels which identify the types and names of the products and Manufacturers. Unload and handle to prevent chipping and breakage.
- C. Protect masonry materials and aggregates during storage and construction from excess wetting by rain, snow or ground water, and from staining or intermixture with earth or other types of materials.
- D. Protect grout, mortar and cement products from deterioration by moisture and temperature. Store in a dry location or in waterproof containers. Protect liquid components from freezing.
- E. Do not overload the structure when storing materials on the roof.
- F. Protect roof surfaces where material and equipment is placed on them, and where construction traffic occurs, with 6 mil fire retardant polyethylene, covered with 1-1/2 inch thick foam insulation, overlaid with 2 by 10 wooden planks.

1.07 GUARANTEE

- A. Provide a written Contractor's Guarantee which guaranties that all work will remain free of material and workmanship defects and in a watertight condition for five years period beginning upon Final Completion:
 - 1. Defects include but are not limited to the following: leakage, delamination, lifting, loosening, splitting, cracking, joint separation and movement.
 - 2. The Contractor shall make the repairs and modifications necessary to enable the work to perform as guaranteed at his own expense:
 - 3. Guarantee coverage shall include removing and replacing items installed as part of the original work, if removal is needed to make repairs.
- B. Provide one Guarantee that covers "all work performed" when a single contractor is awarded work specified in multiple Sections.
- C. The Guarantee shall take effect no more than 30 days before the satisfactory completion of all punch list work.
- D. The Contractor's Surety Company may add a rider to the Performance Bond which clarifies that Performance Bond Coverage expires two years after Final Completion; i.e., Performance Bond Coverage does not run for the entire five year term of the Contractor's Guarantee.

1.08 JOB CONDITIONS

- A. Perform masonry work only when the air temperature is 40 degrees F and above and will remain so until the masonry has dried, but for not less than 72 hours after work ends.
- B. Erect temporary covers over pedestrian walkways and at building entrances and exits which will remain active as the work progresses.
- C. Prevent mortar from staining the face of surrounding masonry and other building surfaces; immediately remove any which falls or spills. Protect sills, ledges and projections from mortar droppings.
- D. Protect roof surfaces where material and equipment is placed on them, and where construction traffic occurs, with 6 mil fire retardant polyethylene, covered with 1-1/2 inch thick foam insulation, overlaid with 2 by 10 wooden planks.
- E. Coordinate masonry removal and restoration with the installation of new flashings.
- F. Prevent masonry work from rapid drying during hot weather. Use burlap to shield fresh masonry from direct sunlight, and mist fresh masonry with potable water so it cures slowly for at least 72 hours.
 - 1. Remove and replace any new masonry that develops shrinkage cracks, or isn't bonded well to adjoining masonry.

PART 2 - PRODUCTS

2.01 MASONRY UNITS

- A. Face Brick: Severe weather (SW) grade face brick and accessories, including special bricks for corners, and other special conditions, to match the color, surface texture, shape and size of existing bricks.

2.02 MORTAR

A. General Construction Mortar:

1. Type S, custom colored, non-staining masonry cement containing Type I Portland cement meeting ASTM C150 and Type S hydrated lime meeting ASTM C207.
2. Natural or manufactured sand aggregate selected to match the size, texture, graduation and color of the existing mortar aggregate, meeting ASTM C 144.
3. Clean potable water, free of oils, acids, alkalis and organic matter.

B. Pointing Mortar:

1. Factory blended Type N masonry cement, aggregate and custom coloring agent, ready to use when mixed with clean potable water, as supplied by Spec-Mix.

2.03 MISCELLANEOUS MATERIALS

- A. Anchors: Fabricated from Type 304 stainless steel to match existing.
- B. Sealant: High performance, solvent free, formulated and moisture curing silyl-terminated polyether sealant, ASTM C-920, Type S, Grade NS, Class 25, NovaLink construction sealant by ChemLink, color as selected.
- C. Backer Rod: Closed cell polyethylene foam, non-absorbent, compressible, chemically inert rod.
- D. Masonry Water Repellent: Cloudy odorless water-based penetrating liquid, UV stable, alkali resistant, translucent floural carbon emulsion, containing no volatile organic compounds: Cathedral Stone Products, Inc. R-97 Water Repellent.
- E. Weep Inserts: Full height head joint inserts formed of a polypropylene honey comb, three-eighths inch thick, Hohmann & Barnard, Inc. #QV Quadro-Vent.

PART 3 - EXECUTION

3.01 GENERAL

- A. Carefully perform work so the structural integrity of masonry adjoining the work is preserved. Simultaneously remove only limited sections of existing masonry; support and protect masonry remaining next to and above the removal areas.
- B. Completely remove and replace any existing masonry that moves, or if cracks form in the mortar joints between the masonry units, or within the masonry units.
- C. Cure all mortar by misting it with potable water to maintain it in a damp condition for not less than 72 hours. Shield fresh mortar from direct sunlight with wet burlap, and prevent fresh mortar from prematurely drying during the curing period. Remove and replace mortar joints that dry pre-maturely.
- D. Cut and remove existing masonry using hand and machine methods. Equip each cutting machine with a separate dedicated vacuum and manufacturer's blade guard vacuum attachment, and control the amount of dust produced so there are no visible plumes. Comply with OSHA crystalline silica standards for construction.
- E. Do not overcut brick head joints and allow the blade to nick the bricks; remove and replace bricks damaged during the cutting and repointing preparation process at no cost to the Owner.

3.02 MORTAR MIXES

- A. Measurement and Mixing:
1. Measure general construction mortar materials when dry by volume using a pail or similar container. Do not measure with a shovel.
 - a. Mix mortar using 1 part mortar cement and 3 parts sand aggregate.
 - b. Thoroughly mix cement and aggregate in a clean mechanical batch mixer before adding water; then continue mixing and add only enough water to produce a workable mix.
 - c. Do not mix mortar by hand.
 2. Mix factory blended pointing mortar in a clean mechanical batch mixer, adding only enough water to produce a workable mix.
 - a. Do not mix mortar by hand.
 3. Use mortar within 45 minutes of final mixing; do not re-temper or use partially hardened material.
- B. Mix and install mortar with the same ingredients used to produce the approved mock-up. Do not adjust the color or proportions without written approval. Do not use admixtures of any kind in the mortar unless specifically approved.

3.03 BRICK REMOVAL AND REPLACEMENT

- A. Simultaneously remove only limited sections of existing brick masonry; support and protect masonry remaining next to and above the removal areas.
- B. Carefully remove bricks on a piece-by-piece basis. Cut out full units from joint to joint and to permit replacement with full size units. Clean the edges of the remaining bricks, to remove all mortar, dust, and loose debris in preparation for rebuilding.
- C. Install new cap flashings and wall flashing extensions, properly lapped under and connected to the existing wall flashings, as indicated on the drawings and specified elsewhere, before installing new bricks. Install the flashings so a full wythe of new brick will fit flush with the existing wall surface.
- D. Wet bricks which have initial rates of absorption (suction) greater than 30 grams per 30 square inches per minute, (in accordance with ASTM C 67), to ensure the bricks are nearly saturated with water, but surface dry when laid.
- E. Install new brick to replace removed brick. Fit replacement bricks to match the original bond and course pattern. Use a motor driven diamond blade wet saw to cut bricks with clean, sharp unchipped edges.
- F. Lay replacement brick with completely filled bed, head and collar joints. Butter the ends with sufficient mortar to fill the head joints and shove the bricks into place.
- G. Install new bricks with mortar joints to match the width of the adjoining brick joints. Tool the new joints to match existing joints in surrounding brickwork.
- H. Do not cut off the backs of the new bricks if a full wythe of brick doesn't fit. Notify the Architect and obtain his direction before proceeding further.

3.04 REPOINTING EXISTING MASONRY

- A. Joint Preparation:

1. Remove existing mortar and foreign material from the mortar joints to a minimum depth of 1 inch, and deeper where needed to expose sound unweathered mortar.
 2. Remove mortar from the sides of the joints to provide joints with square backs and to expose the masonry for contact with the pointing mortar. Brush or vacuum the joints to remove dirt and loose debris.
 3. Remove mortar and other foreign material from the surface of masonry adjacent to the joint.
 4. Do not spall the edges of adjacent masonry or widen the joints. Replace any masonry which is damaged.
- B. Joint Pointing:
1. Rinse the joint surfaces with water to remove dust and mortar particles just prior to repointing. Time the rinse, so when repointing occurs, excess water has evaporated and the existing masonry is damp but free of standing water.
 2. Apply pointing mortar in 1/2 inch thick layers, and thoroughly compact each layer before adding the next layer, to completely fill each joint.
 3. Slightly recess pointing mortar from the face of the adjacent masonry units. Do not spread mortar on the edges or faces of the masonry. Do not featheredge the mortar.
 4. Tool repointed joints when the mortar is thumbprint hard. Remove excess mortar from the edges of the joints with a soft bristle brush.
- C. Cleaning:
1. Immediately after the mortar has fully hardened, thoroughly clean masonry surfaces of excess mortar and foreign matter using stiff nylon or bristle brushes and clean water.
 2. Do not use metal scrapers or brushes. Do not use acid or alkali cleaning agents. Do not pressure-wash the masonry or new pointing mortar.

3.05 SEALANT JOINTS

- A. Carefully remove existing sealant and back up material from within the joints to a minimum depth of 1-1/2 inches, and from the surface of adjoining masonry at the edges of the joints.
1. Use hand tools and work to avoid damage to adjoining masonry.
 2. Replace adjoining masonry damaged during sealant removal work.
- B. Install new backer rod without puncturing or tearing it, to snugly fill the joint at a depth to yield a sealant joint twice as wide as it is deep.
1. Do not twist backer rods, or install multiple pieces of undersized rod, when the correct size rod is not onsite.
- C. Mask the edges of all joints prior to installing sealant.
1. Push sealant into the joint to completely fill it, tool the sealant to produce a slightly concave, neat recessed joint, and remove joint masking before excess sealant sets.

3.06 WATER REPELLENT

- A. Prepare and clean masonry surfaces to receive water repellent utilizing hand, chemical and pressure water methods as needed to remove all dirt, dust, efflorescence, mold, salt, grease, oil, asphalt, laitance, paint and other foreign materials.
- B. Allow the masonry surfaces to dry for a minimum of 48 hours at a temperature above 50° F.
- C. Mask and protect adjoining surfaces i.e., the roof, flashings, windows, side walls and site plantings from over spray.
- D. Apply two coats of water repellent using a low pressure (15-20 psi maximum) wet fan type nozzle or 1 inch nap roller in a “flooding” application, to thoroughly saturate the masonry, starting at the bottom so the material runs 6 to 8 inches below the points of application.
 - 1. Apply the second coat of water repellent about 10 minutes after the first coat, and as soon as the first coat has soaked into the masonry, but before the first coat dries.

3.07 CLEANING, PROTECTION AND WATERTIGHTNESS

- A. Inspect the interior and exterior of the building and grounds, and submit a written report with photos to document any pre-existing leakage or damage, prior to performing any work.
- B. The Owner will conduct a similar inspection at the completion of the work, and the Contractor will be charged for all leaks and damage that were not documented in the Contractor’s report, or repaired to the Owners satisfaction at the Contractor’s expense.
- C. Provide any equipment, material and labor necessary to protect the site, the building, its contents and occupants, pedestrians, and surrounding landscaped and paved areas from damage due to the construction work or from inclement weather during construction.
- D. Do not perform work during inclement weather. Protect incomplete work and the building from damage by inclement weather - which may occur unexpectedly. Make all work areas watertight at the end of each day's work.
- E. Clean up all litter, refuse, rubbish, scrap materials and debris at least twice a day; at noon and at the end of the work day, so the roof and site are neat, orderly and workmanlike. Place the debris in a dumpster, and remove the dumpster from the site as soon as it is full or no longer being used.
- F. Carefully and thoroughly clean the entire roof to remove all residual debris when all work is complete. After cleaning the roof, thoroughly clean all drain sumps, drain lines, leader heads and leaders. Do not allow debris to enter the drainage system.

END OF SECTION

SECTION 04 2600
SINGLE-WYTHE UNIT MASONRY

PART 1 GENERAL

1.1 RELATED DOCUMENTS

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

1.2 SECTION INCLUDES

- A. Concrete masonry units.
- B. Reinforcement, anchorage, and accessories.

1.3 RELATED REQUIREMENTS

- A. Section 07 8400 - Firestopping: Firestopping at penetrations of masonry work.

1.4 REFERENCE STANDARDS

- A. ASTM A153/A153M - Standard Specification for Zinc Coating (Hot-Dip) on Iron and Steel Hardware; 2023.
- B. ASTM A951/A951M - Standard Specification for Steel Wire for Masonry Joint Reinforcement; 2022.
- C. ASTM A1064/A1064M - Standard Specification for Carbon-Steel Wire and Welded Wire Reinforcement, Plain and Deformed, for Concrete; 2022.
- D. ASTM C270 - Standard Specification for Mortar for Unit Masonry; 2019a, with Editorial Revision.
- E. ASTM C129 - Standard Specification for Nonloadbearing Concrete Masonry Units; 2022.
- F. TMS 402/602 - Building Code Requirements and Specification for Masonry Structures; 2022, with Errata.

1.5 SUBMITTALS

- A. See Section 01 3000 - Administrative Requirements, for submittal procedures.
- B. Product Data: Provide data for decorative masonry units and fabricated wire reinforcement.

1.6 QUALITY ASSURANCE

- A. Comply with provisions of TMS 402/602, except where exceeded by requirements of Contract Documents.
- B. Fire-Resistance Ratings: Provide materials and construction identical to those of assemblies with fire-resistance ratings determined per ASTM E 119 by a testing and inspecting agency, by equivalent concrete masonry thickness, or by another means, as acceptable to authorities having jurisdiction.
 - 1. Equivalent thickness as determined by ASTM C 140.
 - a. Aggregate: Limestone.
 - a) One hour rated:
 - (a) 6" CMU: 55% solid.
 - (b) 8" CMU: 53% solid.
 - (c) 10" CMU: 51.7 solid.

1.7 DELIVERY, STORAGE, AND HANDLING

- A. Deliver, handle, and store masonry units by means that will prevent mechanical damage and contamination by other materials.

1.8 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.

- B. Maintain materials and surrounding air temperature to maximum 90 degrees F prior to, during, and 48 hours after completion of masonry work.

PART 2 PRODUCTS

2.1 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 depths as required to match existing..
 - 2. Special Shapes: Provide non-standard blocks configured for corners.
 - 3. Non-Loadbearing Units: ASTM C129.
 - a. Hollow block.
 - b. Normal weight.

2.2 MORTAR AND GROUT MATERIALS

- A. Use only factory premixed packaged dry materials for mortar and grout, with addition of water only at project site.
- B. Mortar Color: Natural gray unless otherwise indicated.
- C. Mortar Mix Designs: 1, Property Specification.
 - 1. Interior, Non-loadbearing Masonry: Type N.
 - a. Average compressive strength at 28 days: 750 psi.

2.3 REINFORCEMENT AND ANCHORAGE

- A. Single Wythe Joint Reinforcement: ASTM A951/A951M.
 - 1. Type: Truss.
 - 2. Material: 1 steel wire, hot dip galvanized after fabrication to 2, Class B.
 - 3. Size: 0.1483 inch side rods with 0.1483 inch cross rods; width as required to provide not less than 5/8 inch of mortar coverage on each exposure.
- B. 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.

PART 3 EXECUTION

3.1 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.

3.2 PREPARATION

- A. Remove existing units to allow toothing of new units into existing coursing.
- B. Provide temporary bracing during installation of masonry work. Maintain in place until building structure provides permanent bracing.

3.3 COURSING

- A. Establish lines, levels, and coursing to match existing. Protect from displacement.
- B. Maintain masonry courses to uniform dimension. Form vertical and horizontal joints of uniform thickness.
- C. Concrete Masonry Units:
 - 1. Bond: Running. Match existing

3.4 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. Remove excess mortar as work progresses.
- D. Do not shift or tap masonry units after mortar has achieved initial set. Where adjustment must be made, remove mortar and replace.
- E. Perform job site cutting of masonry units with proper tools to provide straight, clean, unchipped edges. Prevent broken masonry unit corners or edges.

3.5 REINFORCEMENT AND ANCHORAGE

- A. Install horizontal joint reinforcement 16 inches on center. Match existing reinforcing course locations.
- B. Lap joint reinforcement ends minimum 6 inches.
- C. 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.
- D. Install anchors to structural framing and existing adjacent units at not more than 16 inches on center.

3.6 BUILT-IN WORK

- A. As work progresses, install built-in metal door frames 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 frames in adjacent mortar joints. Fill frame voids solid with grout.

3.7 TOLERANCES

- A. Install masonry within the site tolerances found in TMS 402/602.
- 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 of Joint Thickness: Head joint, minus 1/4 inch, plus 3/8 inch.

3.8 CLEANING

- A. Remove excess mortar and mortar smears as work progresses.
- B. Clean soiled surfaces with cleaning solution.
- C. Use non-metallic tools in cleaning operations.

END OF SECTION

SECTION 06 1000
ROOF CARPENTRY

PART 1 - GENERAL

1.03 RELATED DOCUMENTS

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

1.04 SUMMARY

- A. All plant, labor, materials, equipment, testing and services necessary to complete the work shown on the drawings, schedules and notes, as specified herein, and as may be required by conditions and authorities having jurisdiction, including, but not limited to, the following:
1. Roof related wood nailers, blocking, shims, and plywood.
 2. Light gauge metal framing.
 3. Re-secure existing roof related blocking where it is being reused; remove and separate multiple layers of blocking, and secure each layer individually.
- B. Related Requirements
1. Masonry Maintenance - Section 04 0100
 2. EPDM Roofing - Section 07 5323
 3. Sheet Metal Flashing & Specialties - Section 07 6200
 4. Roof Accessories - Section 07 7200

1.05 QUALITY ASSURANCE

- A. Installer Qualifications:
1. A firm (Installer) with at least 5 continuous years experience performing work similar to that required for this project, employing personnel skilled in the work specified.
 - a. The Installer shall directly employ the personnel performing the work of this section.
 - b. The Installer shall have a supervisor on the roof when work is in progress. The Supervisor shall have a minimum of 5 years experience with work similar in nature and scope to this project, and speak fluent English.
 1. Submit the supervisor's resume upon request.
 2. The Installer shall provide a reference list of at least three previously completed projects of comparable size and similar design, within fifty miles of this project, which may be observed by representatives of the Owner:
 - a. The reference list shall include at a minimum, the completion date, a description of the work performed, the Owner's name - contact person - phone number and address and the Architect's name - contact person and phone number.
 - b. Submit the reference list upon request.

- B. Material Quality: Obtain each type of material from a single source to ensure consistent quality, color, pattern, and texture.
- C. Pre-Construction Conference: Attend the pre-construction meeting and discuss how and when carpentry work will be performed and coordinated with other work, and how the building will be kept watertight as work occurs.

1.06 SUBMITTALS

- A. Submit the following items far enough in advance to obtain approval prior to performing any work on site:
 - 1. A pre-work site and building inspection report with photos, to document conditions before work starts on site.
 - 2. Manufacturer's technical literature for all materials.
 - 3. Test reports and certifications substantiating compliance with specification requirements if requested by the Architect.
 - 4. 2 foot long on-site samples which show the size, shape, configuration and method of fastening for all wood blocking assemblies, and which show how the blocking assemblies will relate to and fit on adjoining work.
- B. Simultaneously provide all technical submittals needed for this project, for all technical sections, collated by section. Incomplete submittals will not be reviewed.
 - 1. Submittals shall be prepared and made by the firm that will perform the actual work.
 - 2. Provide electronic submittals via an on-line submittal exchange program if one is established for this project; if an on-line program is not established, provide the submittals on portable USB drives in pdf format, organized in folders by Section.
 - a. Do not make submittals via email
 - b. Do not include Safety Data Sheets with the technical submittals.
- C. Safety Data Sheets: Simultaneously provide all Safety Data Sheets needed for this project, for all specification sections - collated by section, in three ring binders. Provide two binders.
- D. Payment requisitions will not be processed until all submittals are received and approved.

1.07 DELIVERY, STORAGE AND HANDLING

- A. Deliver and store materials dry at all times. Cover with tarps and protect against exposure to weather and contact with damp or wet surfaces.
- B. Do not overload the structure when storing material on the roof.
- C. Protect roof surfaces where material and equipment is placed on them, and where construction traffic occurs, with 6 mil fire retardant polyethylene, covered with 1-1/2 inch thick foam insulation, overlaid with 2 by 10 wooden planks.

1.08 GUARANTEE

- A. Provide a written Contractor's Guarantee which guarantees that all work will remain free of material and workmanship defects and in a watertight condition for five years beginning upon Final Completion:

1. Defects include but are not limited to the following: leakage, delamination, lifting, loosening, splitting, cracking, joint separation and movement.
 2. The Contractor shall make the repairs and modifications necessary to enable the work to perform as guaranteed at his own expense:
 3. Guarantee coverage shall include removing and replacing items installed as part of the original work, if removal is needed to make repairs.
- B. Provide one Guarantee that covers “all work performed” when a single contractor is awarded work specified in multiple Sections.
- C. The Guarantee shall take effect no more than 30 days before the satisfactory completion of all punch list work.
- D. The Contractor’s Surety Company may add a rider to the Performance Bond which clarifies that Performance Bond Coverage expires two years after Final Completion; i.e., Performance Bond Coverage does not run for the entire five year term of the Contractor’s Guarantee.

PART 2 - PRODUCTS

2.01 MATERIALS

- A. WOOD, including shims, nailers, blocking, furring and similar members, in the sizes indicated, worked into the shapes shown, and as follows:
1. Lumber: Douglas Fir dimension lumber, free of large knots and other imperfections.
 2. Plywood: Exterior grade APA rated Type CDX underlayment plywood.
 3. Beveled Siding: Utility grade cedar, redwood, or synthetic siding, 1/2 inch by 6 inches and 3/4 inch by 10 inches wide, tapered to 1/8 inch thick.
- B. METAL, including light gauge metal channel and stud sections factory formed of minimum 24 gauge cold rolled galvanized steel.

2.02 FASTENERS

- A. Hot dipped galvanized steel, stainless steel, or steel covered with a proprietary rust inhibiting coating.
1. Do not use un-coated steel nails. Remove and replace carpentry components installed with un-coated steel nails.
- B. Use screws wherever possible, minimum size diameter #12. If nails are used they shall be annular ring shank type.
1. Do not use dry wall screws to secure wood blocking assemblies. Remove and replace carpentry components installed with drywall screws.

2.03 CARPENTRY ACCESSORIES

- A. Gypsum board & related accessories: 5/8 inch thick Type X Firecode gypsum board, galvanized drywall screws, asbestos free factory pre-mixed joint compound, joint tape, and galvanized steel J, L and corner beads.

- B. Fiberglass batt insulation: un-faced fiberglass insulation, minimum thickness 6 inches, and as needed to fill the expansion joints and stud wall blocking cavities.

PART 3 - EXECUTION

3.01 INSTALLATION – GENERAL

- A. Coordinate carpentry work with the installation of the roofing system, insulation, flashings, and other similar items.
- B. Shim and set carpentry work plumb and true, except provide slope at the top surfaces of horizontal members as indicated.
- C. Stagger joints in built up assemblies at least 2 feet to obtain maximum strength. Provide the shapes needed and adjust wood blocking to suit the existing conditions and achieve full bearing and secure attachment. Discard defective material, and pieces which are too small, and fabricate the work with a minimum of joints and an optimum joint arrangement.
- D. Securely attach carpentry work to resist a force of 275 pounds per lineal foot in any direction. Countersink all fasteners flush unless otherwise shown.
- E. Space fasteners to achieve adequate holding power, and generally 12 inches apart. :
 - 1. Space nails in wood blocking 8 inches apart.
 - 2. Install two rows of fasteners on blocking wider than 5 inches.
- F. Fit carpentry work neatly scribed and cut to fit within 1/8 inch of adjoining materials. Position furring, nailers, blocking, shims and similar supports for the proper attachment of subsequent work.
- G. Fasten wood and metal blocking assemblies to metal decks with #12 screws.
- H. Fasten wood and metal blocking assemblies to concrete decks and masonry walls with 1/4 inch diameter Spike or Drive fasteners. Pre-drill the holes.

3.02 CLEANING, PROTECTION AND WATERTIGHTNESS

- A. Inspect the interior and exterior of the building and grounds, and submit a written report with photos to document any pre-existing leakage or damage, prior to performing any work.
- B. The Owner will conduct a similar inspection at the completion of the work, and the Contractor will be charged for all leaks and damage that were not documented in the Contractor's report, or repaired to the Owners satisfaction at the Contractor's expense.
- C. Provide any equipment, material and labor necessary to protect the site, the building, its contents and occupants, pedestrians, and surrounding landscaped and paved areas from damage due to the construction work or from inclement weather during construction.
- D. Do not perform work during inclement weather. Protect incomplete work and the building from damage by inclement weather - which may occur unexpectedly. Make all work areas watertight at the end of each day's work.
- E. Clean up all litter, refuse, rubbish, scrap materials and debris at least twice a day; at noon and at the end of the work day, so the roof and site are neat, orderly and workmanlike. Place the debris in a dumpster, and remove the dumpster from the site as soon as it is full or no longer being used.

- F. Carefully and thoroughly clean the entire roof to remove all residual debris when all work is complete. After cleaning the roof, thoroughly clean all drain sumps, drain lines, leader heads and leaders. Do not allow debris to enter the drainage system.

END OF SECTION

SECTION 07 4213
METAL INFILL PANELS

PART 1 GENERAL

1.1 RELATED DOCUMENTS

- A. Drawings and general provisions of the Contract, including School Facilities Management Contract Manual and Specifications and Division 1 Specification Sections, apply to this Section.
- B. In the event of discrepancies between the specifications and School Facilities Management Contract Manual and Specifications the School Facilities Management Contract Manual and Specifications shall prevail.

1.2 SECTION INCLUDES

- A. Manufactured metal panels for exterior wall panels, with insulation.

1.3 RELATED REQUIREMENTS

- A. Section 07 9200 - Joint Sealants: Sealing joints between metal wall panel system and adjacent construction.

1.4 REFERENCE STANDARDS

- A. AAMA 2605 - Voluntary Specification, Performance Requirements and Test Procedures for Superior Performing Organic Coatings on Aluminum Extrusions and Panels (with Coil Coating Appendix); 2022.
ASTM D1781-76: Climbing Drum Peel Test for Adhesives.
ASTM D3363-74: Method for Film Hardness by Pencil Test
ASTM D2794-90: Resistance of Organic Coatings to the Effects of Rapid Deformation (Impact)
ASTM D3359-90: Method for Measuring Adhesion by the tape test.
ASTM E330-84: Structural Performance of Exterior Windows, Curtain Walls and Doors under the influence of wind loads.

1.5 SUBMITTALS

- A. See Section 01 3000 - Administrative Requirements, for submittal procedures.
- B. Product Data: Manufacturer's data sheets on each product to be used, including:
 - 1. Physical characteristics of components shown on shop drawings.
 - 2. Storage and handling requirements and recommendations.
 - 3. Installation instructions and recommendations.
- C. Samples: Submit two samples of panel, 12 inches by 12 inches in size illustrating finish color, sheen, and texture.
- D. Affidavit certifying materials meet all requirements as specified.
- E. 2 copies of manufacturers standard literature for specified material.
- F. Warranty Documentation for Installation of Building Rainscreen Assembly: Submit installer warranty and ensure that forms have been completed in Yonkers Public Schools's name and registered with installer.

1.6 QUALITY ASSURANCE

- A. Manufacturer Qualifications: Company specializing in manufacturing the products specified in this section with minimum five (5) years of documented experience.

1.7 DELIVERY, STORAGE, AND HANDLING

- A. Protect panels from accelerated weathering by removing or venting sheet plastic shipping wrap.
- B. Store prefinished material off the ground and protected from weather; prevent twisting, bending, or abrasion; provide ventilation; slope metal sheets to ensure proper drainage.

- C. Prevent contact with materials that may cause discoloration or staining of products.

1.8 WARRANTY

- A. See Section 01 7800 - Closeout Submittals, for additional warranty requirements.
- B. Correct defective work within a twenty-five (25) year period after Date of Substantial Completion for degradation of panel finish, including color fading caused by exposure to weather.

PART 2 PRODUCTS

2.1 PANELS

- A. Infill Panels: IP-1 Insulated, aluminum sheet face and back, with edges formed to fit glazing channel and sealed.
1. Thickness: 1".
 2. Exterior Sheet: 1/16 inch thick.
 3. Interior Sheet: 1/16 inch thick.
 4. Core: 1.7-lb density insulation core with Isocyanurate,
 5. Exterior and Interior Substrate: 3/16" High density tempered hardboard inch thick.
 6. Exterior and Interior Finish: Superior performing organic coatings.
 7. Warranty: 25 years.
 8. Product: "Mapes-R" as manufactured by Mapes Architectural Panels; sales@mapes.com / www.mapespanels.com
- B. Infill Panels: IP-2 Insulated, aluminum sheet face and back, with edges formed to fit glazing channel and sealed.
1. Thickness: 1-1/4 (15.6.mm) inch
 2. Exterior Sheet: 1/16 inch thick.
 3. Interior Sheet: 1/16 inch thick.
 4. Core: Isocyanurate, 1.7-lb density insulation core with R-value of 3.61.
 5. Exterior Substrate: 3/16" High density tempered hardboard inch thick.
 6. Interior Substrate: 1/2" Fire code gypsum.
 7. Exterior and Interior Finish: Superior performing organic coatings.
 8. Warranty: 25 years.
 9. Product: "Mapestop" as manufactured by Mapes Architectural Panels; sales@mapes.com / www.mapespanels.com

2.2 FINISHES

- A. Fluoropolymer Coil Coating System: Manufacturer's standard multi-coat metal coil coating system complying with AAMA 2605, including at least 70 percent polyvinylidene fluoride (PVDF) resin, and at least 80 percent of coil coated metal surfaces having minimum total dry film thickness (DFT) of 0.9 mil, 0.0009 inch; color and gloss to match sample.

PART 3 EXECUTION

3.1 EXAMINATION

- A. Verify that system framing members are ready to receive panels.

3.2 INSTALLATION

- A. System Panels:
1. Glaze panels securely and in accordance with approved shop drawings and manufacturers instructions to allow for necessary thermal movement and structural support.
 2. Do not install panels that are observed to be defective including warped, bowed, dented, scratched and delaminating components.
 3. Separate dissimilar metals using gasketed fasteners and blocking to eliminate the possibility of electrolytic reaction.

3.3 CLEANING

- A. Remove site cuttings from finish surfaces.
- B. Remove protective material from panel surfaces.
- C. See Section 01 7419 - Construction Waste Management and Disposal, for additional requirements.
- D. Clean and wash prefinished surfaces with mild soap and water; rinse with clean water.

END OF SECTION

SECTION 07 5323
EPDM ROOFING

PART 1 - GENERAL

1.04 RELATED DOCUMENTS

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

1.05 SUMMARY

- A. All plant, labor, materials, equipment, testing and services necessary to complete the work shown on the drawings, schedules, and keynotes, as specified, and as may be required by conditions and authorities having jurisdiction, including, but not limited to, the following:
 - 1. Inspect the underside of the roof deck before starting work, and periodically each day as work occurs, to determine if there are conduits, pipes, ceiling hangers or fixtures next to the deck or fastened to the deck that could be affected as roof work occurs.
 - a. Perform the work so any conduits, pipes, ceiling hangers or fixtures are not disturbed.
 - b. Replace and reset any conduits, pipes, ceiling hangers or fixtures that are affected by the work.
 - 2. Remove and dispose of existing roofing, insulation, the vapor barrier, underlayment, wood blocking, and flashing;
 - a. Except reuse existing isocyanurate insulation in good condition on the Annex roof. Replace deteriorated sections in accordance with the Unit Prices.
 - b. Clean all residual material from the surface of the decks, and from within the flutes of the steel decks.
 - c. The work may include removing asbestos containing roofing materials. Refer to the asbestos abatement specification for additional information and asbestos removal requirements.
 - 3. Install a new fully adhered unreinforced 60 mil thick EPDM roofing system, including a vapor barrier on concrete deck areas, insulation, cover board, flashing, stripping and related accessories.
 - 4. Provide miscellaneous mechanical, electrical, hoisting and other work needed, and remove, adjust, modify, reset and reconnect all roof-mounted and roof-penetrating equipment.
 - 5. Install new flashings at the roof drains, and all roof-mounted and roof-penetrating equipment.
 - 6. Disconnect and remove abandoned mechanical equipment and curbs, and infill the roof deck.
 - 7. Refasten loose sections of the metal roof decks as Base Bid work.
 - 8. Repair deterioration less than 1/2 inch deep in the surface of the existing concrete deck as Base Bid work.
 - 9. Replace deteriorated portions of existing decks in accordance with the Unit Prices.

10. Protect roof surfaces where material and equipment is placed on them, and where construction traffic occurs, with 6 mil fire retardant polyethylene covered with 1-1/2 inch thick foam insulation, overlaid with 2 by 10 wooden planks.
- B. Related Requirements
1. Masonry Maintenance - Section 04 0100
 2. Roof Carpentry - Section 06 1010
 3. Sheet Metal Flashing & Specialties - Section 07 6200
 4. Roof Accessories - Section 07 7200

1.06 CODE APPROVAL REQUIREMENTS

- A. Install roofing and insulation system components to meet the following minimum requirements:
1. New York State Uniform Fire Prevention and Building Code, which includes by reference the New York State Energy Conservation Code.
 2. Underwriters Laboratories Inc. Class A External Fire Rating for roof assemblies tested in accordance with ASTM E 108 or UL 790.
 3. Underwriters Laboratories Inc. Standard 1256 for roof assemblies with foam insulation.
 4. Minimum wind uplift pressure calculated using ASCE 7 and a safety factor of 2:
 - a. Field Zone - 60 psf
 - b. Perimeter Zones - 100 psf
 - c. Corner Zone - 150 psf
- B. Provide written certification from the roof material Manufacturer, before beginning work, to confirm the roofing system meets these requirements.

1.07 QUALITY ASSURANCE

- A. Installer Qualifications:
1. A firm (Installer) with at least 5 continuous years experience performing work similar to that required for this project, employing personnel skilled in the work specified.
 - a. The Installer shall directly employ the personnel performing the work of this section.
 - b. The Installer shall have a supervisor on the roof when work is in progress. The Supervisor shall have a minimum of 5 years experience with work similar in nature and scope to this project, and speak fluent English.
 1. Submit the supervisor's resume upon request.
 2. The Installer shall provide a reference list of at least three previously completed projects of comparable size and similar design within fifty miles of this project, which may be observed by representatives of the Owner:
 - a. The reference list shall include at a minimum, the completion date, a description of the work performed, the Owner's name - contact person - phone number and address and the Architect's name - contact person and phone number.
 - b. Submit the reference list upon request.

3. The Installer shall be acceptable to or licensed by the Manufacturer of the primary roofing materials and provide written certification from the Manufacturer to confirm this prior to award if requested.
- B. Material Quality: Obtain each type of material from a single source to ensure consistent quality, color, pattern, and texture.

1.08 PRE-CONSTRUCTION CONFERENCE

- A. Meet at the project site between one and two weeks prior to starting work, with the Architect, Owner and other representatives concerned about the work, to discuss the following:
 1. How the building will be kept watertight as old roofing is removed and the work progresses.
 2. How new roofing will be coordinated with the installation of the vapor barrier, insulation, cover board, flashings and other items to provide a watertight installation.
 3. Generally accepted industry practice and the Manufacturer's instructions for handling and installing his products.
 4. The condition of the substrate (deck), curbs, penetrations and other preparatory work needed.
 5. Incomplete submittals; note that progress payments will be not processed until all submittals are received and approved.
 6. The construction schedule, weather forecast, availability of materials, personnel, equipment and facilities needed to proceed and complete the work on schedule.
 7. A schedule for Manufacturer and Architect inspections.

1.09 SUBMITTALS

- A. Submit the following items far enough in advance to obtain approval prior to performing any work on site:
 1. A pre-work site and building inspection report with photos to document conditions before work starts.
 2. Written certification from the Manufacturer which states that the Installer is acceptable or licensed to install the specified roofing; if not previously provided.
 3. Manufacturer's technical literature for all materials.
 4. Samples of the Contractor's Guarantee and Manufacturer's warranty forms.
 5. Test reports and certifications substantiating compliance with specification requirements if requested by the Architect.
- B. Simultaneously provide all technical submittals needed for this project, for all technical sections, collated by section. Incomplete submittals will not be reviewed.
 1. Submittals shall be prepared and made by the firm that will perform the actual work.
 2. Provide electronic submittals via an on-line submittal exchange program if one is established for this project; if an on-line program is not established, provide the submittals on portable USB drives in pdf format, organized in folders by Section.
 - a. Do not make submittals via email

- b. Do not include Safety Data Sheets with the technical submittals.
- C. Safety Data Sheets: Simultaneously provide all Safety Data Sheets needed for this project, for all specification sections - collated by section, in three ring binders. Provide two binders.
- D. Payment requisitions will not be processed until all submittals are received and approved.

1.010 JOB CONDITIONS (CAUTIONS & WARNINGS)

- A. Do not use oil or solvent based roof cement with EPDM roofing. Do not allow waste products, (petroleum grease or oil, solvents, vegetable or mineral oil, animal fat) or direct steam venting to come in contact with any roofing, insulation or flashing product. Do not expose EPDM roofing and accessories to a temperature above 175 degrees Fahrenheit.
- B. Splice cleaner, primer, cements and bonding adhesives are flammable. Do not breathe vapors or use near fire or flame or in a confined or unventilated area. Dispense only from a UL listed safety can or the Manufacturer's original container.
- C. Remove empty adhesive, cleaner and solvent containers and contaminated rags from the roof and legally dispose of them daily.
- D. Do not apply primer, cleaners or adhesives next to ventilation system louvers or windows. Temporarily cover the louvers and windows with 6 mil fire retardant polyethylene and prevent odors from entering the building. Remove temporary covers at the end of each day's work.

1.011 DELIVERY, STORAGE AND HANDLING

- A. Deliver material to the site in the Manufacturer's original and unopened packaging, with intact and legible labels which identify the products and Manufacturers,
- B. Cover all stored materials, except rolls of EPDM and sealed cans of adhesives, with watertight tarpaulins installed immediately upon delivery.
- C. Immediately remove insulation which gets wet from the job site.
- D. Store and install all material within the Manufacturer's recommended temperature range.
- E. Do not overload the structure when storing materials on the roof.
- F. Protect roof surfaces where material and equipment is placed on them, and where construction traffic occurs, with 6 mil fire retardant polyethylene, covered with 1-1/2 inch thick foam insulation, overlaid with 2 by 10 wooden planks.

1.012 GUARANTEE AND WARRANTY

- A. Provide a written Manufacturer's Full System Warranty which warrants that the roofing system, including the insulation, cover board, EPDM roofing and flashings, will remain in a watertight condition for twenty years beginning upon Final Completion.
 - 1. Guarantee coverage shall remain in effect for gust wind speeds up to 72 miles per hour, measured at ground level at the site.
 - 2. Guarantee coverage shall have no dollar value limit.

- B. Provide a written Contractor's Guarantee which guaranties that all work will remain free of material and workmanship defects and in a watertight condition for five years beginning upon Final Completion:
 - 1. Defects include but are not limited to the following: leakage, adhesive separation, delamination, lifting, loosening, splitting, cracking, joint separation, movement and undue expansion or shrinkage.
 - 2. The Contractor shall make the repairs and modifications necessary to enable the work to perform as guaranteed at his own expense:
 - 3. Guarantee coverage shall include removing and replacing materials installed as part of the original work, if removal is needed to affect guaranteed repairs.
 - 4. Guarantee coverage shall remain in effect for gust wind speeds up to 72 miles per hour, measured at ground level at the site.
 - 5. Guarantee coverage shall have no dollar value limit.
- C. Provide one Contractor's Guarantee that covers "all work performed" when a single contractor is awarded work specified in multiple Sections.
- D. The Manufacturer's Warranty and Contractors Guarantee shall take effect no more than 30 days before the completion of all punch list work.
- E. The Contractor's Surety Company may add a rider to the Performance Bond which clarifies that Performance Bond Coverage expires two years after Final Completion; i.e., Performance Bond Coverage does not run for the entire five year term of the Contractor's Guarantee.
- F. Guarantee and Warranty coverage may be cancelled, for the affected portion of the roof, if the work is damaged by winds above 72 mph, by hail, lightning, insects or animals, by failure of the structural substrate, by exposure to harmful chemicals, by other trades on the roof, or by vandalism, or if the Owner fails to maintain the roof in accordance with, or makes roof alterations contrary to, the Manufacturer's printed recommendations.
 - 1. Guarantee and Warranty coverage shall be reinstated, for the remainder of the original period; if the Owner restores the roof to the condition it was in prior to the damage occurring.

1.013 SUBSTITUTIONS

- A. The following factors will be considered when evaluating a possible alternative to the roofing system specified:
 - 1. The wording and intent of the warranty to be issued.
 - 2. The financial status, numbers of years in business, and stability of the entity that will issue the warranty.
 - 3. A reference list of at least five completed similar projects of comparable size, with a successful functional history of at least five years, within approximately fifty miles of the Project.
 - 4. Technical aspects of the system, especially relating to durability, serviceability and performance.
 - 5. The Manufacturer's ability and history providing technical support, on-site inspections and in progress assistance.

6. The availability and experience of local authorized applicators to install and maintain the proposed alternate system.
7. The Manufacturer's willingness and history responding to warranty claims previously made by the Owner, Architect or Consultant's involved in this project.

PART 2 - PRODUCTS

2.01 GENERAL

- A. EPDM roof system components are specified as products of Elevate / Firestone Building Products Company to establish a standard of quality. Equal products and systems from Carlisle SynTec and Johns Manville will be accepted.
- B. Primary products required for this project include:
 1. Vapor barrier
 2. Roof insulation
 3. Cover board
 4. EPDM roofing
 5. Primers and adhesives
 6. Sealants
 7. EPDM flashing
 8. Fasteners

2.02 EPDM

1. Unreinforced 60 mils thick, fire retardant, EPDM (Ethylene Propylene Diene Monomer) sheet membrane conforming to the following minimum physical properties.

PROPERTY	TEST METHOD SPECIFICATION	
Color	—	Gray/Black
Tensile Strength	ASTM D-412	1305 psi min.
Elongation	ASTM D-412	300% min
Tear Strength	ASTM D-624	150 lb/in min
Ozone Resistance	ASTM D-1149	No cracks, 7 days/100 pphm/100°F/50% strain
Heat Aging	ASTM D-573	1200 psi min@ 200% elongation/4 wks/240°F
Brittleness Temperature	ASTM D-746	-49°F
Water Vapor Permanence	ASTM E-96	2.0 perm max
Thickness	ASTM D-412	60 mils plus/minus 6 mils
Fire Retardant		UL Class A

2.03 RELATED MATERIALS

- A. Cleaners, adhesives, sealants, caulking and fasteners furnished by the EPDM system Manufacturer, that comply with low VOC regulations in effect at the time of application.
 1. Stripping: 90 mil thick 5 inch and 9 inch wide self adhering flashing, consisting of 45 mils of semi-cured EPDM factory laminated to 45 mils of cured seaming tape.
 2. Bonding Adhesive: High strength contact adhesive.
 3. Splice Adhesive: High strength synthetic polymer based contact cement formulated specifically to splice EPDM sheets.

4. Lap Sealant: EPDM rubber based gun grade sealant.
 5. Water Block Seal: One component low viscosity butyl rubber sealant.
 6. Pre-Molded Pipe Flashing: Pressure sensitive prefabricated flashings with pre-applied adhesive.
 7. Pourable Sealer: Two component, solvent free polyurethane based sealant.
 8. Reinforced Perimeter Fastening Strips: .030 inch thick reinforced cured EPDM.
 9. Seam Tape Primer: Synthetic rubber polymer based primer designed to clean and prime seam tape splice areas prior to installing the tape.
 10. Seam Splice Tape: Nominal 30 mil thick cured polymer self adhesive tape with release paper carrier, 6 inches wide.
 11. Plates and Bars: Galvanized and corrosion resistant specialty products.
 12. Fasteners: #14 Fluorocarbon polymer coated heavy duty screws.
- B. Primer & Vapor Barrier:
1. Primer: Thin, cut back asphalt meeting ASTM D41.
 2. Vapor Barrier: Fire resistant torch grade SBS modified granular surfaced polyester and glass scrim reinforced cap sheet meeting ASTM D 6163 Type I, Grade G, furnished by the same manufacturer as the EPDM.
- C. Insulation: Flat and tapered rigid cellular polyisocyanurate boards with fibrous felt/fiberglass mat facers, minimum compressive strength 20 psi, meeting ASTM C1289-01, Type II, Class I, Grade 2, as manufactured by Firestone under the trade name of "ISO 95+ Isocyanurate Insulation". Minimum thickness as shown on the drawings.
1. Tapered insulation sloping 1/8 inch per foot.
 2. Crickets sloping 1/4 inch per foot.
- D. Gypsum Cover Board: 1/4 inch thick fire resistant gypsum board decking with inorganic glass mat facers and a water resistant core, formulated in 48 x 48 inch square edge boards, UL Class A, meeting ASTM C-1177, manufactured under the trade name Dens-Deck Prime.
- E. Tapered edge strips – high density isocyanurate or wood fiberboard strips installed at the drain sumps, and insulation transition points.
- F. Insulation adhesive: Two component low rise polyurethane foam adhesive, installed with a mixing extruding Pace Cart dispenser, or with a pleural heated foam rig, Elevate / Firestone I.S.O. Adhesive.
1. Use insulation adhesive suitable for application at the intended application temperatures.
 2. Do not use twin cartridge "caulking gun" adhesive except on very small isolated sections of roof.
- G. Concrete Grout: Fast setting Portland cement based polymer modified repair mortar as manufactured by The Quikrete Companies, under the trade name Quick-Setting Cement, or equal.

PART 3 - EXECUTION

3.01 GENERAL

- A. Install the new roofing system in a watertight, workmanlike manner, meeting the guarantee requirements specified herein; in accordance with the drawings and in conformance with the Manufacturer's requirements, except as enhanced by the drawings and specifications.
- B. Perform work next to roof mounted mechanical equipment, so the work coincides with equipment shutdown periods and does not affect building occupants. Temporarily cover and protect equipment openings, and windows next to the work area, with 6 mil fire retardant polyethylene, so dirt, dust and odors do not enter the equipment or building. Remove covers as soon as the work is complete and at the end of each workday.
- C. Clean substrate surfaces of all laitance, dirt, oil, grease or other foreign matter.
- D. Remove debris daily and as it is generated. Do not stock-pile debris on the roof. Do not leave any debris on the roof at the end of the day. Do not overload the roof structure when moving debris.
- E. Install roof system components on dry surfaces only. Do not install any components when the weather and outside temperatures are not suitable in accordance with the Manufacturer's recommendations.
- F. Complete all work including the equipment flashings, in sequence as quickly as possible so the smallest area possible is under construction at any one time. Complete the entire area of work begun each day, the same day, and make all exposed edges watertight at the end of each day's work.
- G. Protect roof surfaces where material and equipment is placed on them, and where construction traffic occurs, with 6 mil fire retardant polyethylene, covered with 1-1/2 inch thick foam insulation, overlaid with 2 by 10 wooden planks.

3.02 SUBSTRATE INSPECTION

- A. Remove existing roofing, insulation, flashings, underlayment material, and the vapor barrier as indicated, and carefully check the existing deck. To be an acceptable surface for the new roofing system, it is to be well secured to the underlying structure and not rotted or otherwise deteriorated.
- B. Immediately notify the Architect and Owner by telephone and in writing if defects in the substrate are discovered.
- C. Maintain the building watertight in the interim, but do not install new roof system components until defects have been corrected.

3.03 DECK REPAIR

- A. Steel deck repairs:
 - 1. Remove damaged and deteriorated decking across the entire width of individual sections by a length equal to a minimum of two joist bays.
 - 2. Install new deck to match the thickness, gauge and cross section of the existing deck. New steel deck shall be galvanized.
 - 3. Fasten new decking to each joist with #10 screws spaced 6 inches on center.
 - 4. Stitch side seams of steel deck with #10 screws spaced 24 inches apart.
- B. Concrete deck repairs:

1. Perform repairs to the surface of concrete deck areas, 1/2 inch or less in depth, with quick setting non-shrink grout under the Base Bid.
2. Deterioration greater than 1/2 inch deep shall be brought to the Architects attention for his review and direction.

3.04 VAPOR BARRIER ON CONCRETE DECKS

- A. Install primer and a vapor barrier on the concrete decks.
 1. Install the primer and allow it to dry.
 2. Starting at the low point, torch apply and fully adhere the modified bitumen vapor barrier to the primed substrate. Lap sheets at least 4 inches at the ply overlaps and at least 6 inches at the end laps.
 3. Carefully install the vapor barrier sheets to achieve only the minimum required bleed out.
 4. Extend vapor barrier up vertical surfaces at the roof perimeter, and up and around all penetrations and curbs, and seal the vapor barrier to provide continuity of the building air/vapor envelope.

3.05 INSULATION AND COVER BOARD

- A. Install tapered insulation neatly cut at all miters and transitions. Do not lace corner boards.
- B. Install insulation with joints offset between rows and layers a minimum of 12 inches. Cut insulation to fit neatly at penetrations and joints. Fill any gap which is greater than 1/4 inch.
- C. Fasten the all layers of insulation only to the top flute of steel decks, with screws and discs which penetrate through the deck a minimum of 3/4 inch and a maximum of 1-1/2 inches.
 1. Install 16 fasteners per 4 by 8 foot insulation board in the field of the roof.
 2. Install 28 fasteners per 4 by 8 foot insulation board in 8 foot wide perimeter zones.
 3. Install 32 fasteners per 4 by 8 foot insulation board in 8 foot square corner zones.
 4. Carefully choose the length and position of each screw to ensure the screws do not protrude through the underside of the deck where visible inside the school, and to ensure the screws do not damage conduits mounted on the underside of the deck.
- D. Install all layers of insulation over the vapor barrier on concrete deck areas using low rise polyurethane foam adhesive applied in accordance with the Manufacturer's recommendations and to achieve the specified minimum uplift resistance. Offset joints in the insulation between rows and layers a minimum of 12 inches. Cut insulation to fit neatly at penetrations and joints. Fill any gap which is greater than 1/4 inch.
 1. Install 1/2 inch diameter adhesive beads 12 inches on center in the field of the roof.
 2. Install 1/2 inch diameter adhesive beads 6 inches on center in 8 foot wide perimeter zones.
 3. Install 1/2 inch diameter adhesive beads 4 inches on center in 8 foot square corner zones.
- E. Install gypsum cover board using low rise polyurethane foam adhesive applied in accordance with the Manufacturer's recommendations and to achieve the specified minimum uplift resistance, over the insulation with joints offset between rows and layers a minimum of 12 inches. Cut gypsum cover board to fit neatly at penetrations and joints. Fill any gap which is greater than 1/4 inch.
 1. Install 1/2 inch diameter adhesive beads 12 inches on center in the field of the roof.
 2. Install 1/2 inch diameter adhesive beads 6 inches on center in 8 foot wide perimeter zones.
 3. Install 1/2 inch diameter adhesive beads 4 inches on center in 8 foot square corner zones.

- F. Place 5 gallon pails half full of gravel or concrete on the insulation and gypsum cover boards to hold them firmly in position for at least 15 minutes while the low rise foam adhesive sets. Position the pails no more than 24 inches apart in all directions.

1. Insulation and gypsum cover board installed without using pails of concrete or gravel ballast shall be removed and replaced.

3.06 EPDM

- A. Place EPDM roofing on the substrate without stretching it, and allow it to relax approximately one hour – before starting to adhere it to the substrate and form the seams.

- B. Place adjoining sheets in the same manner lapping the edges to shed water.

- C. Fully adhere EPDM to the substrate with bonding adhesive, or use self-adhesive EPDM, with factory applied adhesive..

1. Open each can of adhesive and stir it with an electric paddle mixer for at least 5 minutes before applying the adhesive. Re-stir adhesive that is not used within two hours of initial mixing.
2. Do not punch holes in cans of adhesive and use them in a “Better Spreader” without first opening the cans to mix them.
3. Replace used roller covers each day; discard covers after each day’s use.
4. Allow bonding adhesive to dry to the touch before joining the EPDM to the substrate.
5. Roll the EPDM onto the dried bonding adhesive and immediately rub it vigorously with a soft bristle broom to ensure complete adhesion.

- D. Thoroughly broom and roll self-adhesive EPDM immediately after removing the release paper / film.

- E. EPDM installed over improperly applied adhesive or with adhesive that was not stirred, and roofing installed with blisters, ridges, mole runs, over debris, and with similar deficiencies shall be removed and replaced. Removal shall include the insulation and cover board assembly.

3.07 SPLICING

- A. Form EPDM roof splices with 6 inch wide field applied seam tape, or with 3 inch wide factory applied seam tape.

1. Fold the top sheet back and clean mating surfaces using clean rags with splice wash.
2. Scrub a smooth coat of QuickPrime onto mating surfaces, with long strokes, and to obtain complete coverage, using approximately 1 gallon per 225 square feet. Do not allow the QuickPrime to glob, streak or puddle; allow it to dry to the touch before installing the seam tape.
3. Seam tape shall be positioned so 1/8 inch minimum and 1/2 inch maximum will be exposed at the seam edge when the seam is complete.
 - a. Install 5 inch uncured EPDM stripping over any seam where the tape is exposed less than 1/8 inch or more than 1/2 inch.
4. Roll and allow the top sheet to fall freely into place without stretching or wrinkling it.

5. Pull splice tape release paper from within the seam and neatly mate the seam using hand pressure to rub the membrane together.
 6. Immediately roll the splice with a 2 inch wide roller, using positive pressure, toward the outer edge of splice.
- B. Install uncured EPDM target patches with rounded corners, over all T-Seam intersections.

3.08 PERIMETER FASTENING

- A. Secure the EPDM at the perimeter of each roof level, and at eaves, penetrations, expansion joints and slope changes greater than 1 inch in 12 inches. Utilize surface applied discs or adhere the EPDM to continuous reinforced EPDM fastening strips. Secure the discs and EPDM fastening strips 12 inches on center.

3.09 FLASHINGS

- A. Utilized cured EPDM for all flashings; utilize self-curing EPDM at corners and angle changes only where required by the Manufacturer.
1. Form flashing splices, and the splice between the flashing and main roof sheet with 6 inch seam tape.
 2. Adhere the flashing to vertical surfaces with bonding adhesive.
 3. Fasten the top edge of all flashings, positioning the fasteners 12 inches on center, to be covered by a cap flashing.
- B. Install premolded pipe flashings wherever possible. Where premolded pipe flashings cannot be installed, use field wrapped flashings. Install sealant pockets as a last resort.
- C. Remove existing pipe flashings and Kennedy type couplings and extend the vent pipes to finish a minimum of 18 inches above the roof surface.
1. Extend the pipes using the same type of pipe material as the original vent pipe.
 2. Use threaded or no-hub couplings, positioned within the insulation layer to extend the pipes.

3.010 MISCELLANEOUS

- A. Provide any miscellaneous roofing, flashing, caulking, and metal work needed to leave the work complete and entirely watertight, neat and carefully executed in a thorough and workmanlike manner.
- B. Use mechanics skilled and licensed in the trades to perform mechanical and electrical work. Provide new material, couplings, transition pieces, blocking, fasteners and the like needed to complete the work.

3.011 CLEANING, PROTECTION AND WATERTIGHTNESS

- A. Inspect the interior and exterior of the building and grounds, and submit a written report with photos to document any pre-existing leakage or damage, prior to performing any work.
- B. The Owner will conduct a similar inspection at the completion of the work, and the Contractor will be charged for all leaks and damage that were not documented in the Contractor's report, or repaired to the Owners satisfaction at the Contractor's expense.

- C. Provide any equipment, material and labor necessary to protect the site, the building, its contents and occupants, pedestrians, and surrounding landscaped and paved areas from damage due to the construction work or from inclement weather during construction.
- D. Do not perform work during inclement weather. Protect incomplete work and the building from damage by inclement weather - which may occur unexpectedly. Make all work areas watertight at the end of each day's work.
- E. Clean up all litter, refuse, rubbish, scrap materials and debris at least twice a day; at noon and at the end of the work day, so the roof and site are neat, orderly and workmanlike. Place the debris in a dumpster, and remove the dumpster from the site as soon as it is full or no longer being used.
- F. Carefully and thoroughly clean the entire roof to remove all residual debris when all work is complete. After cleaning the roof, thoroughly clean all drain sumps, drain lines, leader heads and leaders. Do not allow debris to enter the drainage system.

3.012 ROOF INSPECTIONS BY MANUFACTURER

- A. Arrange for the roofing Manufacturer, or his authorized representative, to make a minimum of four inspections in accordance with the following schedule and submit a written report of each inspection to the Architect.
 - 1. First inspection during the first two days of new roof installation.
 - 2. Second inspection when roofing is approximately one third complete.
 - 3. Third inspection when roofing is approximately two thirds complete.
 - 4. Fourth inspection when all roofing and flashings are installed.
- B. Provide 48 hours advance written notice to the Architect, so he may have a representative attend the inspections.
 - 1. Submit the inspection reports within one week following each inspection. Payment requisitions will not be reviewed nor approved until the inspection reports are received.

END OF SECTION

SECTION 07 6200
SHEET METAL FLASHINGS & SPECIALTIES

PART 1 - GENERAL

1.04 RELATED DOCUMENTS

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

1.05 SUMMARY

- A. All plant, labor, materials, equipment, testing and services necessary to complete the work shown on the drawings, schedules and keynotes, as specified herein, and as may be required by conditions and authorities having jurisdiction, including, but not limited to, the following:
 - 1. Sheet metal work that is compatible with the roofing systems specified, including cap flashings, hook strips, fascia, drip edges, factory fabricated roof edge systems, gutters, leaders, soffit panels, and miscellaneous flashings.
- B. Related Requirements
 - 1. Masonry Maintenance - Section 04 0100
 - 2. Roof Carpentry - Section 06 1010
 - 3. EPDM Roofing - Section 07 5323
 - 4. Roof Accessories - Section 07 7200

1.06 CODE APPROVAL REQUIREMENTS

- A. Fabricate and install roof perimeter flashings that comply with the NY State Uniform Fire Prevention and Building Code and with ANSI/SPRI ES-1 "Wind Design Standard for Edge Systems Used with Low Slope Roofing Systems" requirements.

1.07 QUALITY ASSURANCE

- A. Installer Qualifications:
 - 1. A firm (Installer) with at least 5 continuous years experience performing work similar to that required for this project, employing personnel skilled in the work specified.
 - a. The Installer shall directly employ the personnel performing the work of this section.
 - b. The Installer shall have a supervisor on the roof when work is in progress. The Supervisor shall have a minimum of 5 years experience with work similar in nature and scope to this project, and speak fluent English.
 - 1. Submit the supervisor's resume upon request.
 - 2. The Installer shall provide a reference list of at least three previously completed projects of comparable size and similar design, within fifty miles of this project, which may be observed by representatives of the Owner:
 - a. The reference list shall include at a minimum, the completion date, a description of the work performed, the Owner's name - contact person - phone number and address and the Architect's name - contact person and phone number.

- b. Submit the reference list upon request.
- B. Material Quality:
 - 1. Obtain each product from a single Manufacturer which has manufactured the same product in the United States of America for not less than 5 continuous years.
 - 2. Obtain copper and pre-finished sheet metal items from the same mill run to maintain consistent color hue and surface finish.
- C. Pre-Construction Conference: Meet at the project site approximately two weeks prior to starting work, with the Architect, Owner and other representatives concerned about the work, to discuss the following:
 - 1. How the building will be kept watertight as work progresses.
 - 2. How sheet metal work will be coordinated with the installation of the vapor barrier, thermal barrier, insulation, cover board, roofing, flashings, roof accessories and other items to provide a watertight installation.
 - 3. Generally accepted industry practice and the Manufacturer's instructions for handling and installing his products.
 - 4. The condition of the substrate, curbs, penetrations and other preparatory work needed.
 - 5. Incomplete submittals; note that progress payments will not be processed until all submittals are received and approved.
 - 6. The construction schedule, weather forecast, availability of materials, personnel, equipment and facilities needed to proceed and complete the work on schedule.
 - 7. A schedule for Manufacturer and Architect inspections.

1.08 SUBMITTALS

- A. Submit the following items far enough in advance to obtain approval prior to performing any work on site:
 - 1. A pre-work site and building inspection report with photos to document conditions before work starts.
 - 2. Manufacturer's technical literature for all materials.
 - 3. Test reports and certifications substantiating compliance with specification requirements if requested by the Architect.
 - 4. Shop drawings, or 2 foot long samples, for each sheet metal item, to show how it relates and fits on adjoining masonry and wood blocking assemblies, and with the roof, stripping, and flashings.
 - 5. 6 inch square pieces of each type of sheet metal to show surface finish, texture and color.
 - 6. A sample of the Contractor's guarantee form.
- B. Simultaneously provide all technical submittals needed for this project, for all technical sections, collated by section. Incomplete submittals will not be reviewed.

1. Submittals shall be prepared and made by the firm that will perform the actual work.
2. Provide electronic submittals via an on-line submittal exchange program if one is established for this project; if an on-line program isn't established, provide the submittals on portable USB drives in pdf format, organized in folders by Section.
 - a. Do not make submittals via email
 - b. Do not include Safety Data Sheets with the technical submittals.
- C. Safety Data Sheets: Simultaneously provide all Safety Data Sheets needed for this project, for all specification sections - collated by section, in three ring binders. Provide two binders for each building.
- D. Payment requisitions will not be processed until all submittals are received and approved.

1.09 JOB MOCK-UPS

- A. After the submittals are approved, prepare in actual job locations, mock-ups of cap flashings, hook strips, drip edges, fascia, factory fabricated roof edge systems, copings, gutters, leaders, soffit panels, and all other items of sheet metal and related work, for inspection and approval by the Architect.
- B. Construct each mock-up of two full lengths of metal, fastened, connected and stripped-in to the related roofing system, to show the following:
 1. Type, gauge, color, cross-sectional dimensions and shape, and joint and mitering techniques.
 2. Related masonry work, wood blocking, and the attachment techniques and fasteners for all wood and metal components.
 3. Other sheet metal related materials and their installation techniques to fully define the detailing of each mock-up.
- C. Mock-ups shall be constructed to establish the minimum standard of materials and workmanship, and to assure that completed work which matches the mock-ups will be fully functional and serve the purpose for it has been designed.
- D. Approved mock-ups may be left in place and incorporated into the permanent installation. Rejected mock-ups shall be removed and replaced until an acceptable mock-up is approved.
- E. Do not purchase or fabricate sheet metal items until mock-up installation, inspection and approval are completed and approval is documented in writing.

1.010 DELIVERY, STORAGE AND HANDLING

- A. Deliver material to the site in the Manufacturer's original and unopened packaging, with intact and legible labels which identify the products and Manufacturers,
- B. Cover all stored materials with watertight tarpaulins installed immediately upon delivery.
- C. Do not overload the structure when storing materials on the roof.
- D. Protect roof surfaces where material and equipment is placed on them, and where construction traffic occurs, with 6 mil fire retardant polyethylene, covered with 1-1/2 inch thick foam insulation, overlaid with 2 by 10 wooden planks.

1.011 GUARANTEE

- A. Provide a written Contractor's Guarantee which guarantees that all work will remain free of material and workmanship defects and in a watertight condition for five years beginning upon Final Completion:
 - 1. Defects include but are not limited to the following: peeling paint, leakage, adhesive separation, delamination, lifting, loosening, splitting, cracking, and undue expansion.
 - 2. The Contractor shall make the repairs and modifications necessary to enable the work to perform as warranted at his own expense.
 - 3. Guarantee coverage shall include removing and replacing materials installed as part of the original work, if removal is needed to affect guaranteed repairs.
 - 4. Guarantee coverage shall have no dollar limit.
- B. Provide one Contractor's Guarantee that covers "all work performed" when a single contractor is awarded work specified in multiple Sections.
- C. The Guarantee coverage shall take effect no more than 30 days before the completion of all punch list work.
- D. The Contractor's Surety Company may add a rider to the Performance Bond which clarifies that Bond Coverage expires two years after Final Completion; i.e., Performance Bond Coverage does not run for the entire five year term of the Contractor's Guarantee.

PART 2 - PRODUCTS

2.01 MATERIALS

- A. Copper sheet: ASTM B370, 99.0 % pure copper, thickness 16 ounces per square foot. Use copper for all metal items not otherwise indicated
- B. Zinc-Tin coated copper: copper sheet, coated on both sides, with a smooth uniform coating of zinc and tin, base metal weight 16 ounces per square foot, cold rolled temper, available as FreedomGray Copper by Revere.
- C. Solder:
 - 1. 50-50 tin and lead for plain copper, supplied in one pound bars with the alloy mixture stamped into the bar by the Manufacturer.
 - 2. Lead free / or pure tin solder for zinc-tin coated copper, Number 497 by Johnson Manufacturing.
- D. Flux:
 - 1. Water-Soluble Liquid Flux, Kester #3345 for iron soldering of brass and copper.
 - 2. Tin-bearing flux such as "Flux-N-Solder E127 with pure tin" by Johnson Manufacturing.
- E. Aluminum fascias, hook strips, gravel stops and miscellaneous trim: #3105-H14 alloy aluminum, minimum thickness .040 inches unless otherwise indicated, factory finished with a Fluoropolymer Kynar 500 finish, color as selected by the Architect, from the full range of custom and standard colors.
- F. Factory Fabricated Roof Edge System: Extruded aluminum anchor bars secured with #9 stainless steel screws spaced 12 inches on center and .050 inch thick Kynar 500 prefinished aluminum trim covers, independently tested to comply with the ANSI / SPRI ES-1 Wind Design Guide.
- G. Fasteners: fabricated of stainless steel, or material that matches the sheet metal being fastened.

- H. Eveco ventilators: single cone gravity type ventilators, with no moving parts, fabricated of mill finish aluminum, furnished with #8 aluminum insect screen, 1/2 inch aluminum bird screen and factory fabricated curb mount bases, as manufactured by Empire Ventilation Equipment Co., Inc., Long Island City, NY. (Use these on flat roofs.)
- I. Leader Boots: 10 foot long hollow rectangular structural steel tube sections, with 1/4 inch thick walls, fabricated with 4 inch high "hubs" welded to the top, sized to match the leaders draining into them.
 - 1. Fabricate the leader boots with welded adapters, to create a smooth water tight transition to the underground drain pipe.
 - 2. Fabricate the leader boots with 3 inch diameter clean out plugs, positioned about 12 inches above grade; by welding half of a typical threaded coupling onto the side of the boot at a 45 degree angle, and install a threaded / removable plug into the coupling.
 - 3. Grind all welds smooth, then shop prime and paint the leader boots with two coats of finish paint prior to installation. Touch up paint minor scratches after installation.
- J. PVC drain pipe: 6 inch diameter, minimum .120 inch thick solid wall pipe, International Association of Plumbing & Mechanical Officials – Uniform Plumbing Code listed pipe meeting ASTM D3034 SDR-35, with factory formed and solvent welded fittings.
- K. Glass Cloth: open mesh glass fabric coated on each side with plasticized asphalt as manufactured by Karnak Corporation or equal.
- L. Asphalt cement: Federal Specification SS-C-153B, Type 1, asbestos free grade.
- M. Exterior mounted gutters: 7 inch wide, .050 inch thick aluminum seamless, factory finished with Kynar 500 finish, box style gutters (manufactured by Garrety Gutters 800/628-5849) supported with concealed aluminum fascia brackets spaced 12 inches on center fastened with 1-1/2 inch long stainless steel screws.
- N. Exterior mounted leaders and straps: .027 inch thick rectangular corrugated aluminum leaders factory finished with baked acrylic enamel. Fasten each leader with 1/16 inch thick by 1 inch wide straps spaced 7 feet on center.
- O. Sealant: High performance, solvent free, formulated and moisture curing silyl-terminated polyether sealant, ASTM C-920, Type S, Grade NS, Class 25, NovaLink construction sealant by ChemLink, color as selected.
- P. Soffit panels: .032 inches aluminum soffit panels 0.56 inch thick and 12 inches wide factory finished with a Fluoropolymer Kynar 500 Finish, color as selected, as manufactured by Firestone Metal Products Una-Clad under the trade name UC-750 V-Groove.
- Q. Hat Sections: nominal 5/8 inch deep 20 gauge galvanized steel sections.

PART 3 - EXECUTION

3.01 GENERAL

- A. Accurately reproduce the details and design shown, and form profiles, bends and intersections, sharp, true and even. Fabricate sheet metal in the shop whenever possible, and form joints, laps, splices and connections to shed water and condensation in the direction of flow.

- B. Provide any miscellaneous flashing and sheet metal work not shown on the drawings but otherwise needed to leave the project complete and entirely watertight, neatly and carefully executed in a thorough and workmanlike manner.

3.02 INSPECTION

- A. Examine surfaces to receive work of this section and report any defects to the Owner. Commencement of work will be construed as complete acceptance of surfaces.

3.03 INSTALLATION

- A. Fabricate and install copper work in accordance with the current edition of "Copper and Common Sense" as published by the Revere Copper and Brass Company, unless otherwise indicated.
 - 1. Form all joints, except loose locked sealant filled expansion joints, to overlap 2 inches.
 - 2. Secure the joints with rivets spaced 1 inch on center positioned about 1/2 inch from the top edge of the joint, then sweat solder the joint.
 - 3. Use solder only to fill and seal the joint, not for mechanical strength. Form soldered joints continuous, strong and free from defects, with well heated soldering irons. Do not use open flame torches for soldering.
 - 4. Clean soldered joints daily, immediately after soldering, by washing them with soap and water applied with a soft bristle brush, then rinsing with clear water.
- B. Securely fasten and anchor all work, and make provisions for thermal expansion. Submit details of expansion joints for approval. Install fasteners through one edge of metal only, use a hook strip on the other edge.
- C. Use stainless steel pin Zamac type nail-in fasteners, or stainless steel screws and washers with neoprene inserts where fasteners will be exposed.

3.04 CAP FLASHINGS

- A. Install new copper cap flashings built into masonry walls properly joined to all related materials in a watertight manner.
 - 1. Solder all joints in the new cap flashing, except form 2 inch wide flat locked sealant filled expansion joints a maximum of 32 feet on center.
 - 2. Form the flashing to turn up 2 inches inside the wall and finish with a hem on the bottom exposed edge.
 - 3. Fasten the top edge of the cap flashing to the back up masonry 12 inches on center.
 - 4. Install the new cap flashing under flexible type wall flashings where possible. Where it is not possible to lap the new cap flashing under an existing wall flashing, install a ply of glass cloth set in and coated with asphalt cement to connect the new cap flashing to the existing wall flashing.
 - 5. In the absence of an existing wall flashing, or at a solid masonry wall, turn up the new cap flashing 2 inches behind the first wythe of masonry.

6. Install new cap flashings where shown on the drawings, and at a height of 10 to 12 inches above the roof surface – and above the new duct penetrations in the Cafeteria wall..
- B. Install new aluminum cap flashings on skylight and equipment curbs.
 1. Form the cap flashing to extend at least 2 inches under the equipment or skylight, 4 inches over the base flashing, and finish with a 1/2 inch hem on the bottom edge.
 2. Install a 1/2 inch thick by 2 inch wide continuous foam gasket between the cap flashing and mechanical equipment or skylight. Do not set the equipment or skylight in sealant.
 3. Secure the equipment or skylight to the curb with stainless steel screws spaced 12 inches on center.

3.05 DRIP EDGES

- A. Fabricate drip edges to extend 1-1/2 inches past the roof edge, and turn down to ensure water cannot track back and run down the fascia. Secure the drip edge with roofing nails along the top edge, spaced 4 inches apart along the raw metal edge. Form joints in the drip edge with 6 inch wide concealed under plates which duplicate the profile of the drip edge. Set the underplates in a full bed of sealant.

3.06 HOOK STRIPS

- A. Form continuous hook strips with locks that engage the superimposed trim piece a minimum of 3/4 inch, and to cover the entire underside edge of the wood blocking and neatly extend to the building wall.
- B. Fasten hook strips along their bottom edge, just above the 45 degree bend, with nails spaced 4 inches on center into underlying wood blocking; Zamac type nail-in type fasteners spaced 8 inches on center into masonry surfaces, or screws spaced 8 inches on-center into sheet metal surfaces.

3.07 FASCIA

- A. Fabricate new fascia to engage the hook strip 3/4 inch minimum and extend to the top of the wood fascia blocking. Secure the fascia with a continuous hook strip along the bottom edge and roofing nails along the top edge spaced 8 inches apart, positioned to be covered by the roof edge trim. Form joints in the fascia with 6 inch wide concealed under plates which duplicate the profile of the fascia. Set the underplates in a full bed of sealant.

3.08 ROOF EDGE SYSTEM

- A. Install a factory fabricated roof edge system on all roof eaves.
 1. Extend the roof to lap over and down the face of the fascia trim, so it stops just short of the bottom edge of the anchor bar.
 2. Install the anchor bar straight, level and true, set in a full bed of sealant, and secure the bar with #9 by 2 inch long stainless steel screws spaced no more than 12 inches apart.
 3. Pre-drill screw holes in the underlying metal fascia trim, where extra fasteners are needed, and at corners and special conditions.
 4. Install color matching under plates at each joint in the roof edge trim; set the under plates in a full bed of sealant.

3.09 CHIMNEY CAPS & HOODS

- A. Fabricate new chimney caps and hoods from zinc-tin coated copper; to cover the entire top of the chimney, to overlap the exterior bed joint 2 inches, and to extend up and over the flue liners and turn down inside them. Turn the cap down 4 inches inside the chimney if there are no flue liners. Cover all masonry between the flues. Fasten the chimney cap with a hook strip under the outside edge and Zamac type fasteners spaced 12 inches apart along the inside edge if there is no clay flue liner.
- B. Position the hood a minimum of 18 inches above the top of the flues to provide adequate exhaust clearance.
- C. Support the hood with 1/4 by 1-1/2 inch half twisted stainless steel bars, spaced and braced, approximately 12 inches apart at the perimeter of the hood.

3.010 LEADER BOOTS & UNDERGROUND PIPE

- A. Install new 6 inch diameter underground PVC drain lines, surface clean out fittings and leader transition adapters at exterior leader locations.
 - 1. Saw cut, remove and neatly replace bituminous pavement and concrete sidewalk areas.
 - 2. Carefully excavate and restore grass and planted areas.
 - 3. Bury the new PVC drain lines a minimum of 24 inches deep and slope them 1/4 inch per foot towards out-flow connection points.

3.011 SOFFIT PANELS

- A. Install hat sections in equally spaced rows a maximum of 16 inches on center, to support the panels.
- B. Fasten each hat sections to the substrate with screws or Zamac nail-ins (depending on substrate) spaced 12 inches on center.
- C. Install 'J' mold and trim pieces in full lengths, with the ends notched to form a telescoping 3inch overlap. Face the overlaps to shed water, and where visible from the ground, away from prominent building entrance locations. Set the trim overlap into a full bed of sealant which matches the color of the trim.
- D. Install panels level, and straight with seams parallel, to achieve the design appearance indicated.
- E. Fasten the panels to each hat section with concealed stainless steel screws in each seam spaced 6 inches on center.

3.012 CLEANING, PROTECTION AND WATERTIGHTNESS

- A. Inspect the interior and exterior of the building and grounds, and submit a written report with photos to document any pre-existing leakage or damage, prior to performing any work.
- B. The Owner will conduct a similar inspection at the completion of the work, and the Contractor will be charged for all leaks and damage that were not documented in the Contractor's report, or repaired to the Owners satisfaction at the Contractor's expense.
- C. Provide any equipment, material and labor necessary to protect the site, the building, its contents and occupants, pedestrians, and surrounding landscaped and paved areas from damage due to the construction work or from inclement weather during construction.

- D. Do not perform work during inclement weather. Protect incomplete work and the building from damage by inclement weather - which may occur unexpectedly. Make all work areas watertight at the end of each day's work.
- E. Clean up all litter, refuse, rubbish, scrap materials and debris at least twice a day; at noon and at the end of the work day, so the roof and site are neat, orderly and workmanlike. Place the debris in a dumpster, and remove the dumpster from the site as soon as it is full or no longer being used.
- F. Carefully and thoroughly clean the entire roof to remove all residual debris when all work is complete. After cleaning the roof, thoroughly clean all drain sumps, drain lines, leader heads and leaders. Do not allow debris to enter the drainage system.

END OF SECTION

**SECTION 07 7200
ROOF ACCESSORIES**

PART 1 - GENERAL

1.04 RELATED DOCUMENTS

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

1.05 SUMMARY

- A. All plant, labor, materials, equipment, testing and services necessary to complete the work shown on the drawing's schedules and keynotes, as specified herein, and as may be required by conditions and authorities having jurisdiction, including, but not limited to, the following:

1. Roof specialties that are compatible with the roofing systems specified, including:
 - a. Plastic skylights.
 - b. Drains, drainpipes and couplings.
 - c. Pipe insulation and fitting covers.
 - d. Aluminum access hatches.
 - e. Hatch safety rails.
 - f. Galvanized steel roof access ladders.
 - g. Steel pipe safety rails.
 - h. Roof walkway pads and concrete pavers.
2. Prepare, prime and paint existing roof top equipment, and the miscellaneous rooftop items indicated.

B. Related Requirements

- | | |
|---------------------------------------|-------------------|
| 1. Masonry Maintenance | - Section 04 0100 |
| 2. Roof Carpentry | - Section 06 1010 |
| 3. EPDM Roofing | - Section 07 5323 |
| 4. Sheet Metal Flashing & Specialties | - Section 07 6200 |

1.06 CODE APPROVAL REQUIREMENTS

- A. Fabricate and install roof accessories that comply with the NY State Uniform Fire Prevention and Building Code.

1.07 QUALITY ASSURANCE

A. Installer Qualifications:

1. A firm (Installer) with at least 5 continuous years' experience performing work similar to that required for this project, employing personnel skilled in the work specified.
 - a. The Installer shall directly employ the personnel performing the work of this section.
 - b. The Installer shall have a supervisor on the roof when work is in progress. The Supervisor shall have a minimum of 5 years experience with work similar in nature and scope to this project and speak fluent English.
1. Submit the supervisor's resume upon request.

2. The Installer shall provide a reference list of at least three previously completed projects of comparable size and similar design, within fifty miles of this project, which may be observed by representatives of the Owner:
 - a. The reference list shall include at a minimum, the completion date, a description of the work performed, the Owner's name - contact person - phone number and address and the Architect's name - contact person and phone number, and the Contractor's Supervisor's name.
 - b. Submit the reference list upon request.
- B. Material Quality: Obtain each product from a single Manufacturer which has manufactured the same product in the United States of America for not less than 5 continuous years.
- C. Pre-Construction Conference: Meet at the project site between one and two weeks prior to starting work, with the Architect, Owner and other representatives concerned about the work, to discuss the following:
 1. How the building will be kept watertight as work progresses.
 2. How roof accessory work will be coordinated with the installation of the vapor barrier, thermal barrier, insulation, cover board, roofing, flashings, and other items to provide a watertight installation.
 3. Generally accepted industry practice and the Manufacturer's instructions for handling and installing his products.
 4. The condition of the substrate, curbs, penetrations, and other preparatory work needed.
 5. Incomplete submittals: note that progress payments will not be processed until all submittals are received and approved.
 6. The construction schedule, forecast weather, availability of materials, personnel, equipment, and facilities needed to proceed and complete the work on schedule.
 7. A schedule for Manufacturer and Architect inspections.

1.08 SUBMITTALS

- A. Submit the following items far enough in advance to obtain approval prior to performing any work:
 1. A pre-work site and building inspection report with photos to document conditions before work starts.
 2. Manufacturer's installation instructions and technical data sheets for each item. Material sample submittals are not needed unless requested to show color and texture.
 3. Samples of the Contractor's and Manufacturer's guarantee/warranty forms.
 4. Test reports and certifications substantiating compliance with specification requirements if requested by the Architect.
- B. Simultaneously provide all technical submittals needed for this project, for all technical sections, collated by section. Incomplete submittals will not be reviewed.
 1. Submittals shall be prepared and made by the firm that will perform the actual work.

2. Provide electronic submittals via an on-line submittal exchange program if one is established for this project; if an on-line program is not established, provide the submittals on portable USB drives in pdf format, organized in folders by Section.
 - a. Do not make submittals via email.
 - b. Do not include Safety Data Sheets with the technical submittals.
- C. Safety Data Sheets: Simultaneously provide all Safety Data Sheets needed for this project, for all specification sections - collated by section, in three ring binders. Provide two binders.
- D. Payment requisitions will not be processed until all submittals are received and approved.

1.09 DELIVERY, STORAGE AND HANDLING

- A. Deliver material to the site in the Manufacturer's original and unopened packaging, with intact and legible labels which identify the products and Manufacturers,
- B. Cover all stored materials with watertight tarpaulins installed immediately upon delivery.
- C. Do not overload the structure when storing materials on the roof.
- D. Protect roof surfaces where material and equipment is placed on them, and where construction traffic occurs, with 6 mil fire retardant polyethylene, covered with 1-1/2 inch thick foam insulation, overlaid with 2 by 10 wooden planks.

1.010 GUARANTEE

- A. Provide a written Contractor's Guarantee which guarantees that all work will remain free of material and workmanship defects and in a watertight condition for five years beginning upon Final Completion:
 1. Defects include but are not limited to the following: peeling paint, leakage, adhesive separation, delamination, lifting, loosening, splitting, cracking, movement, and undue expansion.
 2. The Contractor shall make the repairs and modifications necessary to enable the work to perform as warranted at his own expense.
 3. Guarantee coverage shall include removing and replacing materials installed as part of the original work if removal is needed to affect repairs.
 4. Guarantee coverage shall have no dollar limit.
- B. Provide one Contractor's Guarantee that covers "all work performed" when a single contractor is awarded work specified in multiple Sections.
- C. The Guarantee shall take effect no more than 30 days before the satisfactory completion of all punch list work.
- D. The Contractor's Surety Company may add a rider to the Performance Bond which clarifies that Performance Bond Coverage expires two years after Final Completion, i.e., Performance Bond Coverage does not run for the entire five year term of the Contractor's Guarantee.
- E. Provide a Manufacturer's written warranty, which warrants the skylights will remain watertight for a minimum 5-year term beginning upon final completion.

PART 2 - PRODUCTS

2.01 GENERAL

- A. Provide Manufacturer's standard units, modified as necessary to comply with the specified requirements. Fabricate each unit in a shop to the greatest extent possible, using the following components:
1. Aluminum Sheet: ASTM B 209 alloy 3003, tempered for forming and performance; mill finish, except as otherwise noted.
 2. Extruded Aluminum: Standard extrusions alloy 6063-T52; 0.078 inch minimum thickness for primary framing and curb member legs, 0.062 inch thickness for secondary framing and covers; mill finish, except as otherwise indicated.
 3. Insulation: Rigid fiber glass boards where encapsulated inside metal skirts, rigid isocyanurate where covered with roof flashings on the exterior of curbs.
 4. Wood Nailers: Dimension grade Douglas Fir, not less than 1-1/2 inches thick.
 5. Fasteners: Nonmagnetic stainless steel or hot dipped galvanized steel, to match the finish of the material being fastened.
 6. Gaskets: Tubular neoprene or polyvinyl chloride, or block sponge neoprene.
 7. Sealant: Polyisobutylene; nonhardening, nonskinning, nondrying, nonmigrating sealant.

2.02 PLASTIC SKYLIGHTS

- A. Factory assembled dome and frame assemblies with welded corners manufactured by Kingspan / Bristolite or American Skylights are specified as the basis of design to establish a quality standard. Equal products are acceptable provided they comply with the following requirements:
1. Glazing sheet thickness required for a minimum of 30 pounds per square foot external and 30 pounds per square foot internal loading; and to comply with the minimum thickness and wind pressure requirements of AAMA/WDMA/CSA 101/I.S.2/A440 as set forth in paragraph 2405.5 of the NYS Uniform Fire Prevention and Building Code.
 2. Outer Dome: Dome shaped polycarbonate meeting the following tests:
 - a. Burn Rate ASTM D635 - Not over 2.5
 - b. Smoke Developed ASTM D2843
 - c. Smoke Density Not over 75%
 3. Inner Panel: Clear multiwall polycarbonate panel meeting the following tests:
 - a. Burn Rate ASTM D635 - Not over 2.5
 - b. Smoke Developed ASTM D2843
 - c. Smoke Density Not over 75%
 4. Fall Protection: Fabricate the skylights so the dome and panel will not disengage from the frame upon impact of 755 foot pounds, and to comply with OSHA 1910.23 Fall Protection Guidelines.
 5. Energy Performance Ratings:
 - a. Maximum U-factor 0.50
 - b. Solar Heat Gain Coefficient (SHGC) of 0.40
- B. Curb Construction: Provide units with integral internal gutters and weep holes to drain condensation; fabricated with formed and extruded thermally broken welded aluminum frames and retaining angles for installation on field constructed curb assemblies.

2.03 DRAINS, DRAIN PIPES, AND COUPLINGS

- A. Conventional cast iron bottom and side outlet roof drains, installed with drain receivers, under deck clamps, cast iron strainers, cast iron clamping rings and factory installed stainless steel gravel screens Series 1011 as manufactured by Jay R. Smith Manufacturing Company.
- B. Match the drain outlet size and style to the building drain line, except if the drain line is a copper pipe, then furnish the drain body with a threaded outlet and use a male adapter to connect the drain body to the drain line.

- C. Drain pipe: cast iron pipe with no hub fittings, minimum 3 inch diameter, and larger to match the existing building drain lines.
- D. No-hub couplings: heavy duty rubber neoprene sleeve couplings with full length Type 304 stainless steel shields and at least 4 worm drive clamps, conforming to ASTM A564.

2.04 PIPE INSULATION AND FITTING COVERS

- A. Insulation: minimum 1 inch thick pre-molded 3.5 lb. heavy density fiberglass pipe insulation with UL rated non-combustible service jackets.
- B. .030 inch thick factory fabricated white PVC "Smoke Safe" fitting and drain bowl covers as manufactured by the Speedline Corporation, with a maximum Flame Spread Value of 25 and a maximum Smoke Developed Value of 50 in accordance with ASTM E8450.

2.05 ALUMINUM ACCESS HATCHES

- A. Hatches constructed of welded 11 gauge mill finish aluminum, with 12 inch high curbs and integral cap flashings, heavy pintle hinges, compression spring operators, a spring latch with interior and exterior handles, an interior padlock hasp, and stainless steel hardware, as manufactured by the Bilco Company, in the sizes needed to fit the deck openings, and as indicated.
- B. Furnish new padlocks for all hatches - Master Lock Model #ML6125KA, Master Pro Series Weather Tough padlock with 2-3/8 inch wide steel case and 5-pin W6000 removable cylinder, and a replaceable 3/8 inch diameter case-hardened BORON alloy steel shackle. All padlocks shall be keyed alike. Furnish the Owner with 20 keys.

2.06 HATCH SAFETY RAILS

- A. Safety rails shall comply with OSHA Standard CFR 29 1910.23 and CFR 29 1910.27
- B. Safety rails shall be bolted to the exterior surface of the curb above the flashing with 3/8 inch diameter stainless steel bolts, constructed of 1-1/2 inch diameter hot rolled electrically welded tubing meeting ASTM A500 Grade B, sized and configured to provide a safety railing on four sides of the hatch 42 inches above the roof surface with a self closing gate supported with heavy duty hinges with 5/8 inch diameter pins - basis of design: Roof Hatch Safety Rails by SafePro Roof Top Fall Protection.
- C. Gate shall be fabricated of galvanized steel tubing, with no chains or latches.
- D. Gate shall be powder paint coated, color shall be as selected by the Architect

2.07 GALVANIZED STEEL ROOF ACCESS LADDERS

- A. Fabricate ladders from 1-1/4 inch inside diameter steel pipe rails, spaced 22 inches apart, and 3/4 inch solid steel rebar rungs spaced 12 inches on center. Fit the rungs into drilled holes in the centerline of the rails, weld and grind the welds smooth. Extend the ladder rails and form goose-neck returns to finish 42 inches above the roof surface.
 - 1. Hot dip galvanize coat the ladder and mounting brackets after fabrication. Install with Type 316 stainless steel hardware.
- B. Fabricate a security cover for the new interior ladder at the new roof hatch on the Annex roof from 1-1/2 inch x 1-1/2 inch by 1/4 inch angle and 1/4 inch thick by nominal 1 inch flat expanded mesh. Prime and paint the security cover after fabrication. Install it with Type 316 stainless steel hardware.

2.08 GUARD RAIL ASSEMBLIES

2.09 Shop fabricated from 1-1/4 inch inside diameter schedule 40 steel pipe - ASTM A53 grade B.

2.010 ROOF WALKWAY PADS AND CONCRETE PAVERS

- A. 2 inches thick, 24 inches by 24 inches precast concrete pavers, natural buff color and finish, minimum 7500 psi compressive strength as manufactured by Hanover Architectural Products.
- B. 30 inches by 30 inches hard rubber black walkway pads manufactured by Firestone.

2.011 PAINT AND PRIMER

- A. Alkyd base rust inhibiting exterior primer and high gloss finish paint for ferrous metal surfaces as manufactured by Shirwin Williams or equal.

PART 3 - EXECUTION

3.01 INSTALLATION

- A. General: Field measure existing openings. Comply with manufacturer's instructions and recommendations. Coordinate with the installation of roof deck, other substrates to receive specialty units, vapor barriers, roof insulation, roofing and flashing to ensure that each element of the work performs and fits properly, and that combined elements are waterproof and weathertight. Anchor units securely to supporting structural substrates, adequate to withstand lateral and thermal stresses as well as inward and outward loading pressures.

3.02 PLASTIC SKYLIGHTS

- A. Remove the existing skylight and curb assembly using care not to damage the roof deck or skylight well liner. Re-support ceiling and shaft components that are attached to the skylight curb or shaft liner. Construct or extend the existing curb to finish 10 inches above the roof surface. Install new base and cap flashings, and restore & finish the shaft liner to match the original construction. Install the new skylight on top of a 1/2 inch by 2 inch foam gasket.

3.03 DRAINS, DRAIN PIPES AND COUPLINGS

- A. Remove and replace the existing drains where roof removal and replacement work is indicated:
 - 1. Remove the existing drains and flashings; use care not to break or disturb the drain pipes within the building.
 - 2. Modify the existing drain lines to properly connect to the new drain assemblies.
 - 3. Enlarge the hole in the deck and reinforce the deck to accommodate the new drain, and install the drain recessed below the roof surface to achieve maximum drainage.
 - 4. Support the drain with a stamped sump drain receiver, secure it with an under deck clamp and patch the deck around the new drain.
 - 5. Connect the new drain to the existing drain line to conform to all applicable codes and insulate the underside of the drain body and drain line.
- B. Connect the fittings and sections of cast iron pipe using heavy duty no-hub couplings; solvent weld PVC fittings and pipe, and use threaded connections to join steel fittings and pipe.

- C. Install new drain pipes to slope 1/4 inch per foot, and support each section of pipe with a hanger, supported on a structural member or strut, on each side of every coupling. Do not rely on the couplings to support any weight. Do not hang the drain pipes from the roof deck.

3.04 PIPE INSULATION AND FITTING COVERS

- A. Install insulation on all horizontal drain piping, and on new vertical pipes installed to connect the new drains to the existing lines.
- B. Install insulation on the undersides of the new drains.
- C. Install white PVC fitting and drain bowl covers, and wrap the joints between fitting covers and pipe insulation jackets with 3 inch wide white PVC tape.

3.05 ROOF HATCHES AND HATCH GUARD RAILS

- A. Carefully remove existing roof hatch assemblies, wood blocking and shaft lining components.
- B. Cut and remove portion of the existing deck and install new steel angles to reinforce the deck opening where new hatches are being installed at new locations.
- C. Block solid under the hatch curb to support it at the level of the new roof; extend and restore the shaft liner.
- D. Orient the hatches for proper egress and install new flashings.
- E. Install guard rails, fastened to the hatch frame, above the roof flashings.

3.06 GALVANIZED STEEL ROOF ACCESS LADDERS

- A. Install ladders at the interior and exterior locations shown. Support and secure each ladder at the top and bottom and at intermediate points spaced a maximum of 5 feet on center. Use bolted steel brackets, anchored with 1/2 inch diameter stainless steel epoxy set bolts. Space the ladders to provide 7 inches of toe clearance. Extend the rails 42 inches and goose-neck form them to provide additional support at the top of the ladder.

3.07 GUARD RAIL ASSEMBLIES

- A. Fabricate the guard rail in an iron shop in equal length sections to the configuration shown and to resist an individual point load of 200 pounds.
- B. Carefully cut and cope all connections and join them with continuous arc welds. Carefully grind all welds and adjoining surfaces smooth, after welding.
- C. Provide telescoping inside expansion slip joints between sections a maximum of 20 feet on center.
- D. Shop prime all fabricated items. Spot prime all field joints and scratches prior to finish painting with two coats of finish paint.

3.08 ROOF WALKWAY PADS AND CONCRETE PAVERS

- A. Install concrete pavers, spaced 5 feet on center for pipe and conduit supports, and under equipment indicated on the drawings.
 - 1. Install pavers over a piece of hard rubber walkway pad.

- B. Install hard rubber walkway pads to provide a path 2-1/2 feet wide where shown, and at all roof access points, i.e., ladders and hatches, under concrete pavers used for conduit and pipe supports, and around all HVAC equipment.
 - 1. Adhere each pad with five self adhesive strips - do not install the pads using three strips of tape as supplied by the manufacturer.

3.09 PAINTING

- A. Scrape and wire brush the existing roof top equipment, and the vent pipes to remove loose and peeling paint and surface rust.
- B. Install one coat of primer and two finish coats of paint using a brush or roller. Wait 24 hours for each coat of paint to dry before applying the next coat.

3.010 MISCELLANEOUS

- A. Provide and install any sealants needed, where shown or required.
- B. Perform mechanical and electrical work using skilled and licensed tradesmen.
- C. Provide new material, couplings, transition pieces, blocking, fasteners and the similar accessories needed to complete the work.

3.011 CLEANING, PROTECTION AND WATERTIGHTNESS

- A. Inspect the interior and exterior of the building and grounds and submit a written report with photos to document any pre-existing leakage or damage, prior to performing any work.
- B. The Owner will conduct a similar inspection at the completion of the work, and the Contractor will be charged for all leaks and damage that were not documented in the Contractor's report or repaired to the Owners satisfaction at the Contractor's expense.
- C. Provide any equipment, material and labor necessary to protect the site, the building, its contents and occupants, pedestrians, and surrounding landscaped and paved areas from damage due to the construction work or from inclement weather during construction.
- D. Do not perform work during inclement weather. Protect incomplete work and the building from damage by inclement weather - which may occur unexpectedly. Make all work areas watertight at the end of each day's work.
- E. Clean up all litter, refuse, rubbish, scrap materials and debris at least twice a day; at noon and at the end of the work day, so the roof and site are neat, orderly and workmanlike. Place the debris in a dumpster and remove the dumpster from the site as soon as it is full or no longer being used.
- F. Carefully and thoroughly clean the entire roof to remove all residual debris when all work is complete. After cleaning the roof, thoroughly clean all drain sumps, drain lines, leader heads and leaders. Do not allow debris to enter the drainage system.

END OF SECTION

SECTION 07 8400 FIRESTOPPING

PART 1 GENERAL

1.1 RELATED DOCUMENTS

- A. Drawings and general provisions of the Contract, including School Facilities Management Contract Manual and Specifications and Division 1 Specification Sections, apply to this Section.
- B. In the event of discrepancies between the specifications and School Facilities Management Contract Manual and Specifications the School Facilities Management Contract Manual and Specifications shall prevail.

1.2 SECTION INCLUDES

- A. Firestopping systems.
- B. Firestopping of joints and penetrations in fire resistance rated and smoke resistant assemblies, whether indicated on drawings or not, and other openings indicated.

1.3 RELATED REQUIREMENTS

- A. Section 01 6116 - Volatile Organic Compound (VOC) Content Restrictions.

1.4 REFERENCE STANDARDS

- A. ASTM E119 - Standard Test Methods for Fire Tests of Building Construction and Materials; 2022.
- B. ASTM E814 - Standard Test Method for Fire Tests of Penetration Firestop Systems; 2023a.
- C. ASTM E1966 - Standard Test Method for Fire-Resistive Joint Systems; 2015 (Reapproved 2019).
- D. ASTM E2837 - Standard Test Method for Determining the Fire Resistance of Continuity Head-of-Wall Joint Systems Installed Between Rated Wall Assemblies and Nonrated Horizontal Assemblies; 2023.
- E. ITS (DIR) - Directory of Listed Products; Current Edition.
- F. FM 4991 - Approval Standard of Firestop Contractors; 2013.
- G. FM (AG) - FM Approval Guide; Current Edition.
- H. SCAQMD 1168 - Adhesive and Sealant Applications; 1989, with Amendment (2022).
- I. UL 2079 - Standard for Tests for Fire Resistance of Building Joint Systems; Current Edition, Including All Revisions.
- J. UL (FRD) - Fire Resistance Directory; Current Edition.
- K. UL 2079 - Standard Test Method of Fire Resistant Joints

1.5 SUBMITTALS

- A. See Section 01 3000 - Administrative Requirements, for submittal procedures.
- B. Schedule of Firestopping: List each type of penetration, fire rating of the penetrated assembly, and firestopping test or design number.
- C. Product Data: Provide data on product characteristics, performance ratings, and limitations.
- D. Manufacturer's Certificate: Certify that products meet or exceed specified requirements.

1.6 QUALITY ASSURANCE

- A. Fire Testing: Provide firestopping assemblies of designs that provide the scheduled fire ratings when tested in accordance with methods indicated.
 - 1. Listing in UL (FRD), FM (AG), or ITS (DIR) will be considered as constituting an acceptable test report.
- B. Manufacturer Qualifications: Company specializing in manufacturing the products specified in this section with minimum three years documented experience.

- C. Installer Qualifications: Company specializing in performing the work of this section and:

PART 2 PRODUCTS

2.1 MATERIALS

- A. Primers, Sleeves, Forms, Insulation, Packing, Stuffing, and Accessories: Provide type of materials as required for tested firestopping assembly.

2.2 FIRESTOPPING ASSEMBLY REQUIREMENTS

- A. Head-of-Wall Joint System Firestopping at Joints Between Fire-Rated Wall Assemblies and Non-Rated Horizontal Assemblies: Use 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.
- B. Floor-to-Floor, Wall-to-Wall, and Wall-to-Floor Joints, Except Perimeter, Where Both Are Fire-Rated: Use 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.
- C. Through Penetration Firestopping: Use system that has been tested according to ASTM E814 to have fire resistance F Rating equal to required fire rating of penetrated assembly.

2.3 FIRESTOPPING FOR FLOOR-TO-FLOOR, WALL-TO-FLOOR, AND WALL-TO-WALL JOINTS

- A. Gypsum Board Walls:
1. Wall to Wall Joints That Have Movement Capabilities (Dynamic):
 - a. 1 Hour Construction: UL System WW-D-0067; Hilti CP 606 Flexible Firestop Sealant.
 2. Top of Wall Joints at Concrete Over Metal Deck:
 - a. 2 Hour Construction: UL System HW-D-0034; Specified Technologies Inc. ES Elastomeric Firestop Sealant.
 - b. 2 Hour Construction: UL System HW-D-0043; Specified Technologies Inc. AS200 Elastomeric Spray.
 3. Top of Wall Joints at Concrete Over Metal Deck, Wall Parallel to Ribs:
 - a. 1 Hour Construction: UL System HW-D-0049; Hilti CFS-SP WB Firestop Joint Spray and CP 672.

2.4 FIRESTOPPING PENETRATIONS THROUGH CONCRETE AND CONCRETE MASONRY CONSTRUCTION

- A. Penetrations Through Floors or Walls By:
1. Multiple Penetrations in Large Openings:
 - a. 1 & 2 Hour Construction: UL System C-AJ-8143; Hilti FS-ONE MAX Intumescent Firestop Sealant.
 2. Uninsulated Metallic Pipe, Conduit, and Tubing:
 - a. 1 & 2 Hour Construction: UL System C-AJ-1226; Hilti FS-ONE MAX Intumescent Firestop Sealant.
 3. Electrical Cables Not In Conduit:
 - a. 1 & 2 Hour Construction: UL System W-J-3199; Hilti CFS-SL SK Firestop Sleeve Kit.
 4. Insulated Pipes:
 - a. 1 & 2 Hour Construction: UL System C-AJ-5091; Hilti FS-ONE IMAX intumescent Firestop Sealant.
 5. HVAC Ducts, Uninsulated:
 - a. 1 & 2 Hour Construction: UL System C-AJ-7111; Hilti FS-ONE MAX Intumescent Firestop Sealant.
- B. Penetrations Through Floors By:
1. Multiple Penetrations in Large Openings:
 - a. 1 & 2 Hour Construction: UL System F-A-8012; Hilti CFS-S SIL GG Firestop Silicone Sealant Gun-Grade or CFS-S SIL SL Firestop Silicone Sealant Self-Leveling.

2. Uninsulated Metallic Pipe, Conduit, and Tubing:
 - a. 1 & 2 Hour Construction: UL System F-A-1016; Hilti CP 680-P/M Cast-In Device.
3. Insulated Pipes:
 - a. 2 Hour Construction: UL System F-A-5015; Hilti CP 680-P/M Cast-In Device.
- C. Penetrations Through Walls By:
 1. Uninsulated Metallic Pipe, Conduit, and Tubing:
 - a. 2 Hour Construction: UL System W-J-1067; Hilti FS-ONE MAX Intumescent Firestop Sealant.
 - b. 1 Hour Construction: UL System W-J-1067; Hilti FS-ONE MAX Intumescent Firestop Sealant.
 2. Electrical Cables Not In Conduit:
 - a. 2 Hour Construction: UL System C-AJ-3095; Hilti FS-ONE MAX Intumescent Firestop Sealant.
 3. Insulated Pipes:
 - a. 2 Hour Construction: UL System C-AJ-5091; Hilti FS-ONE MAX Intumescent Firestop Sealant.
 - b. 1 Hour Construction: UL System C-AJ-5091; Hilti FS-ONE MAX Intumescent Firestop Sealant.
 4. HVAC Ducts, Uninsulated:
 - a. 1 & 2 Hour Construction: UL System W-J-7109; Hilti FS-ONE MAX Intumescent Firestop Sealant or CP 606 Flexible Firestop Sealant.
 5. HVAC Ducts, Insulated:
 - a. 1 & 2 Hour Construction: UL System W-J-7112; Hilti FS-ONE MAX Intumescent Firestop Sealant.

2.5 FIRESTOPPING PENETRATIONS THROUGH GYPSUM BOARD WALLS

- A. Blank Openings:
- B. Penetrations By:
 1. Multiple Penetrations in Large Openings:
 - a. 1 Hour Construction: UL System W-L-1408; Hilti FS-ONE MAX Intumescent Firestop Sealant.
 2. Uninsulated Metallic Pipe, Conduit, and Tubing:
 - a. 2 Hour Construction: UL System W-L-1054; Hilti FS-ONE MAX Intumescent Firestop Sealant.
 - b. 1 Hour Construction: UL System W-L-1164; Hilti FS-ONE MAX Intumescent Firestop Sealant.
 3. Electrical Cables Not In Conduit:
 - a. 1 Hour Construction: UL System W-L-3393; Hilti CFS-SL RK Retrofit Sleeve Kit for existing cables.
 4. Insulated Pipes:
 - a. 1 Hour Construction: UL System W-L-5028; Hilti FS-ONE MAX Intumescent Firestop Sealant.
 5. HVAC Ducts, Insulated:
 - a. 2 Hour Construction: UL System W-L-7156; Hilti FS-ONE MAX Intumescent Firestop Sealant.
 - b. 1 Hour Construction: UL System W-L-7156; Hilti FS-ONE MAX Intumescent Firestop Sealant.

2.6 MATERIALS

- A. Firestopping Sealants: Provide only products having lower volatile organic compound (VOC) content than required by South Coast Air Quality Management District Rule No.1168.
- B. Elastomeric Silicone Firestopping: Single component silicone elastomeric compound and compatible silicone sealant; conforming to the following:
 - 1. Manufacturers:
 - a. 3M Fire Protection Products; Product CP-25WB: www.3m.com/firestop.
 - b. Substitutions: See Section 01 6000 - Product Requirements.
- 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. Manufacturers:
 - a. Thermafiber, Inc; Product ____: www.thermafiber.com.
 - b. Substitutions: See Section 01 6000 - Product Requirements.
- D. Primers, Sleeves, Forms, Insulation, Packing, Stuffing, and Accessories: Type required for tested assembly design.

PART 3 EXECUTION

3.1 EXAMINATION

- A. Verify openings are ready to receive the work of this section.

3.2 PREPARATION

- A. Clean substrate surfaces of dirt, dust, grease, oil, loose material, or other materials that could adversely affect bond of firestopping material.
- B. Remove incompatible materials that could adversely affect bond.
- C. Install backing materials to prevent liquid material from leakage.

3.3 INSTALLATION

- A. Install materials in manner described in fire test report and in accordance with manufacturer's instructions, completely closing openings.
- B. Do not cover installed firestopping until inspected by authorities having jurisdiction.
- C. Install labeling required by code.

3.4 PROTECTION

- A. Protect adjacent surfaces from damage by material installation.

END OF SECTION

SECTION 07 9200
JOINT SEALANTS

PART 1 GENERAL

1.1 RELATED DOCUMENTS

- A. Drawings and general provisions of the Contract, including School Facilities Management Contract Manual and Specifications and Division 1 Specification Sections, apply to this Section.
- B. In the event of discrepancies between the specifications and School Facilities Management Contract Manual and Specifications the School Facilities Management Contract Manual and Specifications shall prevail.

1.2 SECTION INCLUDES

- A. Nonsag gunnable joint sealants.
- B. Self-leveling pourable joint sealants.
- C. Joint backings and accessories.

1.3 RELATED REQUIREMENTS

- A. Section 07 8400 - Firestopping: Firestopping sealants.
- B. Section 08 8001 - GLAZING: Glazing sealants and accessories.

1.4 REFERENCE STANDARDS

- A. ASTM C661 - Standard Test Method for Indentation Hardness of Elastomeric-Type Sealants by Means of a Durometer; 2015 (Reapproved 2022).
- B. ASTM C920 - Standard Specification for Elastomeric Joint Sealants; 2018.
- C. ASTM C1193 - Standard Guide for Use of Joint Sealants; 2016 (Reapproved 2023).
- D. ASTM C1330 - Standard Specification for Cylindrical Sealant Backing for Use with Cold Liquid-Applied Sealants; 2023.

1.5 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. Sample product warranty.
 - 7. 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 Eisenbach & Ruhnke Engineering, P.C.. and submit at least two physical samples for verification of color of each required sealant.
- F. Executed warranty.

1.6 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.

1.7 WARRANTY

- A. See Section 01 7800 - Closeout Submittals for additional warranty requirements.
- B. Manufacturer Warranty: Provide 2-year manufacturer warranty for installed sealants and accessories that fail to achieve a watertight seal, exhibit loss of adhesion or cohesion, or do not cure. Complete forms in Yonkers Public Schools's name and register with manufacturer.

1.8 MOCK-UP

- A. Mockups: Before installing joint sealants, apply elastomeric sealants as follows to verify selections made under sample submittals and to demonstrate aesthetic effects and qualities of materials and execution:
 - 1. Joints in mockups of assemblies specified in other Sections that are indicated to receive elastomeric joint sealants, which are specified by reference to this Section.
- B. Construct mock-up with specified sealant types and with other components noted.
- C. Locate where directed.
- D. Mock-up may remain as part of the Work.

PART 2 PRODUCTS

2.1 MANUFACTURERS

- A. Non-Sag Sealants: Permits application in joints on vertical surfaces without sagging or slumping.
 - 1. Bostik Inc: www.bostik-us.com.
 - 2. Dow Corning Corporation: www.dowcorning.com/construction/#sle.
 - 3. Sika Corporation: www.usa-sika.com.
 - 4. W.R. Meadows, Inc: www.wrmeadows.com/sle.
- 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. Dow Chemical Company: consumer.dow.com/en-us/industry/ind-building-construction.html/#sle.
 - 2. Sika Corporation: www.usa-sika.com/#sle.
 - 3. W.R. Meadows, Inc: www.wrmeadows.com/#sle.

2.2 JOINT SEALANT APPLICATIONS

- A. Scope:
 - 1. Exterior Joints: Seal open joints in any newly installed components, 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. Joints between door, window, and other frames and adjacent construction.
 - b. Joints between different exposed materials.
 - 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.
- B. Vertical Exterior Joints: Use non-sag polyurethane sealant, unless otherwise indicated.
- C. Interior Vertical Joints: Use non-sag polyurethane sealant, unless otherwise indicated.
 - 1. Joints between Fixtures in Wet Areas and Floors, Walls, and Ceilings: Mildew-resistant silicone sealant; white.

- D. Exterior and Interior Horizontal Joints: Single component, self-leveling, premium-grade polyurethane sealant

2.3 JOINT SEALANTS - GENERAL

- A. Sealants and Primers: Provide products with levels of volatile organic compound (VOC) content as indicated in Section 01 6116.

2.4 NONSAG JOINT SEALANTS

- A. Polyurethane Sealant: 1, Grade NS, Uses M and A; single component; not expected to withstand continuous water immersion or traffic.
1. Movement Capability: Plus 100 percent, minus 50 percent, minimum.
 2. Color: To be selected by Eisenbach & Ruhnke Engineering, P.C.. from manufacturer's standard range.
 3. Service Temperature Range: Minus 40 to 180 degrees F.
 4. Manufacturers:
 - a. Pecora Corporation; Dynatrol I;: www.pecora.com.
 - b. Sika Corporation; Sikaflex-1a: www.usa-sika.com.
 5. Applications: Use for:
 - a. All exterior and interior vertical joints.
 6. Substitutions: 01 2500 - Substitution Procedures

2.5 SELF-LEVELING SEALANTS

- A. Self-Leveling Silicone Sealant: 1, Grade P, Uses M and A; single or multicomponent, explicitly approved by manufacturer for traffic exposure when recessed below traffic surface; not expected to withstand continuous water immersion.
1. Movement Capability: Plus 100 percent, minus 50 percent, minimum.
 2. Hardness Range: 0 to 15, Shore A, when tested in accordance with ASTM C661.
 3. Color: To be selected by Eisenbach & Ruhnke Engineering, P.C.. from manufacturer's standard range.
 4. Service Temperature Range: Minus 40 to 180 degrees F.
 5. Manufacturers:
 - a. Dow; DOWSIL SL Parking Structure Sealant: www.dow.com/#sle.
 - b. Pecora Corporation; Pecora 300 SL (Self-Leveling): www.pecora.com/#sle.
 - c. Sika Corporation; Sikaflex 1c SL: www.usa-sika.com/#sle.
 - d. Use for all horizontal exterior joints .
 - e. Substitutions: 01 2500 - Substitution Procedures

2.6 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: 1; Type O - Open Cell Polyurethane.
 2. Type for Joints Subject to Pedestrian or Vehicular Traffic: 1; Type C - Closed Cell Polyethylene.
 3. Open Cell: 40 to 50 percent larger in diameter than joint width. (Not to be used in flat or horizontal joints)
 4. Closed Cell and Bi-Cellular: 25 to 33 percent larger in diameter than joint width. (Use for flat and horizontal joints)
- 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. Masking Tape: Self-adhesive, nonabsorbent, non-staining, removable without adhesive residue, and compatible with surfaces adjacent to joints and sealants.
- D. Primers: Type recommended by sealant manufacturer to suit application; non-staining.

PART 3 EXECUTION

3.1 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.

3.2 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.

3.3 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.
- H. Self-leveling joints: Recess joint depth as recommended by the sealant manufacturer.

END OF SECTION

SECTION 08 1113
HOLLOW METAL DOORS AND FRAMES

PART 1 GENERAL

1.1 RELATED DOCUMENTS

- A. Drawings and general provisions of the Contract, including School Facilities Management Contract Manual and Specifications and Division 1 Specification Sections, apply to this Section.
- B. In the event of discrepancies between the specifications and School Facilities Management Contract Manual and Specifications the School Facilities Management Contract Manual and Specifications shall prevail.

1.2 SECTION INCLUDES

- A. Standard and custom hollow metal doors and frames
 - 1. Fire-rated hollow metal doors and frames.

1.3 RELATED REQUIREMENTS

- A. Section 08 1613 - Fiberglass Doors and Aluminum Frames
- B. Section 09 9123 - Interior Painting.

1.4 ABBREVIATIONS AND ACRONYMS

- A. HMMA: Hollow Metal Manufacturers Association.
- B. SDI: Steel Door Institute.
- C. UL: Underwriters Laboratories.

1.5 REFERENCE STANDARDS

- A. ADA Standards - 2010 ADA Standards for Accessible Design; 2010.
- B. ANSI/ICC A117.1 - American National Standard for Accessible and Usable Buildings and Facilities; International Code Council; 2009.
- C. ANSI/NFPA 105: Standard for the Installation of Smoke Door Assemblies.
- D. ANSI/SDI 122 - Installation and Troubleshooting Guide for Standard Steel Doors and Frames.
- E. ANSI/NFPA 80 - Standard for Fire Doors and Fire Windows; National Fire Protection Association
- F. ANSI/BHMA A156.115 - Hardware Preparation in Steel Doors and Frames.
- G. ANSI/SDI A250.4 - Test Procedure and Acceptance Criteria for Physical Endurance for Steel Doors, Frames and Frame Anchors; 2022.
- H. ANSI/SDI A250.6 - Recommended Practice for Hardware Reinforcing on Standard Steel Doors and Frames; 2020.
- I. ANSI/SDI A250.8 - Specifications for Standard Steel Doors and Frames (SDI-100); 2023.
- J. ANSI/SDI A250.10 - Test Procedure and Acceptance Criteria for Prime Painted Steel Surfaces for Steel Doors and Frames; 2020.
- K. ANSI/SDI A250.11 - Recommended Erection Instructions for Steel Frames.
- L. ASTM A653/A653M - Standard Specification for Steel Sheet, Zinc-Coated (Galvanized) or Zinc-Iron Alloy-Coated (Galvannealed) by the Hot-Dip Process; 2023.
- M. ASTM A924 - Standard Specification for General Requirements for Steel Sheet, Metallic-Coated by the Hot-Dip Process.
- N. ASTM A1008/A1008M - Standard Specification for Steel, Sheet, Cold-Rolled, Carbon, Structural, High-Strength Low-Alloy, High-Strength Low-Alloy with Improved Formability, Required Hardness, Solution Hardened, and Bake Hardenable; 2021a.

- O. ASTM A1011/A1011M - Standard Specification for Steel, Sheet and Strip, Hot-Rolled, Carbon, Structural, High-Strength Low-Alloy, High-Strength Low-Alloy with Improved Formability, and Ultra-High Strength; 2023.
- P. ASTM C 1363 - Standard Test Method for Thermal Performance of Building Assemblies by Means of a Hot Box Apparatus
- Q. ASTM E330/E330M - Standard Test Method for Structural Performance of Exterior Windows, Doors, Skylights and Curtain Walls by Uniform Static Air Pressure Difference; 2014 (Reapproved 2021).
- R. ASTM E413 - Classification for Rating Sound Insulation; 2022.
- S. BHMA A156.115 - Hardware Preparation in Steel Doors and Frames; 2016.
- T. ICC A117.1 - Accessible and Usable Buildings and Facilities; 2017.
- U. ITS (DIR) - Directory of Listed Products; Current Edition.
- V. NAAMM HMMA 831 - Hardware Locations for Hollow Metal Doors and Frames; 2011.
- W. NAAMM HMMA 840 - Guide Specifications For Receipt, Storage and Installation of Hollow Metal Doors and Frames; 2017.
- X. NAAMM HMMA 861 - Guide Specifications for Commercial Hollow Metal Doors and Frames; 2014.
- Y. NFPA 252 - Standard Methods of Fire Tests of Door Assemblies; 2022.
- Z. SDI 117 - Manufacturing Tolerances for Standard Steel Doors and Frames; 2023.
- AA. UL (BMD) - Building Materials Directory; current edition.
- AB. UL (DIR) - Online Certifications Directory; Current Edition.
- AC. UL 10C - Standard for Positive Pressure Fire Tests of Door Assemblies; Current Edition, Including All Revisions.
- AD. UL 1784 - Standard for Air Leakage Tests of Door Assemblies; Current Edition, Including All Revisions.

1.6 SUBMITTALS

- A. See Section 01 3000 - Administrative Requirements, for submittal procedures.
- B. Product Data: Materials and details of design and construction, hardware locations, reinforcement type and locations, anchorage and fastening methods, and finishes.

1.7 QUALITY ASSURANCE

- A. Manufacturer Qualifications: Company specializing in manufacturing products specified in this section, with not less than ten (10) years documented experience.
- B. Installer Qualifications: Company specializing in performing work of the type specified and with at least five (5) years of documented experience.
- C. Source Limitations: Obtain hollow metal doors and frames through one source from a single manufacturer wherever possible.
- D. Quality Standard: In addition to requirements specified, furnish SDI-Certified manufacturer products that comply with ANSI/SDI A250.8, latest edition, "Recommended Specifications for Standard Steel Doors and Frames".
- E. Fire-Rated Door Assemblies: Assemblies complying with NFPA 80 that are listed and labeled by a qualified testing agency, for fire-protection ratings indicated, based on testing at positive pressure according to UL10C (neutral pressure at 40" above sill) or UL 10C.

1.8 DELIVERY, STORAGE, AND HANDLING

- A. Comply with NAAMM HMMA 840 or ANSI/SDI A250.8 (SDI-100) in accordance with specified requirements.
- B. Deliver hollow metal work palletized, wrapped, or crated to provide protection during transit and Project site storage. Do not use non-vented plastic.

- C. Deliver welded frames with two removable spreader bars across bottom of frames, tack welded to jambs and mullions.
- D. Store hollow metal work under cover at Project site. Place in stacks of five units maximum in a vertical position with heads up, spaced by blocking, on minimum 4-inch high wood blocking. Do not store in a manner that traps excess humidity.
 - 1. Provide minimum 1/4-inch space between each stacked door to permit air circulation. Door and frames to be stacked in a vertical upright position

1.9 PROJECT CONDITIONS

- A. Field Measurements: Verify actual dimensions of openings by field measurements before fabrication.

1.10 COORDINATION

- A. Coordinate installation of anchorages for hollow metal frames. Furnish setting drawings, templates, and directions for installing anchorages, including sleeves, concrete inserts, anchor bolts, and items with integral anchors. Deliver such items to Project site in time for installation.

1.11 WARRANTY

- A. Special Warranty: Manufacturer's standard form in which manufacturer agrees to repair or replace doors that fail in materials or workmanship within specified warranty period.
- B. Warranty includes installation and finishing that may be required due to repair or replacement of defective doors.
- C. Refer to Section 01 7800 - Closeout Submittals for additional requirements.

PART 2 PRODUCTS

2.1 MANUFACTURERS

- A. Hollow Metal Doors and Frames:
 - 1. Ceco Door, an Assa Abloy Group company: www.assaabloydss.com.
 - 2. Curries, an Assa Abloy Group company: www.assaabloydss.com.
 - 3. Steelcraft, an Allegion brand 1819 N. Pennsylvania St. Carmel, IN 46032; Toll Free Tel: 877-578-1247: www.allegion.com/us.
 - 4. Substitutions: See Section 01 2500 Substitution Procedures .

2.2 PERFORMANCE REQUIREMENTS

- A. Requirements for Hollow Metal Doors and Frames:
 - 1. Steel Sheet: Comply with one or more of the following requirements; galvanized steel complying with ASTM A653/A653M, cold-rolled steel complying with ASTM A1008/A1008M, or hot-rolled pickled and oiled (HRPO) steel complying with ASTM A1011/A1011M, commercial steel (CS) Type B, for each.
 - 2. Accessibility: Comply with ICC A117.1 and ADA Standards.
 - 3. Door Top Closures: Flush end closure channel, with top and door faces aligned.
 - 4. Door Edge Profile: Beveled.
 - 5. Typical Door Face Sheets: Flush.
 - 6. Hardware Preparations, Selections and Locations: Comply with NAAMM HMMA 830 and NAAMM HMMA 831 or BHMA A156.115 and ANSI/SDI A250.8 (SDI-100) in accordance with specified requirements.
 - a. Provide 14 gauge channel reinforcing for all door closers.
 - 7. Galvanizing including all doors and frames: All components hot-dipped zinc-iron alloy-coated (galvanized), manufacturer's standard coating thickness.

2.3 STEEL DOORS

- A. Fire-Rated Doors:

1. Grade: ANSI A250.8 Level 3, physical performance Level A, Model 1, full flush continuous welded.
 - a. Level 2 - Heavy-duty.
 - b. Physical Performance Level B, 500,000 cycles; in accordance with ANSI/SDI A250.4.
 - c. Model 1 - Full Flush.
 - d. Door Face Metal Thickness: 18 gage, 0.042 inch, minimum.
 - e. Zinc Coating: A60/ZF180 galvanized coating; ASTM A653/A653M.
2. Fire Rating: 1-1/2 hours, tested in accordance with UL 10C and NFPA 252 ("positive pressure fire tests").
 - a. Provide units listed and labeled by UL (DIR) or ITS (DIR).
 - b. Attach fire rating label to each fire rated unit.
3. Door Core Material: Vertical steel stiffeners tack welded to face sheets with insulation between.
4. Door Thickness: 1-3/4 inches, nominal.
5. Door Face Sheets: Flush.
6. Door Finish: Factory primed and field finished.
7. Product:
 - a. Curries, an Assa Abloy Group Company; Series 707: www.assaabloydss.com.
 - b. Ceco Door, an Assa Abloy Group company; Legion: www.assaabloydss.com.

2.4 HOLLOW METAL FRAMES

- A. Comply with standards and/or custom guidelines as indicated for corresponding door in accordance with applicable door frame requirements.
- B. Frame Finish: Same as hollow metal door.
- C. Interior Door Frames, Fire-Rated: Full profile/continuously welded type..
 1. Fire Rating: Same as door, labeled.
 2. Frame Metal Thickness: 14 gage, 0.067 inch, minimum.
 3. Frame Finish: Factory primed and field finished.
- D. Provide mortar guard boxes for hardware cut-outs in frames to be installed in masonry or to be grouted.

2.5 FINISHES

- A. Refer to Section 09 9113 Exterior Painting and 09 9123 Interior Painting.
- B. Primer: Rust-inhibiting, complying with 1, zinc molybdate type.

2.6 ACCESSORIES

- A. Door Window Frames: Door window frames with glazing securely fastened within door opening.
 1. Size: As indicated on drawings.
 2. Stops and Moldings: Provide stops and moldings around glazed lites where indicated. Form corners of stops and moldings with butted or mitered hairline joints at fabricator's shop. Fixed and removable stops to allow multiple glazed lites each to be removed independently. Coordinate frame rabbet widths between fixed and removable stops with the type of glazing and installation indicated.
 3. Moldings for Glazed Lites in Doors and Loose Stops for Glazed Lites in Frames: Fabricated from same material as door face sheet in which they are installed.
 4. Fixed Frame Moldings: Formed integral with hollow metal frames, a minimum of 5/8 inch (16 mm) high unless otherwise indicated. Provide fixed frame moldings and stops on outside of exterior and on secure side of interior doors and frames.
 5. Preformed Metal Frames for Light Openings: Manufacturer's standard frame formed of 0.048-inch-thick, cold rolled steel sheet; with baked enamel or powder coated finish; and approved for use in doors of fire protection rating indicated.
 6. Metal Finish: Match door

7. Glazing: Refer to Section 08 8000.
- B. Mortar Guards: Formed from same material as frames, not less than 0.016 inches thick.
- C. Grout for Frames: Mortar grout complying with ASTM C476 with maximum slump of 4 inches as measured in accordance with ASTM C143/C143M for hand troweling in place; plaster grout and thinner pumpable grout are prohibited.
- D. Silencers: Resilient rubber, fitted into drilled hole; provide three on strike side of single door, three on center mullion of pairs, and two on head of pairs without center mullions.
- E. Temporary Frame Spreaders: Provide for factory- or shop-assembled frames.
- F. Frame Anchors: Minimum of six wall anchors and two base anchors.
 1. Masonry Type: Adjustable strap-and-stirrup or T-shaped anchors to suit frame size, formed from A60 metallic coated material, not less than 0.042 inch thick, with corrugated or perforated straps not less than 2 inches wide by 10 inches long; or wire anchors not less than 0.177 inch thick.
 2. Floor Anchors: Floor anchors to be provided at each jamb, formed from A60 metallic coated material, not less than 0.042 inches thick.

2.7 FABRICATION

- A. Fabricate hollow metal work to be rigid and free of defects, warp, or buckle. Accurately form metal to required sizes and profiles, with minimum radius for thickness of metal. Where practical, fit and assemble units in manufacturer's plant. When shipping limitations so dictate, frames for large openings are to be fabricated in sections for splicing or splining in the field by others.
- B. Tolerances: Fabricate hollow metal work to tolerances indicated in ANSI/SDI A250.8.
- C. Hollow Metal Doors:
 1. Glazed Lites: Factory cut openings in doors with applied trim or kits to fit. Factory install glazing where indicated.
- D. Hollow Metal Frames:
 1. Shipping Limitations: Where frames are fabricated in sections due to shipping or handling limitations, provide alignment plates or angles at each joint, fabricated of same thickness metal as frames.
 2. Welded Frames: Weld joints continuously through full throat width of frames, including rabbets, soffits, and stops; grind, fill, dress, and make smooth, flush, and invisible.
 - a. Welded frames are to be provided with two steel spreaders temporarily attached to the bottom of both jambs to serve as a brace during shipping and handling. Spreader bars are for bracing only and are not to be used to size the frame opening.
 3. Sidelight and Transom Bar Frames: Provide closed tubular members with no visible face seams or joints, fabricated from same material as door frame. Fasten members at crossings and to jambs by butt welding.
 4. Equal Rabbet Frames: Provide frames with equal rabbet dimensions unless glazing and removable stops require wider dimensions on glass side of frame.
 5. High Frequency Hinge Reinforcement: Provide high frequency hinge reinforcements at door openings 48-inches and wider with mortise butt type hinges at top hinge locations.
 6. Continuous Hinge Reinforcement: Provide welded continuous 12 gauge straps for continuous hinges specified in hardware sets in Division 08 Section "Door Hardware".
 7. Provide countersunk, flat- or oval-head exposed screws and bolts for exposed fasteners unless otherwise indicated for removable stops, provide security screws at exterior locations.
 8. Mortar Guards: Provide guard boxes at back of hardware mortises in frames at all hinges and strike preps regardless of grouting requirements.
 9. Jamb Anchors: Provide number and spacing of anchors as follows:

- a. Masonry Type: Locate anchors not more than 18 inches from top and bottom of frame. Space anchors not more than 32 inches o.c. and as follows:
 - a) Two anchors per jamb up to 60 inches high.
 - b) Three anchors per jamb from 60 to 90 inches high.
 - c) Four anchors per jamb from 90 to 120 inches high.
 - d) Four anchors per jamb plus 1 additional anchor per jamb for each 24 inches or fraction thereof above 120 inches high.
- 10. Door Silencers: Except on weatherstripped or gasketed doors, drill stops to receive door silencers. Silencers to be supplied by frame manufacturer regardless if specified in Division 08 Section "Door Hardware".
- E. Hardware Preparation: Factory prepare hollow metal work to receive template mortised hardware; include cutouts, reinforcement, mortising, drilling, and tapping according to the Door Hardware Schedule and templates furnished as specified in Division 08 Section "Door Hardware."
 - 1. Locate hardware as indicated, or if not indicated, according to ANSI/SDI A250.8.
 - 2. Reinforce doors and frames to receive non-template, mortised and surface mounted door hardware.
 - 3. Comply with applicable requirements in ANSI/SDI A250.6 and ANSI/DHI A115 Series specifications for preparation of hollow metal work for hardware.
 - 4. Coordinate locations of conduit and wiring boxes for electrical connections with Division 26 Sections.

2.8 STEEL FINISHES

- A. Prime Finishes: Doors and frames to be cleaned, and chemically treated to insure maximum finish paint adhesion. Surfaces of the door and frame exposed to view to receive a factory applied coat of rust inhibiting shop primer.
 - 1. Shop Primer: Manufacturer's standard, fast-curing, lead and chromate free primer complying with ANSI/SDI A250.10 acceptance criteria; recommended by primer manufacturer for substrate; and compatible with substrate and field-applied coatings.

PART 3 EXECUTION

3.1 EXAMINATION

- A. Verify existing conditions before starting work.
- B. Verify that opening sizes and tolerances are acceptable.
- C. Verify that finished walls are in plane to ensure proper door alignment.

3.2 PREPARATION

- A. Coat inside of frames to be installed in masonry or to be grouted, with bituminous coating, prior to installation.
- B. Remove welded in shipping spreaders installed at factory. Restore exposed finish by grinding, filling, and dressing, as required to make repaired area smooth, flush, and invisible on exposed faces.
- C. Prior to installation, adjust and securely brace welded hollow metal frames for square, level, twist, and plumb condition.
- D. Tolerances shall comply with SDI-117 "Manufacturing Tolerances Standard Steel Doors and Frames."
- E. Drill and tap doors and frames to receive non-template, mortised, and surface-mounted door hardware.

3.3 INSTALLATION

- A. Install doors and frames in accordance with manufacturer's instructions and related requirements of specified door and frame standards or custom guidelines indicated and NAAMM HMMA 840.
- B. 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. Hollow Metal Frames: Install hollow metal frames of size and profile indicated. Comply with ANSI/SDI A250.11 and NFPA 80 at fire rated openings.
 - 1. Set frames accurately in position, plumbed, leveled, aligned, and braced securely until permanent anchors are set. After wall construction is complete and frames properly set and secured, remove temporary braces, leaving surfaces smooth and undamaged. Shim as necessary to comply with installation tolerances.
 - 2. Floor Anchors: Provide floor anchors for each jamb and mullion that extends to floor, and secure with post-installed expansion anchors.
 - 3. Masonry Walls: Coordinate installation of frames to allow for solidly filling space between frames and masonry with mortar.
 - 4. Grout Requirements: Do not grout head of frames unless reinforcing has been installed in head of frame. Do not grout vertical or horizontal closed mullion members.
- F. Hollow Metal Doors: Fit hollow metal doors accurately in frames, within clearances specified below. Shim as necessary.
 - 1. Non-Fire-Rated Standard Steel Doors:
 - a. Jambs and Head: 1/8 inch plus or minus 1/16 inch.
 - b. Between Edges of Pairs of Doors: 1/8 inch plus or minus 1/16 inch.
 - c. Between Bottom of Door and Top of Threshold: Maximum 3/8 inch.
 - d. Between Bottom of Door and Top of Finish Floor (No Threshold): Maximum 3/4 inch.
 - 2. Fire-Rated Doors: Install doors with clearances according to NFPA 80.
- G. Field Glazing: Comply with installation requirements in Section 08 8000 - Glazing and with hollow metal manufacturer's written instructions.
- H. Install door hardware as specified in Section 08 7100.
- I. Comply with glazing installation requirements of Section 08 8000.
- J. Coordinate installation of electrical connections to electrical hardware items.
- K. Touch up damaged factory finishes.
- L. Field paint all doors and frames in accordance with specification section 09 9000.

3.4 TOLERANCES

- A. Clearances Between Door and Frame: Comply with related requirements of specified frame standards or custom guidelines indicated in accordance with SDI 117 or NAAMM HMMA 861.
- B. Maximum Diagonal Distortion: 1/16 inch measured with straight edge, corner to corner.

3.5 ADJUSTING

- A. Adjust for smooth and balanced door movement.
- B. Final Adjustments: Check and readjust operating hardware items immediately before final inspection. Leave work in complete and proper operating condition. Remove and replace defective work, including hollow metal work that is warped, bowed, or otherwise unacceptable.
- C. Remove grout and other bonding material from hollow metal work immediately after installation.
- D. Prime-Coat and Painted Finish Touchup: Immediately after erection, sand smooth rusted or damaged areas of prime coat, or painted finishes, and apply touchup of compatible air drying, rust-inhibitive primer, zinc rich primer (exterior and galvanized openings) or finish paint.

3.6 SCHEDULE

- A. Refer to Door and Frame Schedule on the drawings.

END OF SECTION

SECTION 08 7101 DOOR HARDWARE

PART 1 GENERAL

1.1 RELATED DOCUMENTS

- A. Drawings and general provisions of the Contract, including School Facilities Management Contract Manual and Specifications and Division 1 Specification Sections, apply to this Section.
- B. In the event of discrepancies between the specifications and School Facilities Management Contract Manual and Specifications the School Facilities Management Contract Manual and Specifications shall prevail.

1.2 SUMMARY

- A. This Section includes commercial door hardware for the following:
 - 1. Swinging doors.
- B. Door hardware includes, but is not necessarily limited to, the following:
 - 1. Mechanical door hardware.
 - 2. Electromechanical door hardware.
- C. Related Sections:
 - 1. Section 08 1113 - Hollow Metal Doors and Frames.
- D. Codes and References: Comply with the version year adopted by the Authority Having Jurisdiction.
 - 1. ANSI A117.1 - Accessible and Usable Buildings and Facilities.
 - 2. ICC/IBC - International Building Code.
 - 3. NFPA 70 - National Electrical Code.
 - 4. NFPA 80 - Fire Doors and Windows.
 - 5. NFPA 101 - Life Safety Code.
 - 6. Section 01 4100 - Regulatory Requirements: State Building Codes, Local Amendments.
- E. Standards: All hardware specified herein shall comply with the following industry standards:
 - 1. ANSI/BHMA Certified Product Standards - A156 Series
 - 2. UL10C - Positive Pressure Fire Tests of Door Assemblies

1.3 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. Warranty information for each product.
- 4. 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.
- C. Shop Drawings: Details of electrified access control hardware indicating the following:
 - 1. Wiring Diagrams: Upon receipt of approved schedules, submit detailed system wiring diagrams for power, signaling, monitoring, communication, and control of the access control system electrified hardware. Differentiate between manufacturer-installed and field-installed wiring. Include the following:
 - a. Elevation diagram of each unique access controlled opening showing location and interconnection of major system components with respect to their placement in the respective door openings.
 - b. Complete (risers, point-to-point) access control system block wiring diagrams.
 - c. Wiring instructions for each electronic component scheduled herein.
 - 2. Electrical Coordination: Coordinate with related sections the voltages and wiring details required at electrically controlled and operated hardware openings.
- D. Keying Schedule: After a keying meeting with the owner has taken place prepare a separate keying schedule detailing final instructions. Submit the keying schedule in electronic format. Include keying system explanation, door numbers, key set symbols, hardware set numbers and special instructions. Owner must approve submitted keying schedule prior to the ordering of permanent cylinders/cores.
- E. Informational Submittals:
 - 1. 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.
- F. 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 Procedures.

1.4 QUALITY ASSURANCE

- A. Manufacturers Qualifications: Engage qualified manufacturers with a minimum five (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: A minimum three (3) years documented experience installing both standard and electrified door 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 five (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 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 this section from a single source unless otherwise indicated.
- E. Keying Conference: Conduct conference to comply with requirements in Section 01 3000 - Administrative Requirements. Keying conference to incorporate the following criteria into the final keying schedule document:
 - 1. Function of building, purpose of each area and degree of security required.
 - 2. Plans for existing and future key system expansion.
 - 3. Requirements for key control storage and software.
 - 4. Installation of permanent keys, cylinder cores and software.
 - 5. Address and requirements for delivery of keys.

1.5 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 YPS Office of Facilities Management via registered mail or overnight package service. Instructions for delivery to the YPS Office of Facilities Management shall be established at the "Keying Conference".

1.6 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: 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.

1.7 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.
- B. Warranty Period: Written warranty, executed by manufacturer(s), agreeing to repair or replace components of standard and electrified door hardware that fails in materials or workmanship within specified warranty period after final acceptance by the Owner. Failures include, but are not limited to, the following:
 - 1. Structural failures including excessive deflection, cracking, or breakage.
 - 2. Faulty operation of the hardware.
 - 3. Deterioration of metals, metal finishes, and other materials beyond normal weathering.
 - 4. Electrical component defects and failures within the systems operation.
- C. Standard Warranty Period: One year from date of Substantial Completion, unless otherwise indicated.
- D. Special Warranty Periods:
 - 1. Seven years for heavy duty cylindrical (bored) locks and latches.
 - 2. Five years for exit hardware.
 - 3. Twenty five years for manual surface door closer bodies.

4. Two years for electromechanical door hardware.

1.8 MAINTENANCE SERVICE

- A. Maintenance Tools and Instructions: Furnish a complete set of specialized tools and maintenance instructions as needed for YPS Office of Facilities Management's continued adjustment, maintenance, and removal and replacement of door hardware. Refer to Section 01 7900 - Demonstration and Training.

PART 2 PRODUCTS

2.1 SCHEDULED DOOR HARDWARE

- A. General: Provide door hardware for each door to comply with requirements in Door Hardware Sets and each referenced section that products are to be supplied under.
- B. Designations: Requirements for quantity, item, size, finish or color, grade, function, and other distinctive qualities of each type of door hardware are indicated in the Door Hardware Sets at the end of Part 3. Products are identified by using door hardware designations, as follows:
 1. Named Manufacturer's Products: Product designation and manufacturer are listed for each door hardware type required for the purpose of establishing requirements. Manufacturers' names are abbreviated in the Door Hardware Schedule.
- C. Substitutions: Requests for substitution and product approval for inclusive mechanical and electromechanical door hardware in compliance with the specifications must be submitted in writing and in accordance with the procedures and time frames outlined in Section 01 2500 - Substitution Procedures. Approval of requests is at the discretion of the YPS Office of Facilities Management and Fuller and D'Angelo, P.C.
 1. Fuller and D'Angelo, P.C. will not review or approve substitutions during the bidding phase.

2.2 HANGING DEVICES

- A. Hinges: ANSI/BHMA A156.1 certified butt hinges with number of hinge knuckles as specified in the Door Hardware Sets.
 1. Quantity: Provide the following hinge quantity, unless otherwise indicated:
 - a. Two Hinges: For doors with heights up to 60 inches.
 - b. Three Hinges: For doors with heights 61 to 90 inches.
 - c. Four Hinges: For doors with heights 91 to 120 inches.
 - d. For doors with heights more than 120 inches, provide 4 hinges, plus 1 hinge for every 30 inches of door height greater than 120 inches.
 2. Hinge Size: Provide the following, unless otherwise indicated, with hinge widths sized for door thickness and clearances required:
 - a. Widths up to 3'0": 4-1/2" standard or heavy weight as specified.
 - b. Sizes from 3'1" to 4'0": 5" standard or heavy weight as specified.
 3. Hinge Weight and Base Material: Unless otherwise indicated, provide the following:
 - a. Exterior Doors: Heavy weight, non-ferrous, ball bearing hinges unless Hardware Sets indicate standard weight.
 - b. Interior Doors: Standard weight, steel, ball bearing hinges unless Hardware Sets indicate heavy weight.
 4. Hinge Options: Comply with the following where indicated in the Hardware Sets or on Drawings:
 - a. Non-removable Pins: Provide set screw in hinge barrel that, when tightened into a groove in hinge pin, prevents removal of pin while door is closed.
 5. Acceptable Manufacturers:
 - a. McKinney Products (MK). ASSA ABLOY Architectural Door Accessories (MK) - TA Series.
 - b. Bommer Industries (BO) - LB Series.
 - c. Hager Companies (HA) - CB Series.

2.3 CYLINDERS AND KEYING

- A. General: Cylinder manufacturer to have minimum (10) years experience designing secured master key systems and have on record a published security keying system policy.
- B. Source Limitations: Obtain each type of keyed cylinder and keys from the same source manufacturer as locksets and exit devices, unless otherwise indicated.
 - 1. Manufacturers:
 - a. Corbin Russwin Hardware (RU).
- C. Cylinders: Original manufacturer cylinders complying with the following:
 - 1. Mortise Type: Threaded cylinders with rings and cams to suit hardware application.
 - 2. Rim Type: Cylinders with back plate, flat-type vertical or horizontal tailpiece, and raised trim ring.
 - 3. Bored-Lock Type: Cylinders with tailpieces to suit locks.
 - 4. Mortise and rim cylinder collars to be solid and recessed to allow the cylinder face to be flush and be free spinning with matching finishes.
 - 5. Keyway: Match Facility Standard
- D. Permanent Cores: Manufacturer's standard; finish face to match lockset; complying with the following:
 - 1. Removable Cores: Core insert, removable by use of a special key, and for use with only the core manufacturer's cylinder and door hardware. Provide removable core (small or large format) as specified in Hardware Sets.
- E. Keying System: Each type of lock and cylinders to be factory keyed.
 - 1. Conduct specified "Keying Conference" to define and document keying system instructions and requirements.
 - 2. Furnish factory cut, nickel-silver large bow permanently inscribed with a visual key control number as directed by Owner.
 - 3. Existing System: Field verify and key locks to match Owner's existing system.
- F. Key Quantity: Provide the following minimum number of keys:
 - 1. Change Keys per Cylinder: Three (3).
 - 2. Master Keys (per Master Key Level/Group): Five (5).
 - 3. Construction Keys (where required): Ten (10).
 - 4. Construction Control Keys (where required): Two (2).
 - 5. Permanent Control Keys (where required): Two (2).
- G. Construction Keying: Provide temporary keyed construction cores.
- H. Key Registration List (Bitting List):
 - 1. Provide keying transcript list to Owner's representative in the proper format for importing into key control software.
 - 2. Provide transcript list in writing or electronic file as directed by the Owner.

2.4 MECHANICAL LOCKS AND LATCHING DEVICES

- A. Cylindrical Locksets, Grade 1 (Heavy Duty): ANSI/BHMA A156.2, Series 4000, Grade 1 certified.
 - 1. Furnish with solid cast levers, standard 2 3/4" backset, and 1/2" (3/4" at rated paired openings) throw brass or stainless steel latchbolt.
 - 2. Locks are to be non-handed and fully field reversible.
 - 3. Extended cycle test: Locks to have been cycle tested in ordinance with ANSI/BHMA 156.2 requirements to 2 million cycles.
 - 4. Manufacturers:
 - a. Corbin Russwin Hardware (RU) – CL3300 Series.
 - b. Sargent Manufacturing (SA) – 10 Line.

2.5 ELECTROMECHANICAL LOCKS AND LATCHING DEVICES

- A. Mortise Locksets, Grade 1 (Heavy Duty): ANSI/BHMA A156.13 Series 1000, Grade 1 certified locksets furnished in the functions as specified in the Hardware Sets. Lock chassis fabricated of heavy gauge steel, zinc dichromate plated, with through-bolted application. Furnish with solid cast levers, standard 2 3/4" backset, and 1/2" (3/4" at rated paired openings) throw brass or stainless steel latchbolt. . UL listed. Fail secure.
 - 1. Acceptable Manufacturers:
 - a. Corbin Russwin Hardware (RU) – ML20900 ECLSeries.
- B. Lock Trim Design: As specified in Hardware Sets.

2.6 LOCK AND LATCH STRIKES

- A. Strikes: Provide manufacturer's standard strike with strike box for each latch or lock bolt, with curved lip extended to protect frame, finished to match door hardware set, unless otherwise indicated, and as follows:
 - 1. Flat-Lip Strikes: For locks with three-piece antifriction latchbolts, as recommended by manufacturer.
 - 2. Extra-Long-Lip Strikes: For locks used on frames with applied wood casing trim.
 - 3. Aluminum-Frame Strike Box: Provide manufacturer's special strike box fabricated for aluminum framing.
 - 4. Double-lipped strikes: For locks at double acting doors. Furnish with retractable stop for rescue hardware applications.
- B. Standards: Comply with the following:
 - 1. Strikes for Mortise Locks and Latches: BHMA A156.13.
 - 2. Strikes for Bored Locks and Latches: BHMA A156.2.
 - 3. Strikes for Auxiliary Deadlocks: BHMA A156.36.
 - 4. Dustproof Strikes: BHMA A156.16.

2.7 CONVENTIONAL EXIT DEVICES

- A. General Requirements: All exit devices specified herein shall meet or exceed the following criteria:
 - 1. At doors not requiring a fire rating, provide devices complying with NFPA 101 and listed and labeled for "Panic Hardware" according to UL305. Provide proper fasteners as required by manufacturer including sex nuts and bolts at openings specified in the Hardware Sets.
 - 2. Where exit devices are required on fire rated doors, provide devices complying with NFPA 80 and with UL labeling indicating "Fire Exit Hardware". Provide devices with the proper fasteners for installation as tested and listed by UL. Consult manufacturer's catalog and template book for specific requirements.
 - 3. Except on fire rated doors, provide exit devices with hex key dogging device to hold the pushbar and latch in a retracted position. Provide optional keyed cylinder dogging on devices where specified in Hardware Sets.
 - 4. Devices must fit flat against the door face with no gap that permits unauthorized dogging of the push bar. The addition of filler strips is required in any case where the door light extends behind the device as in a full glass configuration.
 - 5. Lever Operating Trim: Where exit devices require lever trim, furnish manufacturer's heavy duty escutcheon trim with threaded studs for thru-bolts.
 - a. Lock Trim Design: As indicated in Hardware Sets, provide finishes and designs to match that of the specified locksets.
 - b. Where function of exit device requires a cylinder, provide a cylinder (Rim or Mortise) as specified in Hardware Sets.
 - 6. Vertical Rod Exit Devices: Where surface or concealed vertical rod exit devices are used at interior openings, provide as less bottom rod (LBR) unless otherwise indicated. Provide dust proof strikes where thermal pins are required to project into the floor.

7. Rail Sizing: Provide exit device rails factory sized for proper door width application.
 8. Through Bolt Installation: For exit devices and trim as indicated in Door Hardware Sets.
- B. Conventional Push Rail Exit Devices (Heavy Duty): ANSI/BHMA A156.3, Grade 1 certified panic and fire exit hardware devices furnished in the functions specified in the Hardware Sets. Exit device latch to be stainless steel, pullman type, with deadlock feature.
1. Manufacturers:
 - a. Corbin Russwin Hardware (RU) - ED4000 / ED5000 Series.
 - b. Sargent Manufacturing (SA) - 80 Series.

2.8 DOOR CLOSERS

- A. All door closers specified herein shall meet or exceed the following criteria:
1. General: Door closers to be from one manufacturer, matching in design and style, with the same type door preparations and templates regardless of application or spring size. Closers to be non-handed with full sized covers including installation and adjusting information on inside of cover.
 2. Standards: Closers to comply with UL-10C for Positive Pressure Fire Test and be U.L. listed for use of fire rated doors.
 - a. All closer covers shall be metal.
 3. Cycle Testing: Provide closers which have surpassed 15 million cycles in a test witnessed and verified by UL.
 4. Size of Units: Comply with manufacturer's written recommendations for sizing of door closers depending on size of door, exposure to weather, and anticipated frequency of use. Where closers are indicated for doors required to be accessible to the physically handicapped, provide units complying with ANSI ICC/A117.1.
 5. Closer Arms: Provide heavy duty, forged steel closer arms unless otherwise indicated in Hardware Sets.
 6. Closers shall not be installed on exterior or corridor side of doors; where possible install closers on door for optimum aesthetics.
 7. Closer Accessories: Provide door closer accessories including custom templates, special mounting brackets, spacers and drop plates as required for proper installation. Provide through-bolt and security type fasteners as specified in the hardware sets.
- B. Door Closers, Surface Mounted (Heavy Duty): ANSI/BHMA A156.4, Grade 1 surface mounted, heavy duty door closers with complete spring power adjustment, sizes 1 thru 6; and fully operational adjustable according to door size, frequency of use, and opening force. Closers to be rack and pinion type, one piece cast iron or aluminum alloy body construction, with adjustable backcheck and separate non-critical valves for closing sweep and latch speed control. Provide non-handed units standard.
1. Manufacturers:
 - a. Corbin Russwin Hardware (RU) - DC8000 Series.
 - b. Sargent Manufacturing (SA) - 351 Series.
 - c. Norton Door Controls (NO) - 7500 Series.

2.9 ARCHITECTURAL TRIM

- A. Door Protective Trim
1. General: Door protective trim units to be of type and design as specified below or in the Hardware Sets.
 2. Size: Fabricate protection plates (kick, armor, or mop) not more than 2" less than door width (LDW) on stop side of single doors and 1" LDW on stop side of pairs of doors, and not more than 1" less than door width on pull side. Coordinate and provide proper width and height as required where conflicting hardware dictates. Height to be as specified in the Hardware Sets.

3. Where plates are applied to fire rated doors with the top of the plate more than 16" above the bottom of the door, provide plates complying with NFPA 80. Consult manufacturer's catalog and template book for specific requirements for size and applications.
4. Protection Plates: ANSI/BHMA A156.6 certified protection plates (kick, armor, or mop), fabricated from the following:
 - a. Stainless Steel: 300 grade, 050-inch thick.
5. Options and fasteners: Provide manufacturer's designated fastener type as specified in the Hardware Sets. Provide countersunk screw holes.
6. Manufacturers:
 - a. Hiawatha, Inc. (HI).
 - b. Rockwood Products; ASSA ABLOY Architectural Door Accessories (RO).
 - c. Trimco (TC).

2.10 DOOR STOPS AND HOLDERS

- A. General: Door stops and holders to be of type and design as specified below or in the Hardware Sets.
- B. Door Stops and Bumpers: ANSI/BHMA A156.16, Grade 1 certified door stops and wall bumpers. Provide wall bumpers, either convex or concave types with anchorage as indicated, unless floor or other types of door stops are specified in Hardware Sets. Do not mount floor stops where they will impede traffic. Where floor or wall bumpers are not appropriate, provide overhead type stops and holders.
 1. Acceptable Manufacturers:
 - a. Hiawatha, Inc. (HI).
 - b. Rockwood Manufacturing (RO).
 - c. Trimco (TC).
- C. Overhead Door Stops and Holders: ANSI/BHMA A156.8, Grade 1 certified overhead stops and holders to be surface or concealed types as indicated in Hardware Sets. Track, slide, arm and jamb bracket to be constructed of extruded bronze and shock absorber spring of heavy tempered steel. Provide non-handed design with mounting brackets as required for proper operation and function.
 1. Manufacturers:
 - a. Rixson Door Controls (RF).
 - b. Rockwood Products; ASSA ABLOY Architectural Door Accessories (RO).
 - c. Sargent Manufacturing (SA).

2.11 FABRICATION

- A. Fasteners: Provide door hardware manufactured to comply with published templates generally prepared for machine, wood, and sheet metal screws. Provide screws according to manufacturers recognized installation standards for application intended.

2.12 FINISHES

- A. Standard: Designations used in the Hardware Sets and elsewhere indicate hardware finishes complying with ANSI/BHMA A156.18, including coordination with traditional U.S. finishes indicated by certain manufacturers for their products.
- B. Provide quality of finish, including thickness of plating or coating (if any), composition, hardness, and other qualities complying with manufacturer's standards, but in no case less than specified by referenced standards for the applicable units of hardware.
- C. Protect mechanical finishes on exposed surfaces from damage by applying a strippable, temporary protective covering before shipping.

PART 3 EXECUTION

3.1 EXAMINATION

- A. Examine scheduled openings, with Installer present, for compliance with requirements for installation tolerances, labeled fire door assembly construction, wall and floor construction, and other conditions affecting performance.

- B. Notify YPS Office of Facilities Management of any discrepancies or conflicts between the door schedule, door types, drawings and scheduled hardware. Proceed only after such discrepancies or conflicts have been resolved in writing.

3.2 PREPARATION

- A. Hollow Metal Doors and Frames: Comply with ANSI/DHI A115 series.

3.3 INSTALLATION

- A. Install each item of mechanical and electromechanical hardware and access control equipment to comply with manufacturer's written instructions and according to specifications.
 - 1. Installers are to be trained and certified by the manufacturer on the proper installation and adjustment of fire, life safety, and security products including: hanging devices; locking devices; closing devices; and seals.
- B. Mounting Heights: Mount door hardware units at heights indicated in following applicable publications, unless specifically indicated or required to comply with governing regulations:
 - 1. Standard Steel Doors and Frames: DHI's "Recommended Locations for Architectural Hardware for Standard Steel Doors and Frames."
 - 2. Where indicated to comply with accessibility requirements, comply with ANSI A117.1 "Accessibility Guidelines for Buildings and Facilities."
 - 3. Provide blocking in drywall partitions where wall stops or other wall mounted hardware is located.
 - 4. Provide blocking in drywall partitions where wall stops or other wall mounted hardware is located
- C. Retrofitting: Install door hardware to comply with manufacturer's published templates and written instructions. Where cutting and fitting are required to install door hardware onto or into surfaces that are later to be painted or finished in another way, coordinate removal, storage, and reinstallation of surface protective trim units with finishing work specified in Division 9 Sections. Do not install surface-mounted items until finishes have been completed on substrates involved.
- D. Thresholds: Set thresholds for exterior and acoustical doors in full bed of sealant complying with requirements specified in Section 07 9200 - Joint Sealants.
- E. Storage: Provide a secure lock up for hardware delivered to the project but not yet installed. Control the handling and installation of hardware items so that the completion of the work will not be delayed by hardware losses before and after installation.

3.4 FIELD QUALITY CONTROL

- A. Field Inspection: Supplier will perform a final inspection of installed door hardware and state in written report, submitted to the YPS Office of Facilities Management, whether work complies with or deviates from requirements, including whether door hardware is properly installed, operating and adjusted.

3.5 ADJUSTING

- A. Initial Adjustment: Adjust and check each operating item of door hardware and each door to ensure proper operation or function of every unit. Replace units that cannot be adjusted to operate as intended. Adjust door control devices to compensate for final operation of heating and ventilating equipment and to comply with referenced accessibility requirements.

3.6 CLEANING AND PROTECTION

- A. Protect all hardware stored on construction site in a covered and dry place. Protect exposed hardware installed on doors during the construction phase. Install any and all hardware at the latest possible time frame.
- B. Clean adjacent surfaces soiled by door hardware installation.
- C. Clean operating items as necessary to restore proper finish. and provide final protection and maintain conditions that ensure door hardware is without damage or deterioration at time of owner occupancy.

3.7 DEMONSTRATION

- A. Instruct Owner's maintenance personnel to adjust, operate, and maintain mechanical and electromechanical door hardware. Refer to Section 01 7900 - Demonstration and Training for additional requirements.

3.8 DOOR HARDWARE SETS

- A. The hardware sets represent the design intent and direction of the YPS Office of Facilities Management and Fuller and D'Angelo, P.C. 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.
1. Quantities listed are for each pair of doors, or for each single door.
 2. The supplier is responsible for handing and sizing all products.
 3. Where multiple options for a piece of hardware are given in a single line item, the supplier shall provide the appropriate selection for the material and application.
 4. At existing openings with new hardware the supplier shall field inspect existing conditions prior to the submittal stage to verify the specified hardware will work as required. Provide alternate solutions and proposals as needed.
- B. Manufacturer's Abbreviations:
1. MK - McKinney
 2. RU - Corbin Russwin
 3. SA - SARGENT
 4. MC - Medeco
 5. RF - Rixson
 6. NO - Norton
 7. RO - Rockwood
 8. PE - Pemko

3.9 HARDWARE SETS

Set: 01

3	Hinge, Hvy Wt (Sq. Edge Door)	TA386 5" x 4-1/2"	US26D	MK
1	Reinforcing Pivot	MK5540	US32D	MK
1	Storage Cylindrical Lock	CL3357 PZD CT6B	626	RU
1	Permanent Core	CR8000	626	RU
1	Surface Closer	P7500	689	NO
1	Kick Plate	K1050 - 10" x 2" LDW x 4BE x CSK	US32D-316	RO
1	Floor Stop	400 / 441CU	US26D	RO
1	Conc Overhead Stop	6-336	630	RF (Door G-01)

Set: 02

3	Hinge, Hvy Wt (Sq. Edge Door)	TA386 5" x 4-1/2"	US26D	MK
1	Reinforcing Pivot	MK5540	US32D	MK
1	Electromechanical mortise Lock	ML20906xSEC PZD CT6B	626	RU
1	Permanent Core	CR8000	626	RU
1	Door Closer	P7500	689	NO
1	Power Transfer Cable	TSB-C		MK
1	Kick Plate	K1050 - 10" x 2" LDW x 4BE x CSK	US32D-316	RO

1	Wall Stop	400 / 441CU	US26D	RO
Set: 03				
6	Hinge, Hvy Wt (Sq. Edge Door)	TA386 5" x 4-1/2"	US26D	MK
2	Surface Vert Rod Exit, Entrance	12-43-NB-8716 ET-P	US32D	SA
2	Door Closer	P7500	689	NO
2	Kick Plate	K1050 - 10" x 2" LDW x 4BE x CSK	US32D-316	RO
2	Electromagnetic Holder	998M	689	RF
1	Latch Guard Cover - Top Rod	BFRC x LAR	US32D	RO
Set: 04				
6	Hinge, Hvy Wt (Sq. Edge Door)	TA386 5" x 4-1/2"	US26D	MK
2	Surface Vert Rod Exit, Passage	12-43-NB-8715 ET-P	US32D	SA
2	Door Closer	P7500	689	NO
2	Kick Plate	K1050 - 10" x 2" LDW x 4BE x CSK	US32D-316	RO
2	Electromagnetic Holder	998M	689	RF
1	Latch Guard Cover - Top Rod	BFRC x LAR	US32D	RO
Set: 05				
3	Hinge, Hvy Wt (Sq. Edge Door)	TA792 5" x 4-1/2"	US26D	MK
1	Reinforcing Pivot	MK5540	US32D	MK
1	Classroom Intruder Lock	CL3352 PZD CT6B	626	RU
1	Permanent Core	CR8000	626	RU
1	Indicator Auxiliary Deadbolt	DL2261	626	RU
1	Surface Closer	P7500	689	NO
1	Kick Plate	K1050 - 10" x 2" LDW x 4BE x CSK	US32D-316	RO
1	Floor Stop	400 / 441CU	US26D	RO

SET 06

1	Electric Strike	1006	628	HES
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(Install in existing frame. Coordinate frame mortise size and configuration)

END OF SECTION

SECTION 08 8813
FIRE-RATED GLAZING

PART 1 GENERAL

1.1 SECTION INCLUDES

- A. Fire-rated glazing units.
- B. Glazing compounds.

1.2 RELATED REQUIREMENTS

- A. Section 08 1113 - Hollow Metal Doors and Frames: Glazed lites in doors.

1.3 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 (Reaffirmed 2020).
- C. ASTM C864 - Standard Specification for Dense Elastomeric Compression Seal Gaskets, Setting Blocks, and Spacers; 2005 (Reapproved 2019).
- D. ASTM C1048 - Standard Specification for Heat-Strengthened and Fully Tempered Flat Glass; 2018.
- E. ASTM C1193 - Standard Guide for Use of Joint Sealants; 2016 (Reapproved 2023).
- F. ASTM E84 - Standard Test Method for Surface Burning Characteristics of Building Materials; 2023c.
- G. GANA (GM) - GANA Glazing Manual; 2022.
- H. GANA (SM) - GANA Sealant Manual; 2008.
- I. ICC (IBC) - International Building Code; Most Recent Edition Adopted by Authority Having Jurisdiction, Including All Applicable Amendments and Supplements.
- J. ITS (DIR) - Directory of Listed Products; Current Edition.
- K. NFPA 252 - Standard Methods of Fire Tests of Door Assemblies; 2022.
- L. UL (DIR) - Online Certifications Directory; Current Edition.
- M. UL 10B - Standard for Fire Tests of Door Assemblies; Current Edition, Including All Revisions.
- N. UL 10C - Standard for Positive Pressure Fire Tests of Door Assemblies; Current Edition, Including All Revisions.
- O. UL 263 - Standard for Fire Tests of Building Construction and Materials; Current Edition, Including All Revisions.

1.4 SUBMITTALS

- A. See Section 01 3000 - Administrative Requirements for submittal procedures.
- B. Product Data on Glazing Unit 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. Specimen warranty.

1.5 QUALITY ASSURANCE

- A. Perform work in accordance with GANA (GM) for glazing installation methods.
- B. Manufacturer Qualifications: Company specializing in manufacturing the products specified in this section with minimum three years of documented experience.

1.6 WARRANTY

- A. See Section 01 7800 - Closeout Submittals for additional warranty requirements.
- B. Manufacturer Warranty for Laminated Glass: Provide 5-year manufacturer warranty coverage for delamination, including providing products to replace failed units, and commencing on the Date of Substantial Completion. Complete forms in Yonkers Public Schools's name and register with manufacturer.

PART 2 PRODUCTS

2.1 GLASS MATERIALS

2.2 GLAZING UNITS

- A. Fire-Protection-Rated Glazing: Type, thickness, and configuration of glazing that contains flame, smoke, and does not block radiant heat, as required to achieve indicated fire rating period of 45 minutes or less.
 - 1. Applications:
 - a. Glazing in fire-resistance-rated door assembly.
 - 2. Glass Type: Specialty tempered float glass.
 - 3. Provide products listed by ITS (DIR) or UL (DIR) and approved by authorities having jurisdiction.
 - 4. Safety Glazing Certification: 16 CFR 1201 Category II.
 - 5. Glazing Method: As required for fire rating.
 - 6. Fire-Rating Period: 45 minutes.
 - 7. Markings for Fire-Protection-Rated Glazing Assemblies: Provide permanent markings on fire-protection-rated glazing in compliance with ICC (IBC), local building code, and authorities having jurisdiction
 - a. "D" - meets fire door assembly criteria of NFPA 252, UL 10B, or UL 10C fire test standards.
 - b. "XXX" - placeholder that represents fire-rating period, in minutes.
 - 8. Products:
 - a. SAFTIFIRST, a division of O'Keeffe's Inc; SuperLite I-XL: www.safti.com/#sle.

2.3 ACCESSORIES

- A. Setting Blocks: Aluminum silicate, 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. Glazing Tape: Flexible tape made from spun calcium-magnesium-silica fibers in binder; designed to remain stable at temperatures up to 2,012 degrees F.
 - 1. Thickness: As recommended by framing manufacturer for glazing application.

PART 3 EXECUTION

3.1 Examination

- 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.

3.2 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.

3.3 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 referenced glazing 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. Set glass lites of system with uniform pattern, draw, bow, and similar characteristics.
- E. Set glass lites in proper orientation so that coatings face exterior or interior as indicated.
- F. Prevent glass from contact with contaminating substances that may result from construction operations including, but not limited to weld spatter, fire-safing, plastering, mortar droppings, etc.

3.4 CLEANING

- A. Remove excess glazing materials from finish surfaces immediately after application using solvents or cleaners recommended by manufacturers.
- B. Remove nonpermanent 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 four days prior to Date of Substantial Completion in accordance with glass manufacturer's written recommendations.

END OF SECTION

SECTION 09 5100
ACOUSTICAL CEILINGS

PART 1 GENERAL

1.1 RELATED DOCUMENTS

- A. Drawings and general provisions of the Contract, including School Facilities Management Contract Manual and Specifications and Division 1 Specification Sections, apply to this Section.
- B. In the event of discrepancies between the specifications and School Facilities Management Contract Manual and Specifications the School Facilities Management Contract Manual and Specifications shall prevail.

1.2 SECTION INCLUDES

- A. New acoustical panels and suspended grid as required and indicated on drawings.

1.3 RELATED REQUIREMENTS

- A. Section 01 6116 - Volatile Organic Compound (VOC) Content Restrictions.
- B. Section 07 9200 - Joint Sealants.
- C. Divisions 22, 23, and 26 for air outlets and inlets, light fixtures, and fire alarm.

1.4 REFERENCE STANDARDS

- A. ASTM B209 - Standard Specification for Aluminum and Aluminum-Alloy Sheet and Plate; 2014.
- B. ASTM B209M - Standard Specification for Aluminum and Aluminum-Alloy Sheet and Plate (Metric); 2014.
- C. ASTM C635/C635M - Standard Specification for Manufacture, Performance, and Testing of Metal Suspension Systems for Acoustical Tile and Lay-in Panel Ceilings; 2022.
- D. ASTM C636/C636M - Standard Practice for Installation of Metal Ceiling Suspension Systems for Acoustical Tile and Lay-In Panels; 2019.
- E. ASTM E84 - Standard Test Method for Surface Burning Characteristics of Building Materials; 2023c.
- F. ASTM E580/E580M - Standard Practice for Installation of Ceiling Suspension Systems for Acoustical Tile and Lay-in Panels in Areas Subject to Earthquake Ground Motions; 2022.
- G. ASTM E1264 - Standard Classification for Acoustical Ceiling Products; 2023.
- H. CHPS (HPPD) - High Performance Products Database; Current Edition.
- I. Ceilings and Interior Systems Construction Association (CISCA): Code of Practices.

1.5 ADMINISTRATIVE REQUIREMENTS

- A. Sequence work to ensure acoustical ceilings are not installed until building is enclosed, sufficient heat is provided, dust generating activities have terminated, and overhead work is completed, tested, and approved.
- B. Do not install acoustical units until after interior wet work is dry.

1.6 SUBMITTALS

- A. See Section 01 3000 - Administrative Requirements, for submittal procedures.
- B. Shop Drawings: Indicate grid layout and related dimensioning.
- C. Product Data: Provide data on suspension system components and acoustical units.
- D. Samples: Submit two full size samples illustrating material and finish of acoustical units.
- E. Manufacturer's Installation Instructions: Indicate special procedures.

1.7 QUALITY ASSURANCE

- A. Suspension System Manufacturer Qualifications: Company specializing in manufacturing the products specified in this section with minimum three years experience.
- B. Acoustical Unit Manufacturer Qualifications: Company specializing in manufacturing the products specified in this section with minimum 10 years experience.
- C. Fire Performance: ASTM E84 surface burning characteristics. Flame Spread index 25 or less. Smoke development index 50 or less. (UL Labeled) Class A in accordance to ASTM E1264
- D. Installers Qualifications: Company specializing in the installation of acoustical ceilings specified in this section with minimum 5 years documented experience.
- E. Mock-Up: Provide a mock-up for evaluation of surface preparation techniques and application workmanship.
 - 1. Finish areas designated by YPS Office of Facilities Management and Fuller and D'Angelo, P.C..
 - 2. Do not proceed with remaining work until workmanship, color, and sheen are approved by YPS Office of Facilities Management and Fuller and D'Angelo, P.C..
 - 3. Refinish mock-up area as required to produce acceptable work.

1.8 EXTRA MATERIALS

- A. See Section 01 6000 - Product Requirements.
- B. Deliver extra acoustical units for YPS Office of Facilities Management's use in maintenance. Label and store where directed by the Owner including codes used on the Drawings. Do not deliver to the Project site until the YPS Office of Facilities Management is prepared to receive and store maintenance materials.
 - 1. Panels: Furnish 5 percent of total acoustic unit area of extra panels to YPS Office of Facilities Management.
 - 2. Suspension System Components: Furnish 5 percent of each exposed component of the quantity installed

1.9 DELIVERY, STORAGE, AND HANDLING

- A. Deliver in unopened bundles and store in a dry place with adequate air circulation. Do not deliver material to building until wet conditions such as concrete, plaster, paint, and adhesives have been completed and cured.
- B. Store products in manufacturer's unopened packaging until ready for installation.
- C. Protect system components from excessive moisture in shipment, storage, and handling

1.10 WARRANTY

- A. Warranty: Provide manufacturer's standard warranty against manufacturing defects in material or workmanship when installed in accordance with the current CISCA Handbook and ASTM C367.

1.11 FIELD CONDITIONS

- A. Maintain uniform temperature of minimum 60 degrees F, and maximum humidity of 40 percent prior to, during, and after acoustical unit installation.

PART 2 PRODUCTS

2.1 MANUFACTURERS

- A. Acoustic Tiles/Panels:
 - 1. Armstrong World Industries, Inc: www.armstrong.com.
 - 2. Substitutions: See Section 01 2500 - Substitution Procedures.

2.2 ACOUSTICAL UNITS

- A. Acoustical Tile Type 1: Painted mineral fiber, 1 Type III, Form: 1, Pattern EIC with the following characteristics:
 - 1. Application: Corridors, Lobby and Offices.

2. Size: 24 by 24 inches. See Finish Schedule.
 3. Thickness: 7/8 inches.
 4. Light Reflectance: 85 percent, determined in accordance with 1.
 5. NRC Range: 0.75 determined in accordance with 1.
 6. Articulation Class (AC): 170, determined in accordance with 1.
 7. Ceiling Attenuation Class (CAC): 35, determined in accordance with 1.
 8. Sag/Humidity Resistance: Standard
 9. Fire Performance: Class A UL)
 10. Edge: Square tegular.
 11. Surface Color: White.
 12. Suspension System: Exposed grid Type Prelude XL.
 13. Products:
 - a. Cirrus High NRC 563.
- B. Acoustical Panels, Type 2: Mineral fiber with membrane-faced overlay, with the following characteristics:
1. Application(s): Kitchen and Adjacent Ancillary Spaces.
 2. Classification: ASTM E1264 Type IV.
 - a. Form: 2, water felted.
 - b. Pattern: "E" - lightly textured.
 3. Size: 24 by 24 inches.
 4. Thickness: 1 inches.
 5. Composition: Water felted.
 6. NRC Range: 0.80 to 0.85, determined in accordance with ASTM E1264.
 7. Ceiling Attenuation Class (CAC): 38, determined in accordance with ASTM E1264.
 8. Sag/Humidity Resistance: Standard
 9. Fire Performance: Class A UL)
 10. Panel Edge: Square.
 11. Color: White.
 12. Suspension System Type Prelude XL: Exposed grid.
 13. Products:
 - a. Armstrong World Industries, Inc; Calla Health Zone 2230, www.armstrongceilings.com.

2.3 SUSPENSION SYSTEM(S)

- A. Manufacturers:
1. Armstrong World Industries, Inc; Product Prelude XL 15/16": www.armstrong.com.
 2. Structural Classification: Intermediate duty, ASTM C 635.
- B. Metal Suspension Systems - General: Complying with 1; die cut and interlocking components, with stabilizer bars, clips, splices, and perimeter moldings as required.
1. Materials:
 - a. Aluminum Grid: Aluminum sheet, ASTM B209 (ASTM B209M).

2.4 ACCESSORIES

- A. Support Channels and Hangers: Galvanized steel; size and type to suit application and ceiling system flatness requirement specified.
- B. Hanger Wire: 12 gauge, 0.08 inch galvanized steel wire.
- C. Hold-Down Clips: Manufacturer's standard clips to suit application.
1. Provide for all lobby vestibules.

- D. Perimeter Moldings: Same metal and finish as grid.
 - 1. Minimum 7/8" horizontal flange
- E. Acoustical Sealant For Perimeter Moldings: Specified in Section 07 9200 - Joint Sealants.
- F. Touch-up Paint: Type and color to match acoustical and grid units.

PART 3 EXECUTION

3.1 EXAMINATION

- A. Verify existing conditions before starting work.
- B. Verify that layout of hangers will not interfere with other work.

3.2 PREPARATION

- A. Install after major above-ceiling work is complete.
- B. Coordinate the location of hangers with other work.
- C. Provide hanger clips during steel deck erection. Provide additional hangers and inserts as required.

3.3 INSTALLATION - SUSPENSION SYSTEM

- A. Repair and Install suspension system in accordance with ASTM C636/C636M, ASTM E580/E580M, and manufacturer's instructions and as supplemented in this section.
- B. Perimeter Molding: Install at intersection of ceiling and vertical surfaces and at junctions with other interruptions.
 - 1. Use longest practical lengths.
- C. Suspension System, Non-Seismic: Hang suspension system independent of walls, columns, ducts, pipes and conduit. Where carrying members are spliced, avoid visible displacement of face plane of adjacent members.
- D. Do not support components on main runners or cross runners if weight causes total dead load to exceed deflection capability.
- E. Support fixture loads using supplementary hangers located within 6 inches of each corner, or support components independently.

3.4 INSTALLATION - ACOUSTICAL UNITS

- A. Install acoustical units in accordance with manufacturer's instructions.
- B. Fit acoustical units in place, free from damaged edges or other defects detrimental to appearance and function.
- C. Fit border trim neatly against abutting surfaces.
- D. Install acoustical units level, in uniform plane, and free from twist, warp, and dents.
- E. Cutting Acoustical Units:
 - 1. Make field cut edges of same profile as factory edges.

3.5 TOLERANCES

- A. Maximum Variation from Flat and Level Surface: 1/8 inch in 10 feet.
- B. Maximum Variation from Plumb of Grid Members Caused by Eccentric Loads: 2 degrees.

3.6 ADJUSTING AND CLEANING

- A. Replace damaged or broken material, Clean exposed surfaces of acoustical ceilings, including trim, edge moldings, and suspension members. Comply with mfg., touch up procedures using touch up paint as required for small nicks and minor scratches in the surface, Remove and replace any work that cannot be successfully cleaned and repaired to permanently eliminate evidence of damage.
 - 1. Provide touch up kit for Owner's use.

END OF SECTION

SECTION 09 6500
RESILIENT FLOORING

PART 1 GENERAL

1.1 RELATED DOCUMENTS

- A. Drawings and general provisions of the Contract, including School Facilities Management Contract Manual and Specifications and Division 1 Specification Sections, apply to this Section.
- B. In the event of discrepancies between the specifications and School Facilities Management Contract Manual and Specifications the School Facilities Management Contract Manual and Specifications shall prevail.

1.2 SECTION INCLUDES

- A. Removals.
- B. Crack repair.
- C. Underlayment.
- D. Resilient tile flooring.
- E. Resilient base.
- F. Installation accessories.

1.3 RELATED REQUIREMENTS

- A. Section 02 2080 - Asbestos Removal and Disposal.
- B. Section 03 3000 - Cast-in-Place Concrete: Restrictions on curing compounds for concrete slabs and floors to receive adhesive-applied resilient flooring.
- C. Section 05 5100 - Metal Stairs.

1.4 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 F150 - Standard Test Method for Electrical Resistance of Conductive and Static Dissipative Resilient Flooring; 2006 (Reapproved 2018).
- C. ASTM E84 - Standard Test Method for Surface Burning Characteristics of Building Materials.
- D. ASTM F710 - Standard Practice for Preparing Concrete Floors to Receive Resilient Flooring; 2022.
- E. ASTM F925: Standard Test Method for Resistance to Chemicals of Resilient Flooring.
- F. ASTM F1700 - Standard Specification for Solid Vinyl Floor Tile; 2020.
- G. ASTM F1861 - Standard Specification for Resilient Wall Base; 2021.
- H. ASTM F1869 - Standard Test Method for Measuring Moisture Vapor Emission Rate of Concrete Subfloor Using Anhydrous Calcium Chloride; 2023.
- I. ASTM F-1869 Test Method for Measuring Moisture Vapor Emissions in Concrete.
- J. ASTM F2170 - Standard Test Method for Determining Relative Humidity in Concrete Floor Slabs Using in situ Probes; 2019a.
- K. ASTM F2170 - Standard Test Method for Determining Relative Humidity in Concrete Floor Slabs.
- L. ASTM F2420 - Standard Test Method for Determining Relative Humidity on the Surface of Concrete
- M. CAL (CHPS LEM) - Low-Emitting Materials Product List; California Collaborative for High Performance Schools (CHPS); current edition at www.chps.net/.
- N. NFPA 253 - Standard Method of Test for Critical Radiant Flux of Floor Covering Systems Using a Radiant Heat Energy Source; 2023.

1.5 SUBMITTALS

- A. See Section 01 3000 - Administrative Requirements, for submittal procedures.
- B. Product Data: Provide data on specified products, describing physical and performance characteristics; including sizes, patterns and colors available; and installation instructions.
- C. Verification Samples: Submit two samples, 18" x 18" in size illustrating color and pattern for each resilient flooring product specified.
- D. Sustainable Design Submittal: Submit VOC content documentation for flooring and adhesives.
- E. Certification: Prior to installation of flooring, submit written certification by flooring manufacturer and adhesive manufacturer that condition of subfloor is acceptable.
- F. Maintenance Data: Include maintenance procedures, recommended maintenance materials, and suggested schedule for cleaning, stripping, and re-waxing.
- G. MSDS (Material Safety Data Sheets) should be submitted for all adhesives used:
 - 1. Membrane, primer, patch, leveler, heat weld rod, cold weld, liquid wax and cleaning agents
- H. Maintenance Materials: Furnish the following for Yonkers Public Schools's use in maintenance of project.
 - 1. See Section 01 6000 - Product Requirements, for additional provisions.
 - 2. Extra Materials: Furnish two cartons of tile for each fifty boxes or fraction thereof, for each type, color, pattern and size of the tile installed, from same manufactured lot as materials installed.
 - a. Deliver extra tile to YPS Office of Facilities Management after completion of work.
 - b. Furnish tiles in protective packaging with identifying labels.

1.6 QUALITY ASSURANCE

- A. Manufacturer Qualifications: Company specializing in manufacturing specified flooring with minimum 10 years documented experience, with resilient flooring of types equivalent to those specified.
 - 1. Manufacturers proposed for use, which are not named in this section, shall submit evidence of ability to meet performance requirements specified not less than 10 days prior to bid date.
 - a. Color Matching: Provide resilient flooring products, including wall base and accessories, from one manufacturer to ensure color matching.
- B. Installer Qualifications: Company specializing in installing specified flooring with minimum three years documented experience.

1.7 DELIVERY, STORAGE, AND HANDLING

- A. Upon receipt, immediately remove any shrink-wrap and check materials for damage and the correct style, color, quantity and run numbers.
- B. Store all materials off of the floor in an acclimatized, weather-tight space.
- C. Deliver products to Project site in manufacturer's original, unopened cartons and containers, each bearing names of product and manufacturer, Project identification, and shipping and handling instructions

1.8 MOCK UP

- A. Field Samples per Section 001 4000 - Quality Requirements. Provide field samples, dry laid, to demonstrate aesthetic effects of materials in place.

1.9 FIELD CONDITIONS

- A. Store materials for not less than 48 hours before, during, and 72 hours after installation, in area of installation at a temperature of 70 degrees F to achieve temperature stability. Thereafter, maintain conditions above 55 degrees F.

1.10 PRE-INSTALLATION TESTING

- A. Conduct pre-installation testing as follows:
 - 1. ASTM F-1869 Test Method for Measuring Moisture Vapor Emissions in Concrete Maximum: 3 lbs/1000 SF

2. ASTM F-2170 Test Method for Determining Relative Humidity in Concrete: Maximum RH: 55%.

1.11 WARRANTY

- A. Provide manufacturer's non-prorated ten (10) year limited warranty to be free from defects in material and workmanship, under normal use and service, to repair or replace all defective tiles including reasonable labor.

PART 2 PRODUCTS

2.1 TILE FLOORING

- A. Luxury Vinyl Tile: Printed film type, with transparent or translucent wear layer.
1. Manufacturers:
 - a. Amtico Company; Signature Collection / Abstract : www.amtico.com.
 2. Minimum Requirements: Comply with ASTM F1700, of Class III, Type B.
 3. VOC Limits: As tested using U.S. EPA Reference Test Method 24 and in accordance with (per) SCAQMD Rule 1113, SCAQMD Rule 1168, BAAQMD Regulation 8, Rule 51, and California Air Resources Board (CARB).
 4. Plank Tile Size: 12 by 24 inch.
 5. Wear Layer Thickness: 0.040 inch.
 6. Total Thickness: 0.100 inch.
 7. Pattern and Color: Linear Chalk.
 8. Class II or B per NFPA 101.
 9. Substitutions: 01 2500 - Substitution Procedures

2.2 RESILIENT BASE

- A. Resilient Base: ASTM F1861, Type TS rubber, vulcanized thermoset; top set Style B, Cove, and Style A straight for carpet installation as follows:
1. Manufacturers:
 - a. Johnsonite, a Tarkett Company: www.johnsonite.com.
 2. Critical Radiant Flux (CRF): Minimum 0.45 watt per square centimeter, when tested in accordance with ASTM E 648 or NFPA 253.
 3. Height: 4 inch.
 4. Thickness: 0.125 inch.
 5. Length: Roll.
 6. Color: To be selected by Eisenbach & Ruhnke Engineering, P.C.. from manufacturer's full range.
 7. Accessories: Premolded external corners and internal corners.

2.3 ACCESSORIES

- A. Self-Drying, Cement-Based Finish Underlayment
1. Trowelable leveling compounds: Portland-cement-based formulation provided or approved by resilient flooring manufacturer for water-soluble adhesives on concrete.
 2. Product: "Ardex Feather Finish®", Ardex Engineered Cements, 400 Ardex Park Drive, Aliquippa, PA 15001 USA, Tel: 724-203-5000.
- B. Adhesive for Vinyl Tile Flooring:
1. Adhesive shall be as recommended by the manufacturer, compatible with tile and substrate.
 - a. Note that recommendations shall be made which reflect and are compatible with the results of moisture level tests in the concrete substrate.
 2. Manufacturers:
 - a. Amtico RP-18.
 - b. Substitutions: 01 2500 - Substitution Procedures.

PART 3 EXECUTION

3.1 EXAMINATION

- A. Verify that surfaces are flat to tolerances acceptable to flooring manufacturer, free of cracks that might telegraph through flooring, clean, dry, and free of curing compounds, surface hardeners, and other chemicals that might interfere with bonding of flooring to substrate.
- 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 resilient base.
- C. Cementitious Subfloor Surfaces: Verify that substrates are ready for resilient flooring installation by testing for moisture and alkalinity (pH).
 - 1. Test as Follows:
 - a. Internal Relative Humidity: ASTM F2170.
 - b. Moisture Vapor Emission: ASTM F1869.
 - 2. Obtain instructions if test results are not within limits recommended by resilient flooring manufacturer and adhesive materials manufacturer.
- D. Verify that existing concrete sub floor do not containing curing compound by placing 1/4 cup of water on surface. If water beads up scarify surface.
- E. Verify that required floor-mounted utilities are in correct location.

3.2 PREPARATION

- A. Prepare floor substrates as recommended by flooring and adhesive manufacturers.
- B. Concrete substrate that fully conforms to the requirements of ASTM F710 Standard Practice for Preparing Concrete Floors to Receive Resilient Flooring is required, or as detailed in the manufacturer's Installation Guide.
- C. Crack and Joint Repair: Concrete must be structurally sound, solid, dry, and free of laitance, dirt, debris, coatings, sealers, solvent base adhesives and any contaminant that may act as a bond breaker.
 - 1. Dry diamond blade may be used to prepare cracks and create a clean surface for bonding.
 - 2. Do not use sweeping compounds, solvents or acid etching to prepare the surface.
 - 3. Cracks or joints should be free of dust, dirt, oils and any other debris.
 - 4. New concrete should be fully cured and free of movement.
- D. Underlayment: All concrete substrates must be solid, thoroughly clean and free of oil, wax, grease, asphalt, latex and gypsum compounds, curing compounds, sealers and any contaminant that might act as a bond breaker.
 - 1. **Mechanically profile with grinder 100% of all existing substrates receiving resilient flooring. Provide dust control as required.**
 - a. After profiling test substrate by place drop of water, or other means to insure all coatings, sealers etc have been removed. Repeat profiling if necessary.
- E. Use trowelable leveling and patching compound, according to manufacturer's written instructions, to fill cracks, holes and depressions in substrates.
- F. Provide leveling compound over 100% of all existing substrates receiving resilient flooring

3.3 INSTALLATION GENERAL

- A. Starting installation constitutes acceptance of subfloor conditions.
- B. Install in accordance with manufacturer's written instructions.
Adhesive-Applied Installation:
 - 1. Spread only enough adhesive to permit installation of materials before initial set as recommended by the manufacturer.
 - 2. Fit joints and butt seams tightly.
 - 3. Set flooring in place, press with heavy roller to attain full adhesion.

- C. Where type of floor finish, pattern, or color are different on opposite sides of door, terminate flooring under centerline of door.
- D. Install edge strips at unprotected or exposed edges, where flooring terminates, and where indicated.
 - 1. Resilient Strips: Attach to substrate using contact adhesive.
- E. Scribe flooring to walls, columns, cabinets, floor outlets, and other appurtenances to produce tight joints.
- F. Install flooring in recessed floor access covers, maintaining floor pattern.
- G. Do not mix manufacturing batches of a color within the same area.
- H. Do not install resilient flooring over building expansion joints.
- I. Do not install defective or damaged resilient flooring.
- J. Layout resilient flooring to provide equal size at perimeter. Adjust layout as necessary to reduce the amount of resilient flooring which is cut to less than half full width.
- K. Install resilient flooring without voids at seams. Lay seams together without stress.
- L. Remove excess adhesive immediately

3.4 INSTALLATION TILE FLOORING

- A. Mix tile from container to ensure shade variations are consistent when tile is placed, unless otherwise indicated in manufacturer's installation instructions.
- B. Lay out tiles from center marks established with principal walls, discounting minor offsets, so tiles at opposite edges of room are of equal width. Adjust as necessary to avoid using cut widths that equal less than one-half of a tile at perimeter.
 - 1. Lay tiles square with room axis, unless otherwise indicated.
- C. Install plank tile with a random offset of at least 6 inches from adjacent rows.

3.5 INSTALLATION RESILIENT BASE

- A. Fit joints tightly and make vertical. Maintain minimum dimension of 18 inches between joints.
- B. Miter internal corners. At external corners, 'V' cut back of base strip to 2/3 of its thickness and fold. At exposed ends, use premolded units.
- C. Install base on solid backing. Bond tightly to wall and floor surfaces.
- D. Scribe and fit to door frames and other interruptions.

3.6 CLEANING

- A. Remove excess adhesive from floor, base, and wall surfaces without damage.
- B. Clean in accordance with manufacturer's written instructions.
- C. Cleaning of Vinyl Composition Tile
 - 1. Sweep or dust mop to remove dirt and grit. Do not use treated dust mops.
 - 2. Add heavy duty cleaner to cool water following the manufacturer's instructions.
 - 3. Remove the solution with a wet-dry vacuum or auto scrubber until floor is dry and free of residue.
 - 4. Rinse the floor with clean water. Repeat the rinse process as necessary to remove all haze and residue.

3.7 PROTECTION

- A. Prohibit traffic on resilient flooring for 48 hours after installation and 72 hours heavy rolling loads.

3.8 SCHEDULE

- A. Refer to Finish Schedule on drawings.

END OF SECTION

SECTION 09 9000
PAINTING AND COATING

PART 1 GENERAL

1.1 SECTION INCLUDES

- A. Surface preparation.
- B. Interior painting and coating systems.
- C. Exterior painting and coating systems.
- D. Scope:
 - 1. Finish all newly installed surfaces, surfaces noted to be finished and any surfaces disturbed by construction activities, exposed to view, unless fully factory-finished and unless otherwise indicated.
 - a. Exterior:
 - a) Concrete: Cementitious siding, Flexboard, Transite, non-roof shingles, common brick, stucco, tilt-up concrete, precast, and cast-in-place concrete.
 - b) Metal, Miscellaneous: Iron, ornamental iron, structural iron and steel, and other ferrous metal.
 - b. Interior:
 - a) Concrete Masonry Units: Concrete, split face, scored, smooth, high density, low density, and fluted.
 - b) Metal: Structural steel columns, joists, trusses, beams, miscellaneous and ornamental iron, structural iron, and other ferrous metal.
 - c) Concrete: Floors, non-vehicular.

1.2 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. SSPC-SP 1 - Solvent Cleaning; 2015, with Editorial Revision (2016).
- C. SSPC-SP 2 - Hand Tool Cleaning; 2018.
- D. SSPC-SP 13 - Surface Preparation of Concrete; 2018.

1.3 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. Product characteristics.
 - 2. Surface preparation instructions and recommendations.
 - 3. Primer requirements and finish specification.
 - 4. Storage and handling requirements and recommendations.
 - 5. Application methods.
 - 6. Clean-up information.
- C. Maintenance Materials: Furnish the following for Yonkers Public Schools'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 manufacturer's label.

1.4 QUALITY ASSURANCE

- A. Applicator Qualifications: Company specializing in performing the type of work specified with minimum 3 years experience and approved by manufacturer.

1.5 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, product name, product code, color designation, VOC content, batch date, environmental handling, surface preparation, application, and use instructions.
- C. Paint Materials: Store at a minimum of 45 degrees F and a maximum of 90 degrees F, in ventilated area, and as required by manufacturer's instructions.
- D. Handling: Maintain a clean, dry storage area to prevent contamination or damage to materials.

1.6 FIELD CONDITIONS

- A. Do not apply materials when environmental conditions are outside the ranges required by manufacturer.
- B. Follow manufacturer's recommended procedures for producing the best results, including testing substrates, moisture in substrates, and humidity and temperature limitations.

PART 2 PRODUCTS

2.1 MANUFACTURERS

- A. Basis of Design Products: Subject to compliance with requirements, provide Sherwin-Williams Company (The) products indicated; www.sherwin-williams.com/#sle.
- B. Comparable Products: Products of approved manufacturers will be considered in accordance with 01 6000 - Product Requirements, and the following:
 - 1. Products that meet or exceed performance and physical characteristics of basis of design products.

2.2 PAINTINGS AND COATINGS

- A. General:
 - 1. Provide factory-mixed coatings unless otherwise indicated.
 - 2. Do not reduce, thin, or dilute coatings or add materials to coatings unless specifically indicated in manufacturer's 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.
 - 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. Accessory Materials: Provide primers, sealers, cleaning agents, cleaning cloths, sanding materials, and clean-up materials as required for final completion of painted surfaces.

2.3 Paint Systems - Exterior

- A. Concrete: Stucco, tilt-up, precast, and poured-in-place cement.
 - 1. Elastomeric System:
 - a. Flat Finish:
 - a) 1st Coat: Sherwin-Williams Loxon Concrete and Masonry Primer Sealer LX02W50: www.sherwin-williams.com/#sle.
 - (a) 5.3 to 8 mils wet, 2.1 to 3.2 mils dry.
 - b) 2nd and 3rd Coat: Sherwin-Williams ConFlex XL Elastomeric High Build Coating, CF11W50: www.sherwin-williams.com/#sle.

- (a) 13 to 16 mils wet, 6 to 7.5 mils dry per coat.

B. Metal, Miscellaneous: Ferrous metal.

1. Alkyd Systems, Water-Based:

a. Semi-Gloss Finish:

- a) 1st Coat: Sherwin-Williams Pro Industrial Pro-Cryl Universal Primer, B66-1310 Series: www.sherwin-williams.com/#sle.

- (a) 5 mils wet, 2 mils dry per coat.

- b) 2nd and 3rd Coat: Sherwin-Williams Pro Industrial Water Based Alkyd Urethane Enamel Semi-Gloss, B53-1150 Series: www.sherwin-williams.com/#sle.

- (a) 4 to 5 mils wet, 1.4 to 1.7 mils dry per coat.

2.4 Paint Systems - INTERIOR

A. Masonry CMU: .

1. Latex Systems:

a. Eg-Shel/Satin Finish:

- a) 1st Coat: Sherwin-Williams PrepRite Block Filler, B25W25: www.sherwin-williams.com/#sle.

- (a) 75 to 125 sq ft/gal.

- b) 2nd and 3rd Coat: Sherwin-Williams ProMar 200 Zero VOC Eg-Shel, B20-2600 Series: www.sherwin-williams.com/#sle.

- (a) 4 mils wet, 1.7 mils dry per coat.

B. Metal: Ferrous metal, doors and frames.

1. Alkyd Systems, Water-Based:

a. Semi-Gloss Finish:

- a) 1st Coat: Sherwin-Williams Pro Industrial Pro-Cryl Universal Primer, B66-1310 Series: www.sherwin-williams.com/#sle.

- (a) 5 mils wet, 2 mils dry per coat.

- b) 2nd and 3rd Coat: Sherwin-Williams Pro Industrial Water Based Alkyd Urethane Enamel Semi-Gloss, B53-1150 Series: www.sherwin-williams.com/#sle.

- (a) 4 to 5 mils wet, 1.4 to 1.7 mils dry per coat.

C. Concrete: Floors, non-vehicular.

1. Latex Systems:

a. Satin Finish:

- a) 1st and 2nd Coat: Sherwin-Williams Porch and Floor Enamel, A32-200 Series: www.sherwin-williams.com/#sle.

- (a) 4 mils wet, 1.5 mils dry per coat.

PART 3 EXECUTION

3.1 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 affect proper application.
- C. Test shop-applied primer for compatibility with subsequent cover materials.

3.2 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. Concrete:
 - 1. Fill bug holes, air pockets, and other voids with cement patching compound. See specification section 03 0100.
- D. Masonry: Remove efflorescence and chalk.
- E. Gypsum Board: Fill minor defects with filler compound; sand smooth and remove dust prior to painting.
- F. Plaster: Fill hairline cracks, small holes, and imperfections with patching plaster. Make smooth and flush with adjacent surfaces. Treat textured, soft, porous, or powdery surfaces in accordance with manufacturer's instructions.
- G. Concrete Floors and Traffic Surfaces: Prepare concrete according to SSPC-SP 13.
- H. Ferrous Metal:
 - 1. Shop-Primed Surfaces: Sand and scrape to remove loose primer and rust. Feather edges to make touch-up patches inconspicuous. Prime bare steel surfaces.
 - 2. Existing Surfaces: Remove rust, loose mill scale, and other foreign substances using methods recommended by paint manufacturer and Prep surface in accordance with SSPC-SP-3. Protect from corrosion until coated.

3.3 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.
- C. Apply coatings at spread rate required to achieve manufacturer's recommended dry film thickness.

3.4 Priming

- A. Apply primer to all surfaces unless specifically not required by coating manufacturer. Apply in accordance with coating manufacturer's instructions.
- B. Primers specified in painting schedules may be omitted on items factory primed or factory finished items if acceptable to top coat manufacturers.

3.5 Cleaning

- A. Collect waste material that could constitute a fire hazard, place in closed metal containers, and remove daily from site.
- B. Clean surfaces immediately of overspray, splatter, and excess material.
- C. After coating has cured, clean and replace finish hardware, fixtures, and fittings previously removed.

3.6 PROTECTION

- A. Protect finished coatings from damage until completion of project.
- B. Touch-up damaged finishes after Substantial Completion.

END OF SECTION

SECTION 10 2113
PLASTIC TOILET COMPARTMENTS

PART 1 GENERAL

1.1 RELATED DOCUMENTS

- A. Drawings and general provisions of the Contract, including School Facilities Management Contract Manual and Specifications and Division 1 Specification Sections, apply to this Section.
- B. In the event of discrepancies between the specifications and School Facilities Management Contract Manual and Specifications the School Facilities Management Contract Manual and Specifications shall prevail.

1.2 SECTION INCLUDES

- A. Solid polymer toilet compartments. (HDPE Toilet Partitions and NFPA 286 certification)

1.3 REFERENCE STANDARDS

- A. ASTM A167 - Standard Specification for Stainless and Heat-Resisting Chromium-Nickel Steel Plate, Sheet, and Strip.
- B. ASTM B221 - Standard Specification for Aluminum and Aluminum-Alloy Extruded Bars, Rods, Wire, Profiles, and Tubes
- C. ASTM E 84: Standard Test Method for Surface Burning Characteristics of Building Materials
- D. NFPA 286 - Standard Methods of Fire Tests for Evaluating Contribution of Wall and Ceiling Interior Finish to Room Fire Growth; 2024.

1.4 QUALITY ASSURANCE

- A. Manufacturer's Qualifications: A company regularly engaged in manufacture of products specified in this section, and whose products have been in satisfactory use under similar service conditions for not less than 5 years.
- B. Installer's Qualifications: A Company or Individual, regularly engaged in installation of products specified in this Section, with a minimum of 5 years experience.

1.5 ADMINISTRATIVE REQUIREMENTS

- A. Coordination: Coordinate the work with placement of support framing and anchors in walls and ceilings.

1.6 SUBMITTALS

- A. See Section 01 3000 - Administrative Requirements, for submittal procedures.
- B. Shop Drawings: Indicate partition plan, elevation views, dimensions, details of wall and floor supports, door swings.
- C. Manufacturer's Installation Instructions: Indicate special procedures.
- D. Manufacturer's guarantee.

1.7 WARRANTY

- A. Manufacturer's guarantees its plastic against breakage, corrosion, and delamination under normal conditions for 25 years from the date of receipt by the customer. If materials are found to be defective during that period for reasons listed above, the materials will be replaced free of charge.

PART 2 PRODUCTS

2.1 MANUFACTURERS

- A. Scranton Products: www.scrantonproducts.com.
 - 1. Substitutions: Refer to 01 6000 - Product Requirements.

2.2 PLASTIC TOILET COMPARTMENTS

- A. Toilet Compartments: Factory fabricated doors, pilasters, and divider panels made of solid molded high density polyethylene (HDPE) resins, overhead braced. (Floated HDPE is not acceptable.)
 - 1. Waterproof and nonabsorbent, with self-lubricating surface, resistant to marks by pens, pencils, markers, and other writing instruments
 - 2. Color: As selected by the Engineer to match existing.
- B. Doors:
 - 1. Thickness: 1 inch.
 - 2. Width: 24 inch.
 - 3. Width for Handicapped Use: 36 inch, out-swinging.
 - 4. Height: 55 inch.
- C. Panels:
 - 1. Thickness: 1 inch.
 - 2. Height: 55 inch.
 - 3. Depth: As indicated on drawings.
- D. Pilasters: Pilasters shall be 81-1/2" high finished height. Pilasters shall include a mounting system comprised of a one piece 20 gauge, 304 stainless steel with #4 finish 3" high shoe with an integral plate in the bottom. The shoe shall be mounted to the floor utilizing concrete anchors supplied by Manufacturer or equal. The concrete anchors shall be driven through the plate affixing it to the concrete floor. The concrete anchors shall have 2,700 lbs of holding strength when used in 5,000 psi concrete flooring. The pilaster height shall be adjusted by utilizing the machine thread bolt supplied which is placed into a metal insert installed in the bottom of the pilaster at the manufacturing facility.
- E. Pilasters:
 - 1. Thickness: 1 inch.
 - 2. Width: As required to fit space; minimum 3 inch.
 - 3. Mount: 14" above finish floor.

2.3 ACCESSORIES

- A. Pilaster Shoes: Stainless steel, satin finish, 3 inches high; concealing floor fastenings.
 - 1. Provide adjustment for floor variations with screw jack through steel saddles integral with pilaster.
- B. Head Rails: Extruded aluminum, anti-grip profile secured to pilaster with stainless steel tamper resistant Torx head sex bolt.
 - 1. Size: Manufacturer's standard size.
- C. Wall Brackets: Continuous type, "U" shape natural anodized aluminum.
- D. Attachments, Screws, and Bolts: Stainless steel, tamper proof type.
 - 1. For attaching panels and pilasters to brackets: Through-bolts and nuts; tamper proof.
- E. Hardware: Satin stainless steel:
 - 1. 8 inches long, fabricated from heavy-duty extruded aluminum with bright dip anodized finish, wrap-around flanges, adjustable on 30-degree increments, through bolted to doors and pilasters with stainless steel, Torx head sex bolts.
 - 2. Hinges operate on field-adjustable nylon cams, field adjustable in 30 degree increments.
 - 3. Door Strike and Keeper:
 - a. 6 inches long, fabricate from heavy-duty extruded aluminum with bright dip anodized finish, with wrap-around flanges secured to pilasters with stainless steel tamper resistant Torx head sex bolts.
 - a) Bumper: Extruded black vinyl.
 - 4. Latch and Housing:
 - a. Heavy-duty extruded aluminum.

- b. Latch housing: Bright dip anodized finish.
 - c. Slide bolt and button with lift emergency access feature in strike keeper.: Black anodized finish
- 5. Coat Hook/Bumper:
 - a. Combination type, chrome plated Zamak.
 - b. Equip outswing handicapped doors with second door pull and door stop
- 6. Provide door pull for outswinging doors.
- 7. **Provide door pull both sides of ADA compartments.**

PART 3 EXECUTION

3.1 EXAMINATION

- A. Verify that field measurements are as indicated.
- B. Verify existing panel dimensions and clearances.
- C. Start of work constitutes acceptance of job.

3.2 INSTALLATION

- A. Install pilaster secure, rigid, plumb, and level in accordance with manufacturer's instructions.
- B. Attach panel brackets securely to walls using anchor devices.
- C. Attach panels and pilasters to brackets. Locate head rail joints at pilaster center lines.
- D. No evidence of cutting, drilling, and/or patching shall be visible on the finished work.
- E. All panels shall typically be mounted at 14" above finished floor
- F. Field touch-up of scratches or damaged finish will not be permitted. Replace damaged or scratched materials with new materials.

3.3 TOLERANCES

- A. Maximum Variation From True Position: 1/4 inch.
- B. Maximum Variation From Plumb: 1/8 inch.

3.4 ADJUSTING/CLEANING

- A. Adjust and align hardware to uniform clearance at vertical edge of doors, not exceeding 3/16 inch.
- B. Adjust hinges to position doors in partial opening position when unlatched. Return out-swinging doors to closed position.
- C. Adjust adjacent components for consistency of line or plane.
- D. Finished surfaces shall be cleaned after installation and be left free of all imperfections.

3.5 PROTECTION

- A. Protect installed products until completion of project.
- B. Touch-up, repair or replace damaged products before Substantial Completion.
- C. Remove factory protective coverings and clean finish surfaces in accordance with manufacturer's instructions before substantial completion.

END OF SECTION

SECTION 22 0000

GENERAL PLUMBING REQUIREMENTS

PART 1 -GENERAL

1.01 RELATED DOCUMENTS

- A. Provisions of the General Conditions, Supplementary Conditions and Division 01 -General Requirements, and applicable provisions elsewhere in the Contract Documents apply to work of Division 22.
- B. In case of disagreement between Drawings and Specifications, or within either document itself, obtain written clarification from the Mechanical Engineer through the Architect. Failure to obtain clarification prior to bid will result in the better quality and greater quantity being required during the construction phase without additional reimbursement.

1.02 DESCRIPTION OF SYSTEMS

- A. The related work of Division 22 includes but is not limited to:
 - 1. Section 220000 - General Plumbing Requirements.
 - 2. Section 220010 - Plumbing Related Work.
 - 3. Section 220500 - Pipe, Valves and Pipe Specialties.
 - 4. Section 220553 - Plumbing Identification.
 - 5. Section 220700 - Plumbing Insulation.
 - 6. Section 222000 - Plumbing Systems.

1.03 DESCRIPTION OF WORK

- A. Work Included: Unless specified otherwise, provide all supervision, labor, materials, transportation, equipment, hauling, and services necessary for a complete and operational mechanical system. Provide all incidental items such as offsets, fittings, etc. required as part of the work even though not specifically shown on Contract Drawings or Specifications.
- B. Inspection: Inspect work proceeding or interfacing with work of Division 22 sections prior to submitting bid and report any known or observed defects that affect the Mechanical Design to the General Contractor. Do not proceed with the construction work until defects are corrected.
- C. Existing Utilities are indicated as accurately as possible on the Drawings. If utilities are encountered and not indicated on Drawings, notify the Architect prior to proceeding with work.

1.04 UTILITIES, EXTENSIONS, CONNECTIONS AND FEES FOR WATER AND SEWER

- A. Provide all services within the building to a point five (5) feet outside of building. Provide permanent marker at grade for other contractors' location reference for connection purposes.
- B. Provide all building services and connections to site utilities, as indicated on Drawings.
- C. In the event that the serving utility company installs their own taps, service, meters, etc., all costs imposed by this action shall be paid for by the Owner. Extensions from termination points to connection with building services and systems will be the responsibility of the Division 22 Contractor.
- D. Contractor shall be responsible for all pads, meter enclosures, valves and appurtenances, all in conformance with requirements of the serving utility company.

1.05 REFERENCES

- A. General:
 - 1. For products or workmanship specified by Association, Trade or Federal Standards, comply with requirements of the standard, except when more rigid requirements are specified or are required by applicable codes.
 - 2. The date of the standard is that which is in effect as of the date of the Contract Documents, except when a specific date is specified.

1.06 QUALITY CONTROL

- A. Materials and apparatus required for the work shall be new and of first-class quality; to be furnished, delivered, erected, connected and finished in every detail; and to be so selected and arranged so as to fit properly into the building spaces.

- B. Unless otherwise specifically indicated, equipment and materials shall be installed in accordance with the recommendations of the manufacturer. This includes the performance of tests as recommended by the manufacturer.

1.07 EXAMINATION OF CONTRACT DRAWINGS AND SPECIFICATIONS

- A. The Mechanical Drawings show the general arrangement of piping, ductwork, mechanical equipment, and appurtenances, and shall be followed as closely as actual building construction and the work of other trades will permit.
- B. The Architectural and Structural Drawings shall be considered part of the mechanical work insofar as these Drawings furnish this Division with information relating to design and construction of the building.
- C. Field verify building dimensions governing mechanical work. Do not scale the Mechanical Drawings for dimensions. If field dimensions are not available take dimensions, measurements, locations, levels, etc. from the Architectural Drawings and the approved Shop Drawings submitted on the actual equipment to be furnished.
- D. The Mechanical Contractor shall request of the Test and Balance (TAB) Contractor an early review of the Contract Documents for the purpose of identifying where proper balancing cannot be achieved. The report requirements are referred to in Division 23, Temperature Controls section, "Submittals." Forward a copy of the report to the mechanical engineer for review. The Mechanical Contractor shall modify the system as recommended by the TAB Contractor or refer unresolved issues to the Mechanical Engineer for resolution prior to ordering of ductwork and equipment. Unresolved balancing issues from untimely or incomplete application of these requirements will be the responsibility of the Mechanical Contractor to correct.
- E. No extra compensation shall be claimed or allowed due to differences between the actual dimensions and those indicated on the Drawings.
- F. Discrepancies: Examine Drawings and Specifications for other parts of the work, and if any discrepancies occur between the plans for the work of this Division and the plans for the work of others, report such discrepancies to the General Contractor and obtain written instructions for any changes necessary. Report any inconsistencies between the drawings and specifications and the installation requirements of equipment manufacturers.
- G. Order of Precedence: The precedence of Mechanical Construction Documents is as follows:
 - 1. Addenda and modifications to the Drawings and Specifications take precedence over the original Drawings and Specifications.
 - 2. Should there be a conflict within the Specifications or within Drawings of the same scale, the more stringent or higher quality requirements shall apply.
 - 3. In the Drawings, the precedence shall be figured dimensions over scaled dimensions and noted materials over graphic indications.
 - 4. Should a conflict arise between the Drawings and the Specifications the most stringent shall have precedence.
 - 5. Should there be a conflict in dimensions or locations between Mechanical Drawings and/or Architectural/Structural Drawings, the Architectural/Structural Drawings shall have precedence.

1.08 EXAMINATION OF PROJECT SITE

- A. Examine site carefully to determine conditions to be encountered, work to be performed, equipment, materials to be transported, stored, furnished, and other features applicable to completion of the work.
- B. Study Drawings and Specifications, report inconsistencies, errors, omissions or conflicts with codes and ordinances.
- C. Submittal of bid will indicate satisfactory examination of the Documents have been made, and applicable allowances included in the bid.

1.09 REGULATORY REQUIREMENTS

- A. Refer to Architectural Drawings and Division 01 specifications for a list of applicable codes.
- B. Execute work per Underwriters, Public Utility, Local and State Codes, Ordinances and applicable regulations. Obtain and pay for required permits, inspections, and certificates. Notify Architect of items not meeting said requirements.

- C. Comply with latest editions of all applicable codes, standards, ordinances and regulations in effect as of the date of the Contract Documents.
- D. If discrepancies occur between the Contract Documents and any applicable codes, ordinances, acts, or standards, the most stringent requirements shall apply.
- E. Where hourly fire and smoke ratings are indicated or required, whether or not shown, provide components and assemblies meeting requirements of the American Insurance Association, Factory Mutual Insurance Association and listed by Underwriters Laboratories, Inc.

1.10 COORDINATION

- A. The Contractor shall plan all of his work in advance, and shall inform the General Contractor of the proposed construction schedule and anticipated completion date upon request. Contractor shall complete the entire installation as soon as the condition of the remaining building construction will permit.
- B. Before purchase, fabrication, or installation of items, determine if the installation will properly fit and can be installed as contemplated without interference with structural elements or the work of other trades.
- C. Locations of pipes, ducts, switches, panels, equipment, and fixtures, shall be adjusted to accommodate the work or interferences anticipated and encountered. Determine the exact route and location of each pipe and duct prior to fabrication.
- D. Right of Way: Lines which pitch shall have the right-of-way over those which do not pitch. Lines whose elevations cannot be changed shall have right-of-way over lines whose elevations can be changed.
- E. Offsets, transitions and changes in direction of pipes and ducts shall be made as required to maintain proper head room and pitch of sloping lines whether or not indicated on the Drawings.
- F. Where major conflicts occur, contractor shall rely upon the Architect/Engineer to make final decision regarding priority of right-of-way. Contractor shall request written clarification from the Architect/Engineer prior to conflict reaching critical stage requiring removal of previously installed equipment or system components either by himself or by other trades involved.
- G. When directed by the Architect/Engineer, submit Shop Drawings showing interrelationship of various portions of work and work of other trades. Failure to properly coordinate may result in removal and relocation at expense to the Contractor.
- H. Coordinate all electrical work with Electrical Contractor. Read the Electrical Specification and report any inconsistencies. See "Electrical Wiring and Safety Device Work and Material Responsibilities" in this section.
- I. Coordinate all cutting & patching with General Contractor.
- J. Utility Interruptions: Coordinate mechanical utility interruptions with the Owner and the Utility Company. Plan work so that duration of the interruption is kept to a minimum.

1.11 PROJECT CONDITIONS

- A. Accessibility:
 - 1. Contractor shall be responsible for the sufficiency of the size of shafts and chases and the adequate clearance in double partitions and hung ceilings for proper installation of work. Coordinate these requirements with the General Contractor. Such spaces and clearances shall be kept to the minimum size required.
 - 2. Locate all equipment which must be serviced, operated, or maintained in fully accessible positions. Furnish access doors for this purpose. Minor deviations from Drawings may be allowed to provide for better accessibility. Any changes shall be approved by the Architect prior to making the change.
 - 3. Provide the General Contractor with the exact locations of access doors. Locations of these doors shall be submitted in sufficient time to be installed in the normal course of work.
 - 4. Demonstration of access will be required prior to project completion. The contractor is responsible for providing reasonable and safe access for all system components. Contractor to arrange with an Owner's Representative a time for the demonstration prior to the final punchlist.
- B. Fabrication: Before installing and/or fabricating any lines of piping or ductwork the Contractor shall assure himself that they can be run as contemplated in cooperation with Contractors of other Divisions of the Work and the physical constraints of the Structural and Architectural Work.

- C. Freeze Protection: Do not run pipes in outside walls, or locations where freezing may occur. Piping next to outside walls shall be in furred spaces with insulation between the piping and the outside wall. Insulation of piping shall not be considered freeze protection.
- D. Scaffolding, Rigging and Hoisting: Provide scaffolding, rigging, hoisting and services necessary for erection and delivery into the premises of any equipment and apparatus furnished. Remove same from premises when no longer required.

1.12 SUBMITTALS:

- A. Within thirty days after award of the Contract, submit to Architect complete catalog data and/or Shop Drawings for each item of material and for every manufactured item of equipment to be used in the work. Such data shall include specific performance data, material description, rating, capacity, dimensions, and type for each item of material, each manufactured item, and all component parts utilized in final operating mechanical system. Applicable data shall be underlined and each applicable item identified in each catalog by the same identification acronyms used on the Drawings.
- B. This Contractor shall submit to the Architect the number of copies required by the General and Special Conditions of Division 01, but in no case less than four (4) copies.
- C. Each item submitted shall bear the Contractor's stamp, be dated and signed certifying that he has reviewed and approved the Submittal.
- D. For each item scheduled on the Drawings, submit a replication of that schedule indicating actual data of the submitted equipment in the schedule.
- E. The review comments of the Architect and/or Engineer do not in any case supersede the Drawings and Specifications, and shall not relieve the Contractor from responsibility for deviations from the Drawings or Specifications unless the Contractor has called to the attention of the Architect and/or Engineer, in writing, such deviations at the time of submission, nor shall it relieve the Contractor from responsibility for errors of any sort in the items submitted.
- F. Test Reports: Submit certified test reports as required by various Sections of Division 22 showing compliance in accordance with the General Conditions of the Contract.
- G. Deviations: It is the contractors responsibility to indicate deviations from the Plans And Specifications. Approval shall not be considered acceptance of the deviation unless it has been explicitly indicated.

1.13 SITE OBSERVATION REPORTS

- A. During the construction period the Engineer may issue periodic site observation reports. The contractor shall immediately address the issues and provide a written response identifying the "Responsible Contractor," "Date," "Corrective Action Taken," and "Recommendations."
- B. The written response must be returned to the Architect no later than (5) working days after receipt of the site observation report.

1.14 PRODUCT OPTIONS AND SUBSTITUTIONS

- A. Substitutions: Comply with Division 01 & Instructions to Bidders.
- B. Contractors desiring to use alternate equipment or materials and manufacturers or suppliers desiring to furnish alternate materials or equipment in lieu of those specified, shall submit requests for approval to the Engineer not less than seven (7) calendar days prior to scheduled closing date for receipt of proposals.
- C. Materials and equipment are specified by manufacturer and catalog numbers. The manufacturers and catalog numbers are used to establish a degree of quality and style for such equipment and material.
- D. When alternate or substitute materials and equipment are used, Contractor will be responsible for space requirement, configurations, performance, changes in bases, supports, structural members and openings in structure, electrical changes and other apparatus and trades that may be affected by their use. Contractor shall provide drawings for alternate/substitute equipment in detail equal to the construction documents.

1.15 PROJECT RECORD DOCUMENTS

- A. General: Comply with Division 01.
- B. Job Site Documents: Maintain at the job site, one record copy of the following:

1. Drawings
 2. Specifications
 3. Addenda
 4. Reviewed Shop Drawings
 5. Field Test Records
- C. Do not use record documents for construction purposes. Maintain documents in clean, dry legible condition, apart from documents used for construction.
- D. Record Information: Label each document "Record Document." Mark information with contrasting color using ink. Keep each record current. Do not permanently conceal any work until required information is recorded. Record the following information on drawings:
1. Horizontal and vertical location of underground utilities.
 2. Location of internal utilities and appurtenances concealed in construction.
 3. Field changes of dimension and detail.
 4. Changes by change order or field order.
 5. Details not on original Contract Drawings.
- E. Contractor shall transfer all as-built information on to CAD files. Electronic copy will be provided upon request.
- F. Record the following information on Specifications:
1. Manufacturer, trade name, catalog number and supplier of each product and item of equipment actually installed.
 2. Changes by change order or field order.
 3. Other matters not originally specified.
- G. Shop Drawings: Maintain Shop Drawings as record documents recording changes made after review as specified for drawings above.

1.16 DELIVERY, STORAGE AND HANDLING

- A. Deliver and store materials and equipment in manufacturer's unopened containers fully identified with manufacturer's name, trade name, type, class, grade, size and color.
- B. Protection: Make provisions for coordination with Owner and other Contractors for safe storage of materials and equipment. Store materials and equipment off the ground and under cover, protected from damage.
- C. All items subject to moisture damage, such as controls, shall be stored in a dry, heated space.
- D. Large Items: Make arrangements with other Contractors on the job for introduction into the building of equipment too large to pass through finished openings. Schedule delivery of large equipment requiring special openings as required for installation without delaying the work of other project trades.
- E. Acceptance: Check and sign for materials to be furnished by Division 22 and other trades for installation under Division 22 upon delivery. Assume responsibility for the storage and safekeeping of such materials from time of delivery until final acceptance.
- F. Inspection: Stored material shall be readily accessible for inspection by the Architect until installed.

1.17 WARRANTIES

- A. Warranty: In accordance with Division 01, provide a written warranty to the Owner covering the entire mechanical work to be free from defective materials, equipment and workmanship. If the warranty period is not defined in Division 01, the minimum warranty period will be for a period of two years after Date of Acceptance. Purchase of manufacturer's extended warranty may be required to comply with the warranty period requirement. During this period provide labor and materials as required to repair or replace defects at no additional cost to the Owner. Provide certificates for such items of equipment which have warranties in excess of one year. Submit to the General Contractor.
- B. This warranty will be in addition to the terms of any specific equipment warranties or warranty modifications resulting from use of equipment for temporary heat or ventilation.

1.18 SCHEDULE OF TESTING

- A. Provide testing in accordance with the General Conditions of the Contract. Make all specified tests on piping, ductwork and related systems as necessary. Demonstrate the proper operation of equipment installed under this project.
- B. Equipment shall not be tested, or operated for any purpose until fully lubricated in accordance with manufacturer's instructions and until connections to fully operative systems have been accomplished.
- C. A schedule of testing shall be drawn up by the Division 22 Contractor in such a manner that it will show areas tested, test pressure, length of test, date, time and signature of testing personnel. All testing must be performed in the presence of the General Contractor's representative; his signature for verification of the test must appear on the schedule. At completion of testing, the schedule shall then be submitted in triplicate to the Architect.
- D. Make sure operational and performance tests are made on seasonal equipment.
- E. Complete all tests required by Code Authorities, such as smoke detection, life safety, fire protection and health codes.

1.19 DEMONSTRATION OF ACCESS

- A. The Contractor shall demonstrate to the Owner's designated representative the access to all switches, valves, actuators, dampers, motors, lubrication lines, sensors and panels. Contractor shall correct deficiencies noted by the Owner. Refer outstanding issues to the Architect/Engineer for resolution. Contractor to be responsible for arranging the demonstration prior to final inspection.

1.20 CERTIFICATES AND KEYS

- A. Certificates: Upon completion of the work, deliver to the General Contractor one copy of Certificate of Final Inspection.
- B. Keys: Upon completion of work, submit keys for mechanical equipment, panels, etc. to the General Contractor.

1.21 OPERATING AND MAINTENANCE DATA

- A. Submit three (3) typed and bound copies of the maintenance manual, 8-1/2" x 11" in size, to the Architect, for review and approval. These approved copies shall then be transmitted to the Owner.
- B. The manual shall be enclosed in a stiff-back, three-ring binder and shall have:
 - 1. Table of Contents, Equipment List with identification used in contract documents.
 - 2. Alphabetical list of all system components including the name, address, and 24-hour phone number of the company responsible for servicing each item during the first year of operation.
 - 3. Operating instructions for complete system, including procedures for fire or failure of major equipment and procedures for normal starting/operating/shutdown and long-term shutdown.
 - 4. Maintenance instructions, including valves, valve tag and other identified equipment lists, proper lubricants and lubricating instructions for each piece of equipment and necessary cleaning/replacing/adjusting schedules.
 - 5. Manufacturer's data on each piece of equipment, including:
 - a. Installation instructions.
 - b. Drawings and Specifications (approved Shop Drawings).
 - c. Parts lists.
 - d. Complete wiring and temperature control diagrams. (Approved Shop Drawings).
 - e. Completed and approved TAB report.

1.22 INSTRUCTIONAL SESSIONS

- A. Be responsible for scheduling instructional meetings for maintenance personnel on the proper operation and maintenance of all mechanical systems, using the maintenance manual as a guide. These meetings must be scheduled through the Architect or General Contractor and with enough advanced notice that all personnel can be notified. Provide instructional sessions as required.
- B. B. Video tape instructional sessions for Owner's future use.

PART 2 -PRODUCTS (NOT APPLICABLE)

PART 3 -EXECUTION (NOT APPLICABLE)

END OF SECTION

SECTION 22 0523

GENERAL-DUTY VALVES FOR PLUMBING PIPING

PART 1 GENERAL

1.01 SECTION INCLUDES

- A. Applications.
- B. General requirements.
- C. Ball valves.
- D. Check valves.
- E. Gate valves.
- F. Plug valves.

1.02 RELATED REQUIREMENTS

- A. Section 22 0719 - Plumbing Piping Insulation.
- B. Section 22 1005 - Plumbing Piping.

1.03 ABBREVIATIONS AND ACRONYMS

- A. CWP: Cold working pressure.
- B. EPDM: Ethylene propylene copolymer rubber.
- C. NRS: Non-rising stem.
- D. OS&Y: Outside screw and yoke.
- E. RS: Rising stem.
- F. SWP: Steam working pressure.

1.04 REFERENCE STANDARDS

- A. ASME B1.20.1 - Pipe Threads, General Purpose (Inch); 2013.
- B. ASME B16.1 - Gray Iron Pipe Flanges and Flanged Fittings: Classes 25, 125, and 250; 2015.
- C. ASME B16.5 - Pipe Flanges and Flanged Fittings NPS 1/2 Through NPS 24 Metric/Inch Standard; 2017.
- D. ASME B16.18 - Cast Copper Alloy Solder Joint Pressure Fittings; 2012.
- E. ASME B31.9 - Building Services Piping; 2014.
- F. ASME BPVC-IX - Boiler and Pressure Vessel Code, Section IX - Welding, Brazing, and Fusing Procedures; Welders; Brazers; and Welding, Brazing and Fusing Operators; 2017.
- G. ASTM A48/A48M - Standard Specification for Gray Iron Castings; 2003 (Reapproved 2016).
- H. ASTM A126 - Standard Specification for Gray Iron Castings for Valves, Flanges, and Pipe Fittings; 2004 (Reapproved 2014).
- I. ASTM B62 - Standard Specification for Composition Bronze or Ounce Metal Castings; 2017.
- J. MSS SP-78 - Cast Iron Plug Valves, Flanged and Threaded Ends; 2011.
- K. MSS SP-80 - Bronze Gate, Globe, Angle and Check Valves; 2013.
- L. MSS SP-110 - Ball Valves Threaded, Socket-Welding, Solder Joint, Grooved and Flared Ends; 2010.
- M. NSF 61 - Drinking Water System Components - Health Effects; 2017.
- N. NSF 372 - Drinking Water System Components - Lead Content; 2016.

1.05 SUBMITTALS

- A. See Section 01 3000 - Administrative Requirements, for submittal procedures.
- B. Product Data: Provide data on valves including manufacturers catalog information. Submit performance ratings, rough-in details, weights, support requirements, and piping connections.

1.06 QUALITY ASSURANCE

- A. Welding Materials and Procedures: Comply with ASME BPVC-IX.

PART 2 PRODUCTS

2.01 APPLICATIONS

- A. See drawings for specific valve locations.
- B. Provide the following valves for the applications if not indicated on drawings:
1. Shutoff: Ball, butterfly, gate or plug.
 2. Dead-End: Single-flange butterfly (lug) type.
 3. Throttling: Provide globe, angle, ball, or butterfly.
- C. Domestic, Hot and Cold Water Valves:
1. 2 NPS (50 DN) and Smaller:
 - a. Bronze and Brass: Provide with solder-joint or threaded ends.
 - b. Bronze Angle: Class 125, bronze disc.
 - c. Ball: One piece, full port, brass or bronze with brass trim.
 - d. Bronze Swing Check: Class 125, bronze disc.
 - e. Bronze Gate: Class 125, NRS.

2.02 GENERAL REQUIREMENTS

- A. Valve Pressure and Temperature Ratings: No less than rating indicated; as required for system pressures and temperatures.
- B. Valve Sizes: Match upstream piping unless otherwise indicated.
- C. Valve Actuator Types:
1. Handwheel: Valves other than quarter-turn types.
- D. Valve-End Connections:
1. Threaded End Valves: ASME B1.20.1.
 2. Flanges on Iron Valves: ASME B16.1 for flanges on iron valves.
 3. Pipe Flanges and Flanged Fittings 1/2 NPS (15 DN) through 24 NPS (600 DN): ASME B16.5.
- E. General ASME Compliance:
1. Solder-joint Connections: ASME B16.18.
 2. Building Services Piping Valves: ASME B31.9.
- F. Valve Materials for Potable Water: NSF 61 and NSF 372.

2.03 BRASS BALL VALVES

- A. Two Piece, Full Port with Brass Trim:
1. Comply with MSS SP-110.
 2. SWP Rating: 150 psig (1035 kPa).
 3. CWP Rating: 600 psig (4140 kPa).
 4. Body: Forged brass.
 5. Ends: Threaded.
 6. Seats: PTFE.

2.04 BRONZE BALL VALVES

- A. Two Piece, Full Port with Bronze Trim:
1. Comply with MSS SP-110.
 2. SWP Rating: 150 psig (1035 kPa).
 3. CWP Rating: 600 psig (4140 kPa).
 4. Body: Bronze.
 5. Ends: Threaded.
 6. Seats: PTFE.

2.05 BRONZE SWING CHECK VALVES

- A. Class 125: CWP Rating: 200 psig (1380 kPa).
 - 1. Comply with MSS SP-80, Type 3.
 - 2. Design: Horizontal flow.
 - 3. Body: Bronze, ASTM B62.
 - 4. Ends: Threaded as indicated.
 - 5. Disc: Bronze.

2.06 BRONZE GATE VALVES

- A. Rising Stem (RS):
 - 1. Comply with MSS SP-80, Type I.
 - 2. Class 125: CWP Rating: 200 psig: (1380 kPa).
 - 3. Body: ASTM B62, bronze with integral seat and screw-in bonnet.
 - 4. Ends: Threaded or solder joint joint.
 - 5. Stem: Bronze.
 - 6. Disc: Solid wedge; bronze.
 - 7. Packing: Asbestos free.
 - 8. Handwheel: Malleable iron, bronze, or aluminum.

2.07 LUBRICATED PLUG VALVES

- A. Regular Gland with Flanged Ends:
 - 1. Comply with MSS SP-78, Type II.
 - 2. Class 125: CWP Rating: 200 psig (1380 kPa).
 - 3. Body: ASTM A48/A48M or ASTM A126, cast iron with lubrication sealing system.
 - 4. Pattern: Regular or short.
 - 5. Plug: Cast iron or bronze with sealant groove.

PART 3 EXECUTION

3.01 EXAMINATION

- A. Discard all packing materials and verify that valve interior, including threads and flanges are completely clean without signs of damage or degradation that could result in leakage.
- B. Verify valve parts to be fully operational in all positions from closed to fully open.
- C. Confirm gasket material to be suitable for the service, to be of correct size, and without defects that could compromise effectiveness.
- D. Should valve is determined to be defective, replace with new valve.

3.02 INSTALLATION

- A. Provide unions or flanges with valves to facilitate equipment removal and maintenance while maintaining system operation and full accessibility for servicing.
- B. Provide separate valve support as required and locate valve with stem at or above center of piping, maintaining unimpeded stem movement.

END OF SECTION

SECTION 22 0529

HANGERS AND SUPPORTS FOR PLUMBING PIPING AND EQUIPMENT

PART 1 GENERAL

1.01 SECTION INCLUDES

- A. Support and attachment components for equipment, piping, and other plumbing work.

1.02 RELATED REQUIREMENTS

- A. Section 03 3000 - Cast-in-Place Concrete: Concrete equipment pads.

1.03 REFERENCE STANDARDS

- A. ASTM A123/A123M - Standard Specification for Zinc (Hot-Dip Galvanized) Coatings on Iron and Steel Products; 2017.
- B. ASTM A153/A153M - Standard Specification for Zinc Coating (Hot-Dip) on Iron and Steel Hardware; 2016a.
- C. ASTM B633 - Standard Specification for Electrodeposited Coatings of Zinc on Iron and Steel; 2015.
- D. MFMA-4 - Metal Framing Standards Publication; 2004.
- E. MSS SP-58 - Pipe Hangers and Supports - Materials, Design, Manufacture, Selection, Application, and Installation; 2009.

1.04 SUBMITTALS

- A. See Section 01 3000 - Administrative Requirements, for submittal procedures.
- B. Product Data: Provide manufacturer's standard catalog pages and data sheets for metal channel (strut) framing systems, nonpenetrating rooftop supports, post-installed concrete and masonry anchors, and thermal insulated pipe supports.

1.05 QUALITY ASSURANCE

- A. Comply with applicable building code.

PART 2 PRODUCTS

2.01 SUPPORT AND ATTACHMENT COMPONENTS

- A. General Requirements:
 - 1. Comply with MSS SP-58.
 - 2. Provide all required hangers, supports, anchors, fasteners, fittings, accessories, and hardware as necessary for the complete installation of plumbing work.
 - 3. Provide products listed, classified, and labeled as suitable for the purpose intended, where applicable.
 - 4. Where support and attachment component types and sizes are not indicated, select in accordance with manufacturer's application criteria as required for the load to be supported. Include consideration for vibration, equipment operation, and shock loads where applicable.
 - 5. Do not use wire, chain, perforated pipe strap, or wood for permanent supports unless specifically indicated or permitted.
 - 6. Steel Components: Use corrosion resistant materials suitable for the environment where installed.
 - a. Zinc-Plated Steel: Electroplated in accordance with ASTM B633.
 - b. Galvanized Steel: Hot-dip galvanized after fabrication in accordance with ASTM A123/A123M or ASTM A153/A153M.
- B. Metal Channel (Strut) Framing Systems:
 - 1. Manufacturers:
 - a. Cooper B-Line, a division of Eaton Corporation: www.cooperindustries.com/#sle.
 - b. Thomas & Betts Corporation: www.tnb.com/#sle.
 - c. Unistrut, a brand of Atkore International Inc: www.unistrut.com/#sle.
 - d. or approved equal.
 - 2. Comply with MFMA-4.
 - 3. Channel Material:

- a. Indoor Dry Locations: Use painted steel, zinc-plated steel, or galvanized steel.
 - b. Outdoor and Damp or Wet Indoor Locations: Use galvanized steel.
- 4. Minimum Channel Thickness: Steel sheet, 12 gage, 0.1046 inch (2.66 mm).
- 5. Minimum Channel Dimensions: 1-5/8 inch (41 mm) width by 13/16 inch (21 mm) height.
- C. Hanger Rods: Threaded zinc-plated steel unless otherwise indicated.
 - 1. Minimum Size, Unless Otherwise Indicated or Required:
 - a. Equipment Supports: 1/2 inch (13 mm) diameter.
 - b. Piping up to 1 inch (27 mm) nominal: 1/4 inch (6 mm) diameter.
 - c. Piping larger than 1 inch (27 mm) nominal: 3/8 inch (10 mm) diameter.
 - d. Trapeze Support for Multiple Pipes: 3/8 inch (10 mm) diameter.
- D. Anchors and Fasteners:
 - 1. Manufacturers - Mechanical Anchors:
 - a. Hilti, Inc: www.us.hilti.com/#sle.
 - b. ITW Red Head, a division of Illinois Tool Works, Inc: www.itwredhead.com/#sle.
 - c. Powers Fasteners, Inc: www.powers.com/#sle.
 - d. Simpson Strong-Tie Company Inc: www.strongtie.com/#sle.
 - e. or approved equal.
 - 2. Unless otherwise indicated and where not otherwise restricted, use the anchor and fastener types indicated for the specified applications.
 - 3. Concrete: Use preset concrete inserts, expansion anchors, or screw anchors.
 - 4. Steel: Use beam clamps, machine bolts, or welded threaded studs.
 - 5. Powder-actuated fasteners are not permitted.
 - 6. Preset Concrete Inserts: Continuous metal channel (strut) and spot inserts specifically designed to be cast in concrete ceilings, walls, and floors.
 - a. Comply with MFMA-4.
 - b. Channel Material: Use galvanized steel.
 - c. Minimum Channel Thickness: Steel sheet, 12 gage, 0.1046 inch (2.66 mm) minimum base metal thickness.
 - d. Manufacturer: Same as manufacturer of metal channel (strut) framing system.

PART 3 EXECUTION

3.01 EXAMINATION

- A. Verify that mounting surfaces are ready to receive support and attachment components.
- B. Verify that conditions are satisfactory for installation prior to starting work.

3.02 INSTALLATION

- A. Install products in accordance with manufacturer's instructions.
- B. Provide independent support from building structure. Do not provide support from piping, ductwork, conduit, or other systems.
- C. Unless specifically indicated or approved by Engineer, do not provide support from suspended ceiling support system or ceiling grid.
- D. Unless specifically indicated or approved by Engineer, do not provide support from roof deck.
- E. Do not penetrate or otherwise notch or cut structural members without approval of Structural Engineer.
- F. Equipment Support and Attachment:
 - 1. Use metal fabricated supports or supports assembled from metal channel (strut) to support equipment as required.
 - 2. Use metal channel (strut) secured to studs to support equipment surface-mounted on hollow stud walls when wall strength is not sufficient to resist pull-out.
 - 3. Use metal channel (strut) to support surface-mounted equipment in wet or damp locations to provide space between equipment and mounting surface.
 - 4. Securely fasten floor-mounted equipment. Do not install equipment such that it relies on its own weight for support.

- G. Preset Concrete Inserts: Use manufacturer-provided closure strips to inhibit concrete seepage during concrete pour.
- H. Secure fasteners according to manufacturer's recommended torque settings.
- I. Remove temporary supports.

END OF SECTION

SECTION 22 0553

IDENTIFICATION FOR PLUMBING PIPING AND EQUIPMENT

PART 1 GENERAL

1.01 SECTION INCLUDES

- A. Nameplates.
- B. Tags.
- C. Pipe markers.

1.02 REFERENCE STANDARDS

- A. ASME A13.1 - Scheme for the Identification of Piping Systems; 2015.
- B. ASTM D709 - Standard Specification for Laminated Thermosetting Materials; 2017.

1.03 SUBMITTALS

- A. See Section 01 3000 - Administrative Requirements, for submittal procedures.
- B. List: Submit list of wording, symbols, letter size, and color coding for mechanical identification.
- C. Chart and Schedule: Submit valve chart and schedule, including valve tag number, location, function, and valve manufacturer's name and model number.

PART 2 PRODUCTS

2.01 IDENTIFICATION APPLICATIONS

- A. Piping: Tags.
- B. Valves: Tags and ceiling tacks where located above lay-in ceiling.
- C. Water Treatment Devices: Nameplates.

2.02 NAMEPLATES

- A. Description: Laminated three-layer plastic with engraved letters.

2.03 TAGS

- A. Manufacturers:
- B. Plastic Tags: Laminated three-layer plastic with engraved black letters on light contrasting background color. Tag size minimum 1-1/2 inch (40 mm) diameter.
- C. Metal Tags: Brass with stamped letters; tag size minimum 1-1/2 inch (40 mm) diameter with smooth edges.

2.04 PIPE MARKERS

- A. Comply with ASME A13.1.
- B. Plastic Pipe Markers: Factory fabricated, flexible, semi-rigid plastic, preformed to fit around pipe or pipe covering; minimum information indicating flow direction arrow and identification of fluid being conveyed.
- C. Plastic Tape Pipe Markers: Flexible, vinyl film tape with pressure sensitive adhesive backing and printed markings.
- D. Color code as follows:
 - 1. Potable, Cooling, Boiler, Feed, Other Water: Green with white letters.

PART 3 EXECUTION

3.01 PREPARATION

- A. Degrease and clean surfaces to receive adhesive for identification materials.

3.02 INSTALLATION

- A. Install plastic nameplates with corrosive-resistant mechanical fasteners, or adhesive. Apply with sufficient adhesive to ensure permanent adhesion and seal with clear lacquer.

- B. Install tags with corrosion resistant chain.
- C. Install plastic pipe markers in accordance with manufacturer's instructions.
- D. Install plastic tape pipe markers complete around pipe in accordance with manufacturer's instructions.
- E. Use tags on piping 3/4 inch (20 mm) diameter and smaller.
 - 1. Identify service, flow direction, and pressure.
 - 2. Install in clear view and align with axis of piping.

END OF SECTION

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SECTION 22 0716

PLUMBING EQUIPMENT INSULATION

PART 1 GENERAL

1.01 SECTION INCLUDES

- A. Equipment insulation.
- B. Covering.

1.02 REFERENCE STANDARDS

- A. ASTM C177 - Standard Test Method for Steady-State Heat Flux Measurements and Thermal Transmission Properties by Means of the Guarded-Hot-Plate Apparatus; 2013.
- B. ASTM C518 - Standard Test Method for Steady-State Thermal Transmission Properties by Means of the Heat Flow Meter Apparatus; 2017.
- C. ASTM C534/C534M - Standard Specification for Preformed Flexible Elastomeric Cellular Thermal Insulation in Sheet and Tubular Form; 2016.
- D. ASTM C553 - Standard Specification for Mineral Fiber Blanket Thermal Insulation for Commercial and Industrial Applications; 2013.
- E. ASTM C1695 - Standard Specification for Fabrication of Flexible Removable and Reusable Blanket Insulation for Hot Service; 2010 (Reapproved 2015).
- F. ASTM E84 - Standard Test Method for Surface Burning Characteristics of Building Materials; 2018.
- G. ASTM E96/E96M - Standard Test Methods for Water Vapor Transmission of Materials; 2016.
- H. UL 723 - Standard for Test for Surface Burning Characteristics of Building Materials; Current Edition, Including All Revisions.

1.03 SUBMITTALS

- A. See Section 01 3000 - Administrative Requirements, for submittal procedures.
- B. Product Data: Provide product description, thermal characteristics, list of materials and thickness for equipment scheduled.

PART 2 PRODUCTS

2.01 REGULATORY REQUIREMENTS

- A. Surface Burning Characteristics: Flame spread index/Smoke developed index of 25/50, maximum, when tested in accordance with ASTM E84 or UL 723.

2.02 GLASS FIBER, FLEXIBLE

- A. Manufacturers:
 - 1. CertainTeed Corporation: www.certainteed.com/#sle.
 - 2. Johns Manville Corporation: www.jm.com/#sle.
 - 3. Knauf Insulation; Atmosphere Duct Wrap: www.knaufinsulation.com/#sle.
 - 4. Owens Corning Corporation: www.ocbuildingspec.com/#sle.
 - 5. or approved equal.
- B. Insulation: ASTM C553; flexible, noncombustible.
 - 1. K (Ksi) Value: 0.36 at 75 degrees F (0.052 at 24 degrees C), when tested in accordance with ASTM C177 or ASTM C518.
 - 2. Maximum Service Temperature: 450 degrees F (232 degrees C).
 - 3. Maximum Water Vapor Absorption: 5.0 percent by weight.
- C. Vapor Barrier Jacket: Kraft paper reinforced with glass fiber yarn and bonded to aluminized film.
 - 1. Moisture Vapor Permeability: 0.02 perm inch (0.029 ng/Pa s m), when tested in accordance with ASTM E96/E96M.
 - 2. Secure with self-sealing longitudinal laps and butt strips.

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- D. Tie Wire: 0.048 inch (1.22 mm) stainless steel with twisted ends on maximum 12 inch (300 mm) centers.

2.03 FLEXIBLE REMOVABLE AND REUSABLE BLANKET INSULATION

- A. Manufacturers:
1. Auburn Manufacturing Inc; Ever Green Cut 'n Wrap: www.auburnmfg.com/#sle.
 2. or approved equal.
- B. Insulation: ASTM C553 Type V; flexible, noncombustible.
1. Comply with ASTM C1695.
 2. Maximum Water Vapor Absorption: Less than 5.0 percent by weight.

2.04 FLEXIBLE ELASTOMERIC CELLULAR INSULATION

- A. Manufacturers:
1. Aeroflex USA, Inc: www.aeroflexusa.com/#sle.
 2. Armacell LLC; AP Armaflex: www.armacell.us/#sle.
 3. K-Flex USA LLC: www.kflexusa.com/#sle.
 4. or approved equal.
- B. Insulation: Preformed flexible elastomeric cellular rubber insulation complying with ASTM C534/C534M Grade 3, in sheet form.
1. Minimum Service Temperature: Minus 40 degrees F (Minus 40 degrees C).
 2. Maximum Service Temperature: 220 degrees F (104 degrees C).
 3. Connection: Waterproof vapor barrier adhesive.

2.05 JACKETS

- A. PVC Plastic:
1. Manufacturers:
 - a. Johns Manville Corporation: www.jm.com/#sle.
 - b. or approved equal.
 2. Jacket: Sheet material, off-white color.
 - a. Minimum Service Temperature: Minus 40 degrees F (Minus 40 degrees C).
 - b. Maximum Service Temperature: 180 degrees F (82 degrees C).
 - c. Moisture Vapor Permeability: 0.02 perm inch (0.029 ng/Pa s m), when tested in accordance with ASTM E96/E96M.

PART 3 EXECUTION

3.01 INSTALLATION

- A. Install in accordance with manufacturer's instructions.
- B. Factory Insulated Equipment: Do not insulate.
- C. Exposed Equipment: Locate insulation and cover seams in least visible locations.
- D. Cover glass fiber insulation with metal mesh and finish with heavy coat of insulating cement.

END OF SECTION

SECTION 22 0719
PLUMBING PIPING INSULATION

PART 1 GENERAL

1.01 SECTION INCLUDES

- A. Piping insulation.
- B. Jackets and accessories.

1.02 RELATED REQUIREMENTS

- A. Section 22 1005 - Plumbing Piping: Placement of hangers and hanger inserts.

1.03 REFERENCE STANDARDS

- A. ASTM C177 - Standard Test Method for Steady-State Heat Flux Measurements and Thermal Transmission Properties by Means of the Guarded-Hot-Plate Apparatus; 2013.
- B. ASTM C534/C534M - Standard Specification for Preformed Flexible Elastomeric Cellular Thermal Insulation in Sheet and Tubular Form; 2016.
- C. ASTM C547 - Standard Specification for Mineral Fiber Pipe Insulation; 2017.
- D. ASTM C795 - Standard Specification for Thermal Insulation for Use in Contact with Austenitic Stainless Steel; 2008 (Reapproved 2013).
- E. ASTM E84 - Standard Test Method for Surface Burning Characteristics of Building Materials; 2018.
- F. ASTM E96/E96M - Standard Test Methods for Water Vapor Transmission of Materials; 2016.
- G. UL 723 - Standard for Test for Surface Burning Characteristics of Building Materials; Current Edition, Including All Revisions.

1.04 SUBMITTALS

- A. See Section 01 3000 - Administrative Requirements, for submittal procedures.
- B. Product Data: Provide product description, thermal characteristics, list of materials and thickness for each service, and locations.

1.05 QUALITY ASSURANCE

- A. Manufacturer Qualifications: Company specializing in manufacturing the Products specified in this section with not less than three years of documented experience.

PART 2 PRODUCTS

2.01 REGULATORY REQUIREMENTS

- A. Surface Burning Characteristics: Flame spread index/Smoke developed index of 25/50, maximum, when tested in accordance with ASTM E84 or UL 723.

2.02 GLASS FIBER

- A. Manufacturers:
 - 1. CertainTeed Corporation: www.certainteed.com.
 - 2. Johns Manville Corporation: www.jm.com.
 - 3. Knauf Insulation; Earthwool 1000 Degree Pipe Insulation: www.knaufinsulation.com/#sle.
 - 4. Owens Corning Corporation; Fiberglas Pipe Insulation ASJ: www.ocbuildingspec.com/#sle.
 - 5. Owens Corning Corporation; VaporWick Pipe Insulation: www.ocbuildingspec.com/#sle.
 - 6. or approved equal.
- B. Insulation: ASTM C547 and ASTM C795; rigid molded, noncombustible.
 - 1. K (Ksi) Value: ASTM C177, 0.24 at 75 degrees F (0.035 at 24 degrees C).
 - 2. Maximum Service Temperature: 850 degrees F (454 degrees C).
 - 3. Maximum Moisture Absorption: 0.2 percent by volume.

2.03 FLEXIBLE ELASTOMERIC CELLULAR INSULATION

- A. Manufacturers:

1. Aeroflex USA, Inc: www.aeroflexusa.com.
 2. Armacell LLC; AP Armaflex: www.armacell.us/#sle.
 3. K-Flex USA LLC; Insul-Tube: www.kflexusa.com/#sle.
 4. or approved equal.
- B. Insulation: Preformed flexible elastomeric cellular rubber insulation complying with ASTM C534/C534M Grade 1; use molded tubular material wherever possible.
1. Minimum Service Temperature: Minus 40 degrees F (Minus 40 degrees C).
 2. Maximum Service Temperature: 220 degrees F (104 degrees C).
 3. Connection: Waterproof vapor barrier adhesive.

2.04 JACKETS

- A. PVC Plastic.
1. Jacket: One piece molded type fitting covers and sheet material, off-white color.
 - a. Minimum Service Temperature: 0 degrees F (Minus 18 degrees C).
 - b. Maximum Service Temperature: 150 degrees F (66 degrees C).
 - c. Moisture Vapor Permeability: 0.002 perm inch (0.0029 ng/Pa s m), maximum, when tested in accordance with ASTM E96/E96M.
 - d. Thickness: 10 mil (0.25 mm).
 - e. Connections: Brush on welding adhesive.

PART 3 EXECUTION

3.01 EXAMINATION

- A. Verify that piping has been tested before applying insulation materials.
- B. Verify that surfaces are clean and dry, with foreign material removed.

3.02 INSTALLATION

- A. Install in accordance with manufacturer's instructions.

3.03 SCHEDULES SEE SCHEDULE ON P-001

END OF SECTION

SECTION 22 1005
PLUMBING PIPING

PART 1 GENERAL

1.01 SECTION INCLUDES

- A. Pipe, pipe fittings, specialties, and connections for piping systems.
 - 1. Sanitary sewer.
 - 2. Domestic water.
 - 3. Flanges, unions, and couplings.
 - 4. Pipe hangers and supports.
 - 5. Valves.
 - 6. Water pressure reducing valves.
 - 7. Strainers.

1.02 RELATED REQUIREMENTS

- A. Section 22 0719 - Plumbing Piping Insulation.

1.03 REFERENCE STANDARDS

- A. ASME B16.3 - Malleable Iron Threaded Fittings: Classes 150 and 300; 2016.
- B. ASME B16.18 - Cast Copper Alloy Solder Joint Pressure Fittings; 2012.
- C. ASME B16.22 - Wrought Copper and Copper Alloy Solder-Joint Pressure Fittings; 2013.
- D. ASME B16.26 - Cast Copper Alloy Fittings for Flared Copper Tubes; 2013.
- E. ASME B31.1 - Power Piping; 2016.
- F. ASME B31.9 - Building Services Piping; 2014.
- G. ASSE 1003 - Performance Requirements for Water Pressure Reducing Valves for Domestic Water Distribution Systems; 2009.
- H. ASTM A53/A53M - Standard Specification for Pipe, Steel, Black and Hot-Dipped, Zinc-Coated, Welded and Seamless; 2018.
- I. ASTM A74 - Standard Specification for Cast Iron Soil Pipe and Fittings; 2017.
- J. ASTM A234/A234M - Standard Specification for Piping Fittings of Wrought Carbon Steel and Alloy Steel for Moderate and High Temperature Service; 2017.
- K. ASTM B32 - Standard Specification for Solder Metal; 2008 (Reapproved 2014).
- L. ASTM B88 - Standard Specification for Seamless Copper Water Tube; 2016.
- M. ASTM B88M - Standard Specification for Seamless Copper Water Tube (Metric); 2016.
- N. ASTM B813 - Standard Specification for Liquid and Paste Fluxes for Soldering of Copper and Copper Alloy Tube; 2016.
- O. ASTM B828 - Standard Practice for Making Capillary Joints by Soldering of Copper and Copper Alloy Tube and Fittings; 2016.
- P. ASTM C564 - Standard Specification for Rubber Gaskets for Cast Iron Soil Pipe and Fittings; 2014.
- Q. ASTM D2564 - Standard Specification for Solvent Cements for Poly(Vinyl Chloride) (PVC) Plastic Piping Systems; 2012.
- R. ASTM D2665 - Standard Specification for Poly(Vinyl Chloride) (PVC) Plastic Drain, Waste, and Vent Pipe and Fittings; 2014.
- S. ASTM D2729 - Standard Specification for Poly(Vinyl Chloride) (PVC) Sewer Pipe and Fittings; 2011.
- T. ASTM D2855 - Standard Practice for the Two-Step (Primer & Solvent Cement) Method of Joining Poly(Vinyl Chloride) (PVC) or Chlorinated Poly(Vinyl Chloride) (CPVC) Pipe and Piping Components with Tapered Sockets; 2015.
- U. ASTM D3034 - Standard Specification for Type PSM Poly(Vinyl Chloride) (PVC) Sewer Pipe and Fittings; 2016.

- V. CISPI 301 - Standard Specification for Hubless Cast Iron Soil Pipe and Fittings for Sanitary and Storm Drain, Waste and Vent Piping Applications; 2009 (Revised 2012).
- W. CISPI 310 - Specification for Coupling for Use in Connection with Hubless Cast Iron Soil Pipe and Fittings for Sanitary and Storm Drain, Waste, and Vent Piping Applications; 2011 (Revised 2012).
- X. ICC-ES AC01 - Acceptance Criteria for Expansion Anchors in Masonry Elements; 2015.
- Y. ICC-ES AC193 - Acceptance Criteria for Mechanical Anchors in Concrete Elements; 2015.
- Z. MSS SP-58 - Pipe Hangers and Supports - Materials, Design, Manufacture, Selection, Application, and Installation; 2009.
- AA. NSF 61 - Drinking Water System Components - Health Effects; 2017.
- AB. NSF 372 - Drinking Water System Components - Lead Content; 2016.

1.04 SUBMITTALS

- A. See Section 01 3000 - Administrative Requirements, for submittal procedures.
- B. Product Data: Provide data on pipe materials, pipe fittings, valves, and accessories. Provide manufacturers catalog information. Indicate valve data and ratings.

1.05 QUALITY ASSURANCE

- A. Perform work in accordance with applicable codes.

PART 2 PRODUCTS

2.01 GENERAL REQUIREMENTS

- A. Potable Water Supply Systems: Provide piping, pipe fittings, and solder and flux (if used), that comply with NSF 61 and NSF 372 for maximum lead content; label pipe and fittings.

2.02 SANITARY SEWER PIPING, BURIED WITHIN 5 FEET (1500 MM) OF BUILDING

- A. Cast Iron Pipe: CISPI 301, hubless.
 - 1. Fittings: Cast iron.
 - 2. Joints: CISPI 310, neoprene gasket and stainless steel clamp and shield assemblies.
- B. PVC Pipe: ASTM D2665 or ASTM D3034.
 - 1. Fittings: PVC.
 - 2. Joints: Solvent welded, with ASTM D2564 solvent cement.

2.03 SANITARY SEWER PIPING, ABOVE GRADE

- A. Cast Iron Pipe: ASTM A74, service weight.
 - 1. Fittings: Cast iron.
 - 2. Joint Seals: ASTM C564 neoprene gaskets, or lead and oakum.
- B. Cast Iron Pipe: CISPI 301, hubless, service weight.
 - 1. Fittings: Cast iron.
 - 2. Joints: CISPI 310, neoprene gaskets and stainless steel clamp-and-shield assemblies.
- C. PVC Pipe: ASTM D2729.
 - 1. Fittings: PVC.
 - 2. Joints: Solvent welded, with ASTM D2564 solvent cement.

2.04 DOMESTIC WATER PIPING, ABOVE GRADE

- A. Copper Tube: ASTM B88 (ASTM B88M), Type K (A), Drawn (H).
 - 1. Fittings: ASME B16.18, cast copper alloy or ASME B16.22, wrought copper and bronze.
 - 2. Joints: ASTM B32, alloy Sn95 solder.

2.05 NATURAL GAS PIPING, ABOVE GRADE

- A. Steel Pipe: ASTM A53/A53M Schedule 40 black.
 - 1. Fittings: ASME B16.3, malleable iron, or ASTM A234/A234M, wrought steel welding type.
 - 2. Joints: Threaded or welded to ASME B31.1.

2.06 FLANGES, UNIONS, AND COUPLINGS

- A. Unions for Pipe Sizes 3 Inches (80 mm) and Under:
 - 1. Ferrous Pipe: Class 150 malleable iron threaded unions.
 - 2. Copper Tube and Pipe: Class 150 bronze unions with soldered joints.

2.07 PIPE HANGERS AND SUPPORTS

- A. Provide hangers and supports that comply with MSS SP-58.
 - 1. If type of hanger or support for a particular situation is not indicated, select appropriate type using MSS SP-58 recommendations.
 - 2. Overhead Supports: Individual steel rod hangers attached to structure or to trapeze hangers.
 - 3. Trapeze Hangers: Welded steel channel frames attached to structure.
 - 4. Vertical Pipe Support: Steel riser clamp.
- B. Plumbing Piping - Drain, Waste, and Vent:
 - 1. Hangers for Pipe Sizes 1/2 Inch (15 mm) to 1-1/2 Inches (40 mm): Malleable iron, adjustable swivel, split ring.
 - 2. Hangers for Pipe Sizes 2 Inches (50 mm) and Over: Carbon steel, adjustable, clevis.
- C. Plumbing Piping - Water:
 - 1. Hangers for Pipe Sizes 1/2 Inch (15 mm) to 1-1/2 Inches (40 mm): Malleable iron, adjustable swivel, split ring.
- D. Hanger Fasteners: Attach hangers to structure using appropriate fasteners, as follows:
 - 1. Concrete Wedge Expansion Anchors: Complying with ICC-ES AC193.
 - 2. Masonry Wedge Expansion Anchors: Complying with ICC-ES AC01.

2.08 WATER PRESSURE REDUCING VALVES

- A. Manufacturers:
 - 1. Amtrol Inc: www.amtrol.com.
 - 2. Cla-Val Company: www.cla-val.com.
 - 3. Flomatic Valves: www.flomatic.com/#sle.
 - 4. Watts Regulator Company: www.wattsregulator.com.
 - 5. or approved equal.
- B. Up to 2 Inches (50 mm):
 - 1. ASSE 1003, bronze body, stainless steel, and thermoplastic internal parts, fabric reinforced diaphragm, strainer, threaded single union ends.

2.09 STRAINERS

- A. Manufacturers:
 - 1. Armstrong International, Inc: www.armstronginternational.com.
 - 2. Green Country Filter Manufacturing: www.greencountryfilter.com.
 - 3. WEAMCO: www.weamco.com.
- B. Size 2 Inches (50 mm) and Under:
 - 1. Threaded brass body for 175 psi (1200 kPa) CWP, Y pattern with 1/32 inch (0.8 mm) stainless steel perforated screen.
 - 2. Class 150, threaded bronze body 300 psi (2070 kPa) CWP, Y pattern with 1/32 inch (0.8 mm) stainless steel perforated screen.

PART 3 EXECUTION

3.01 INSTALLATION

- A. Install in accordance with manufacturer's instructions.
- B. Provide non-conducting dielectric connections wherever jointing dissimilar metals.
- C. Route piping in orderly manner and maintain gradient. Route parallel and perpendicular to walls.
- D. Install piping to maintain headroom, conserve space, and not interfere with use of space.
- E. Provide clearance in hangers and from structure and other equipment for installation of insulation and access to valves and fittings.

- F. Copper Pipe and Tube: Make soldered joints in accordance with ASTM B828, using specified solder, and flux meeting ASTM B813; in potable water systems use flux also complying with NSF 61 and NSF 372.
- G. PVC Pipe: Make solvent-welded joints in accordance with ASTM D2855.
- H. Pipe Hangers and Supports:
 - 1. Install in accordance with ASME B31.9.

END OF SECTION

SECTION 22 1006
PLUMBING PIPING SPECIALTIES

PART 1 GENERAL

1.01 SECTION INCLUDES

- A. Drains.
- B. Cleanouts.
- C. Backflow preventers.

1.02 RELATED REQUIREMENTS

- A. Section 22 1005 - Plumbing Piping.

1.03 REFERENCE STANDARDS

- A. ADA Standards - Americans with Disabilities Act (ADA) Standards for Accessible Design; 2010.
- B. ASME A112.6.3 - Floor and Trench Drains; 2016.
- C. ASSE 1013 - Performance Requirements for Reduced Pressure Principle Backflow Preventers and Reduced Pressure Principle Fire Protection Backflow Preventers; 2011.
- D. NSF 61 - Drinking Water System Components - Health Effects; 2017.
- E. NSF 372 - Drinking Water System Components - Lead Content; 2016.

1.04 SUBMITTALS

- A. See Section 01 3000 - Administrative Requirements, for submittal procedures.
- B. Product Data: Provide component sizes, rough-in requirements, service sizes, and finishes.

PART 2 PRODUCTS

2.01 GENERAL REQUIREMENTS

- A. Specialties in Potable Water Supply Systems: Provide products that comply with NSF 61 and NSF 372 for maximum lead content.

2.02 DRAINS

- A. Manufacturers:
 - 1. Jay R. Smith Manufacturing Company: www.jayrsmith.com.
 - 2. Josam Company: www.josam.com.
 - 3. Zurn Industries, LLC: www.zurn.com.
 - 4. or approved equal.
- B. Floor Drain (FD-1):
 - 1. ASME A112.6.3; lacquered cast iron or stainless steel, two piece body with double drainage flange, weep holes, reversible clamping collar, and round, adjustable nickel-bronze strainer.

2.03 CLEANOUTS

- A. Manufacturers:
 - 1. Jay R. Smith Manufacturing Company: www.jayrsmith.com.
 - 2. Josam Company: www.josam.com.
 - 3. Zurn Industries, LLC: www.zurn.com.
 - 4. or approved equal.
- B. Cleanouts at Interior Finished Floor Areas (CO-1):
 - 1. Lacquered cast iron body with anchor flange, reversible clamping collar, threaded top assembly, and round gasketed scored cover in service areas and round gasketed depressed cover to accept floor finish in finished floor areas.

2.04 BACKFLOW PREVENTERS

- A. Manufacturers:
 - 1. Conbraco Industries, Inc: www.apollovalves.com.
 - 2. Watts Regulator Company, a part of Watts Water Technologies: www.wattsregulator.com.

3. Zurn Industries, LLC: www.zurn.com.
 4. or approved equal.
- B. Reduced Pressure Backflow Preventers:
1. ASSE 1013; bronze body with bronze internal parts and stainless steel springs; two independently operating, spring loaded check valves; diaphragm type differential pressure relief valve located between check valves; third check valve that opens under back pressure in case of diaphragm failure; non-threaded vent outlet; assembled with two gate valves, strainer, and four test cocks.

PART 3 EXECUTION

3.01 INSTALLATION

- A. Install in accordance with manufacturer's instructions.
- B. Extend cleanouts to finished floor or wall surface. Lubricate threaded cleanout plugs with mixture of graphite and linseed oil. Ensure clearance at cleanout for rodding of drainage system.
- C. Pipe relief from backflow preventer to nearest drain.

END OF SECTION

SECTION 22 4000
PLUMBING FIXTURES

PART 1 GENERAL

1.01 SECTION INCLUDES

- A. Water closets.
- B. Lavatories.

1.02 RELATED REQUIREMENTS

- A. Section 22 1005 - Plumbing Piping.
- B. Section 22 1006 - Plumbing Piping Specialties.

1.03 REFERENCE STANDARDS

- A. ADA Standards - Americans with Disabilities Act (ADA) Standards for Accessible Design; 2010.
- B. ASME A112.18.9 - Protectors/Insulators for Exposed Waste and Supplies on Accessible Fixtures; 2011.
- C. ASTM C177 - Standard Test Method for Steady-State Heat Flux Measurements and Thermal Transmission Properties by Means of the Guarded-Hot-Plate Apparatus; 2013.
- D. ASTM C518 - Standard Test Method for Steady-State Thermal Transmission Properties by Means of the Heat Flow Meter Apparatus; 2017.
- E. ASTM C1822 - Standard Specification for Insulating Covers on Accessible Lavatory Piping; 2015.
- F. ASTM G21 - Standard Practice for Determining Resistance of Synthetic Polymeric Materials to Fungi; 2015.
- G. FM (AG) - FM Approval Guide; current edition.
- H. IAPMO Z124 - Plastic Plumbing Fixtures; 2017.
- I. ANSI Z358.1 - American National Standard for Emergency Eyewash and Shower Equipment; 2014.
- J. ASHRAE Std 18 - Methods of Testing for Rating Drinking-Water Coolers with Self-Contained Mechanical Refrigeration; 2013.
- K. ASME A112.6.1M - Supports for Off-the-Floor Plumbing Fixtures for Public Use; 1997 (Reaffirmed 2017).
- L. ASME A112.18.1 - Plumbing Supply Fittings; 2018.
- M. ASME A112.18.9 - Protectors/Insulators for Exposed Waste and Supplies on Accessible Fixtures; 2011.
- N. ASME A112.19.1 - Enamelled Cast Iron and Enamelled Steel Plumbing Fixtures; 2018.
- O. ASME A112.19.2 - Ceramic Plumbing Fixtures; 2013.
- P. ASME A112.19.3 - Stainless Steel Plumbing Fixtures; 2017.
- Q. ASME A112.19.4M - Porcelain Enameled Formed Steel Plumbing Fixtures; 1994 (R2009).
- R. ASME A112.19.5 - Flush Valves and Spuds for Water Closets, Urinals, and Tanks; 2017.
- S. ASME A112.19.15 - Bathtub/Whirlpool Bathtubs with Pressure Sealed Doors; 2012.
- T. ASSE 1014 - Performance Requirements for Backflow Prevention Devices for Hand-Held Showers; 2005.
- U. ASSE 1070 - Performance Requirements for Water Temperature Limiting Devices; 2015.
- V. ASTM C1822 - Standard Specification for Insulating Covers on Accessible Lavatory Piping; 2015.
- W. ASTM D570 - Standard Test Method for Water Absorption of Plastics; 1998 (Reapproved 2010).
- X. ASTM D638 - Standard Test Method for Tensile Properties of Plastics; 2014.
- Y. ASTM D696 - Standard Test Method for Coefficient of Linear Thermal Expansion of Plastics Between - 30 C and 30 C with a Vitreous Silica Dilatometer; 2016.
- Z. ASTM D785 - Standard Test Method for Rockwell Hardness of Plastics and Electrical Insulating Materials; 2008 (Reapproved 2015).

- AA. ASTM E84 - Standard Test Method for Surface Burning Characteristics of Building Materials; 2018.
- AB. IAPMO Z124 - Plastic Plumbing Fixtures; 2017.
- AC. ICC A117.1 - Accessible and Usable Buildings and Facilities; 2017.
- AD. ISFA 2-01 - Classification and Standards for Solid Surfacing Material; 2013.
- AE. ITS (DIR) - Directory of Listed Products; current edition.
- AF. NEMA LD 3 - High-Pressure Decorative Laminates; 2005.
- AG. NSF 61 - Drinking Water System Components - Health Effects; 2017.
- AH. NSF 372 - Drinking Water System Components - Lead Content; 2016.
- AI. UL (DIR) - Online Certifications Directory; Current Edition.

1.04 SUBMITTALS

- A. See Section 01 3000 - Administrative Requirements, for submittal procedures.
- B. Product Data: Provide catalog illustrations of fixtures, sizes, rough-in dimensions, utility sizes, trim, and finishes.

1.05 QUALITY ASSURANCE

- A. Manufacturer Qualifications: Company specializing in manufacturing the type of products specified in this section, with minimum three years of documented experience.

1.06 DELIVERY, STORAGE, AND HANDLING

- A. Accept fixtures on site in factory packaging. Inspect for damage.
- B. Protect installed fixtures from damage by securing areas and by leaving factory packaging in place to protect fixtures and prevent use.

PART 2 PRODUCTS

2.01 GENERAL REQUIREMENTS

- A. Potable Water Systems: Provide plumbing fittings and faucets that comply with NSF 61 and NSF 372 for maximum lead content; label pipe and fittings.
- B. Water Efficiency: EPA WaterSense label is required for all water closets, urinals, lavatory faucets, and showerheads.

2.02 REGULATORY REQUIREMENTS

- A. Comply with applicable codes for installation of plumbing systems.
- B. Comply with UL (DIR) requirements.
- C. Perform work in accordance with local health department regulations.
- D. Provide certificate of compliance from Authority Having Jurisdiction indicating approval of installation.

2.03 FLUSH VALVE WATER CLOSETS

- A. Water Closets: Vitreous china, ASME A112.19.2, floor mounted, siphon jet flush action, china bolt caps.
 - 1. Bowl: ASME A112.19.2; 16.5 inches (420 mm) high with elongated rim.
 - 2. Flush Valve: Exposed (top spud).
 - 3. Handle Height: 44 inches (1117 mm) or less.
 - 4. Supply Size: 1-1/2 inches (38 mm).
 - 5. Outlet Size: 2 inches (50 mm).
 - 6. Color: White.
 - 7. Manufacturers:
 - a. Advanced Modern Technologies Corporation: www.amtcorporation.com/#sle.
 - b. American Standard, Inc: www.americanstandard-us.com/#sle.
 - c. Gerber Plumbing Fixtures LLC: www.gerberonline.com/#sle.
 - d. Kohler Company: www.kohler.com/#sle.
 - e. Zurn Industries, Inc: www.zurn.com/#sle.

- f. or approved equal.
- B. Flush Valves: ASME A112.18.1, diaphragm type, complete with vacuum breaker stops and accessories.
 - 1. Exposed Type: Chrome plated, escutcheon, integral screwdriver stop.
 - 2. Manufacturers:
 - a. American Standard, Inc: www.americanstandard-us.com/#sle.
 - b. Delany Products: www.delanyproducts.com/#sle.
 - c. Sloan Valve Company: www.sloanvalve.com/#sle.
 - d. Zurn Industries, Inc: www.zurn.com/#sle.
 - e. or approved equal.
 - f. Substitutions: See Section 01 6000 - Product Requirements.
- C. Seats:
 - 1. Manufacturers:
 - a. American Standard, Inc: www.americanstandard-us.com/#sle.
 - b. Bemis Manufacturing Company: www.bemismfg.com/#sle.
 - c. Church Seat Company: www.churchseats.com/#sle.
 - d. Zurn Industries, Inc: www.zurn.com/#sle.
 - e. or approved equal.
- D. Water Closet Carriers:
 - 1. Manufacturers:
 - a. Jay R. Smith MFG. Co: www.jrsmith.com/#sle.
 - b. JOSAM Company: www.josam.com/#sle.
 - c. Zurn Industries, Inc: www.zurn.com/#sle.
 - d. or approved equal.

2.04 LAVATORIES

- A. Lavatory Manufacturers:
 - 1. American Standard, Inc: www.americanstandard-us.com/#sle.
 - 2. DXV by American Standard, Inc: www.dxv.com/#sle.
 - 3. Gerber Plumbing Fixtures LLC: www.gerberonline.com/#sle.
 - 4. Kohler Company: www.kohler.com/#sle.
 - 5. Zurn Industries, Inc: www.zurn.com/#sle.
 - 6. or approved equal.
 - 7. Substitutions: See Section 01 6000 - Product Requirements.
- B. Vitreous China Wall Hung Basin: ASME A112.19.2; vitreous china wall hung lavatory, _____ minimum, with 4 inch (100 mm) high back, rectangular basin with splash lip, front overflow, and soap depression.
 - 1. Drilling Centers: 4 inch (100 mm).
- C. Supply Faucet Manufacturers:
 - 1. American Standard, Inc: www.americanstandard-us.com/#sle.
 - 2. DXV by American Standard, Inc: www.dxv.com/#sle.
 - 3. Grohe America, Inc: www.grohe.com/us/#sle.
 - 4. Kohler Company: www.kohler.com/#sle.
 - 5. Zurn Industries, Inc: www.zurn.com/#sle.
 - 6. or approved equal.
- D. Supply Faucet: ASME A112.18.1; chrome plated combination supply fitting with pop-up waste, water economy aerator with maximum flow of 0.5 gallon per minute (low-flow) (1.9 liters per minute (low-flow)), indexed handles.
- E. Accessories:
 - 1. Chrome plated 17 gage, 0.0538 inch (1.37 mm) brass P-trap with clean-out plug and arm with escutcheon.
 - 2. Offset waste with perforated open strainer.
 - 3. Carrier:
 - a. Manufacturers:

- 1) Jay R. Smith MFG. Co: www.jrsmith.com/#sle.
 - 2) JOSAM Company: www.josam.com/#sle.
 - 3) Zurn Industries, Inc: www.zurn.com/#sle.
 - 4) or approved equal.
- b. ASME A112.6.1M; cast iron and steel frame with tubular legs, lugs for floor and wall attachment, threaded studs for fixture hanger, bearing plate and studs.

2.05 UNDER-LAVATORY PIPE SUPPLY COVERS

- A. Manufacturers:
1. Plumberex Specialty Products, Inc: www.plumberex.com/#sle.
 2. or approved equal.
- B. Basis of Design: Plumberex Specialty Products, Inc; www.plumberex.com/#sle.
1. Fusion Molded Under-Lavatory Insulators (Non-Sewn): Plumberex Handy-Shield Maxx.
 2. Slim Fit Under-Lavatory Insulators (Non-Sewn): Plumberex Trap Gear.
 3. Under-Lavatory Covers with Snap-Lock Fasteners (Molded): Plumberex Pro-Extreme.
- C. General:
1. Insulate exposed drainage piping including hot, cold and tempered water supplies under lavatories or sinks per ADA Standards.
 2. Adhesives, sewing threads and two ply laminated materials are prohibited.
 3. Exterior Surfaces: Smooth nonabsorbent with no finger recessed indentations for easy cleaning.
 4. Construction: 1/8 inch (3.2 mm) PVC with antimicrobial, antifungal and UV resistant properties.
 - a. Provide one piece injected molded design with internal bridge at top of J-bend to prevent separating.
 - b. Comply with ASTM C1822 Type III for covers on accessible lavatory piping.
 - c. Comply with ASME A112.18.9 for covers on accessible lavatory piping.
 - d. Comply with ICC A117.1.
 5. Fasteners: Reusable, snap-locking fasteners with no sharp or abrasive external surfaces. No cable ties allowed.

PART 3 EXECUTION

3.01 EXAMINATION

- A. Verify that walls and floor finishes are prepared and ready for installation of fixtures.

3.02 PREPARATION

- A. Rough-in fixture piping connections in accordance with minimum sizes indicated in fixture rough-in schedule for particular fixtures.

3.03 INSTALLATION

- A. Install each fixture with trap, easily removable for servicing and cleaning.
- B. Provide chrome plated rigid or flexible supplies to fixtures with loose key stops, reducers, and escutcheons.
- C. Install components level and plumb.

3.04 CLEANING

- A. Clean plumbing fixtures and equipment.

3.05 PROTECTION

- A. Protect installed products from damage due to subsequent construction operations.
- B. Repair or replace damaged products before Date of Substantial Completion.

END OF SECTION

SECTION 23 0000

GENERAL PROVISIONS - MECHANICAL

PART 1 GENERAL

1.01 RELATED DOCUMENTS

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

1.02 SUMMARY

- A. The work to be completed under this division of the specifications shall include the furnishing of all supplies, equipment, labor, supervision and all materials not specifically mentioned, ready for use, in accordance with all applicable codes and authorities having jurisdiction, including heating, ventilation, air conditioning, plumbing, sprinkler equipment, associated items and Automatic Temperature Control components. It is the intention of these specifications and drawings to indicate finished work that is tested and ready for operation including but not limited to:
 - 1. Removals.
 - 2. Cutting and Patching
 - 3. Piping.
 - 4. Drainage from noted equipment to floor drains, roof, sink, or funnel drains.
 - 5. Piping connections to equipment.
 - 6. Vibration isolation elements for piping and equipment.
 - 7. Equipment isolation bases.
 - 8. Seismic restraints for isolated and non-isolated ductwork, VAV boxes, and equipment
 - 9. Testing.
- B. The data indicated in these drawings and specifications are as exact as could be secured but their absolute accuracy is not guaranteed. Do not scale drawings. Exact locations, distances, levels and other conditions will be governed by the building. Use the drawings and specifications or guidance and secure the engineer's approval of changes in locations.
- C. Construction methods and good installation practice.
 - 1. The contractor shall visit the site and become thoroughly familiar with all existing conditions under which the work and work of other trades will be installed. This contract includes all necessary offsets, transitions, modifications and relocation required to install all new equipment in new or existing spaces. Contractor shall include any modifications required in existing ductwork and/or equipment for installation of new HVAC equipment and new equipment of other trades. All new and existing equipment and systems shall be fully operational under this contract before the project is considered complete.
 - 2. The contractor shall be held responsible for any assumptions that are made, any omissions or errors made as a result of failure to visit the site and become thoroughly familiar with the existing conditions and the contract documents of all trades.

1.03 DEFINITIONS

- A. Refer to Section 01 4216 -Definitions.

1.04 CODES, REGULATIONS AND STANDARDS

- A. Published specifications, standards tests, or recommended methods of trade, industry or governmental organizations apply to work in all Sections as noted below:
 - 1. ASHRAE -American Society of heating, Refrigerating and Air Conditioning engineers.
 - 2. AABC -Associated Air Balance Controls.
 - 3. AMCA -Air Moving and Conditioning Association.
 - 4. ADC -Air Diffuser Council.
 - 5. NEMA -National Electrical Manufacturers' Association.
 - 6. ANSI -American National Standards Institute.
 - 7. ASME -American Society of Mechanical Engineers.
 - 8. ASTM -American Society for Testing and Materials.
 - 9. EPA -Environmental Protection Agency
 - 10. NFPA -National Fire Protection Association.

11. NFPA 101 -Life Safety Code
12. NFPA 70 -National Electrical Code
13. NFPA 72 -National Fire Alarm Code
14. ARI -Air-Conditioning and Refrigeration Institute.
15. UL -Underwriters' Laboratories, Inc.
16. OSHA -Occupational Safety and Health Administration Regulations
17. All New York State and local codes

1.05 PERMITS, FEES AND INSPECTIONS

- A. The contractor shall give all necessary notices, obtain all permits, and pay for all government, state sales taxes and applicable fees. The contractor shall file all drawings, complete all documents and obtain all necessary approvals from the proper authorities or agency having jurisdiction. Obtain all required certificates of inspection covering work. The contractor shall see that all required inspections and tests are made and shall cooperate to make these tests as thorough and as readily made as possible.

1.06 MATERIALS AND WORKMANSHIP

- A. Refer to Section 01 4000 -Quality Requirements for additional requirements.
- B. All materials and apparatus required for the work, except as otherwise specified, shall be new and of first-class quality. It shall be furnished, delivered, erected, connected, finished in every detail and so selected and arranged as to fit properly into the building spaces. Where no specific kind or quality material is given, a first-class standard article as accepted by the engineer shall be furnished.
- C. All equipment and materials shall be specification grade and bear the underwriter's label. No substitute or alternate equipment, material, etc. Will be considered for this project.
- D. All work shall be of a quality consistent with good trade practice and shall be installed in a neat, workmanlike manner. The engineer/owner reserves the right to reject any work which, in his opinion, has been installed in a substandard, dangerous or in a unserviceable manner. The contractor shall replace rejected work in a satisfactory manner at no extra cost to the owner.

1.07 GUARANTEE AND SERVICE

- A. The contractor shall. Guarantee all workmanship and materials for a period of two year from the date of acceptance of the installation. In addition, the contractor shall Provide, free of charge, one year 's maintenance guarantee on maintained service and adjustment of all equipment in this contract.

1.08 RECORD DRAWINGS

- A. Refer to Section 01 7800 -Closeout Submittals for additional requirements.
- B. Maintain, at the job site, a set of drawings indicating all changes in location of the equipment, devices, etc. From the original layout. Clearly mark in red all changes on the drawings. At the completion of the project the contractor shall turn over the record drawings to the engineer/owner.

1.09 COORDINATION

- A. All work shall be carried out in conjunction with other trades and full cooperation shall be given in order that all work may proceed with a minimum of delay and interference.

1.10 SHOP DRAWING

- A. Refer to Section 01 3000 -Administrative Requirements for additional requirements.
 1. Prior to delivery to the work area, but well in advance of requirements necessary to allow engineer ample time for review, contractor shall submit for approval, in PDF format of each shop drawing. Indicate on each submission:
 - a. Location
 - b. Architect/Engineers names
 - c. Item identification/description
 - d. Approval stamp of prime contractor
 - e. All shop drawings and coordination drawings shall include locations and sizes of existing equipment along with new work. Drawings shall include locations and sizes of existing equipment along with new work. Drawings shall indicate locations of hangers, supports, expansion joints, guides, anchors and anchor loads. Submit shop drawings for the following
 - 1) Piping.

- 2) Pipe insulation.
- 3) Duct insulation.
- 4) Valves
- 5) Ductwork layout, coordination drawings, sheet metal standards and details
- 6) Air and piping balancing reports
- 7) Dielectric fittings.
- 8) Through-penetration firestop assemblies.
- 9) Testing.
- 10) Controls

1.11 OPERATING INSTRUCTIONS

- A. Refer to Section 01 7800 -Closeout Submittals for submittal and additional requirements.
- B. The contractor shall furnish to the Owner and engineer instructions for operating and maintaining all systems and equipment.
 1. Manufacturer's advertising literature or catalogs will not be acceptable for operating and maintenance instructions
- C. The contractor, in the above-mentioned instructions, shall include the maintenance schedule for the principal items of equipment furnished under this division.
- D. An authorized manufacturer's representative shall attest in writing that his equipment has been properly installed prior to startup. These letters will be bound into operating and maintenance books.

1.12 MANUFACTURER'S INSTRUCTION

- A. Install all equipment in accordance with manufacturer's instructions or requirements for proper operation and maintenance.

1.13 CUTTING, PATCHING, REPAIRING AND PAINTING

- A. Refer to Section 01 7000 Execution for additional requirements.
- B. The general contractor shall perform all cutting, patching, repairing and painting for all electrical items and equipment called for under this contract.

1.14 TEMPORARY FACILITIES AND CONTROLS

- A. Refer to Section 01 5000 -Temporary Facilities and Controls for additional requirements.

1.15 DRAWING AND INTENT

- A. Drawings are intended as working drawings for general layout of the various items of equipment. However Layout of accessories, specialties, equipment and piping systems are diagrammatic unless specifically dimensioned, and do not necessarily indicate every required valve, fittings, elbow, pipe, transitions, trap, junction or pull box, offsets or similar items required for the installation to be complete.

1.16 CONTINUITY OF EXISTING SYSTEM;

- A. Maintain continuity of the existing vent, waste, soil, hot and cold water systems to the areas not affected by the alteration.

1.17 INTERRUPTION OF SERVICE

- A. Contractor shall request shut down of service for all mechanical and electrical systems.
- B. Contractor shall coordinate with Owner's Representative. All shut downs shall be scheduled by the Owner's Representative.

1.18 MEASUREMENTS

- A. All measurements taken at the building shall take precedence over scale dimensions. Every part of the plans shall be fitted to the actual conditions at the building. If there is a conflict with the scale dimensions. Contact architect and/or engineer for direction/clarification.

1.19 PROTECTION OF EQUIPMENT MATERIALS AND FIXTURES

- A. Close pipe openings with caps or plugs during installation. Tightly cover and protect fixtures and equipment against dirt, water and chemical or mechanical injury. At completion of all work, fixtures, exposed materials and equipment shall be thoroughly cleaned.

1.20 SCAFFOLDING, RIGGING AND HOISTING:

- A. Unless otherwise specified, contractor shall furnish all scaffolding, rigging, hoisting, and services necessary for the erection and delivery into the premises of any equipment and apparatus furnished. This will apply to any equipment that is being removed from the premises.

1.21 HOUSEKEEPING

- A. This contractor shall be responsible for keeping stock of materials and equipment stored on premises in a tidy and orderly manner and, at all times, keep the premises free from accumulation of waste material or rubbish caused by their employees at work. He shall remove his rubbish and surplus materials from the job site and shall have the premises and their work in a clean and well maintained condition.

1.22 QUIET OPERATION

- A. All work shall operate under all conditions of load without my sound or vibration which is offensive in the opinion of the engineer. In the case of the moving machinery, sound or vibration noticeable outside of room in which it is installed, or annoying inside given room, will be consider unacceptable by the engineer and shall be remedied in approved manner by the contractor at their own expense.

1.23 ACCESSIBILITY

- A. Place valves, unions Drains, and items requiring maintenance, adjustment, or repair, in ccessible locations. Coordinate final location of access panels with architect.

1.24 OWNER'S INSTRUCTIONS AND SYSTEM OPERATION

- A. Refer to Section 01 7900 -Demonstration and Training

1.25 AT THE TIME OF THE JOB'S ACCEPTANCE BY THE OWNER, CONTRACTOR SHALL FURNISH ONE COMPLETE SET OF APPROVED CERTIFIED DRAWINGS TO THE OWNER. IN ADDITION THE CONTRACTOR SHALL FURNISHED MAINTENANCE AND OPERATING INSTRUCTIONS FOR ALL EQUIPMENT. THE INSTRUCTIONS SHALL BE WRITTEN IN LAYMAN'S TERMS AND SHALL BE INSERTED IN VINYL-COVERED THREE RING BINDER. THE INFORMATION IN THE BINDER SHALL BE FIRST SENT TO AND APPROVED BY THEARCHITECT/ENGINEER BEFORE TURNING OVER TO THE OWNER.

PART 2 PRODUCTS

2.01 MATERIALS

- A. All materials and equipment provided under this section shall be new, first grade, best of their respective kinds and in no way shall they be less than the quality and intent set forth under this section. They shall meet the requirements of all standards set up to govern the manufacturer of HVAC materials and comply with all applicable codes and standards.

PART 3 -EXECUTION

3.01 EXAMINATION

- A. Verify that existing conditions are acceptable prior to starting installations.
- B. Preinstallation Testing: Test substrate for existing fire alarms system prior to modifications.

3.02 PREPARATION

- A. Protection of In-Place Conditions: Prior to removals and during new work protect existing, floor, walls, ceilings, equipment and furnishings.
- B. Removal: Removing existing equipment, ductwork, devices, wiring as required to install new work.
- C. Measure indicated mounting heights to bottom of unit, devices, registers, etc. for suspended items and to center of unit for wall-mounting items.
- D. Headroom Maintenance: If mounting heights or other location criteria are not indicated, arrange and install components and equipment to provide maximum possible headroom consistent with these requirements.

3.03 INSTALLATION GENERAL

- A. Equipment: Install to facilitate service, maintenance, and repair or replacement of components of equipment and other nearby installations. Connect in such a way as to facilitate future disconnecting with minimum interference with other items in the vicinity.

- B. Right of Way: Give to piping systems installed at a required slope.
- C. All work, materials and manner of installing same shall be in strict accordance with the latest code.
- D. Unless otherwise indicated all wiring exposed in finished and occupied areas shall be wire mold (2000 series or equal). Conduit shall be installed within new stud partitions, mechanical room, above ceilings in rigid galvanized steel conduit (RGS) shall be used for wiring in the following locations:
 - 1. Exposed to moisture or mechanical damage.
- E. Electrical metallic tubing (EMT) shall be used for concealed and exposed wiring in dry locations as follows:
 - 1. Interior receptacle and power branch circuit wiring
- F. All conduit shall be installed in parallel and perpendicular to the building lines. All conduit shall be supported using cadmium plated conduit straps and hangers. Separate conduit systems shall be installed for normal, and low voltage power.
- G. Mechanical equipment shall be isolated from the building structure by means of noise and vibration isolators as scheduled on the drawings or within these specifications.
- H. No rigid connections between equipment and building structure shall be made that degrades the noise and vibration isolation systems herein specified.
- I. Electrical circuit connections to isolated equipment shall be looped to allow free motion of isolated equipment.
- J. The contractor shall not install any equipment, piping or conduit which makes rigid contact with the "building" unless permitted in this Specification. Building includes, but is not limited to, slabs, beams, columns, studs and walls.
- K. Isolation mounting deflection shall be minimum as specified or scheduled on drawings.
- L. Coordinate work with other trades to avoid rigid contact with the building. Inform other trades following work, such as plastering or electrical, to avoid any contact which would reduce the vibration isolation.

3.04 DUCT INSTALLATION

- A. Drawing plans, schematics, and diagrams indicate general location and arrangement of duct system. Indicated duct locations, configurations, and arrangements were used to size ducts and calculate friction loss for air-handling equipment sizing and for other design considerations. Install duct systems as indicated unless deviations to layout are approved on Shop Drawings and Coordination Drawings.

3.05 PIPING INSTALLATIONS

- A. Drawing plans, schematics, and diagrams indicate general location and arrangement of piping systems. Indicate piping locations and arrangements if such were used to size pipe and calculate friction loss, expansion, pump sizing, and other design considerations. Install piping as indicated unless deviations to layout are approved on Coordination Drawings.
- B. Install piping in concealed locations, unless otherwise indicated and except in equipment rooms and service areas.

3.06 ADJUSTING

- A. Repair or remove and replace defective work, as directed by (Architect/Owner) upon completion of installation.
- B. Adjust moving or operating parts to function smoothly.

3.07 CLEANING AND PROTECTING

- A. Thoroughly clean all electrical equipment, devices and enclosures upon completion of all work. Repaint any equipment whose finish is damaged or rusted. Match manufacturer's original finish.
- B. Clean finished surfaces, touch up as required, and remove or refinish damaged or soiled areas to match original factory finish, as approved by Architect.
- C. Properly and completely protect against all damage, all apparatus, equipment, etc., included in this contract. The contractor will be held responsible for any damage to furnished apparatus, equipment, etc., until final acceptance.

- D. The contractor shall take whatever means necessary and/or required to protect owner's property within the working areas from dust, debris and other matter generated by the work. No work shall commence in areas where protection is required until approval has been given to the contractor by the owner.

END OF SECTION

SECTION 23 0510

HVAC DEMOLITION

PART 1 - GENERAL

1.01 STIPULATIONS

- A. Drawings and General Provisions of the Contract, including General and Supplementary Conditions and Division 01 Sections, apply to this Section.

1.02 RELATED DOCUMENTS

- A. Drawings and general provisions of the Contract, including General and Supplementary Conditions and other Division 23 Specification Sections, apply to this Section.

1.03 SUMMARY

- A. This Section includes the following:
 - 1. Demolition and removal of selected portions of Division 23 systems.
 - 2. Salvage of existing items to be reused or recycled.
- B. Related Sections include the following:
 - 1. Division 23 Sections for demolishing, cutting, patching, or relocating mechanical items.

1.04 DEFINITIONS

- A. Remove: Detach items from existing construction and legally dispose of them off-site, unless indicated to be removed and salvaged or removed and reinstalled.
- B. Existing to Remain: Existing items of construction that are not to be removed and that are not otherwise indicated to be removed, removed and salvaged, or removed and reinstalled.

1.05 MATERIALS OWNERSHIP

- A. Except for items or materials indicated to be reused, salvaged, reinstalled, or otherwise indicated to remain Owner's property, demolished materials shall become Contractor's property and shall be removed from Project site.
 - 1. Coordinate with Owner's, who will establish special procedures for removal and salvage.

1.06 SUBMITTALS

- A. Proposed Dust-Control and Noise-Control Measures: Submit statement or drawing that indicates the measures proposed for use, proposed locations, and proposed time frame for their operation. Identify options if proposed measures are later determined to be inadequate.
- B. Schedule of Selective Demolition Activities: Indicate the following:
 - 1. Detailed sequence of selective demolition and removal work, with starting and ending dates for each activity. Ensure Owner's building managers and other tenants' on-site operations are uninterrupted.
 - 2. Interruption of utility services. Indicate how long utility services will be interrupted.
 - 3. Coordination for shutoff, capping, and continuation of utility services.
 - 4. Use of elevator and stairs.
 - 5. Locations of proposed dust- and noise-control temporary partitions and means of egress, including for other tenants affected by selective demolition operations.
 - 6. Coordination of Owner's continuing occupancy of portions of existing building and of Owner's partial occupancy of completed Work.
- C. Inventory: After selective demolition is complete, submit a list of items that have been removed and salvaged.
- D. Pre-demolition Photographs or Videotapes: Show existing conditions of adjoining construction and site improvements, including finish surfaces that might be misconstrued as damage caused by selective demolition operations. Comply with Division 01 Section "Photographic Documentation." Submit before Work begins.
- E. Landfill Records: Indicate receipt and acceptance of hazardous wastes by a landfill facility licensed to accept hazardous wastes.

1.07 QUALITY ASSURANCE

- A. Demolition Firm Qualifications: An experienced firm that has specialized in demolition work similar in material and extent to that indicated for this Project.
- B. Regulatory Requirements: Comply with governing EPA notification regulations before beginning selective demolition. Comply with hauling and disposal regulations of authorities having jurisdiction.
- C. Standards: Comply with ANSI A10.6 and NFPA 241.
- D. Pre demolition Conference: Conduct conference at Project site to comply with requirements herein. Review methods and procedures related to selective demolition including, but not limited to, the following:
 - 1. Inspect and discuss condition of construction to be selectively demolished.
 - 2. Review structural load limitations of existing structure.
 - 3. Review and finalize selective demolition schedule and verify availability of materials, demolition personnel, equipment, and facilities needed to make progress and avoid delays.
 - 4. Review requirements of work performed by other trades that rely on substrates exposed by selective demolition operations.
 - 5. Requirements of system downtime and scheduling with site personnel.

1.08 PROJECT CONDITIONS

- A. Owner will occupy portions of building immediately adjacent to selective demolition area. Conduct selective demolition so Owner's operations will not be disrupted. Provide not less than 72 hours' notice to Owner of activities that will affect Owner's operations.
- B. Maintain access to existing walkways, corridors, and other adjacent occupied or used facilities.
 - 1. Do not close or obstruct walkways, corridors, or other occupied or used facilities without written permission from authorities having jurisdiction.
- C. Owner assumes no responsibility for condition of areas to be selectively demolished.
 - 1. Conditions existing at time of inspection for bidding purpose will be maintained by Owner as far as practical.
- D. Hazardous Materials: It is not expected that hazardous materials will be encountered in the Work.
 - 1. If materials suspected of containing hazardous materials are encountered, do not disturb; immediately notify Engineer and Owner. Owner will remove hazardous materials under a separate contract.
- E. E. Hazardous Materials: Hazardous materials are present in building to be selectively demolished. A report on the presence of hazardous materials is on file for review and use. Examine report to become aware of locations where hazardous materials are present.
 - 1. Hazardous material remediation is specified elsewhere in the Contract Documents.
 - 2. Do not disturb hazardous materials or items suspected of containing hazardous materials except under procedures specified elsewhere in the Contract Documents.
- F. Storage or sale of removed items or materials on-site is not permitted.
- G. Utility Service: Maintain existing utilities indicated to remain in service and protect them against damage during selective demolition operations.
 - 1. Maintain fire-protection facilities in service during selective demolition operations.

1.09 WARRANTY

- A. Existing Warranties: Remove, replace, patch, and repair materials and surfaces cut or damaged during selective demolition, by methods and with materials so as not to void existing warranties.
 - 1. If possible, retain original Installer or fabricator to patch the exposed Work listed below that is damaged during selective demolition. If it is impossible to engage original
 - 2. Installer or fabricator, engage another recognized experienced and specialized firm.
 - a. Processed concrete finishes.
 - b. Stonework and stone masonry.
 - c. Roofing.
 - d. Fire stopping.
 - e. Fluid-applied flooring

PART 2 - PRODUCTS

2.01 REPAIR MATERIALS

- A. Use repair materials identical to existing materials.
 - 1. If identical materials are unavailable or cannot be used for exposed surfaces, use materials that visually match existing adjacent surfaces to the fullest extent possible.
 - 2. Use materials whose installed performance equal or surpasses that of existing materials.
- B. Comply with material and installations requirements specified in individual Specification Sections.

PART 3 - EXECUTION

3.01 EXAMINATION

- A. Verify that utilities have been disconnected and capped.
- B. Survey existing conditions and correlate with requirements indicated to determine extent of selective demolition required.
- C. Inventory and record the condition of items to be removed and reinstalled and items to be removed and salvaged.
- D. When unanticipated mechanical, electrical, or structural elements that conflict with intended function or design are encountered, investigate and measure the nature and extent of conflict. Promptly submit a written report to Architect/Engineer.
- E. Engage a professional engineer to survey condition of building to determine whether removing any element might result in structural deficiency or unplanned collapse of any portion of structure or adjacent structures during selective demolition operations.
- F. Perform surveys as the Work progresses to detect hazards resulting from selective demolition activities.

3.02 UTILITY SERVICES

- A. Existing Utilities: Maintain services indicated to remain and protect them against damage during selective demolition operations.
- B. Do not interrupt existing utilities serving occupied or operating facilities unless authorized in writing by Owner and authorities having jurisdiction. Provide temporary services during interruptions to existing utilities, as acceptable to Owner and to authorities having jurisdiction.
 - 1. Provide at least 72 hours' notice to Owner if shutdown of service is required during changeover.
 - 2. Perform work during unoccupied night or weekend hours as required by Owner during disruption of utilities.
- C. Utility Requirements: Locate, identify, disconnect, and seal or cap off indicated utility services and mechanical/electrical systems serving areas to be selectively demolished.
 - 1. Building Owner or Representative will arrange to shut off indicated services/systems when requested by Contractor.
 - 2. Arrange to shut off indicated utilities with utility companies.
 - 3. If services/systems are required to be removed, relocated, or abandoned, before proceeding with selective demolition provide temporary services/systems that bypass area of selective demolition and that maintain continuity of services/systems to other parts of building.
 - 4. Cut off pipe or conduit in walls or partitions to be removed. Cap, valve, or plug and seal remaining portion of pipe or conduit after bypassing.
- D. Utility Requirements: Refer to Division 23 and 26 Sections for shutting off, disconnecting, removing, and sealing or capping utilities. Do not start selective demolition work until utility disconnecting and sealing have been completed and verified in writing.

3.03 PREPARATION

- A. Site Access and Temporary Controls: Conduct selective demolition and debris-removal operations to ensure minimum interference with roads, streets, walks, walkways, and other adjacent occupied and used facilities.
 - 1. Comply with requirements for access and protection specified in Division 01 Section "Temporary Facilities and Controls."

- B. Temporary Facilities: Provide temporary barricades and other protection required to prevent injury to people and damage to adjacent buildings and facilities to remain.
 - 1. Provide protection to ensure safe passage of people around selective demolition area and to and from occupied portions of building.
 - 2. Provide temporary weather protection, during interval between selective demolition of existing construction on exterior surfaces and new construction, to prevent water leakage and damage to structure and interior areas.
 - 3. Protect walls, ceilings, floors, and other existing finish work that are to remain or that are exposed during selective demolition operations.
 - 4. Cover and protect furniture, furnishings, and equipment that have not been removed.
 - 5. Comply with requirements for temporary enclosures, dust control, heating, and cooling specified in Division 01 Section "Temporary Facilities and Controls."
- C. Temporary Shoring: Provide and maintain shoring, bracing, and structural supports as required to preserve stability and prevent movement, settlement, or collapse of construction and finishes to remain, and to prevent unexpected or uncontrolled movement or collapse of construction being demolished.
 - 1. Strengthen or add new supports when required during progress of selective demolition.

3.04 SELECTIVE DEMOLITION, GENERAL

- A. General: Demolish and remove existing construction only to the extent required by new construction and as indicated. Use methods required to complete the Work within limitations of governing regulations and as follows:
 - 1. Proceed with selective demolition systematically, from higher to lower level. Complete selective demolition operations above each floor or tier before disturbing supporting members on the next lower level.
 - 2. Neatly cut openings and holes plumb, square, and true to dimensions required. Use cutting methods least likely to damage construction to remain or adjoining construction. Use hand tools or small power tools designed for sawing or grinding, not hammering and chopping, to minimize disturbance of adjacent surfaces. Temporarily cover openings to remain.
 - 3. Cut or drill from the exposed or finished side into concealed surfaces to avoid marring existing finished surfaces.
 - 4. Do not use cutting torches until work area is cleared of flammable materials. At concealed spaces, such as duct and pipe interiors, verify condition and contents of hidden space before starting flame-cutting operations. Maintain fire watch and portable fire suppression devices during flame-cutting operations.
 - 5. Maintain adequate ventilation when using cutting torches.
 - 6. Remove decayed, vermin-infested, or otherwise dangerous or unsuitable materials and promptly dispose of off-site.
 - 7. Remove structural framing members and lower to ground by method suitable to avoid free fall and to prevent ground impact or dust generation.
 - 8. Locate selective demolition equipment and remove debris and materials so as not to impose excessive loads on supporting walls, floors, or framing.
 - 9. Return elements of construction and surfaces that are to remain to condition existing before selective demolition operations begun.
 - 10. Provide demolition on an on-going basis, schedule permitting. Demolition of existing systems or portions there to shall be performed without interruption of the operation of the central heating plant.
 - 11. Remove demolition debris on a continuous and daily basis as work proceeds. Do not leave debris in the room.
 - 12. Schedule and locate dumpster space as required by the project and coordinate location with facility personnel.
 - 13. Remove from site boilers and other large pieces of equipment immediately upon movement. Coordinate schedule of removal trains and cranes with facility personnel so that removal minimizes impact on-site traffic movement.
 - 14. Maintain the operation of the central heating plant due to requirements of site steam while demolition is in progress. Where conditions cannot be met, coordinate and schedule with facility personnel and other requirements to minimize down-time.

- B. Reuse of Building Elements: Project has been designed to result in end-of-Project rates for reuse of building elements as follows. Do not demolish building elements beyond what is indicated on Drawings without Architect's approval.
 - 1. Non-shell Elements: 50 percent.
- C. Removed and Salvaged Items:
 - 1. Clean salvaged items.
 - 2. Pack or crate items after cleaning. Identify contents of containers.
 - 3. Store items in a secure area until delivery to Owner.
 - 4. Transport items to Owner's storage area.
 - 5. Protect items from damage during transport and storage.
- D. Removed and Reinstalled Items:
 - 1. Clean and repair items to functional condition adequate for intended reuse. Paint equipment to match new equipment.
 - 2. Pack or crate items after cleaning and repairing. Identify contents of containers.
 - 3. Protect items from damage during transport and storage.
 - 4. Reinstall items in locations indicated. Comply with installation requirements for new materials and equipment. Provide connections, supports, and miscellaneous materials necessary to make item functional for use indicated.
- E. Existing Items to Remain: Protect construction indicated to remain against damage and soiling during selective demolition. When permitted by Engineer, items may be removed to a suitable, protected storage location during selective demolition and cleaned and reinstalled in their original locations after selective demolition operations are complete.
- F. Concrete: Demolish in small sections. Cut concrete to a depth of at least 3/4 inch at junctures with construction to remain, using power-driven saw. Dislodge concrete from reinforcement at perimeter of areas being demolished, cut reinforcement, and then remove remainder of concrete indicated for selective demolition. Neatly trim openings to dimensions indicated.
- G. Concrete: Demolish in sections. Cut concrete full depth at junctures with construction to remain and at regular intervals, using power-driven saw, then remove concrete between saw cuts.
- H. Masonry: Demolish in small sections. Cut masonry at junctures with construction to remain and at regular intervals, using power-driven saw, then remove concrete between saw cuts.
- I. Concrete Slabs-on-Grade: Saw cut perimeter of area to be demolished, then break up and remove.
- J. Resilient Floor Coverings: Remove floor coverings and adhesive according to recommendations in RFCI-WP and its Addendum.
 - 1. Remove residual adhesive and prepare substrate for new floor coverings by one of the methods recommended by RFCI.
- K. Roofing: Remove no more existing roofing than can be covered in one day by new roofing. Refer to applicable Division 07 Section for new roofing requirements.
- L. Air-Conditioning Equipment: Remove equipment without releasing refrigerants.

3.05 DISPOSAL OF DEMOLISHED MATERIALS

- A. General: Except for items or materials indicated to be reused, salvaged, reinstalled, or Otherwise indicated to remain Owner's property, remove demolished materials from Project site and legally dispose of them in an EPA-approved landfill.
 - 1. Do not allow demolished materials to accumulate on-site.
 - 2. Remove and transport debris in a manner that will prevent spillage on adjacent surfaces and areas.
 - 3. Remove debris from elevated portions of building by chute, hoist, or other device that will convey debris to grade level in a controlled descent.
 - 4. Comply with requirements specified in Division 01 Section "Construction Waste Management."
- B. Burning: Do not burn demolished materials.
- C. Disposal: Transport demolished materials off Owner's property and legally dispose of them.

3.06 CLEANING

- A. Clean adjacent structures and improvements of dust, dirt, and debris caused by selective demolition operations. Return adjacent areas to condition existing before selective demolition operations began.

END OF SECTION

SECTION 23 0513

COMMON MOTOR REQUIREMENTS FOR HVAC EQUIPMENT

PART 1 GENERAL

1.01 SECTION INCLUDES

- A. General construction and requirements.
- B. Applications.
- C. Single phase electric motors.
- D. Three phase electric motors.

1.02 REFERENCE STANDARDS

- A. ABMA STD 9 - Load Ratings and Fatigue Life for Ball Bearings; 2015.
- B. NEMA MG 1 - Motors and Generators; 2017.
- C. NFPA 70 - National Electrical Code; Most Recent Edition Adopted by Authority Having Jurisdiction, Including All Applicable Amendments and Supplements.

1.03 SUBMITTALS

- A. See Section 01 3000 - Administrative Requirements for submittal procedures.
- B. Product Data: Provide wiring diagrams with electrical characteristics and connection requirements.
- C. Operation Data: Include instructions for safe operating procedures.

1.04 QUALITY ASSURANCE

- A. Comply with NFPA 70.

PART 2 PRODUCTS

2.01 MANUFACTURERS

- A. Baldor Electric Company/ABB Group: www.baldor.com.
- B. Leeson Electric Corporation: www.leeson.com.
- C. Regal-Beloit Corporation (Century): www.centuryelectricmotor.com.
- D. or approved equal.

2.02 GENERAL CONSTRUCTION AND REQUIREMENTS

- A. Construction:
 - 1. Open drip-proof type except where specifically noted otherwise.
 - 2. Design for continuous operation in 104 degrees F (40 degrees C) environment.
 - 3. Design for temperature rise in accordance with NEMA MG 1 limits for insulation class, service factor, and motor enclosure type.
- B. Visible Nameplate: Indicating motor horsepower, voltage, phase, cycles, RPM, full load amps, locked rotor amps, frame size, manufacturer's name and model number, service factor, power factor, efficiency.
- C. Wiring Terminations:
 - 1. Provide terminal lugs to match branch circuit conductor quantities, sizes, and materials indicated. Enclose terminal lugs in terminal box sized to NFPA 70, threaded for conduit.
 - 2. For fractional horsepower motors where connection is made directly, provide threaded conduit connection in end frame.

2.03 APPLICATIONS

- A. Single phase motors for pumps: Capacitor start, capacitor run type.

2.04 SINGLE PHASE POWER - CAPACITOR START MOTORS

- A. Starting Torque: Three times full load torque.
- B. Starting Current: Less than five times full load current.
- C. Pull-up Torque: Up to 350 percent of full load torque.

- D. Breakdown Torque: Approximately 250 percent of full load torque.
- E. Motors: Capacitor in series with starting winding; provide capacitor-start/capacitor-run motors with two capacitors in parallel with run capacitor remaining in circuit at operating speeds.
- F. Drip-proof Enclosure: Class A (50 degrees C temperature rise) insulation, NEMA Service Factor, prelubricated sleeve bearings.
- G. Enclosed Motors: Class A (50 degrees C temperature rise) insulation, 1.0 Service Factor, prelubricated ball bearings.

2.05 THREE PHASE POWER - SQUIRREL CAGE MOTORS

- A. Power Output, Locked Rotor Torque, Breakdown or Pull Out Torque: NEMA Design B characteristics.
- B. Design, Construction, Testing, and Performance: Comply with NEMA MG 1 for Design B motors.
- C. Insulation System: NEMA Class B or better.
- D. Bearings: Grease lubricated anti-friction ball bearings with housings equipped with plugged provision for relubrication, rated for minimum ABMA STD 9, L-10 life of 20,000 hours. Calculate bearing load with NEMA minimum V-belt pulley with belt center line at end of NEMA standard shaft extension. Stamp bearing sizes on nameplate.

2.06 ELECTRONICALLY COMMUTATED MOTORS (ECM)

PART 3 EXECUTION

3.01 INSTALLATION

- A. Install in accordance with manufacturer's instructions.
- B. Install securely on firm foundation. Mount ball bearing motors with shaft in any position.
- C. Check line voltage and phase and ensure agreement with nameplate.

END OF SECTION

SECTION 23 0516

EXPANSION FITTINGS AND LOOPS FOR HVAC PIPING

PART 1 GENERAL

1.01 SECTION INCLUDES

- A. Flexible pipe connectors.
- B. Pipe loops, offsets, and swing joints.

1.02 RELATED REQUIREMENTS

- A. Section 23 2113 - Hydronic Piping.

1.03 REFERENCE STANDARDS

- A. ASME B16.1 - Gray Iron Pipe Flanges and Flanged Fittings: Classes 25, 125, and 250; 2015.
- B. ASME B16.5 - Pipe Flanges and Flanged Fittings NPS 1/2 Through NPS 24 Metric/Inch Standard; 2017.
- C. ASTM A269/A269M - Standard Specification for Seamless and Welded Austenitic Stainless Steel Tubing for General Service; 2015a.
- D. ASTM A536 - Standard Specification for Ductile Iron Castings; 1984 (Reapproved 2014).
- E. EJMA (STDS) - EJMA Standards; Tenth Edition.
- F. FM (AG) - FM Approval Guide; current edition.

1.04 SUBMITTALS

- A. See Section 01 3000 - Administrative Requirements, for submittal procedures.
- B. Product Data:
 - 1. Flexible Pipe Connectors: Indicate maximum temperature and pressure rating, face-to-face length, live length, hose wall thickness, hose convolutions per foot (meter) and per assembly, fundamental frequency of assembly, braid structure, and total number of wires in braid.

PART 2 PRODUCTS

2.01 FLEXIBLE PIPE CONNECTORS - STEEL PIPING

- A. Manufacturers:
 - 1. Mercer Rubber Company: www.mercer-rubber.com.
 - 2. The Metraflex Company: www.metraflex.com/#sle.
 - 3. or approved equal.
- B. Inner Hose: Bronze.
- C. Exterior Sleeve: Single braided, stainless steel.
- D. Pressure Rating: 125 psi and 450 degrees F (862 kPa and 232 degrees C).
- E. Size: Use pipe sized units.
- F. Maximum offset: 3/4 inch (20 mm) on each side of installed center line.

PART 3 EXECUTION

3.01 INSTALLATION

- A. Install in accordance with manufacturer's instructions.
- B. Install in accordance with EJMA (Expansion Joint Manufacturers Association) Standards.
- C. Install flexible pipe connectors on pipes connected to vibration isolated equipment. Provide line size flexible connectors.
- D. Install flexible connectors at right angles to displacement. Install one end immediately adjacent to isolated equipment and anchor other end. Install in horizontal plane unless indicated otherwise.

END OF SECTION

SECTION 23 0519
METERS AND GAUGES FOR HVAC PIPING

PART 1 GENERAL

1.01 SECTION INCLUDES

- A. Flow meters.
- B. Pressure gauges and pressure gauge taps.
- C. Thermometers and thermometer wells.
- D. Static pressure gauges.

1.02 REFERENCE STANDARDS

- A. ASME B40.100 - Pressure Gauges and Gauge Attachments; 2013.
- B. ASME MFC-3M - Measurement of Fluid Flow in Pipes Using Orifice, Nozzle and Venturi; 2004.
- C. ASTM E1 - Standard Specification for ASTM Liquid-in-Glass Thermometers; 2014.
- D. ASTM E77 - Standard Test Method for Inspection and Verification of Thermometers; 2014, with Editorial Revision (2017).
- E. AWWA M6 - Water Meters -- Selection, Installation, Testing, and Maintenance; 2012.
- F. UL 393 - Indicating Pressure Gauges for Fire-Protection Service; Current Edition, Including All Revisions.

1.03 SUBMITTALS

- A. See Section 01 3000 - Administrative Requirements, for submittal procedures.
- B. Product Data: Provide list that indicates use, operating range, total range and location for manufactured components.

1.04 FIELD CONDITIONS

- A. Do not install instrumentation when areas are under construction, except for required rough-in, taps, supports and test plugs.

PART 2 PRODUCTS

2.01 LIQUID FLOW METERS

- A. Calibrated ASME MFC-3M Venturi orifice plate and flanges with valved taps, chart for conversion of differential pressure readings to flow rate, with pressure gauge in case.
- B. Annular element flow stations with meter set.
 - 1. Measuring Station: Type 316 stainless steel pitot type flow element inserted through welded threaded couplet, with safety shut-off valves and quick coupling connections, and permanent metal tag indicating design flow rate, reading for design flow rate, metered fluid, line size, station or location number.
 - a. Pressure rating: 275 psi (1896 kPa).
 - b. Maximum temperature: 400 degrees F (204 degrees C).
 - c. Accuracy: Plus 0.55 percent to minus 2.30 percent.

2.02 PRESSURE GAUGES

- A. Pressure Gauges: ASME B40.100, UL 393 drawn steel case, phosphor bronze bourdon tube, rotary brass movement, brass socket, with front recalibration adjustment, black scale on white background.
 - 1. Case: Steel with brass bourdon tube.
 - 2. Size: 4-1/2 inch (115 mm) diameter.
 - 3. Mid-Scale Accuracy: One percent.
 - 4. Scale: Psi.

2.03 PRESSURE GAUGE TAPPINGS

- A. Gauge Cock: Tee or lever handle, brass for maximum 150 psi (1034 kPa).
- B. Needle Valve: Brass, 1/4 inch (6 mm) NPT for minimum 150 psi (1034 kPa).

2.04 STEM TYPE THERMOMETERS

- A. Thermometers - Adjustable Angle: Red- or blue-appearing non-toxic liquid in glass; ASTM E1; lens front tube, cast aluminum case with enamel finish, cast aluminum adjustable joint with positive locking device; adjustable 360 degrees in horizontal plane, 180 degrees in vertical plane.
 - 1. Size: 9 inch (225 mm) scale.
 - 2. Window: Clear Lexan.
 - 3. Accuracy: 2 percent, per ASTM E77.
 - 4. Calibration: Degrees F.

2.05 DIAL THERMOMETERS

- A. Thermometers - Fixed Mounting: Dial type bimetallic actuated; ASTM E1; stainless steel case, silicone fluid damping, white with black markings and black pointer, hermetically sealed lens, stainless steel stem.
 - 1. Size: 5 inch (125 mm) diameter dial.
 - 2. Lens: Clear glass.
 - 3. Accuracy: 1 percent.
 - 4. Calibration: Degrees F.

2.06 THERMOMETER SUPPORTS

- A. Socket: Brass separable sockets for thermometer stems with or without extensions as required, and with cap and chain.

2.07 TEST PLUGS

- A. Test Plug: 1/4 inch (6 mm) or 1/2 inch (13 mm) brass fitting and cap for receiving 1/8 inch (3 mm) outside diameter pressure or temperature probe with Nordel core for temperatures up to 350 degrees F (176 degrees C).

2.08 STATIC PRESSURE GAUGES

- A. 3-1/2 inch (90 mm) diameter dial in metal case, diaphragm actuated, black figures on white background, front recalibration adjustment, 2 percent of full scale accuracy.

PART 3 EXECUTION

3.01 INSTALLATION

- A. Install in accordance with manufacturer's instructions.
- B. Install positive displacement meters with isolating valves on inlet and outlet to AWWA M6. Provide full line size valved bypass with globe valve for liquid service meters.
- C. Provide one pressure gauge per pump, installing taps before strainers and on suction and discharge of pump. Pipe to gauge.
- D. Install thermometers in piping systems in sockets in short couplings. Enlarge pipes smaller than 2-1/2 inch (60 mm) for installation of thermometer sockets. Ensure sockets allow clearance from insulation.
- E. Provide instruments with scale ranges selected according to service with largest appropriate scale.
- F. Install gauges and thermometers in locations where they are easily read from normal operating level. Install vertical to 45 degrees off vertical.
- G. Adjust gauges and thermometers to final angle, clean windows and lenses, and calibrate to zero.
- H. Locate test plugs adjacent thermometers and thermometer sockets.

END OF SECTION

SECTION 23 0523

GENERAL-DUTY VALVES FOR HVAC PIPING

PART 1 GENERAL

1.01 SECTION INCLUDES

- A. Applications.
- B. General requirements.
- C. Globe valves.
- D. Ball valves.
- E. Butterfly valves.
- F. Check valves.
- G. Gate valves.
- H. Plug valves.
- I. Chainwheels.

1.02 ABBREVIATIONS AND ACRONYMS

- A. CWP: Cold working pressure.
- B. EPDM: Ethylene propylene copolymer rubber.
- C. NBR: Acrylonitrile-butadiene, Buna-N, or nitrile rubber.
- D. NRS: Nonrising stem.
- E. OS&Y: Outside screw and yoke.
- F. PTFE: Polytetrafluoroethylene.
- G. RS: Rising stem.
- H. SWP: Steam working pressure.
- I. TFE: Tetrafluoroethylene.

1.03 REFERENCE STANDARDS

- A. ASME B1.20.1 - Pipe Threads, General Purpose (Inch); 2013.
- B. ASME B16.1 - Gray Iron Pipe Flanges and Flanged Fittings: Classes 25, 125, and 250; 2015.
- C. ASME B16.5 - Pipe Flanges and Flanged Fittings NPS 1/2 Through NPS 24 Metric/Inch Standard; 2017.
- D. ASME B16.18 - Cast Copper Alloy Solder Joint Pressure Fittings; 2012.
- E. ASME B16.34 - Valves - Flanged, Threaded and Welding End; 2017.
- F. ASME B31.9 - Building Services Piping; 2014.
- G. ASME BPVC-IX - Boiler and Pressure Vessel Code, Section IX - Welding, Brazing, and Fusing Procedures; Welders; Brazers; and Welding, Brazing and Fusing Operators; 2017.
- H. ASTM A126 - Standard Specification for Gray Iron Castings for Valves, Flanges, and Pipe Fittings; 2004 (Reapproved 2014).
- I. ASTM A395/A395M - Standard Specification for Ferritic Ductile Iron Pressure-Retaining Castings for Use at Elevated Temperatures; 1999 (Reapproved 2014).
- J. ASTM A536 - Standard Specification for Ductile Iron Castings; 1984 (Reapproved 2014).
- K. ASTM B62 - Standard Specification for Composition Bronze or Ounce Metal Castings; 2017.
- L. MSS SP-67 - Butterfly Valves; 2017.
- M. MSS SP-71 - Cast Iron Swing Check Valves, Flanged and Threaded Ends; 2011, with Errata (2013).
- N. MSS SP-72 - Ball Valves with Flanged or Butt-Welding Ends for General Service; 2010a.
- O. MSS SP-80 - Bronze Gate, Globe, Angle and Check Valves; 2013.

- P. MSS SP-85 - Cast Iron Globe & Angle Valves, Flanged and Threaded Ends; 2011.
- Q. MSS SP-110 - Ball Valves Threaded, Socket-Welding, Solder Joint, Grooved and Flared Ends; 2010.

1.04 SUBMITTALS

- A. See Section 01 3000 - Administrative Requirements, for submittal procedures.
- B. Product Data: Provide data on valves including manufacturers catalog information. Submit performance ratings, rough-in details, weights, support requirements, and piping connections.

1.05 QUALITY ASSURANCE

- A. Manufacturer:
 - 1. Obtain valves for each valve type from single manufacturer.
 - 2. Company must specialize in manufacturing products specified in this section, with not less than three years of documented experience.
- B. Welding Materials and Procedures: Comply with ASME BPVC-IX.

1.06 DELIVERY, STORAGE, AND HANDLING

- A. Prepare valves for shipping as follows:
 - 1. Minimize exposure of operable surfaces by setting plug and ball valves to open position.
 - 2. Protect valve parts exposed to piped medium against rust and corrosion.
 - 3. Protect valve piping connections such as grooves, weld ends, threads, and flange faces.
 - 4. Adjust globe, gate, and angle valves to the closed position to avoid clattering.
 - 5. Secure check valves in either the closed position or open position.
 - 6. Adjust butterfly valves to closed or partially closed position.
- B. Use the following precautions during storage:
 - 1. Maintain valve end protection and protect flanges and specialties from dirt.
 - a. Provide temporary inlet and outlet caps.
 - b. Maintain caps in place until installation.
 - 2. Store valves in shipping containers and maintain in place until installation.
 - a. Store valves indoors in dry environment.
- C. Exercise the following precautions for handling:
 - 1. Avoid the use of operating handles or stems as rigging or lifting points.

PART 2 PRODUCTS

2.01 APPLICATIONS

- A. Provide the following valves for the applications if not indicated on drawings:
 - 1. Throttling (Hydronic): Butterfly, Ball, and Globe.
 - 2. Isolation (Shutoff): Butterfly and Gate.
 - 3. Swing Check (Pump Outlet):
 - a. 2 NPS (50 DN) and Smaller: Bronze with bronze disc.
 - b. 2-1/2 NPS (65 DN) and Larger: Iron with lever and weight, lever and spring, or center-guided with resilient seat.
 - 4. Dead-End: Butterfly, single-flange (lug) type.
- B. Substitutions of valves with higher CWP classes or SWP ratings for same valve types are permitted when specified CWP ratings or SWP classes are not available.
- C. Heating Hot Water Valves:
 - 1. 2 NPS (50 DN) and Smaller, Brass and Bronze Valves:
 - a. Threaded ends.
 - b. Angle: Bronze disc, Class 125.
 - c. Ball: Full port, one piece, brass trim.
 - d. Swing Check: Bronze disc, Class 125.
 - e. Gate: NRS, Class 125.
 - f. Globe: Bronze disc, Class 125.
 - 2. 2-1/2 NPS (65 DN) and Larger, Iron Valves:
 - a. 2-1/2 NPS (65 DN) to 4 NPS (100 DN): Threaded ends.

- b. Ball: 2-1/2 NPS (65 DN) to 10 NPS (250 DN), Class 150.
- c. Single-Flange Butterfly: 2-1/2 NPS (65 DN) to 12 NPS (300 DN), aluminum-bronze disc, EPDM seat, 200 CWP.
- d. Grooved-End Butterfly: 2-1/2 NPS (65 DN) to 12 NPS (300 DN), 175 CWP.
- e. Swing Check: Metal seats, Class 125.
- f. Swing Check: 2-1/2 NPS (65 DN) to 12 NPS (300 DN), lever and spring closure control, Class 125.
- g. Plate-Type Check: Single plate, metal seat, Class 125 .
- h. Gate: NRS, Class 125.
- i. Globe: 2-1/2 NPS (65 DN) to 12 NPS (300 DN), Class 125.

2.02 GENERAL REQUIREMENTS

- A. Valve Pressure and Temperature Ratings: No less than rating indicated; as required for system pressures and temperatures.
- B. Valve Sizes: Match upstream piping unless otherwise indicated.
- C. Valve Actuator Types:
- D. Valves in Insulated Piping: Provide 2 NPS (50 DN) stem extensions and the following features:
 - 1. Gate Valves: Rising stem.
 - 2. Ball Valves: Extended operating handle of non-thermal-conductive material, and protective sleeve that allows operation of valve without breaking the vapor seal or disturbing insulation.
 - 3. Butterfly Valves: Extended neck.
 - 4. Memory Stops: Fully adjustable after insulation is installed.
- E. Valve-End Connections:
 - 1. Threaded End Valves: ASME B1.20.1.
 - 2. Flanges on Iron Valves: ASME B16.1 for flanges on iron valves.
 - 3. Solder Joint Connections: ASME B16.18.
- F. General ASME Compliance:
 - 1. Building Services Piping Valves: ASME B31.9.

2.03 BRONZE ANGLE VALVES

- A. Class 125: CWP Rating: 200 psig: (1380 kPa).
 - 1. Comply with MSS SP-80, Type 1.
 - 2. Body: Bronze; ASTM B62, with integral seat and screw in bonnet.
 - 3. Ends: Threaded.
 - 4. Stem: Bronze.
 - 5. Disc: Bronze, PTFE, or TFE.
 - 6. Packing: Asbestos free.
 - 7. Handwheel: Bronze or aluminum.

2.04 BRONZE GLOBE VALVES

- A. Class 125: CWP Rating: 200 psig: (1380 kPa).
 - 1. Comply with MSS SP-80, Type 1.
 - 2. Body: Bronze; ASTM B62, with integral seat and screw in bonnet.
 - 3. Ends: Threaded or solder joint.
 - 4. Stem and Disc: Bronze or PTFE.
 - 5. Packing: Asbestos free.
 - a. Handwheel: Malleable iron.

2.05 IRON GLOBE VALVES

- A. Class 125: CWP Rating: 200 psig: (1380 kPa).
 - 1. Comply with MSS SP-85, Type I.
 - 2. Body: Gray iron; ASTM A126, with bolted bonnet.
 - 3. Ends: Flanged.
 - 4. Trim: Bronze.

5. Packing and Gasket: Asbestos free.
6. Operator: Handwheel or chainwheel.

2.06 BRASS BALL VALVES

- A. One Piece, Reduced Port with Brass Trim:
 1. Comply with MSS SP-110.
 2. CWP Rating: 400 psig (2760 kPa).
 3. Body: Forged brass.
 4. Ends: Threaded.
 5. Seats: PTFE or TFE.
 6. Stem: Brass.
 7. Ball: Chrome-plated brass.
- B. Two Piece, Full Port and Regular Port with Stainless Steel Trim:
 1. Comply with MSS SP-110.
 2. SWP Rating: 150 psig (1035 kPa).
 3. CWP Rating: 600 psig (4140 kPa).
 4. Body: Forged brass.
 5. Ends: Threaded.
 6. Seats: PTFE or TFE.
 7. Ball: Chrome-plated brass.

2.07 BRONZE BALL VALVES

- A. One Piece, Reduced Port with Bronze Trim:
 1. Comply with MSS SP-110.
 2. CWP Rating: 400 psig (2760 kPa).
 3. Body: Bronze.
 4. Ends: Threaded.
 5. Seats: PTFE.
- B. Two Piece, Regular Port and Full Port with Bronze or Brass Trim:
 1. Comply with MSS SP-110.
 2. SWP Rating: 150 psig (1035 kPa).
 3. CWP Rating: 600 psig (4140 kPa).
 4. Body: Bronze.
 5. Ends: Threaded.
 6. Seats: PTFE .
 7. Stem: Bronze or brass.

2.08 IRON BALL VALVES

- A. Split Body, Full Port:
 1. Comply with MSS SP-72.
 2. CWP Rating: 200 psig (1380 kPa).
 3. Body: ASTM A126, gray iron.
 4. Ends: Flanged.
 5. Seats: PTFE.
 6. Stem: Stainless steel.
 7. Ball: Stainless steel.

2.09 IRON, SINGLE FLANGE BUTTERFLY VALVES

- A. Lug type: Bi-directional dead end service without downstream flange.
 1. Comply with MSS SP-67, Type I.
 2. CWP Rating: 150 psig (1035 kPa).
 3. Body Material: ASTM A126 cast iron.
 4. Stem: One or two-piece stainless steel.
 5. Seat: NBR.
 6. Disc: Coated ductile iron.

2.10 IRON, GROOVED-END BUTTERFLY VALVES

- A. CWP Rating: 175 psig (1200 kPa).
 - 1. Comply with MSS SP-67, Type I.
 - 2. Body: Coated ductile iron.
 - 3. Stem: Stainless steel.
 - 4. Disc: Coated ductile iron.
 - 5. Disc Seal: EPDM.

2.11 BRONZE SWING CHECK VALVES

- A. Class 125: CWP Rating: 200 psig (1380 kPa).
 - 1. Comply with MSS SP-80, Type 3.
 - 2. Body Design: Horizontal flow.
 - 3. Body Material: Bronze, ASTM B62.
 - 4. Ends: Threaded.
 - 5. Disc: Bronze.

2.12 IRON, FLANGED END SWING CHECK VALVES

- A. Class 125: CWP Rating: 200 psig (1380 kPa) with Metal Seats.
 - 1. Comply with MSS SP-71, Type I.
 - 2. Design: Clear or full waterway with flanged ends.
 - 3. Body: Gray iron with bolted bonnet in accordance with ASTM A126.
 - 4. Trim: Bronze.
 - 5. Disc Holder: Bronze.
 - 6. Gasket: Asbestos free.

2.13 IRON SWING CHECK VALVES WITH CLOSURE CONTROL

2.14 IRON, CENTER-GUIDED CHECK VALVES

2.15 IRON, PLATE-TYPE CHECK VALVES

2.16 BRONZE GATE VALVES

- A. Non-Rising Stem (NRS), Rising Stem (RS), or _____:
 - 1. Comply with MSS SP-80, Type I.
 - 2. Body Material: Bronze with integral seat and union-ring bonnet.
 - 3. Ends: Threaded or solder joint.
 - 4. Stem: Bronze.
 - 5. Disc: Solid wedge; bronze.
 - 6. Packing: Asbestos free.
 - 7. Handwheel: Malleable iron, bronze, or aluminum.

2.17 IRON GATE VALVES

- A. NRS or OS & Y:
 - 1. Comply with MSS SP-70, Type I.
 - 2. Class 125: 2-1/2 NPS (65 DN) to 12 NPS (300 DN), CWP Rating: 200 psig (1380 kPa).
 - 3. Body Material: Gray iron with bolted bonnet.
 - 4. Ends: Flanged.
 - 5. Trim: Bronze.
 - 6. Disc: Solid wedge.
 - 7. Packing and Gasket: Asbestos free.

2.18 CHAINWHEELS

- A. Description: Valve actuation assembly with sprocket rim, brackets, and chain.
 - 1. Brackets: Type, number, size, and fasteners required to mount actuator on valve.
 - 2. Attachment: For connection to ball and butterfly valve stems.
 - 3. Sprocket Rim with Chain Guides: Ductile iron include zinc coating.
 - 4. Chain: Hot-dip galvanized steel. Sized to fit sprocket rim.

PART 3 EXECUTION

3.01 EXAMINATION

- A. Discard all packing materials and verify that valve interior, including threads and flanges, are completely clean without signs of damage or degradation that could result in leakage.
- B. Verify valve parts to be fully operational in all positions from closed to fully open.
- C. Confirm gasket material to be suitable for the service, to be of correct size, and without defects that could compromise effectiveness.
- D. Should valve is determined to be defective, replace with new valve.

3.02 INSTALLATION

- A. Provide unions or flanges with valves to facilitate equipment removal and maintenance while maintaining system operation and full accessibility for servicing.
- B. Provide separate valve support as required and locate valve with stem at or above center of piping, maintaining unimpeded stem movement.

END OF SECTION

SECTION 23 0529

HANGERS AND SUPPORTS FOR HVAC PIPING AND EQUIPMENT

PART 1 GENERAL

1.01 SECTION INCLUDES

- A. Support and attachment components for equipment, piping, and other HVAC/hydronic work.

1.02 RELATED REQUIREMENTS

- A. Section 03 3000 - Cast-in-Place Concrete: Concrete equipment pads.

1.03 REFERENCE STANDARDS

- A. ASTM A123/A123M - Standard Specification for Zinc (Hot-Dip Galvanized) Coatings on Iron and Steel Products; 2017.
- B. ASTM A153/A153M - Standard Specification for Zinc Coating (Hot-Dip) on Iron and Steel Hardware; 2016a.
- C. ASTM B633 - Standard Specification for Electrodeposited Coatings of Zinc on Iron and Steel; 2015.
- D. MFMA-4 - Metal Framing Standards Publication; 2004.

1.04 ADMINISTRATIVE REQUIREMENTS

- A. Coordination:
 - 1. Coordinate sizes and arrangement of supports and bases with the actual equipment and components to be installed.
 - 2. Coordinate the work with other trades to provide additional framing and materials required for installation.
 - 3. Coordinate compatibility of support and attachment components with mounting surfaces at the installed locations.
 - 4. Coordinate the arrangement of supports with ductwork, piping, equipment and other potential conflicts installed under other sections or by others.
 - 5. Notify Engineer of any conflicts with or deviations from Contract Documents. Obtain direction before proceeding with work.
- B. Sequencing:
 - 1. Do not install products on or provide attachment to concrete surfaces until concrete has fully cured in accordance with Section 03 3000.

1.05 SUBMITTALS

- A. See Section 01 3000 - Administrative Requirements, for submittal procedures.
- B. Product Data: Provide manufacturer's standard catalog pages and data sheets for channel (strut) framing systems, nonpenetrating rooftop supports, post-installed concrete and masonry anchors, and thermal insulated pipe supports.

1.06 QUALITY ASSURANCE

- A. Comply with applicable building code.

PART 2 PRODUCTS

2.01 SUPPORT AND ATTACHMENT COMPONENTS

- A. General Requirements:
 - 1. Provide all required hangers, supports, anchors, fasteners, fittings, accessories, and hardware as necessary for the complete installation of plumbing work.
 - 2. Provide products listed, classified, and labeled as suitable for the purpose intended, where applicable.
 - 3. Where support and attachment component types and sizes are not indicated, select in accordance with manufacturer's application criteria as required for the load to be supported. Include consideration for vibration, equipment operation, and shock loads where applicable.

4. Do not use wire, chain, perforated pipe strap, or wood for permanent supports unless specifically indicated or permitted.
5. Steel Components: Use corrosion resistant materials suitable for the environment where installed.
 - a. Indoor Dry Locations: Use zinc-plated steel or approved equivalent unless otherwise indicated.
 - b. Zinc-Plated Steel: Electroplated in accordance with ASTM B633.
 - c. Galvanized Steel: Hot-dip galvanized after fabrication in accordance with ASTM A123/A123M or ASTM A153/A153M.
- B. Metal Channel (Strut) Framing Systems: Factory-fabricated continuous-slot metal channel (strut) and associated fittings, accessories, and hardware required for field-assembly of supports.
 1. Comply with MFMA-4.
 2. Channel Material:
 - a. Indoor Dry Locations: Use painted steel, zinc-plated steel, or galvanized steel.
- C. Hanger Rods: Threaded zinc-plated steel unless otherwise indicated.
 1. Minimum Size, Unless Otherwise Indicated or Required:
 - a. Equipment Supports: 1/2 inch (13 mm) diameter.
 - b. Piping up to 1 inch (27 mm) nominal: 1/4 inch (6 mm) diameter.
 - c. Piping larger than 1 inch (27 mm) nominal: 3/8 inch (10 mm) diameter.
 - d. Trapeze Support for Multiple Pipes: 3/8 inch (10 mm) diameter.
- D. Anchors and Fasteners:
 1. Unless otherwise indicated and where not otherwise restricted, use the anchor and fastener types indicated for the specified applications.
 2. Concrete: Use expansion anchors or screw anchors.
 3. Solid or Grout-Filled Masonry: Use expansion anchors or screw anchors.
 4. Hollow Masonry: Use toggle bolts.
 5. Hollow Stud Walls: Use toggle bolts.
 6. Steel: Use beam clamps, machine bolts, or welded threaded studs.
 7. Sheet Metal: Use sheet metal screws.
 8. Wood: Use wood screws.
 9. Plastic and lead anchors are not permitted.
 10. Post-Installed Concrete and Masonry Anchors: Evaluated and recognized by ICC Evaluation Service, LLC (ICC-ES) for compliance with applicable building code.

PART 3 EXECUTION

3.01 INSTALLATION

- A. Install products in accordance with manufacturer's instructions.
- B. Install anchors and fasteners in accordance with ICC Evaluation Services, LLC (ICC-ES) evaluation report conditions of use where applicable.
- C. Provide independent support from building structure. Do not provide support from piping, ductwork, conduit, or other systems.
- D. Unless specifically indicated or approved by Engineer, do not provide support from suspended ceiling support system or ceiling grid.
- E. Do not penetrate or otherwise notch or cut structural members without approval of Structural Engineer.
- F. Equipment Support and Attachment:
 1. Use metal fabricated supports or supports assembled from metal channel (strut) to support equipment as required.
 2. Use metal channel (strut) secured to studs to support equipment surface-mounted on hollow stud walls when wall strength is not sufficient to resist pull-out.
 3. Use metal channel (strut) to support surface-mounted equipment in wet or damp locations to provide space between equipment and mounting surface.
 4. Securely fasten floor-mounted equipment. Do not install equipment such that it relies on its own weight for support.

- G. Secure fasteners according to manufacturer's recommended torque settings.
- H. Remove temporary supports.

3.02 FIELD QUALITY CONTROL

- A. Inspect support and attachment components for damage and defects.
- B. Repair cuts and abrasions in galvanized finishes using zinc-rich paint recommended by manufacturer.
Replace components that exhibit signs of corrosion.
- C. Correct deficiencies and replace damaged or defective support and attachment components.

END OF SECTION

SECTION 23 0548

VIBRATION AND SEISMIC CONTROLS FOR HVAC PIPING AND EQUIPMENT

PART 1 GENERAL

1.01 SECTION INCLUDES

- A. Equipment support bases.
- B. Vibration isolators.
- C. Seismic snubber assemblies.
- D. Seismic restraints for suspended components and equipment.

1.02 REFERENCE STANDARDS

- A. ASHRAE (HVACA) - ASHRAE Handbook - HVAC Applications; 2015.
- B. FEMA 412 - Installing Seismic Restraints for Mechanical Equipment; 2002.

1.03 SUBMITTALS

- A. See Section 01 3000 - Administrative Requirements, for submittal procedures.
- B. Product Data:
 - 1. Provide manufacturer's product literature documenting compliance with PART 2 PRODUCTS.
 - 2. Include seismic rating documentation for each isolator and restraint component accounting for horizontal, vertical, and combined loads.

PART 2 PRODUCTS

2.01 PERFORMANCE REQUIREMENTS

- A. General:
 - 1. All vibration isolators, base frames and inertia bases to conform to all uniform deflection and stability requirements under all operating loads.
 - 2. Steel springs to function without undue stress or overloading.

2.02 VIBRATION ISOLATORS

- A. Seismic Type:
 - 1. Coil Springs Consisting of Single Elements:
 - a. Housing: Manufactured from cast iron material.
 - b. Ductile Material: Designed and rated for seismic applications.
 - c. Spring: Restrained by housing without significant degradation of vibration isolation capabilities during normal equipment operating conditions.
 - d. Resilient Snubbing Grommet System: Incorporated and designed with clearances of no more than 0.25 inch (6 mm) in any direction preventing direct metal-to-metal contact between supported member and fixed restraint housing.
 - e. Resilient Pad: Located in series with spring.
 - f. Coil Springs: Color coded elements to have a lateral stiffness greater than 0.8 times the rated vertical stiffness with 50 percent overload capacity.
 - g. Finish: Suitable for the application.

2.03 SEISMIC SNUBBER ASSEMBLIES

- A. Comply with:
 - 1. ASHRAE (HVACA) Handbook - HVAC Applications.
 - 2. FEMA 412.

PART 3 EXECUTION

3.01 INSTALLATION - GENERAL

- A. Install in accordance with manufacturer's instructions.
- B. On closed spring isolators, adjust so side stabilizers are clear under normal operating conditions.

- C. Prior to making piping connections to equipment with operating weights substantially different from installed weights, block up equipment with temporary shims to final height. When full load is applied, adjust isolators to load to allow shim removal.

END OF SECTION

SECTION 23 0553

IDENTIFICATION FOR HVAC PIPING AND EQUIPMENT

PART 1 GENERAL

1.01 SECTION INCLUDES

- A. Nameplates.
- B. Tags.
- C. Pipe markers.

1.02 REFERENCE STANDARDS

- A. ASME A13.1 - Scheme for the Identification of Piping Systems; 2015.
- B. ASTM D709 - Standard Specification for Laminated Thermosetting Materials; 2017.

1.03 SUBMITTALS

- A. See Section 01 3000 - Administrative Requirements for submittal procedures.
- B. List: Submit list of wording, symbols, letter size, and color coding for mechanical identification.
- C. Chart and Schedule: Submit valve chart and schedule, including valve tag number, location, function, and valve manufacturer's name and model number.
- D. Product Data: Provide manufacturers catalog literature for each product required.

PART 2 PRODUCTS

2.01 IDENTIFICATION APPLICATIONS

- A. Boilers: Nameplates.
- B. Automatic Controls: Tags. Key to control schematic.
- C. Control Panels: Nameplates.
- D. Dampers: Ceiling tacks, where located above lay-in ceiling.
- E. Piping: Tags.
- F. Pumps: Nameplates.
- G. Tanks: Nameplates.
- H. Valves: Tags and ceiling tacks where located above lay-in ceiling.

2.02 NAMEPLATES

- A. Manufacturers:
 - 1. Advanced Graphic Engraving, LLC: www.advancedgraphicengraving.com.
 - 2. Brimar Industries, Inc: www.pipemarker.com/#sle.
 - 3. Kolbi Pipe Marker Co: www.kolbipipemarkers.com.
 - 4. Seton Identification Products, a Tricor Direct Company: www.seton.com.
 - 5. or approved equal.
- B. Letter Color: White.
- C. Letter Height: 1/4 inch (6 mm).
- D. Background Color: Black.
- E. Plastic: Comply with ASTM D709.

2.03 TAGS

- A. Plastic Tags: Laminated three-layer plastic with engraved black letters on light contrasting background color. Tag size minimum 1-1/2 inch (40 mm) diameter.
- B. Metal Tags: Brass with stamped letters; tag size minimum 1-1/2 inch (40 mm) diameter with smooth edges.

2.04 PIPE MARKERS

- A. Color: Comply with ASME A13.1.

- B. Plastic Tape Pipe Markers: Flexible, vinyl film tape with pressure sensitive adhesive backing and printed markings.
- C. Color code as follows:
 - 1. Heating, Cooling, and Boiler Feedwater: Green with white letters.

PART 3 EXECUTION

3.01 PREPARATION

- A. Degrease and clean surfaces to receive adhesive for identification materials.

3.02 INSTALLATION

- A. Install nameplates with corrosive-resistant mechanical fasteners, or adhesive. Apply with sufficient adhesive to ensure permanent adhesion and seal with clear lacquer.
- B. Install tags with corrosion resistant chain.
- C. Install plastic pipe markers in accordance with manufacturer's instructions.
- D. Install plastic tape pipe markers complete around pipe in accordance with manufacturer's instructions.

END OF SECTION

SECTION 23 0593

TESTING, ADJUSTING, AND BALANCING FOR HVAC

PART 1 GENERAL

1.01 SECTION INCLUDES

- A. Testing, adjustment, and balancing of hydronic systems.

1.02 REFERENCE STANDARDS

- A. AABC (NSTSB) - AABC National Standards for Total System Balance, 7th Edition; 2016.
- B. ASHRAE Std 111 - Measurement, Testing, Adjusting, and Balancing of Building HVAC Systems; 2008.

1.03 SUBMITTALS

- A. See Section 01 3000 - Administrative Requirements, for submittal procedures.
- B. TAB Plan: Submit a written plan indicating the testing, adjusting, and balancing standard to be followed and the specific approach for each system and component.
 - 1. Include at least the following in the plan:
 - a. List of all , water flow, system capacity and efficiency measurements to be performed and a description of specific test procedures, parameters, formulas to be used.
 - b. Copy of field checkout sheets and logs to be used, listing each piece of equipment to be tested, adjusted and balanced with the data cells to be gathered for each.
 - c. Discussion of what notations and markings will be made on the piping drawings during the process.
 - d. Final test report forms to be used.
 - e. Details of how TOTAL flow will be determined; for example:
 - 1) Water: Pump curves, circuit setter, flow station, ultrasonic, etc.
 - f. Specific procedures that will ensure that the water side is operating at the lowest possible pressures and methods to verify this.
 - g. Procedures for formal deficiency reports, including scope, frequency and distribution.
- C. Final Report: Indicate deficiencies in systems that would prevent proper testing, adjusting, and balancing of systems and equipment to achieve specified performance.
 - 1. Revise TAB plan to reflect actual procedures and submit as part of final report.
 - 2.
 - 3. Include actual instrument list, with manufacturer name, serial number, and date of calibration.
 - 4. Form of Test Reports: Where the TAB standard being followed recommends a report format use that; otherwise, follow ASHRAE Std 111.
 - 5. Units of Measure: Report data in I-P (inch-pound) units only.
 - 6. Include the following on the title page of each report:
 - a. Name of Testing, Adjusting, and Balancing Agency.
 - b. Address of Testing, Adjusting, and Balancing Agency.
 - c. Telephone number of Testing, Adjusting, and Balancing Agency.
 - d. Project name.
 - e. Project location.
 - f. Project Engineer.
 - g. Project Contractor.
 - h. Report date.
- D. Project Record Documents: Record actual locations of flow measuring stations and balancing valves and rough setting.

PART 3 EXECUTION

2.01 GENERAL REQUIREMENTS

- A. Perform total system balance in accordance with one of the following:
 - 1. AABC (NSTSB), AABC National Standards for Total System Balance.
- B. Begin work after completion of systems to be tested, adjusted, or balanced and complete work prior to Substantial Completion of the project.

- C. TAB Agency Qualifications:
 - 1. Company specializing in the testing, adjusting, and balancing of systems specified in this section.
 - 2. Certified by one of the following:
 - a. AABC, Associated Air Balance Council: www.aabc.com/#sle; upon completion submit AABC National Performance Guaranty.
- D. TAB Supervisor and Technician Qualifications: Certified by same organization as TAB agency.

2.02 EXAMINATION

- A. Verify that systems are complete and operable before commencing work. Ensure the following conditions:
 - 1. Systems are started and operating in a safe and normal condition.
 - 2. Temperature control systems are installed complete and operable.
 - 3. Proper thermal overload protection is in place for electrical equipment.
 - 4. Hydronic systems are flushed, filled, and vented.
 - 5. Pumps are rotating correctly.
 - 6. Proper strainer baskets are clean and in place.
 - 7. Service and balance valves are open.
- B. Submit field reports. Report defects and deficiencies that will or could prevent proper system balance.
- C. Beginning of work means acceptance of existing conditions.

2.03 ADJUSTMENT TOLERANCES

- A. Hydronic Systems: Adjust to within plus or minus 10 percent of design.

2.04 RECORDING AND ADJUSTING

- A. Field Logs: Maintain written logs including:
 - 1. Running log of events and issues.
 - 2. Discrepancies, deficient or uncompleted work by others.
 - 3. Contract interpretation requests.
 - 4. Lists of completed tests.
- B. Ensure recorded data represents actual measured or observed conditions.
- C. Permanently mark settings of valves, dampers, and other adjustment devices allowing settings to be restored. Set and lock memory stops.
- D. After adjustment, take measurements to verify balance has not been disrupted or that such disruption has been rectified.
- E. Leave systems in proper working order, replacing belt guards, closing access doors, closing doors to electrical switch boxes, and restoring thermostats to specified settings.

2.05 WATER SYSTEM PROCEDURE

- A. Adjust water systems to provide required or design quantities.
- B. Use calibrated Venturi tubes, orifices, or other metered fittings and pressure gages to determine flow rates for system balance. Where flow metering devices are not installed, base flow balance on temperature difference across various heat transfer elements in the system.
- C. Adjust systems to provide specified pressure drops and flows through heat transfer elements prior to thermal testing. Perform balancing by measurement of temperature differential in conjunction with air balancing.
- D. Effect system balance with automatic control valves fully open to heat transfer elements.
- E. Where available pump capacity is less than total flow requirements or individual system parts, full flow in one part may be simulated by temporary restriction of flow to other parts.

2.06 SCOPE

- A. Test, adjust, and balance the following:
 - 1. Boiler Feedwater Pumps.
 - 2. HVAC Pumps.

2.07 MINIMUM DATA TO BE REPORTED

- A. Electric Motors:
 - 1. Manufacturer.
 - 2. Model/Frame.
 - 3. HP/BHP.
 - 4. Phase, voltage, amperage; nameplate, actual, no load.
 - 5. RPM.
 - 6. Service factor.
 - 7. Starter size, rating, heater elements.
- B. Pumps:
 - 1. Identification/number.
 - 2. Manufacturer.
 - 3. Size/model.
 - 4. Service.
 - 5. Design flow rate, pressure drop, BHP.
 - 6. Actual flow rate, pressure drop, BHP.
 - 7. Discharge pressure.
 - 8. Suction pressure.
 - 9. Total operating head pressure.
 - 10. Shut off, discharge and suction pressures.
 - 11. Shut off, total head pressure.
- C. Combustion Equipment:
 - 1. Boiler manufacturer.
 - 2. Model number.
 - 3. Serial number.
 - 4. Firing rate.
 - 5. Overfire draft.
 - 6. Gas meter timing dial size.
 - 7. Gas meter time per revolution.
 - 8. Gas pressure at meter outlet.
 - 9. Gas flow rate.
 - 10. Heat input.
 - 11. Burner manifold gas pressure.
 - 12. Percent carbon monoxide (CO).
 - 13. Percent carbon dioxide (CO₂).
 - 14. Percent oxygen (O₂).
 - 15. Percent excess air.
 - 16. Flue gas temperature at outlet.
 - 17. Ambient temperature.
 - 18. Net stack temperature.
 - 19. Percent stack loss.
 - 20. Percent combustion efficiency.
 - 21. Heat output.

END OF SECTION

SECTION 23 0713
DUCT INSULATION

PART 1 GENERAL

1.01 SECTION INCLUDES

- A. Duct insulation.
- B. Insulation jackets.

1.02 REFERENCE STANDARDS

- A. ASTM E84 - Standard Test Method for Surface Burning Characteristics of Building Materials; 2018.
- B. UL 723 - Standard for Test for Surface Burning Characteristics of Building Materials; Current Edition, Including All Revisions.

1.03 SUBMITTALS

- A. See Section 01 3000 - Administrative Requirements, for submittal procedures.
- B. Product Data: Provide product description, thermal characteristics, list of materials and thickness for each service, and locations.

1.04 QUALITY ASSURANCE

- A. Manufacturer Qualifications: Company specializing in manufacturing products of the type specified in this section with not less than three years of documented experience.

PART 2 PRODUCTS

2.01 REGULATORY REQUIREMENTS

- A. Surface Burning Characteristics: Flame spread index/Smoke developed index of 25/50, maximum, when tested in accordance with ASTM E84 or UL 723.

2.02 JACKETS

- A. Canvas Jacket: UL listed 6 oz/sq yd (220 g/sq m) plain weave cotton fabric treated with dilute fire retardant lagging adhesive.

PART 3 EXECUTION

3.01 EXAMINATION

- A. Test ductwork for design pressure prior to applying insulation materials.
- B. Verify that surfaces are clean, foreign material removed, and dry.

3.02 INSTALLATION

- A. Install in accordance with manufacturer's instructions.
- B. Install in accordance with NAIMA National Insulation Standards.
- C. Insulated Ducts Conveying Air Below Ambient Temperature:
 - 1. Provide insulation with vapor barrier jackets.
 - 2. Finish with tape and vapor barrier jacket.
 - 3. Continue insulation through walls, sleeves, hangers, and other duct penetrations.
 - 4. Insulate entire system, including fittings, joints, flanges, fire dampers, flexible connections, and expansion joints.
- D. Insulated Ducts Conveying Air Above Ambient Temperature:
 - 1. Provide with or without standard vapor barrier jacket.
 - 2. Insulate fittings and joints. Where service access is required, bevel and seal ends of insulation.

**3.03 SCHEDULE SEE M501 (NOTE:PROVIDE HIGH TEMPERATURE INSULATION FOR
DUCTWORK CONNECTED TO EXHAUST FAN EF-1A ONLY)**

END OF SECTION

SECTION 23 0719
HVAC PIPING INSULATION

PART 1 GENERAL

1.01 SECTION INCLUDES

- A. Piping insulation.
- B. Flexible removable and reusable blanket insulation.
- C. Jackets and accessories.

1.02 RELATED REQUIREMENTS

- A. Section 22 1005 - Plumbing Piping: Placement of hangers and hanger inserts.
- B. Section 23 2113 - Hydronic Piping: Placement of hangers and hanger inserts.

1.03 REFERENCE STANDARDS

- A. ASTM C177 - Standard Test Method for Steady-State Heat Flux Measurements and Thermal Transmission Properties by Means of the Guarded-Hot-Plate Apparatus; 2013.
- B. ASTM C195 - Standard Specification for Mineral Fiber Thermal Insulating Cement; 2007 (Reapproved 2013).
- C. ASTM C534/C534M - Standard Specification for Preformed Flexible Elastomeric Cellular Thermal Insulation in Sheet and Tubular Form; 2016.
- D. ASTM C547 - Standard Specification for Mineral Fiber Pipe Insulation; 2017.
- E. ASTM C795 - Standard Specification for Thermal Insulation for Use in Contact with Austenitic Stainless Steel; 2008 (Reapproved 2013).
- F. ASTM E84 - Standard Test Method for Surface Burning Characteristics of Building Materials; 2018.
- G. ASTM E96/E96M - Standard Test Methods for Water Vapor Transmission of Materials; 2016.
- H. UL 723 - Standard for Test for Surface Burning Characteristics of Building Materials; Current Edition, Including All Revisions.

1.04 SUBMITTALS

- A. See Section 01 3000 - Administrative Requirements, for submittal procedures.
- B. Product Data: Provide product description, thermal characteristics, list of materials and thickness for each service, and locations.

PART 2 PRODUCTS

2.01 REGULATORY REQUIREMENTS

- A. Surface Burning Characteristics: Flame spread index/Smoke developed index of 25/50, maximum, when tested in accordance with ASTM E84 or UL 723.

2.02 GLASS FIBER, RIGID

- A. Manufacturers:
 - 1. CertainTeed Corporation: www.certainteed.com.
 - 2. Johns Manville Corporation: www.jm.com.
 - 3. Knauf Insulation; Earthwool 1000 Degree Pipe Insulation: www.knaufinsulation.com/#sle.
 - 4. Owens Corning Corporation; Fiberglas Pipe Insulation ASJ: www.ocbuildingspec.com/#sle.
 - 5. Owens Corning Corporation; VaporWick Pipe Insulation: www.ocbuildingspec.com/#sle.
 - 6. or approved equal.
- B. Insulation: ASTM C547 and ASTM C795; rigid molded, noncombustible.
 - 1. K (Ksi) Value: ASTM C177, 0.24 at 75 degrees F (0.035 at 24 degrees C).
 - 2. Maximum Service Temperature: 850 degrees F (454 degrees C).
 - 3. Maximum Moisture Absorption: 0.2 percent by volume.
- C. Vapor Barrier Jacket: White kraft paper with glass fiber yarn, bonded to aluminized film; moisture vapor transmission when tested in accordance with ASTM E96/E96M of 0.02 perm-inches (0.029 ng/Pa s m).
- D. Tie Wire: 0.048 inch (1.22 mm) stainless steel with twisted ends on maximum 12 inch (300 mm) centers.

- E. Vapor Barrier Lap Adhesive: Compatible with insulation.

2.03 FLEXIBLE ELASTOMERIC CELLULAR INSULATION

- A. Manufacturers:
1. Aeroflex USA, Inc: www.aeroflexusa.com.
 2. Armacell LLC; AP Armaflex: www.armacell.us/#sle.
 3. K-Flex USA LLC; K-Flex Titan: www.kflexusa.com/#sle.
 4. or approved equal.
- B. Insulation: Preformed flexible elastomeric cellular rubber insulation complying with ASTM C534/C534M Grade 1; use molded tubular material wherever possible.
1. Minimum Service Temperature: Minus 40 degrees F (Minus 40 degrees C).
 2. Maximum Service Temperature: 180 degrees F (82 degrees C).
 3. Connection: Waterproof vapor barrier adhesive.

2.04 JACKETS

- A. PVC Plastic.
1. Jacket: One piece molded type fitting covers and sheet material, off-white color.
 - a. Minimum Service Temperature: 0 degrees F (minus 18 degrees C).
 - b. Maximum Service Temperature: 150 degrees F (66 degrees C).
 - c. Moisture Vapor Permeability: 0.002 perm inch (0.0029 ng/Pa s m), maximum, when tested in accordance with ASTM E96/E96M.
 - d. Thickness: 10 mil (0.25 mm).
 - e. Connections: Brush on welding adhesive.
- B. Canvas Jacket: UL listed 6 oz/sq yd (220 g/sq m) plain weave cotton fabric treated with dilute fire retardant lagging adhesive.

PART 3 EXECUTION

3.01 EXAMINATION

- A. Test piping for design pressure, liquid tightness, and continuity prior to applying insulation materials.
- B. Verify that surfaces are clean and dry, with foreign material removed.

3.02 INSTALLATION

- A. Install in accordance with manufacturer's instructions.
- B. Install in accordance with NAIMA National Insulation Standards.
- C. Exposed Piping: Locate insulation and cover seams in least visible locations.
- D. Glass Fiber Insulated Pipes Conveying Fluids Above Ambient Temperature:
1. Provide standard jackets, with or without vapor barrier, factory-applied, or field-applied. Secure with self-sealing longitudinal laps and butt strips with pressure-sensitive adhesive. Secure with outward clinch expanding staples.
 2. Insulate fittings, joints, and valves with insulation of like material and thickness as adjoining pipe. Finish with glass cloth and adhesive or PVC fitting covers.
- E. Inserts and Shields:
1. Shields: Galvanized steel between pipe hangers or pipe hanger rolls and inserts.
- F. Continue insulation through walls, sleeves, pipe hangers, and other pipe penetrations. Finish at supports, protrusions, and interruptions. At fire separations, refer to Section 07 8400.
- G. Pipe Exposed in Mechanical Equipment Rooms or Finished Spaces (less than 10 feet (3 meters) above finished floor): Finish with canvas jacket sized for finish painting.

3.03 SCHEDULE

- A. Heating Systems:
1. Heating Water Supply and Return:
 2. Boiler Feed Water:

END OF SECTION

SECTION 23 0800
COMMISSIONING OF HVAC

PART 1 GENERAL

1.01 SUMMARY

- A. See Section 01 9113 - General Commissioning Requirements for overall objectives; comply with the requirements of Section 01 9113.
- B. This section covers the Contractor's responsibilities for commissioning; each subcontractor or installer responsible for the installation of a particular system or equipment item to be commissioned is responsible for the commissioning activities relating to that system or equipment item.
- C. The Commissioning Authority (CA) directs and coordinates all commissioning activities and provides Prefunctional Checklists and Functional Test Procedures for Contractor's use.
- D. The entire HVAC system is to be commissioned, including commissioning activities for the following specific items:
 - 1. Control system.
 - 2. Major and minor equipment items.
 - 3. Piping systems and equipment.
 - 4. Variable frequency drives.
 - 5. Other equipment and systems explicitly identified elsewhere in Contract Documents as requiring commissioning.
- E. The Prefunctional Checklist and Functional Test requirements specified in this section are in addition to, not a substitute for, inspection or testing specified in other sections.

1.02 RELATED REQUIREMENTS

- A. Section 01 7800 - Closeout Submittals: Scope and procedures for operation and maintenance manuals and project record documents.
- B. Section 23 0593 - Testing, Adjusting, and Balancing for HVAC.

1.03 REFERENCE STANDARDS

- A. ASHRAE Guideline 1.1 - The HVAC&R Technical Requirements for the Commissioning Process; 2007, with Errata (2012).

1.04 SUBMITTALS

- A. Updated Submittals: Keep the Commissioning Authority informed of all changes to control system documentation made during programming and setup; revise and resubmit when substantial changes are made.
- B. Draft Prefunctional Checklists and Functional Test Procedures for Control System: Detailed written plan indicating the procedures to be followed to test, checkout and adjust the control system prior to full system Functional Testing; include at least the following for each type of equipment controlled:
 - 1. System name.
 - 2. List of devices.
 - 3. Step-by-step procedures for testing each controller after installation, including:
 - a. Process of verifying proper hardware and wiring installation.
 - b. Process of downloading programs to local controllers and verifying that they are addressed correctly.
 - c. Process of performing operational checks of each controlled component.
 - d. Plan and process for calibrating valve and damper actuators and all sensors.
 - e. Description of the expected field adjustments for transmitters, controllers and control actuators should control responses fall outside of expected values.
 - 4. Copy of proposed log and field checkout sheets to be used to document the process; include space for initial and final read values during calibration of each point and space to specifically indicate when a sensor or controller has "passed" and is operating within the contract parameters.
 - 5. Description of the instrumentation required for testing.

6. Indicate what tests on what systems should be completed prior to TAB using the control system for TAB work. Coordinate with the Commissioning Authority and TAB contractor for this determination.
- C. Startup Reports, Prefunctional Checklists, and Trend Logs: Submit for approval of Commissioning Authority.
- D. HVAC Control System O&M Manual Requirements. In addition to documentation specified elsewhere, compile and organize at minimum the following data on the control system:
 1. Specific step-by-step instructions on how to perform and apply all functions, features, modes, etc. mentioned in the controls training sections of this specification and other features of this system. Provide an index and clear table of contents. Include the detailed technical manual for programming and customizing control loops and algorithms.
 2. Full as-built set of control drawings.
 3. Full as-built sequence of operations for each piece of equipment.
 4. Full points list; in addition to the information on the original points list submittal, include a listing of all rooms with the following information for each room:
 - a. Floor.
 - b. Room number.
 - c. Room name.
 - d. Reference drawing number.
 - e. Heating and/or cooling valve tag ID.
 5. Full print out of all schedules and set points after testing and acceptance of the system.
 6. Full as-built print out of software program.
 7. Electronic copy on disk of the entire program for this facility.
 8. Marking of all system sensors and thermostats on the as-built floor plan and HVAC drawings with their control system designations.
 9. Maintenance instructions, including sensor calibration requirements and methods by sensor type, etc.
 10. Control equipment component submittals, parts lists, etc.
 11. Warranty requirements.
 12. Copies of all checkout tests and calibrations performed by the Contractor (not commissioning tests).
 13. Organize and subdivide the manual with permanently labeled tabs for each of the following data in the given order:
 - a. Sequences of operation.
 - b. Control drawings.
 - c. Points lists.
 - d. Controller and/or module data.
 - e. Thermostats and timers.
 - f. Sensors and DP switches.
 - g. Valves and valve actuators.
 - h. Dampers and damper actuators.
 - i. Program setups (software program printouts).
- E. Project Record Documents: See Section 01 7800 for additional requirements.
 1. Submit updated version of control system documentation, for inclusion with operation and maintenance data.
 2. Show actual locations of all static and differential pressure sensors (air, water and building pressure) and air-flow stations on project record drawings.
- F. Draft Training Plan: In addition to requirements specified in Section 01 7900, include:
 1. Follow the recommendations of ASHRAE Guideline 1.1.
 2. Control system manufacturer's recommended training.
 3. Demonstration and instruction on function and overrides of any local packaged controls not controlled by the HVAC control system.
- G. Training Manuals: See Section 01 7900 for additional requirements.

1. Provide three extra copies of the controls training manuals in a separate manual from the O&M manuals.

PART 2 PRODUCTS

2.01 TEST EQUIPMENT

- A. Provide all standard testing equipment required to perform startup and initial checkout and required functional performance testing; unless otherwise noted such testing equipment will NOT become the property of Owner.
- B. Equipment-Specific Tools: Where special testing equipment, tools and instruments are specific to a piece of equipment, are only available from the vendor, and are required in order to accomplish startup or Functional Testing, provide such equipment, tools, and instruments as part of the work at no extra cost to Owner; such equipment, tools, and instruments are to become the property of Owner.

PART 3 EXECUTION

3.01 PREPARATION

- A. Cooperate with the Commissioning Authority in development of the Prefunctional Checklists and Functional Test Procedures.
- B. Furnish additional information requested by the Commissioning Authority.
- C. Prepare a preliminary schedule for HVAC pipe and duct system testing, flushing and cleaning, equipment start-up and testing, adjusting, and balancing start and completion for use by the Commissioning Authority; update the schedule as appropriate.
- D. Notify the Commissioning Authority when pipe and duct system testing, flushing, cleaning, startup of each piece of equipment and testing, adjusting, and balancing will occur; when commissioning activities not yet performed or not yet scheduled will delay construction notify ahead of time and be proactive in seeing that the Commissioning Authority has the scheduling information needed to efficiently execute the commissioning process.
- E. Put all HVAC equipment and systems into operation and continue operation during each working day of testing, adjusting, and balancing and commissioning, as required.
- F. Provide test holes in ducts and plenums where directed to allow air measurements and air balancing; close with an approved plug.
- G. Provide temperature and pressure taps in accordance with Contract Documents.

3.02 INSPECTING AND TESTING - GENERAL

- A. Submit startup plans, startup reports, and Prefunctional Checklists for each item of equipment or other assembly to be commissioned.
- B. Perform the Functional Tests directed by the Commissioning Authority for each item of equipment or other assembly to be commissioned.
- C. Provide two-way radios for use during the testing.
- D. Valve/Damper Stroke Setup and Check:
 1. For all valve/damper actuator positions checked, verify the actual position against the control system readout.
 2. Set pump/fan to normal operating mode.
 3. Command valve/damper closed; visually verify that valve/damper is closed and adjust output zero signal as required.
 4. Command valve/damper open; verify position is full open and adjust output signal as required.
 5. Command valve/damper to a few intermediate positions.
 6. If actual valve/damper position does not reasonably correspond, replace actuator or add pilot positioner (for pneumatics).
- E. Isolation Valve or System Valve Leak Check: For valves not by coils.
 1. With full pressure in the system, command valve closed.
 2. Use an ultra-sonic flow meter to detect flow or leakage.
- F. Deficiencies: Correct deficiencies and re-inspect or re-test, as applicable, at no extra cost to Owner.

3.03 TAB COORDINATION

- A. TAB: Testing, adjusting, and balancing of HVAC.
- B. Coordinate commissioning schedule with TAB schedule.
- C. Review the TAB plan to determine the capabilities of the control system toward completing TAB.
- D. Provide all necessary unique instruments and instruct the TAB technicians in their use; such as handheld control system interface for setting terminal unit boxes, etc.
- E. Have all required Prefunctional Checklists, calibrations, startup and component Functional Tests of the system completed and approved by the Commissioning Authority prior to starting TAB.
- F. Provide a qualified control system technician to operate the controls to assist the TAB technicians or provide sufficient training for the TAB technicians to operate the system without assistance.

3.04 CONTROL SYSTEM FUNCTIONAL TESTING

- A. Prefunctional Checklists for control system components will require a signed and dated certification that all system programming is complete as required to accomplish the requirements of Contract Documents and the detailed Sequences of Operation documentation submittal.
- B. Do not start Functional Testing until all controlled components have themselves been successfully Functionally Tested in accordance with Contract Documents.
- C. Using a skilled technician who is familiar with this building, execute the Functional Testing of the control system as required by the Commissioning Authority.
- D. Functional Testing of the control system constitutes demonstration and trend logging of control points monitored by the control system.
 - 1. The scope of trend logging is partially specified; trend log up to 50 percent more points than specified at no extra cost to Owner.
 - 2. Perform all trend logging specified in Prefunctional Checklists and Functional Test procedures.
- E. Functionally Test integral or stand-alone controls in conjunction with the Functional Tests of the equipment they are attached to, including any interlocks with other equipment or systems; further testing during control system Functional Test is not required unless specifically indicated below.
- F. Demonstrate the following to the Commissioning Authority during testing of controlled equipment; coordinate with commissioning of equipment.
 - 1. Setpoint changing features and functions.
 - 2. Sensor calibrations.
- G. Demonstrate to the Commissioning Authority:
 - 1. That all specified functions and features are set up, debugged and fully operable.
 - 2. That scheduling features are fully functional and setup, including holidays.
 - 3. That all graphic screens and value readouts are completed.
 - 4. Correct date and time setting in central computer.
 - 5. That field panels read the same time as the central computer; sample 10 percent of field panels; if any of those fail, sample another 10 percent; if any of those fail test all remaining units at no extra cost to Owner.
 - 6. Functionality of field panels using local operator keypads and local ports (plug-ins) using portable computer/keypad; demonstrate 100 percent of panels and 10 percent of ports; if any ports fail, sample another 10 percent; if any of those fail, test all remaining units at no extra cost to Owner.
 - 7. Power failure and battery backup and power-up restart functions.
 - 8. Global commands features.
 - 9. Security and access codes.
 - 10. Occupant over-rides (manual, telephone, key, keypad, etc.).
 - 11. O&M schedules and alarms.
 - 12. Occupancy sensors and controls.
 - 13. All control strategies and sequences not tested during controlled equipment testing.
- H. If the control system, integral control components, or related equipment do not respond to changing conditions and parameters appropriately as expected, as specified and according to acceptable operating

practice, under any of the conditions, sequences, or modes tested, correct all systems, equipment, components, and software required at no additional cost to Owner.

3.05 OPERATION AND MAINTENANCE MANUALS

- A. See Section 01 7800 for additional requirements.
- B. Add design intent documentation furnished by Engineer to manuals prior to submission to Owner.
- C. Submit manuals related to items that were commissioned to Commissioning Authority for review; make changes recommended by Commissioning Authority.
- D. Commissioning Authority will add commissioning records to manuals after submission to Owner.

3.06 DEMONSTRATION AND TRAINING

- A. See Section 01 7900 for additional requirements.
- B. Demonstrate operation and maintenance of HVAC system to Owner's personnel; if during any demonstration, the system fails to perform in accordance with the information included in the O&M manual, stop demonstration, repair or adjust, and repeat demonstration. Demonstrations may be combined with training sessions if appropriate.
- C. These demonstrations are in addition to, and not a substitute for, Prefunctional Checklists and demonstrations to the Commissioning Authority during Functional Testing.
- D. Provide classroom and hands-on training of Owner's designated personnel on operation and maintenance of the HVAC system, control system, and all equipment items indicated to be commissioned. Provide the following minimum durations of training:
 - 1. HVAC Control System: 4 hours.
 - 2. Boilers and System: 4 hours.
 - 3. Chemical Treatment: 4 hours.
 - 4. Variable Speed Drives: 4 hours.
- E. TAB Review: Instruct Owner's personnel for minimum 8 hours, after completion of TAB, on the following:
 - 1. Review final TAB report, explaining the layout and meanings of each data type.
 - 2. Discuss any outstanding deficient items in control, ducting or design that may affect the proper delivery of air or water.
 - 3. Identify and discuss any terminal units, duct runs, diffusers, coils, fans and pumps that are close to or are not meeting their design capacity.
 - 4. Discuss any temporary settings and steps to finalize them for any areas that are not finished.
 - 5. Other salient information that may be useful for facility operations, relative to TAB.
- F. HVAC Control System Training: Perform training in at least three phases:
 - 1. Phase 1 - Basic Control System: Provide minimum of 8 hours of actual training on the control system itself. Upon completion of training, each attendee, using appropriate documentation, should be able to perform elementary operations and describe general hardware architecture and functionality of the system.
 - a. This training may be held on-site or at the manufacturer's facility.
 - b. If held off-site, the training may occur prior to final completion of the system installation.
 - c. For off-site training, Contractor shall pay expenses of up to two attendees.
 - 2. Phase 2 - Integrating with HVAC Systems: Provide minimum of 8 hours of on-site, hands-on training after completion of Functional Testing. Include instruction on:
 - a. The specific hardware configuration of installed systems in this facility and specific instruction for operating the installed system, including interfaces with other systems, if any.
 - b. Security levels, alarms, system start-up, shut-down, power outage and restart routines, changing setpoints and alarms and other typical changed parameters, overrides, freeze protection, manual operation of equipment, optional control strategies that can be considered, energy savings strategies and set points that if changed will adversely affect energy consumption, energy accounting, procedures for obtaining vendor assistance, etc.

- c. Trend logging and monitoring features (values, change of state, totalization, etc.), including setting up, executing, downloading, viewing both tabular and graphically and printing trends; provide practice in setting up trend logging and monitoring during training session.
 - d. Every display screen, allowing time for questions.
 - e. Point database entry and modifications.
- 3. Phase 3 - Post-Occupancy: Six months after occupancy conduct minimum of 8 hours of training. Tailor training session to questions and topics solicited beforehand from Owner. Also be prepared to address topics brought up and answer questions concerning operation of the system.
- G. Provide the services of manufacturer representatives to assist instructors where necessary.
- H. Provide the services of the HVAC controls instructor at other training sessions, when requested, to discuss the interaction of the controls system as it relates to the equipment being discussed.

END OF SECTION

SECTION 23 0913

INSTRUMENTATION AND CONTROL DEVICES FOR HVAC

PART 1 GENERAL

1.01 SECTION INCLUDES

- A. Input/Output Sensors:
 - 1. Carbon monoxide sensors.
- B. Thermostats:
 - 1. Outdoor reset thermostats.
- C. Flow Sensors:
 - 1. Flow nozzles.
 - 2. Venturi tubes.

1.02 RELATED REQUIREMENTS

- A. Section 23 2113 - Hydronic Piping: Installation of control valves, flow switches, temperature sensor sockets, and gauge taps.
- B. Section 26 0583 - Wiring Connections: Electrical characteristics and wiring connections.
- C. Section 26 2726 - Wiring Devices: Elevation of exposed components.

1.03 SUBMITTALS

- A. See Section 01 3000 - Administrative Requirements, for submittal procedures.
- B. Operation and Maintenance Data: Include inspection period, cleaning methods, recommended cleaning materials, and calibration tolerances.

PART 2 PRODUCTS

2.01 EQUIPMENT - GENERAL

- A. Products Requiring Electrical Connection: Listed and classified by Underwriters Laboratories Inc., as suitable for the purpose specified and indicated.

2.02 THERMOSTATS

PART 3 EXECUTION

3.01 INSTALLATION

- A. Install in accordance with manufacturer's instructions.
- B. Check and verify location of thermostats with plans and room details before installation. Locate 60 inches (1500 mm) above floor. Align with lighting switches and humidistats. Refer to Section 26 2726.
- C. Provide conduit and electrical wiring in accordance with Section 26 0583. Electrical material and installation shall be in accordance with appropriate requirements of Division 26.

END OF SECTION

SECTION 23 0972
VARIABLE FREQUENCY DRIVES

PART 1 - GENERAL

1.01 WORK INCLUDED

- A. Variable frequency drives

1.02 RELATED WORK

- A. Division 23 - Scope of Work
- B. Division 23 - Common Work Results for HVAC

1.03 SUBMITTALS

- A. Submit drawings and/or catalog cuts giving dimension, arrangement, construction materials available speed range drive horsepower rating, electrical characteristics of controller, references signal characteristics, specifications on standard components and required options and installation instructions.

1.04 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 on a standard NEMA Design B induction motor. It is required that the drive manufacturer have an existing:
 - 1. Sales representative exclusively for HVAC products, with expertise in HVAC systems and controls.
 - 2. An independent service organization.
- B. The drive manufacturer shall supply the drive and all necessary controls as herein specified. The manufacturer shall have been engaged in the production of this type of equipment for a minimum of twenty years.

1.05 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
- B. Qualifications:
 - 1. VFDs 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. 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
 - a. Compatibility directive, a requirement for CE marking. The VFD shall meet product standard EN 61800-3 for the First Environment restricted level.
 - 3. Acceptable Manufactures
 - a. ABB ACH Series
 - b. GE Fuji
 - c. Danfoss
 - 4. 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 at the user's site. The CBT product shall record answers to simulations and tests by student ID. The CBT product must be professionally produced and have interactive sessions, student tests and video clips of proper wiring and installation.

5. All VFD's on the project shall be of one manufacturer. Contractor to coordinate with equipment manufacturers and suppliers to meet this requirement.

1.06 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
 4. Compliance to IEEE 519 - harmonic analysis for particular jobsite including total harmonic voltage distortion and total harmonic current distortion (TDD).
 - a. The VFD manufacture shall provide calculations, specific to this installation, showing total harmonic voltage distortion is less than 5%. Input line filters shall be sized and provided as required by the AFD manufacturer to ensure compliance with IEEE standard 519. All VFD's shall include a minimum of 5% impedance reactors, no exceptions.

1.07 WARRANTY

- A. 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. There shall be 365/24 support available via a toll free phone number.

PART 2 - PRODUCTS

2.01 VARIABLE FREQUENCY DRIVES

- A. The VFD package as specified herein shall be enclosed in a UL Listed/NEMA Rated Type 12 (indoor dust tight) enclosure, 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: 0 to 40°C continuous. VFD's that can operate at 40°C intermittently (during a 24 hour period) are not acceptable and must be oversized. Altitude 0 to 3300 feet above sea level, less than 95% humidity, non-condensing.
 2. Enclosure shall be rated UL Type/NEMA 12 and shall be UL listed as a plenum rated VFD. VFD's without these ratings are not acceptable. Enclosure shall be rated UL type 12 and shall be UL listed as a plenum rated VFD. VFD's without these ratings are not acceptable.
- B. All VFDs shall have the following standard features:
 1. All VFDs 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 VFDs.
 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 back up 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. The clock shall also be programmable to control start/stop functions, constant speeds, PID parameter sets and output 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, operating temperature will be monitored and used to cycle the 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 setpoint without safety tripping or component damage (flying start).
 7. The VFD shall have the ability to automatically restart after an over-current, overvoltage, 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 430-150 for 4-pole motors.
 9. The VFD shall have an integral 5% impedance line 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 AC line reactors.
 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 430-2.
 11. The VFD shall include a coordinated AC transient 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 be capable of sensing a loss of load (broken belt / broken coupling) and signal the loss of load condition. The drive shall be programmable to signal this condition via a keypad warning, relay output and/or over the serial communications bus. Relay outputs shall include programmable time delays that will allow for drive acceleration from zero speed without signaling a false under load condition.
 13. 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 AFD 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, relay output and/or over the serial communication bus.
 14. 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.
- C. All VFDs 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.
 2. Two (2) PID Setpoint 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 setpoint shall be adjustable from the VFD keypad, analog inputs, or over the communications bus. There shall be two parameter sets for the first PID that allow the sets to be switched via a digital input, serial communications or from the keypad for night setback, summer/winter setpoints, etc. There shall be an independent, second PID loop that can utilize the second analog input and modulate one of the analog outputs to maintain setpoint of an independent process (ie. valves, dampers, etc.). All setpoints, process variables, etc. to be accessible from the serial communication network. The setpoints shall be set in Engineering units and not require a percentage of the transducer input.
 3. Two (2) programmable analog inputs shall accept current or voltage signals.
 4. 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, and other data.
 5. Six (6) programmable digital inputs for maximum flexibility in interfacing with external devices, typically programmed as follows:
 - a. 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 an 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 status shall also be transmitted over the serial communications bus. All digital inputs shall be programmable to initiate upon an application or removal of 24VDC.
6. Three (3) programmable digital Form-C relay outputs. The relays shall include programmable on and off delay times and adjustable hysteresis. Default settings shall be for run, not faulted (fail safe), and run permissive. 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 2 amps RMS. Outputs shall be true form C type contacts; open collector outputs are not acceptable.
 7. Seven (7) programmable preset speeds.
 8. Two independently adjustable accel and decel ramps with 1 - 1800 seconds adjustable time ramps.
 9. The VFD shall include a motor flux optimization circuit that will automatically reduce applied motor voltage to the motor to optimize energy consumption and audible motor noise.
 10. The VFD shall include a carrier frequency control circuit that reduces the carrier frequency based on actual VFD temperature that allows the highest carrier frequency without derating the VFD or operating at high carrier frequency only at low speeds.
 11. 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). The keypad shall utilize the following assistants:
1. Start-up assistants.
 2. Parameter assistants
 3. Maintenance assistant
 4. Troubleshooting assistant
- E. All applicable operating values shall be capable of being displayed in engineering (user) units.
1. 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):
 2. Output Frequency
 3. Motor Speed (RPM, %, or Engineering units)
 4. Motor Current
 5. Calculated Motor Torque
 6. Calculated Motor Power (kW)
 7. DC Bus Voltage
 8. Output Voltage
- F. The VFD shall include a fireman's override input. Upon receipt of a contact closure from the fireman's control station, the VFD shall operate at an adjustable preset speed. The mode shall override all other inputs (analog/digital, serial communication, and all keypad commands) and force the motor to run at the adjustable, preset speed. "Override Mode" shall be displayed on the keypad. Upon removal of the override signal, the VFD shall resume normal operation.
- G. Serial Communications
1. The VFD shall have an RS-485 port as standard. The standard protocols shall be Modbus, Johnson Controls N2 bus, and Siemens Building Technologies FLN. Optional protocols for LonWorks, BACnet, Profibus, Ethernet, and DeviceNet shall be available.
 - a. 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. Use of non-certified protocols is not allowed.
 2. The BACnet connection shall be PS485, MSTP interface operating at 9.6, 19.2, 38.4 or 76.8 Kbps. The connection shall be tested by the BACnet Testing L (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 BIBB's defined by the BACnet standard protocols 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. 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. The following additional status indications and settings shall be transmitted over the serial communications bus - keypad "Hand" or "Auto" selected, bypass selected, the ability to change the PID setpoint, and the ability to force the unit to bypass (if bypass is specified). The DDC system shall also be able to monitor if the motor is running in the VFD mode or bypass mode (if bypass is specified) over serial communications. A minimum of 15 field parameters shall be capable of being monitored.
- 4. The VFD shall allow the DDC to control the drive's digital and analog outputs via the serial interface. This control shall be independent of any VFD function. For example, the analog outputs may be used for modulating chilled water valves or cooling tower bypass valves. The drive's 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. In addition, all of the drive's digital and analog inputs shall be capable of being monitored by the DDC system.
- 5. The VFD shall include an independent PID loop for customer use. The Independent PID loop may be used for cooling tower bypass valve control, chilled water valve control, etc. Both the VFD control PID loop and the independent PID loop shall continue functioning even if the serial communications connection is lost. 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.
- H. EMI / RFI filters. All VFD's shall include EMI/RFI filters. The onboard filters shall allow the VFD assemble to be CE Marked and the AFD shall meet product standard EN 61800-3 for the First Environment restricted level.
- I. All VFD's through 50HP shall be protected from input and output power mis-wiring. The VFD shall sense this condition and display an alarm on the keypad.
- J. OPTIONAL FEATURES - Optional features to 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. A complete factory wired and tested bypass system consisting of an output contactor and bypass contactor. Overload protection and shall be provided in both drive and bypass modes.
 - 2. Door inter-locked, pad-lockable circuit breaker that will disconnect all input power from the drive and all internally mounted options.
 - 3. Fused VFD only disconnect (service switch). Fast acting fuses exclusive to the VFD - fast acting fuses allow the VFD to disconnect from the line prior to clearing upstream branch circuit protection, maintaining bypass capability. Bypass designs, which have no such fuses, or that incorporate fuses common to both the VFD and the bypass will not be accepted. Three contactor bypass schemes are not acceptable.
 - 4. The drive / bypass shall provide single-phase motor protection in both the VFD and bypass modes.
 - 5. The following operators shall be provided:
 - a. Bypass Hand-Off-Auto
 - b. Drive mode selector
 - c. Bypass mode selector
 - d. Bypass fault reset
 - 6. The following indicating lights (LED type) shall be provided. A test mode or push to test feature shall be provided.
 - a. Power-on (Ready)
 - b. Run enable (safeties) open

- c. Drive mode select damper opening
 - 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
7. The following relay (form C) outputs from the bypass shall be provided:
- a. System started
 - b. System running
 - c. Bypass override enabled
 - d. Drive fault
 - e. Bypass fault (motor overload or underload (broken belt))
 - f. Bypass H-O-A position
8. The digital inputs for the system shall accept 24V or 115 VAC (selectable). The bypass shall incorporate internally sourced power supply and not require an external control power source.
9. Customer Interlock Terminal Strip - 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 Hand, Auto, or Bypass modes (not functional in Fireman's Override 2). The remote start/stop contact shall operate in VFD and bypass modes.
10. Dedicated digital input that will transfer motor from VFD mode to bypass mode upon dry contact closure for fireman's override. Two modes of operation are required.
- a. One mode forces the motor to bypass operation and overrides both the VFD and bypass H-O-A switches and forces the motor to operate across the line (test mode). The system will only respond to the digital inputs and motor protections.
 - b. The second fireman's override mode remains as above, but will also defeat the overload and single-phase protection for bypass and ignore all keypad and digital inputs to the system (run until destruction).
11. The VFD shall include a "run permissive circuit" that will provide a normally open contact whenever a run command is provided (local or remote start command in VFD or bypass mode). The VFD system (VFD or bypass) shall not operate the motor until it receives a dry contact closure from a damper or valve end-switch. When the VFD system safety interlock (fire detector, freezestat, high static pressure switch, etc.) opens, the motor shall coast to a stop and the run permissive contact shall open, closing the damper or valve.
12. Class 20 or 30 (selectable) electronic motor overload protection shall be included.
13. There shall be an internal switch to select manual or automatic bypass.
14. There shall be an adjustable current sensing circuit for the bypass to provide loss of load indication (broken belt) when in the bypass mode.

PART 3 - EXECUTION

3.01 INSPECTION

- A. Examine areas and conditions under which the variable frequency controls are to be installed.
- B. Do not proceed with work until unsatisfactory conditions have been corrected in manner acceptable to installer.

3.02 INSTALLATION OF VARIABLE FREQUENCY DRIVE

- A. General: Install variable frequency drive where indicated, in accordance with equipment manufacturer's published installation instructions, and with recognized industry practices, to ensure that units comply with requirements and serve intended purposes.

- B. Coordination: Coordinate with other work as necessary to interface installation of variable frequency drive with other work.
- C. Access: Provide access space around variable frequency drive for service as indicated.
- D. Support: Install floor-mounted variable frequency drives on 4" high reinforced concrete pad, 4" larger on each side than unit base. Provide a unistrut frame.
- E. Mounting: Mount variable speed drive in accordance with manufacturer's instructions.
- F. Electrical Wiring: Install electrical devices furnished by manufacturer but not specified to be factory-mounted. Furnish copy of manufacturer's wiring diagram submittal to electrical installer.
 - 1. Verify that electrical wiring installation is in accordance with manufacturer's submittal and installation requirements, and local codes. Do not proceed with equipment start-up until wiring installation is acceptable to equipment manufacturer.
- G. 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 installation manual.
- H. Power wiring shall be completed by the electrical contractor. The contractor shall complete all wiring in accordance with the recommendations of the VFD manufacturer as outlined in the installation manual.
- I. Ground Motor Shafts.

3.03 START-UP

- A. Certified factory start-up shall be provided for each drive by a factory authorized service center.
- B. 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.
- C. 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.

3.04 PRODUCT SUPPORT

- A. 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 24/365 technical support line shall be available on a toll-free line.

3.05 FIELD QUALITY CONTROL

- A. Testing: Upon completion of installation of variable frequency drive, manufacturer shall start up and operate equipment to demonstrate capability and compliance with requirements. Field correct malfunctioning units, then retest to demonstrate compliance.
- B. Instruct Owner's personnel on operation of variable frequency drive motor control system.

END OF SECTION

SECTION 23 0993

SEQUENCE OF OPERATIONS FOR HVAC CONTROLS

PART 1 GENERAL

1.01 SECTION INCLUDES

- A. This section defines the manner and method by which controls function. Requirements for each type of control system operation are specified. Equipment, devices, and system components required for control systems are specified in other sections.
- B. Sequence of operation for:
 - 1. Cabinet heaters.
 - 2. Heating coils.
 - 3. Heating water zone control.

1.02 SUBMITTALS

- A. See Section 01 3000 - Administrative Requirements for submittal procedures.
- B. Sequence of Operation Documentation: Submit written sequence of operation for entire HVAC system and each piece of equipment.
 - 1. Preface: 1 or 2 paragraph overview narrative of the system describing its purpose, components and function.
 - 2. State each sequence in small segments and give each segment a unique number for referencing in Functional Test procedures; provide a complete description regardless of the completeness and clarity of the sequences specified in the contract documents.
 - 3. Include at least the following sequences:
 - a. Start-up.
 - b. Warm-up mode.
 - c. Normal operating mode.
 - d. Unoccupied mode.
 - e. Shutdown.
 - f. Capacity control sequences and equipment staging.
 - g. Temperature and pressure control, such as setbacks, setups, resets, etc.
- C. Control System Diagrams: Submit graphic schematic of the control system showing each control component and each component controlled, monitored, or enabled.
 - 1. Label with settings, adjustable range of control and limits.
- D. Points List: Submit list of all control points indicating at least the following for each point.
 - 1. Name of controlled system.
 - 2. Point abbreviation.
 - 3. Point description; such as dry bulb temperature, airflow, etc.
 - 4. Display unit.
 - 5. Control point or setpoint (Yes / No); i.e. a point that controls equipment and can have its setpoint changed.
 - 6. Monitoring point (Yes / No); i.e. a point that does not control or contribute to the control of equipment but is used for operation, maintenance, or performance verification.
- E. Project Record Documents: Record actual locations of components and setpoints of controls, including changes to sequences made after submission of shop drawings.

PART 2 PRODUCTS - NOT USED

PART 3 EXECUTION

3.01 CABINET HEATERS

- A. Single temperature thermostat on return heating water line from floor mounted cabinet heaters de-energizes unit on temperatures below 95 degrees F (35 degrees C).

3.02 HEATING COILS

- A. Single temperature thermostat set at 75 degrees F (24 degrees C) maintains constant space temperature during the day and 15 degrees F cooler at night (during the day and 8 degrees C cooler at night) by modulating two-way control heating valve with spring range of 3 to 7 psig (with spring range of 20 to 48 kPa).

3.03 HEATING WATER ZONE CONTROL

- A. Control heating water supply temperature set at 180 degrees F (82 degrees C) in accordance with outdoor reset schedule by modulating heating water control valve.

END OF SECTION

SECTION 23 0995

BACNET BUILDING AUTOMATION SYSTEM

PART 1 - GENERAL

1.01 RELATED DOCUMENTS

- A. The General Provisions of the Contract, including General, Supplementary, and Special Conditions, and Division 1 - General Requirements, apply to work specified in this section. Subcontractor must familiarize himself with the terms of the above documents.

1.02 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 3 years.
- B. All bidders must have a service and installation office in the (city name) area.
- 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:
- F. Andover Controls Corporation
- G. Or as approved by Owners.

1.03 SCOPE OF WORK

- A. 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. All components of the system - workstations, application controllers, unitary controllers, etc. shall communicate using the BACnet protocol, as defined by ASHRAE Standard 135-2012. No gateways shall be used for communication to controllers furnished under this section. At a minimum, provide controls for the following:
 - 1. Air handling units
 - 2. Return air fans
 - 3. Exhaust and supply fans
 - 4. Boilers including hot water pumps
 - 5. Refrigerant leak detection system
 - 6. Smoke evacuation sequence of AHUs and return fans including smoke control dampers and fire command override panel.
 - 7. Finned tube radiation control
 - 8. Cabinet unit heater controls
 - 9. Power wiring to DDC devices, smoke control dampers and BAS panels.
- B. Except as otherwise noted, the control system shall consist of all Ethernet Network Controllers, Standalone Digital Control Units, workstations, software, sensors, transducers, relays, valves, dampers, damper operators, control panels, and other accessory equipment, 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.
- C. 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.
- D. All interlocking, wiring and installation of control devices associated with the equipment listed below shall be provided under this Contract. 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. Provide services and manpower necessary for commissioning of system in coordination with the HVAC Contractor, Balancing Contractor and Owner's representative.

- F. 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.

1.04 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.
- B. System Description
1. The Building Automation System (BAS) shall be designed in strict accordance with ASHRAE's BACnet standard, 135-2012, to provide interoperability between different building subsystems. The system shall also provide a graphical, web-based operator interface that allows for instant access to any system through a standard browser.
 2. The system shall use BACnet network types and protocols exclusively. Non-BACnet-based systems are not acceptable. The contractor must provide PC-based programming workstations, operator workstations and microcomputer controllers of modular design providing distributed processing capability, and allowing future expansion of both input/output points and processing/control functions. Contractor must provide manufacturer's Protocol Implementation Conformance Statement (PICS) for workstation software and every controller model that are installed.

1.05 FOR THIS PROJECT THE SYSTEM SHALL CONSIST OF THE FOLLOWING COMPONENTS:

- A. Administration and Programming Workstation(s).
1. The BAS Contractor shall furnish (qty) Administration and Programming Workstation Computers and (qty) 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. Workstations must conform to the B-OWS BACnet device profile.
- B. Web-Based Operator Workstations
1. The BAS Contractor shall furnish licenses for (qty) concurrent users to the BAS system. Web-based users shall have access to all system points and graphics, shall be able to receive and acknowledge alarms, and shall be able to control setpoints and other parameters. A central web server shall be provided to manage the web-based users. The web-based interface must conform to the B-OWS BACnet device profile.
- C. Ethernet-based Network Router and/or Controller(s).
1. The BAS Contractor shall furnish (qty) Ethernet-based network controllers as described in Part 2 of the specification. These controllers will connect directly to the Operator Workstation over Ethernet, using the BACnet/IP protocol at a minimum of 100mbps, and provide communication to the Standalone Digital Control Units and/or other Input/Output Modules. Network Controllers shall conform to BACnet device profile B-BC. Network controllers that utilize RS232 serial communications or ARCNET to communicate with the workstations will not be accepted.
 2. Network Controllers shall be tested and certified by the BACnet Testing Laboratory (BTL) as Building Controllers (B-BC).
- D. Standalone Digital Control Units (SDCUs).
1. 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. Each SDCU shall conform to the BACnet device profile B-AAC.
 2. SDCUs shall be tested and certified by the BACnet Testing Laboratory (BTL) as Advanced Application Controllers (B-AAC).

1.06 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
- D. The Electrical Contractor shall provide:
 - 1. All power wiring to motors, heat trace, junction boxes for power to BAS panels.
 - 2. Furnish smoke detectors and wire to the building fire alarm system. HVAC Contractor to mount devices. BAS Contractor to hardwire to fan shut down.
 - 3. Auxiliary contact (pulse initiator) on the electric meter for central monitoring of kWH and KW. Electrical Contractor shall provide the pulse rate for remote readout to the BAS. BAS contractor to coordinate this with the electrical contractor.

1.07 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.
- G. Submittals
 - 1. All shop drawings shall be prepared in Visio Professional or AutoCAD software. In addition to the drawings, the Contractor shall furnish a CD containing the identical information. Drawings shall be B size or larger.
 - 2. 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.
 - 3. Submittal data shall contain manufacturer's data on all hardware and software products required by the specification. Valve, damper and air flow station schedules shall indicate size, configuration, capacity and location of all equipment.
 - 4. 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.
 - 5. Submit five (2) 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.
 - 6. 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.

1.08 SYSTEM STARTUP & 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 plans 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.

1.09 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
 - j. Operational sequences including start-up, shutdown, adjusting and balancing.
 - k. Equipment maintenance.
- C. Classroom training will include a minimum of (1) training slot for two weeks of course material covering workstation operation and controller programming.

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 leadtime 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 and 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

2.01 SYSTEM ARCHITECTURE

- A. General
 - 1. The Building Automation System (BAS) shall consist of Network Router/Controllers (NRCs), a family of Standalone Digital Control Units (SDCUs), Administration and Programming Workstations (APWs), Web-based Operator Workstations (WOWs), and one File Server to support

- system configurations where more than three operator workstations are required. 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.
2. The system shall be designed with a top-level 10/100bT Ethernet network, using the BACnet/IP protocol. A sub-network using the BACnet MS/TP protocol, with a minimum of 76.8kb speed, shall connect the local, stand-alone controllers with Ethernet-level controller/routers. The use of ARCNET, LONworks, RS-232 serial communications, or BACnet Ethernet for these controllers is prohibited.
 3. Level 1 Network Description
 - a. Level 1, the main backbone of the system, shall be an Ethernet 10/100bT LAN/WAN, using BACnet/IP as the communications protocol. Network Router/Controllers, Operator Workstations, and the Central File Server shall connect directly to this network without the need for Gateway devices.
 4. Level 2 Network Description
 - a. Level 2 of the system shall consist of one or more BACnet MS/TP field buses managed by the Network Router/Controllers. Minimum speed shall be 76.8kbps. The Level 2 field bus consists of an RS485, token passing bus that supports up to 127 Standalone Digital Control Units (SDCUs) for operation of HVAC equipment and lighting
- B. BAS LAN Segmentation
1. The BAS shall be capable of being 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.
- C. Standard Network Support
1. All NRCs, 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 NRC'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.
- D. 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. Ethernet-based security/card access controllers shall be able to be added to the existing Level 1 network, 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. Additional web-based operator licenses shall added in the field through an upgrade of the web server's security key, with no re-programming required.
 5. The system shall use the same application programming language for all levels: Operator Workstation, Network Router/Controller, 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.
- E. Support For Open Systems Protocols

1. All hardware and software included under this section shall conform to BACnet standard 135-2001, to promote interoperability between building subsystems. Additionally, the BAS design must include solutions for the integration of the following “open systems” protocols: LonTalk®, Modbus, and digital data communication to third party microprocessors such as chiller controllers, fire panels and variable frequency drives (VFDs).
2. The system shall also provide the ability to program custom ASCII communication drivers, that will reside in a BACnet Gateway, for communication to third party systems and devices. These drivers will provide real time monitoring and control of the third party systems. Once programmed, these data points shall be monitored and controlled in exactly the same manner as native BAS data points.

2.02 NETWORK ROUTER/CONTROLLERS (NRCS)

A. General

1. Network Router Controllers shall combine both network routing functions and control functions into a single unit. NRC's shall route communications between the BACnet/IP network and the BACnet MS/TP field network. They shall also be responsible for monitoring and controlling their own HVAC equipment such as an AHU or boiler. A sufficient number of NRCs shall be supplied to fully meet the requirements of this specification and the attached point list.
2. Each NRC shall be classified as a “native” BACnet device, supporting the BACnet Building Controller (B-BC) profile. Controllers that support a lesser profile such as B-SA are not acceptable. NRCs shall be tested and certified by the BACnet Testing Laboratory (BTL) as Advanced Application Controllers (B-BC).

B. Hardware Specifications

1. Memory:
 - a. Both the operating system of the controller, plus the application program for the controller, shall be stored in non-volatile, FLASH memory. Controllers shall contain enough memory for the current application, plus required history logging, plus a minimum of 20% additional free memory.
2. Communication Ports:
 - a. Each NRC shall provide communication to both the Workstation(s) and the field buses. An on-board 10/100bT Ethernet port shall be provided, as well as a RS-485 port for communications to a maximum of 127 MS/TP devices.
3. Modular Expandability:
 - a. 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. It shall be possible to combine I/O modules as desired to meet the I/O requirements for individual control applications.
4. Hardware Override Switches:
 - a. All digital outputs 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.
5. Local Status Indicator Lamps:
 - a. 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.
6. Real Time Clock (RTC):
 - a. Each NRC 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. The system shall automatically correct for daylight savings time and leap years and be Year 2000 compliant.
7. Power Supply:

- a. The power supply for the NRCs shall be auto sensing, 24Vac/10-40Vdc 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.
 8. Automatic Restart After Power Failure:
 - a. Upon restoration of power after an outage, the NRC 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.
 9. Battery backup:
 - a. The NRC shall include an on-board battery to back up the controller's RAM memory. The battery shall provide accumulated backup of all RAM and clock functions for at least 30 days. In the case of a power failure, the NRC shall first try to restart from the RAM memory. If that memory is corrupted or unusable, then the NRC shall restart itself from its application program stored in its FLASH memory.
- C. Software Specifications
 1. General.
 - a. The NRC shall contain FLASH memory to store both the resident operating system AND the application software. There will be no restrictions placed on the type of application programs in the system. Each NRC 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:
 - a. 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.
 - b. Controllers that use a "canned" program method will not be accepted.
- D. Control Software:
 1. The NRC shall have the ability to perform the following pre-tested control algorithms:
 2. Proportional, Integral plus Derivative Control (PID)
 3. Self Tuning PID
 4. Two Position Control
 5. Digital Filter
 6. Ratio Calculator
 7. Equipment Cycling Protection
 8. Mathematical Functions:
 - a. 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.
 9. Energy Management Applications:
 - a. NRCs shall have the ability to perform any or all of the following energy management routines:
 - b. Time of Day Scheduling
 - c. Calendar Based Scheduling
 - d. Holiday Scheduling
 - e. Temporary Schedule Overrides
 - f. Optimal Start
 - g. Optimal Stop

- h. Night Setback Control
- i. Enthalpy Switchover (Economizer)
- j. Peak Demand Limiting
- k. CFM Tracking
- l. Heating/Cooling Interlock
- m. Free Cooling
- n. Hot Water Reset
- 10. History Logging:
 - a. Each controller shall be capable of LOCALLY logging any input, output, calculated value or other system variable over user defined time intervals ranging from 1 second to 1440 minutes. Any system can be logged in history. A minimum of 1000 values shall be stored in each log. Each log can record either the instantaneous, average, minimum or maximum value of the point. Logged data shall be downloadable to the Operator Workstation for long term archiving based upon user-defined time intervals, or manual command.
- 11. 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 NRC 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. Alarms will be generated based on their priority. A minimum of 255 priority levels shall be provided.
 - d. If communication with the Operator Workstation is temporarily interrupted, the alarm will be time-stamped and buffered in the NRC. When communications return, the alarm will be transmitted to the Operator Workstation if the point is still in the alarm condition.
 - e. Alarms must be capable of being routed to any BACnet workstation that conforms to the B-OWS device profile and uses the BACnet/IP protocol.
- 12. Local Keypad/Display:
 - a. For each NRC, provide a local display of at least 4 lines, providing current display of all critical inputs and outputs that the NRC is controlling. Provide a keypad such that an operator can log on, scroll through point values, and change setpoints that are changeable. The keypad/display must be capable of being mounted either on the controller, or on a control panel door.
- 13. 2.4.6 Embedded Web Server
- 14. Each NRC must have the ability to serve out customized web pages containing any desired I/O values from the entire BAS.

2.03 STANDALONE DIGITAL CONTROL UNITS (SDCUS)

- A. General:
 - 1. Standalone Digital Control Units shall provide control of HVAC and lighting, including air handling units, rooftop units, variable air volume boxes, unit ventilators, and other mechanical equipment. Each controller shall be fully programmable, contain its own control programs and will continue to operate in the event of a failure or communication loss to its associated NRC. Each SDCU provided must be a "native" BACnet device, supporting the BACnet Advanced Application Controller (B-AAC) profile. Controllers that support a lesser profile such as B-SA are not acceptable. SDCUs shall be tested and certified by the BACnet Testing Laboratory (BTL) as Advanced Application Controllers (B-AAC).
- B. Memory:
 - 1. Both the operating system of the controller, plus the application program for the controller, shall be stored in non-volatile, FLASH memory. Controllers shall contain enough memory for the current application, plus required history logging, plus a minimum of 20% additional free memory.
- C. Communication Ports:
 - 1. SDCUs shall have a RS-485 communication port to the BACnet MS/TP field bus, operating at a speed of at least 76.8kbps.
- D. Input/Output:

1. Each SDCU shall have enough inputs and outputs to meet the application's required point count. Each SDCU shall support universal inputs, whereas any input may be software-defined as:
 2. Digital Inputs for status/alarm contacts
 3. Counter Inputs for summing pulses from meters.
 4. Thermistor Inputs for measuring temperatures in space, ducts and thermowells.
 5. Analog inputs for pressure, humidity, flow and position measurements.
 6. SDCU's must support both digital and analog output types:
 7. Digital Outputs for on/off equipment control.
 8. Analog Outputs for valve and damper position control, and capacity control of primary equipment.
- E. Expandability:
1. For larger controllers (16 base inputs and up), provide input and output expansion through the use of plug-in modules. At least two I/O modules must be capable of being added to the base SDCU.
- F. Hardware Override Switches:
1. All digital outputs on air handling unit controllers 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 on air handling unit controllers 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.
- G. Room Sensor Support:
1. The SDCU shall support a basic room thermistor in plain plastic cover; a room sensor with override and setpoint adjust slider; and, a sensor with a one-line display and 6-button keypad. The display sensor shall be able to display the current temperature, setpoint, outside air temperature, relative humidity and setpoint, occupancy mode, and CFM of the individual zone.
- H. Networking:
1. Each SDCU will be able to exchange information on a peer to peer basis with other Standalone Digital Control Units, according to the BACnet MS/TP protocol. 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 through a workstation connected to an NRC.
- I. Indicator Lamps:
1. SDCUs will have as a minimum, LED indication of CPU status, and field bus status.
- J. Real Time Clock (RTC):
1. All SDCUs 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 NRC, which synchronizes all SDCU real time clocks.
- K. Automatic Restart After Power Failure:
1. 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.
- L. Battery Back Up:
1. All SDCUs shall store all programming in non-volatile FLASH memory. All SDCUs except terminal controllers shall include an on-board lithium battery to back up the controller's RAM memory. The battery shall have a shelf life of over 10 years, and provide accumulated backup of all RAM and clock functions for at least 3 years. In the case of a power failure, the SDCU shall first try to restart from the RAM memory. If that memory is corrupted or unusable, then the SDCU shall restart itself from its application program stored in its FLASH memory.
- M. Software - General.
1. The SDCU shall contain FLASH memory to store both the resident operating system AND the application software. There will be no restrictions placed on the type of application programs in the system. Each SDCU 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.

(n) User Programming Language:

- A. The application software shall be user programmable, using the same language as that defined for Network Router/Controllers. Controllers that use a “canned” program method will not be accepted.
- B. Control Software, Mathematical Functions, and Energy Management Applications must be identical to that which is provided with the Network Router/Controller.

2.03.15 HISTORY LOGGING:

- A. Each controller shall be capable of LOCALLY logging any input, output, calculated value or other system variable over user defined time intervals ranging from 1 second to 1440 minutes. Any system can be logged in history. A minimum of 1000 values shall be stored in each log. Each log can record either the instantaneous, average, minimum or maximum value of the point. Logged data shall be downloadable to the Operator Workstation for long term archiving based upon user-defined time intervals, or manual command.

2.04 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 SDCU 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. Alarms will be generated based on their priority. A minimum of 255 priority levels shall be provided.
- D. If communication with the Operator Workstation is temporarily interrupted, the alarm will be time-stamped and buffered in the controller. When communications return, the alarm will be transmitted to the Operator Workstation if the point is still in the alarm condition.
- E. Alarms must be capable of being routed to any BACnet workstation that conforms to the B-OWS device profile and uses the BACnet/IP protocol.

2.05 AIR HANDLER CONTROLLERS

- A. AHU Controllers shall conform to the BACnet Advanced Application Controller (B-AAC) device profile.
- B. 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.
- C. AHU Controllers shall support all the necessary point inputs and outputs as required by the sequence and operate in a standalone fashion.
- D. AHU Controllers shall be fully user programmable to allow for modification of the application software.
- E. 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.
- F. Local Keypad/Display:
 - 1. For each air handler SDCU, provide a local display of at least 4 lines, providing current display of all critical inputs and outputs that the SDCU is controlling. Provide a keypad such that an operator can log on, scroll through point values, and change setpoints that are changeable. The keypad/display must be capable of being mounted either on the controller, or on a control panel door.

2.06 UNITARY CONTROLLERS

- A. Unitary Controllers shall conform to the BACnet Advanced Application Controller (B-AAC) device profile.
- B. 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:
 - 1. Unit Ventilators
 - 2. Packaged Rooftops

3. Fan Coils (2 or 4 Pipe)
4. 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 local time of day scheduling, occupancy mode control, after hour operation, lighting control, alarming, and trending.
5. Unitary Controllers shall be able to communicate with any other Standalone Digital Control Unit on the same MS/TP field bus.

PART 3 - BACNET GATEWAY TO THIRD-PARTY DEVICES

3.01 GENERAL:

- A. Where required, provide a BACnet Gateway to interface to non-BACnet systems that use the Modbus protocol, LONworks protocol, or other proprietary protocol. The Gateway shall communicate directly over Ethernet TCP/IP, and shall use the BACnet/IP protocol to communicate with a BACnet Workstation (B-OWS).

3.02 COMMUNICATION PORTS:

- A. In addition to its on-board Ethernet port, the Gateway shall have at least two serial communications ports for interfaces to third-party systems.

3.03 MEMORY:

- A. The Gateway shall have enough RAM memory to store all point configuration data, plus required history logging and alarm buffering. Minimum RAM shall be 8MB. The operating system of the gateway must be stored in FLASH non-volatile memory.

3.04 USER PROGRAMMING LANGUAGE:

- A. The Gateway shall employ the same user programmable application software that NRCs and SDCUs use.
- B. Control Software, Mathematical Functions, and Energy Management Applications must be identical to that which is provided with the Network Router/Controller. Gateways that do not have an application programming language will not be accepted.

3.05 HISTORY LOGGING:

- A. Each Gateway shall be capable of LOCALLY logging any input, output, calculated value or other system variable over user defined time intervals ranging from 1 second to 1440 minutes. Any system can be logged in history. A minimum of 1000 values shall be stored in each log. Each log can record either the instantaneous, average, minimum or maximum value of the point. Logged data shall be downloadable to the Operator Workstation for long term archiving based upon user-defined time intervals, or manual command.

3.06 OPERATOR WORKSTATION REQUIREMENTS

- A. General.
 1. The operator workstation portion of the BAS shall consist of one or more full-powered configuration and programming workstations, and one or more web-based operator workstations. For this project provide (qty) programming workstations and (qty) web-based user licenses.
 2. The programming and configuration workstation software shall be configurable as either a single workstation system (with a local database) or 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 100MBPS.
 3. The web-based user interface software must be capable of expansion up to 100 concurrent users.
 4. All workstation software, both programming and software and web-based operator software, shall conform to the BACnet B-OWS device profile, using BACnet/IP to communicate to other BACnet devices.
 5. All configuration workstations shall be Pentium 4-based personal computers operating under the Microsoft Windows XP operating system. The application software shall be capable of communication to all Network Router/Controllers and Standalone Digital Control Units, feature high-resolution color graphics, alarming, reporting, and be user configurable for all data collection and data presentation functions.
 6. 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. Administration/Programming Workstation Requirements (Single workstation or multi-workstation configuration).
 - 1. The workstation shall consist of the following:
 - 2. 3 GHz Pentium 4 processor with 4 GB of RAM
 - 3. Microsoft Windows 10 operating system
 - 4. Serial port, parallel port, USB port
 - 5. 10/100MBPS Ethernet NIC
 - 6. 500 GB hard disk
 - 7. CD-RW drive
 - 8. High resolution (minimum 1280 x 1024), 21" flat panel display
 - 9. Optical mouse and full function keyboard
 - 10. Audio sound card and speakers
 - 11. License agreement for all applicable software.
- C. File Server Hardware Requirements (if file server is shown on the drawings).
 - 1. The file server computer shall contain of the following:
 - 2. 3 GHz Pentium 4 processor with 5 GB of RAM
 - 3. Microsoft Windows 2000 Server[®] operating system
 - 4. 10/100MBPS Ethernet NIC
 - 5. 500 GB hard disk
 - 6. CD-RW drive
 - 7. High resolution (minimum 1024 x 768), 21" flat panel display
 - 8. Mouse, full function keyboard
 - 9. License agreement for all applicable software.
- D. Web-Based Operator PC Requirements
 - 1. Any user on the network can access the system, using the following software:
 - 2. Windows 10
 - 3. Internet Explorer 11 and above
 - 4. Java-enabled
- E. Modem
 - 1. Provide one Windows 10-compatible 56 Kbaud modem for dial-in diagnostics.
- F. Administration and Programming Workstation Software
 - 1. General Description
 - a. 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.
 - b. 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.
 - c. 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.
 - 2. System Database
 - a. 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 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.

3. User Interface
 - a. 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 XP 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 shutdown the active alarm viewer and/or unable to load software onto the PC.
4. User Security
 - a. 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.
5. Configuration Interface
 - a. 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.
 - b. 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 the 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.
6. Color Graphic Displays
 - a. 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:
 - b. SVGA, bit-mapped displays. The user shall have the ability to import AutoCAD generated picture files as background displays.
 - c. 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.
- d. 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.
 - e. 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.
 - f. If separate, provide a copy of the full graphic editing software on each workstation.
7. Automatic monitoring
- a. 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.
8. Alarm Management
- a. 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.
 - b. Alarm management features shall include:
 - c. 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.
 - d. 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)
 - e. Automatic printing of the alarm information or alarm report to an alarm printer or report printer.
 - f. Playing an audible beep or audio (wav) file on alarm initiation or return to normal.
 - g. Sending an email or alphanumeric page 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.
 - h. 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.
 - i. An active alarm viewer shall be included which can be customized for each user or user type to hide or display any alarm attributes.
 - j. 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.
 - k. 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.
9. 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.

- b. Reports can be of any length and contain any point attributes from any controller on the network.
 - c. 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.
 - d. It shall be possible to run other executable programs whenever a report is initiated.
 - e. 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.
 - f. Standard reports shall include:
 - 1) Points in each controller.
 - 2) Points in alarm
 - 3) Disabled points
 - 4) Overridden points
 - 5) Operator activity report
 - 6) Alarm history log.
 - 7) Program listing by controller with status.
 - 8) Network status of each controller
10. Spreadsheet-style reports
- a. 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.
11. HTML Reporting
- a. 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.
12. 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.
13. 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 dockable 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.
14. Saving/Reloading
- a. 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.
- 15. Data Logging
 - a. 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 simply menu selection, or from a hot spot on a graphic display. This data shall be able to be saved to file and/or printed.
- 16. Audit Trail
 - a. 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.
- 17. 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.
- G. Web-based Operator Software
 - 1. Day-to-day operation of the system shall be accessible through a standard web browser interface, allowing technicians and operators to view any part of the system from anywhere on the network. Access to the system must be available from a dial-in connection over the Internet.
 - 2. Graphic Displays
 - a. The browser-based interface must share the same graphical displays as the Administration and Programming Workstations, presenting dynamic data on site layouts, floor plans, and equipment graphics. The browser's graphics shall support commands to change setpoints, enable/disable equipment and start/stop equipment.
 - b. Through the browser interface, operators must be able to navigate through the entire system, and change the value or status of any point in any controller. Changes are effective immediately to the controller, with a copy stored in the system database.
 - 3. Alarm Management
 - a. Through the browser interface, a live alarm viewer identical to the alarm viewer on the Administration and Programming workstation shall be presented, if the user's password allows it. Users must be able to receive alarms, silence alarms, and acknowledge alarms through a browser. If desired, specific operator text must be able to be added to the alarm record before acknowledgement.
 - 4. Groups and Schedules
 - a. Through the browser interface, operators must be able to view pre-defined groups of points, with their values updated automatically.

- b. Through the browser interface, operators must be able to change schedules - change start and stop times, and add new times to a schedule.
- 5. User Accounts and Audit Trail
 - a. The same user accounts shall be used for the browser interface and for the operator workstations. Operators must not be forced to memorize multiple passwords.
 - b. All commands and user activity through the browser interface shall be recorded in the system's activity log, which can be later searched and retrieved by user, date, or both.

3.07 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 flowmeter for measurement of liquid, gas or steam 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. Control Valves

1. Provide automatic control valves suitable for the specified controlled media (steam, 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.
2. Control valves shall meet the heating and cooling loads specified, and close 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.
3. Trim material shall be stainless steel for steam and high differential pressure applications.
4. Electric actuation should be provided on all terminal unit reheat applications.

G. Dampers

1. 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 Sheet Metal Contractor.
2. 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 acetal or bronze bearings shall also be provided.
3. 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.
4. For high performance applications, control dampers will meet or exceed the UL Class I leakage rating.
5. Control and smoke dampers shall be Ruskin, or approved equal.
6. Provide opposed blade dampers for modulating applications and parallel blade for two position control.

H. Damper Actuators

1. Damper actuators shall be electronic, and shall be direct coupled over the 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.

I. Smoke Detectors

1. 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.
2. The smoke detector shall utilize a photoelectric detector head.
3. The housing shall permit mechanical installation without removal of the detector cover.
4. The detectors shall be listed by Underwrites Laboratories and meet the requirements of UL 268A.

J. Airflow Measuring Stations

1. Provide a thermal anemometer using instrument grade self heated thermistor sensors with thermistor temperature sensors.
2. 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.
3. The output signal shall be linear with field selectable ranges including 0-5 VDC, 0-10VDC and 4-20 mA.

PART 4 - EXECUTION

4.01 CONTRACTOR RESPONSIBILITIES

A. General

1. Installation of the building automation system shall be performed by the Contractor or a subcontractor. 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 subcontractor.

B. Demolition

1. 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. All other equipment which is removed will be disposed of by the Contractor.
- C. Access to Site
 1. 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
 1. 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 17 and Division 16, wiring requirements of Division 17 will prevail for work specified in Division 17.
- E. Cleanup
 1. 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.

4.02 WIRING, CONDUIT, 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.

- A. 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.
- B. Where different wiring classes terminate within the same enclosure, maintain clearances and install barriers per the National Electric Code.
- C. Where wiring is required to be installed in conduit, EMT shall be used. Conduit shall be minimum 1/2 inch galvanized EMT. Set screw fittings are acceptable for dry interior locations. Watertight compression fittings shall be used for exterior locations and interior locations subject to moisture. Provide conduit sealoff fitting where exterior conduits enter the building or between areas of high temperature/moisture differential.
- D. 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.
- E. 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 gasketed covers.
- F. 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.
- G. Fiber optic cable shall include the following sizes; 50/125, 62.5/125 or 100/140.
- H. Only glass fiber is acceptable, no plastic.
- I. 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.

4.03 HARDWARE INSTALLATION

A. Installation Practices for Wiring

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 droop. 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, 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, steam, or condensate 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. FIPs shall contain power supplies for sensors, interface relays and contactors, and safety circuits.
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 twenty percent 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 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. 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.

3. Junction box covers will be marked to indicate that they are a part of the BAS system.
4. All I/O field devices (except space sensors) that are not mounted within FIP's shall be identified with name plates.
5. All I/O field devices inside FIP's shall be labeled.

4.04 EXISTING CONTROLS.

- A. 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.

4.05 CONTROL SYSTEM SWITCH-OVER

- A. 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.
- B. 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.
- C. 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.

4.06 LOCATION

- A. The location of sensors is per mechanical and architectural drawings.
- B. Space humidity or temperature sensors will be mounted away from machinery generating heat, direct light and diffuser air streams.
- C. 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.
- D. Field enclosures shall be located immediately adjacent to the controller panel(s) to which it is being interfaced.

PART 5 - SOFTWARE INSTALLATION

5.01 GENERAL.

- A. 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.

5.02 DATABASE CONFIGURATION.

- A. The Contractor will provide all labor to configure those portions of the database that are required by the points list and sequence of operation.

5.03 COLOR GRAPHIC DISPLAYS.

- A. 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 setpoint changes as required by the owner.

5.04 REPORTS.

- A. The Contractor will configure a minimum of 6 reports for the owner as listed below:
 1. Central Plant Status Report
 2. Air Handler Status Report
 3. Energy Consumption Report
 4. Space Temperature Report
 5. Specialty Equipment Status Report

5.05 DOCUMENTATION

- A. As built software documentation will include the following:
 1. Descriptive point lists
 2. Application program listing
 3. Application programs with comments.
 4. Printouts of all reports.

5. Alarm list.
6. Printouts of all graphics

5.06 COMMISSIONING AND SYSTEM STARTUP

- A. Point to Point Checkout.
 1. Each I/O device (both field mounted as well as those located in FIPs) 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.
 1. 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.

5.07 SYSTEM ACCEPTANCE TESTING

- A. 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.
- B. 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.
- C. 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.
- D. 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.

5.08 SEQUENCES OF OPERATION

- A. Boiler Controls
- B. Single Zone Air Handlers
- C. Cabinet Heaters
- D. Pumps

END OF SECTION

SECTION 23 2113
HYDRONIC PIPING

PART 1 GENERAL

1.01 SECTION INCLUDES

- A. Hydronic system requirements.
- B. Heating water piping, above grade.
- C. Equipment drains and overflows.
- D. Pipe hangers and supports.
- E. Unions, flanges, mechanical couplings, and dielectric connections.
- F. Valves:
 - 1. Ball valves.
 - 2. Butterfly valves.
 - 3. Check valves.
 - 4. Pressure independent temperature control valves and balancing valves.
- G. Flow controls.

1.02 RELATED REQUIREMENTS

- A. Section 23 0516 - Expansion Fittings and Loops for HVAC Piping.
- B. Section 23 0553 - Identification for HVAC Piping and Equipment.
- C. Section 23 0719 - HVAC Piping Insulation.
- D. Section 23 2114 - Hydronic Specialties.
- E. Section 23 2500 - HVAC Water Treatment: Pipe cleaning.

1.03 REFERENCE STANDARDS

- A. ASME BPVC-IX - Boiler and Pressure Vessel Code, Section IX - Welding, Brazing, and Fusing Procedures; Welders; Brazers; and Welding, Brazing and Fusing Operators; 2017.
- B. ASME B16.3 - Malleable Iron Threaded Fittings: Classes 150 and 300; 2016.
- C. ASME B16.18 - Cast Copper Alloy Solder Joint Pressure Fittings; 2012.
- D. ASME B16.22 - Wrought Copper and Copper Alloy Solder-Joint Pressure Fittings; 2013.
- E. ASME B31.9 - Building Services Piping; 2014.
- F. ASTM A53/A53M - Standard Specification for Pipe, Steel, Black and Hot-Dipped, Zinc-Coated, Welded and Seamless; 2018.
- G. ASTM A106/A106M - Standard Specification for Seamless Carbon Steel Pipe for High-Temperature Service; 2015.
- H. ASTM A234/A234M - Standard Specification for Piping Fittings of Wrought Carbon Steel and Alloy Steel for Moderate and High Temperature Service; 2017.
- I. ASTM A536 - Standard Specification for Ductile Iron Castings; 1984 (Reapproved 2014).
- J. ASTM B32 - Standard Specification for Solder Metal; 2008 (Reapproved 2014).
- K. ASTM B88 - Standard Specification for Seamless Copper Water Tube; 2016.
- L. ASTM B88M - Standard Specification for Seamless Copper Water Tube (Metric); 2016.
- M. ASTM F708 - Standard Practice for Design and Installation of Rigid Pipe Hangers; 1992 (Reapproved 2014).
- N. ASTM F1476 - Standard Specification for Performance of Gasketed Mechanical Couplings for Use in Piping Applications; 2007 (Reapproved 2013).
- O. AWS A5.8M/A5.8 - Specification for Filler Metals for Brazing and Braze Welding; 2011 (Amended 2012).

- P. AWS D1.1/D1.1M - Structural Welding Code - Steel; 2015, with Errata (2016).
- Q. AWWA C606 - Grooved and Shouldered Joints; 2015.
- R. MSS SP-58 - Pipe Hangers and Supports - Materials, Design, Manufacture, Selection, Application, and Installation; 2009.

1.04 SUBMITTALS

- A. See Section 01 3000 - Administrative Requirements, for submittal procedures.
- B. Welders Certificate: Include welders certification of compliance with ASME BPVC-IX.
- C. Product Data:
 - 1. Include data on pipe materials, pipe fittings, valves, and accessories.
 - 2. Provide manufacturers catalog information.

1.05 QUALITY ASSURANCE

- A. Provide all grooved joint couplings, fittings, valves, specialties, and grooving tools from a single manufacturer.
- B. Welder Qualifications: Certify in accordance with ASME BPVC-IX.

1.06 DELIVERY, STORAGE, AND HANDLING

- A. Accept valves on site in shipping containers with labeling in place. Inspect for damage.
- B. Provide temporary protective coating on cast iron and steel valves.
- C. Provide temporary end caps and closures on piping and fittings. Maintain in place until installation.
- D. Protect piping systems from entry of foreign materials by temporary covers, completing sections of the work, and isolating parts of completed system.

PART 2 PRODUCTS

2.01 HYDRONIC SYSTEM REQUIREMENTS

- A. Comply with ASME B31.9 and applicable federal, state, and local regulations.
- B. Piping: Provide piping, fittings, hangers, and supports as required, as indicated, and as follows:
 - 1. Where more than one piping system material is specified, provide joining fittings that are compatible with piping materials and ensure that the integrity of the system is not jeopardized.
 - 2. Use non-conducting dielectric connections whenever jointing dissimilar metals.
 - 3. Grooved mechanical joints may be used in accessible locations only.
 - a. Accessible locations include those exposed on interior of building, in pipe chases, and in mechanical rooms, aboveground outdoors, and as approved by Engineer.
 - b. Grooved mechanical connections and joints comply with AWWA C606.
 - 1) Ductile Iron: Comply with ASTM A536, Grade 65-45-12.
 - 2) Steel: Comply with ASTM A106/A106M, Grade B or ASTM A53/A53M.
 - c. Use rigid joints unless otherwise indicated.
 - d. Use flexible joints at equipment connections.
 - 4. Provide pipe hangers and supports in accordance with ASME B31.9 or MSS SP-58 unless indicated otherwise.
- C. Pipe-to-Valve and Pipe-to-Equipment Connections: Use flanges, unions, or grooved couplings to allow disconnection of components for servicing; do not use direct welded, soldered, or threaded connections.
- D. Valves: Provide valves where indicated:
 - 1. Provide drain valves where indicated, and if not indicated, provide at least at main shut-off, low points of piping, bases of vertical risers, and at equipment. Use 3/4 inch (20 mm) gate valves with cap; pipe to nearest floor drain.
 - 2. In heating water systems, butterfly valves may be used interchangeably with gate and globe valves.
 - 3. For shut-off and to isolate parts of systems or vertical risers, use butterfly valves.
 - 4. For throttling service, use plug cocks. Use non-lubricated plug cocks only when shut-off or isolating valves are also provided.

2.02 HEATING WATER PIPING, ABOVE GRADE

- A. Steel Pipe: ASTM A53/A53M, Schedule 40, black, using one of the following joint types:
 - 1. Welded Joints: ASTM A234/A234M, wrought steel welding type fittings; AWS D1.1/D1.1M welded.
 - 2. Threaded Joints: ASME B16.3, malleable iron fittings.
 - 3. Grooved Joints: AWWA C606 grooved pipe, fittings of same material, and mechanical couplings.
- B. Copper Tube: ASTM B88 (ASTM B88M), Type K (A), drawn, using one of the following joint types:
 - 1. Solder Joints: ASME B16.18 cast brass/bronze or ASME B16.22 solder wrought copper fittings.
 - a. Solder: ASTM B32 lead-free solder, HB alloy (95-5 tin-antimony) or tin and silver.
 - b. Braze: AWS A5.8M/A5.8 BCuP copper/silver alloy.
 - 2. Tee Connections: Mechanically extracted collars with notched and dimpled branch tube.

2.03 EQUIPMENT DRAINS AND OVERFLOWS

- A. Steel Pipe: ASTM A53/A53M, Schedule 40 galvanized; using one of the following joint types:
 - 1. Threaded Joints: Galvanized cast iron, or ASME B16.3 malleable iron fittings.
 - 2. Grooved Joints: AWWA C606 grooved pipe, fittings of same material, and mechanical couplings.
- B. Copper Tube: ASTM B88 (ASTM B88M), Type K (A), drawn; using one of the following joint types:
 - 1. Solder Joints: ASME B16.18 cast brass/bronze or ASME B16.22 solder wrought copper fittings; ASTM B32 lead-free solder, HB alloy (95-5 tin-antimony) or tin and silver.

2.04 PIPE HANGERS AND SUPPORTS

- A. Provide hangers and supports that comply with MSS SP-58.
 - 1. If type of hanger or support for a particular situation is not indicated, select appropriate type using MSS SP-58 recommendations.
 - 2. Hangers for Pipe Sizes 1/2 to 1-1/2 Inches (13 to 38 mm): Malleable iron, adjustable swivel, split ring.
 - 3. Hangers for Hot Pipe Sizes 2 to 4 Inches (50 to 100 mm): Carbon steel, adjustable, clevis.
 - 4. Multiple or Trapeze Hangers: Steel channels with welded spacers and hanger rods.
 - 5. Wall Support for Pipe Sizes to 3 Inches (76 mm): Cast iron hook.
 - 6. Wall Support for Pipe Sizes 4 Inches (100 mm) and Greater: Welded steel bracket and wrought steel clamp.
 - 7. Vertical Support: Steel riser clamp.
 - 8. Floor Support for Hot Pipe Sizes to 4 Inches (100 mm): Cast iron adjustable pipe saddle, lock nut, nipple, floor flange, and concrete pier or steel support.
 - 9. Copper Pipe Support: Carbon steel ring, adjustable, copper plated.
 - 10. Hanger Rods: Mild steel threaded both ends, threaded one end, or continuous threaded.
- B. In grooved installations, use rigid couplings with offsetting angle-pattern bolt pads or with wedge-shaped grooves in header piping to permit support and hanging in accordance with ASME B31.9.

2.05 UNIONS, FLANGES, MECHANICAL COUPLINGS, AND DIELECTRIC CONNECTIONS

- A. Unions for Pipe 2 Inches (50 mm) and Less:
- B. Flanges for Pipe 2 Inches (50 mm) and Greater:
- C. Mechanical Couplings for Grooved and Shouldered Joints: Two or more curved housing segments with continuous key to engage pipe groove, circular C-profile gasket, and bolts to secure and compress gasket.
 - 1. Dimensions and Testing: In accordance with AWWA C606.
 - 2. Mechanical Couplings: Comply with ASTM F1476.
 - 3. Bolts and Nuts: Hot dipped galvanized or zinc-electroplated steel.
 - 4. When pipe is field grooved, provide coupling manufacturer's grooving tools.
- D. Dielectric Connections:
 - 1. Waterways:
 - a. Water impervious insulation barrier capable of limiting galvanic current to 1 percent of short circuit current in a corresponding bimetallic joint.
 - b. Dry insulation barrier able to withstand 600-volt breakdown test.

- c. Construct of galvanized steel with threaded end connections to match connecting piping.
- d. Suitable for the required operating pressures and temperatures.
- 2. Flanges:
 - a. Dielectric flanges with same pressure ratings as standard flanges.
 - b. Water impervious insulation barrier capable of limiting galvanic current to 1 percent of short circuit current in a corresponding bimetallic joint.
 - c. Dry insulation barrier able to withstand 600-volt breakdown test.
 - d. Construct of galvanized steel with threaded end connections to match connecting piping.
 - e. Suitable for the required operating pressures and temperatures.

2.06 BALL VALVES

- A. Up To and Including 2 Inches (50 mm):
 - 1. Bronze one piece body, chrome plated brass ball, teflon seats and stuffing box ring, lever handle with balancing stops, solder ends with union.
- B. Over 2 Inches (50 mm):
 - 1. Ductile iron body, chrome plated stainless steel ball, teflon or Virgin TFE seat and stuffing box seals, lever handle or gear operated, flanged ends, rated to 800 psi (5515 kPa).

2.07 BUTTERFLY VALVES

- A. Body: Cast or ductile iron with resilient replaceable EPDM seat, wafer, lug, or grooved ends, extended neck.
- B. Disc: Construct of aluminum bronze, chrome plated ductile iron, stainless steel, or ductile iron with EPDM encapsulation.
- C. Stem: Stainless steel with stem offset from the centerline to provide full 360-degree circumferential setting.
- D. Operator: 10 position lever handle.

2.08 SWING CHECK VALVES

- A. Up To and Including 2 Inches (50 mm):
 - 1. Bronze body, bronze trim, bronze rotating swing disc, with composition disc, solder ends.
- B. Over 2 Inches (50 mm):
 - 1. Iron body, bronze trim, stainless steel, bronze, or bronze faced rotating swing disc, renewable disc and seat, flanged or grooved ends.

2.09 SPRING LOADED CHECK VALVES

- A. Iron body, bronze trim, split plate, hinged with stainless steel spring, resilient seal bonded to body, wafer, or threaded lug ends.

2.10 FLOW CONTROLS

- A. Construction: Class 125, Brass or bronze body with union on inlet and outlet, temperature and pressure test plug on inlet and outlet, blowdown/backflush drain.
- B. Calibration: Control flow within 10 percent of selected rating, over operating pressure range of 10 times minimum pressure required for control, minimum pressure 2 psi (13.7 kPa).

PART 3 EXECUTION

3.01 PREPARATION

- A. Ream pipe and tube ends. Remove burrs. Bevel plain end ferrous pipe.
- B. Prepare pipe for grooved mechanical joints as required by coupling manufacturer.
- C. Remove scale and dirt on inside and outside before assembly.
- D. Prepare piping connections to equipment using jointing system specified.
- E. Keep open ends of pipe free from scale and dirt. Protect open ends with temporary plugs or caps.
- F. After completion, fill, clean, and treat systems. Refer to Section 23 2500 for additional requirements.

3.02 INSTALLATION

- A. Install in accordance with manufacturer's instructions.
- B. Route piping in orderly manner, parallel to building structure, and maintain gradient.
- C. Install piping to conserve building space and to avoid interference with use of space.
- D. Group piping whenever practical at common elevations.
- E. Sleeve pipe passing through partitions, walls, and floors.
- F. Install firestopping to preserve fire resistance rating of partitions and other elements.
- G. Slope piping and arrange to drain at low points.
- H. Install piping to allow for expansion and contraction without stressing pipe, joints, or connected equipment. Refer to Section 23 0516.
 - 1. Flexible couplings may be used in header piping to accommodate thermal growth, thermal contraction in lieu of expansion loops.
- I. Grooved Joints:
 - 1. Install in accordance with the manufacturer's latest published installation instructions.
 - 2. Gaskets to be suitable for the intended service, molded, and produced by the coupling manufacturer.
- J. Inserts:
 - 1. Provide inserts for placement in concrete formwork.
 - 2. Provide inserts for suspending hangers from reinforced concrete slabs and sides of reinforced concrete beams.
 - 3. Where concrete slabs form finished ceiling, locate inserts flush with slab surface.
- K. Pipe Hangers and Supports:
 - 1. Install in accordance with ASME B31.9, ASTM F708, or MSS SP-58.
 - 2. Install hangers to provide minimum 1/2-inch (13 mm) space between finished covering and adjacent work.
 - 3. Place hangers within 12 inches (300 mm) of each horizontal elbow.
 - 4. Use hangers with 1-1/2 inches (38 mm) minimum vertical adjustment. Design hangers for pipe movement without disengagement of supported pipe.
 - 5. Support vertical piping at every other floor. Support riser piping independently of connected horizontal piping.
 - 6. Where several pipes can be installed in parallel and at same elevation, provide multiple or trapeze hangers.
 - 7. Provide copper plated hangers and supports for copper piping.
- L. Provide clearance in hangers and from structure and other equipment for installation of insulation and access to valves and fittings. Refer to Section 23 0719.
- M. Install valves with stems upright or horizontal, not inverted.

3.03 SCHEDULES

- A. Hanger Spacing for Copper Tubing.
 - 1. 1/2 Inch (15 mm) and 3/4 inch (20 mm): Maximum span, 5 feet (1500 mm); minimum rod size, 1/4 inch (6 mm).
 - 2. 1 Inch (25 mm): Maximum span, 6 feet (1800 mm); minimum rod size, 1/4 inch (6 mm).
 - 3. 1-1/2 Inches (40 mm) and 2 Inches (50 mm): Maximum span, 8 feet (2400 mm); minimum rod size, 3/8 inch (9 mm).
 - 4. 2-1/2 Inches (65 mm): Maximum span, 9 feet (2700 mm); minimum rod size, 3/8 inch (9 mm).
- B. Hanger Spacing for Steel Piping.
 - 1. 1/2 Inch (15 mm), 3/4 Inch (20 mm), and 1 Inch (25 mm): Maximum span, 7 feet (2100 mm); minimum rod size, 1/4 inch (6 mm).
 - 2. 1-1/4 Inches (32 mm): Maximum span, 8 feet (2400 mm); minimum rod size, 3/8 inch (9 mm).
 - 3. 1-1/2 Inches (40 mm): Maximum span, 9 feet (2700 mm); minimum rod size, 3/8 inch (9 mm).

4. 2 Inches (50 mm): Maximum span, 10 feet (3.0 m); minimum rod size, 3/8 inch (9 mm).
5. 2-1/2 Inches (65 mm): Maximum span, 11 feet (3.4 m); minimum rod size, 3/8 inch (9 mm).
6. 3 Inches (80 mm): Maximum span, 12 feet (3.6 m); minimum rod size, 3/8 inch (9 mm).
7. 4 Inches (100 mm): Maximum span, 14 feet (4.3 m); minimum rod size, 1/2 inch (13 mm).
8. 6 Inches (150 mm): Maximum span, 17 feet (5.1 m); minimum rod size, 1/2 inch (13 mm).

END OF SECTION

SECTION 23 2114
HYDRONIC SPECIALTIES

PART 1 GENERAL

1.01 SECTION INCLUDES

- A. Expansion tanks.
- B. Air vents.
- C. Air separators.
- D. Strainers.
- E. Pump connectors.
- F. Combination pump discharge valves.
- G. Pressure-temperature test plugs.
- H. Balancing valves.
- I. Flow meters.
- J. Relief valves.

1.02 RELATED REQUIREMENTS

- A. Section 23 2113 - Hydronic Piping.
- B. Section 23 2500 - HVAC Water Treatment: Pipe cleaning.

1.03 REFERENCE STANDARDS

- A. ASME B16.1 - Gray Iron Pipe Flanges and Flanged Fittings: Classes 25, 125, and 250; 2015.
- B. ASME B16.5 - Pipe Flanges and Flanged Fittings NPS 1/2 Through NPS 24 Metric/Inch Standard; 2017.
- C. ASME BPVC-VIII-1 - Boiler and Pressure Vessel Code, Section VIII, Division 1 - Rules for Construction of Pressure Vessels; 2017.

1.04 SUBMITTALS

- A. See Section 01 3000 - Administrative Requirements, for submittal procedures.
- B. Product Data: Provide product data for manufactured products and assemblies required for this project. Include component sizes, rough-in requirements, service sizes, and finishes. Include product description and model.

1.05 QUALITY ASSURANCE

- A. Manufacturer Qualifications: Company specializing in manufacturing the type of products specified in this section, with minimum three years of documented experience.

1.06 DELIVERY, STORAGE, AND HANDLING

- A. Accept valves on site in shipping containers with labeling in place. Inspect for damage.
- B. Provide temporary end caps and closures on piping and fittings. Maintain in place until installation.
- C. Protect piping systems from entry of foreign materials by temporary covers, completing sections of the work, and isolating parts of completed system.

PART 2 PRODUCTS

2.01 EXPANSION TANKS

- A. Manufacturers:
 - 1. Amtrol Inc: www.amtrol.com.
 - 2. ITT Bell & Gossett: www.bellgossett.com.
 - 3. Taco, Inc: www.taco-hvac.com.
 - 4. or approved equal.
- B. Construction: Welded steel, tested and stamped in accordance with ASME BPVC-VIII-1; supplied with National Board Form U-1, rated for working pressure of 125 psi (860 kPa), with flexible EPDM diaphragm or bladder sealed into tank, and steel support stand.

- C. Accessories: Pressure gauge and air-charging fitting, tank drain; precharge to 12 psi (80 kPa).
- D. Automatic Cold Water Fill Assembly: Pressure reducing valve, reduced pressure double check backflow preventer, test cocks, strainer, vacuum breaker, and valved by-pass.

2.02 AIR VENTS

- A. Manufacturers:
 - 1. Armstrong International, Inc: www.armstronginternational.com.
 - 2. ITT Bell & Gossett: www.bellgossett.com.
 - 3. Taco, Inc: www.taco-hvac.com.
 - 4. or approved equal.
- B. Manual Type: Short vertical sections of 2-inch (50 mm) diameter pipe to form air chamber, with 1/8 inch (3 mm) brass needle valve at top of chamber.
- C. Float Type:
 - 1. Brass or semi-steel body, copper, polypropylene, or solid non-metallic float, stainless steel valve and valve seat; suitable for system operating temperature and pressure; with isolating valve.
 - 2. Cast iron body and cover, float, bronze pilot valve mechanism suitable for system operating temperature and pressure; with isolating valve.

2.03 AIR SEPARATORS

- A. Coalescing Air/Dirt Separators:
 - 1. Manufacturers:
 - a. Armstrong International, Inc: www.armstronginternational.com.
 - b. ITT Bell & Gossett: www.bellgossett.com.
 - c. Spirotherm, Inc: www.spirotherm.com.
 - d. or approved equal.
 - 2. Tank: Fabricated steel tank; tested and stamped in accordance with ASME BPVC-VIII-1; for 150 psi (1034 kPa) operating pressure and 270 degrees F (132 degrees C) maximum operating temperature; subject to the requirements of the application and the manufacturer's standard maximum operating conditions.
 - 3. Coalescing Medium: Provide structured copper or stainless steel medium filling the entire vessel to suppress turbulence and provide air elimination efficiency of 100 percent free air, 100 percent entrained air, and 99.6 percent dissolved air at the installed location.
 - 4. Air Vent: Integral float actuated air vent at top fitting of tank rated at 150 psi (1030 kPa), threaded to the top of the separator.
 - 5. Inlet and Outlet Connections: Threaded for 2 NPS (50 DN) and smaller; Class 150 flanged connections for 2-1/2 NPS (65 DN) and larger.
 - 6. Blowdown Connection: Threaded.
 - 7. Size: Match system flow capacity.

2.04 STRAINERS

- A. Manufacturers:
 - 1. Armstrong International, Inc: www.armstronginternational.com.
 - 2. Flexicraft Industries: www.flexicraft.com.
 - 3. Grinnell Products, a Tyco Business: www.grinnell.com.
 - 4. The Metraflex Company; LPD Y Strainer: www.metralflex.com/#sle.
 - 5. or approved equal.
- B. Size 2 inch (50 mm) and Under:
 - 1. Screwed brass or iron body for 175 psi (1200 kPa) working pressure, Y pattern with 1/32 inch (0.8 mm) stainless steel perforated screen.
- C. Size 2-1/2 inch (65 mm) to 4 inch (100 mm):
 - 1. Provide flanged or grooved iron body for 175 psi (1200 kPa) working pressure, Y pattern with 1/16 inch (1.6 mm), or 3/64 inch (1.2 mm) stainless steel perforated screen.
- D. Size 5 inch (125 mm) and Larger:

1. Provide flanged or grooved iron body for 175 psi (1200 kPa) working pressure, basket pattern with 1/8 inch (3.2 mm) stainless steel perforated screen.

2.05 PUMP CONNECTORS

- A. Manufacturers:
 1. The Metraflex Company; Vane Flex: www.metraflex.com/#sle.
 2. or approved equal.
- B. Flexible Connectors: Flanged, braided type with wetted components of stainless steel, sized to match piping.
 1. Maximum Allowable Working Pressure: 150 psig (1030 kPa) at 120 degrees F (49 degrees C).
 2. Accommodate the Following:
 - a. Axial Deflection in Compression and Expansion: 1/2 inch.
 - b. Lateral Movement: 1/2 inch.
 - c. Angular Rotation: 15 degrees.
 - d. Force developed by 1.5 times specified maximum allowable operating pressure.
 3. End Connections: Same as specified for pipe jointing.
 4. Provide pump connector with integral vanes to reduce turbulent flow.
 5. Provide necessary accessories including, but not limited to, swivel joints.

2.06 COMBINATION PUMP DISCHARGE VALVES

- A. Manufacturers:
- B. Valves: Straight or angle pattern, flanged cast-iron valve body with bolt-on bonnet for 175 psi (1200 kPa) operating pressure, non-slam check valve with spring-loaded bronze disc and seat, stainless steel stem, and calibrated adjustment permitting flow regulation.

2.07 PRESSURE-TEMPERATURE TEST PLUGS

- A. Manufacturers:
 1. Ferguson Enterprises Inc: www.fnw.com/#sle.
 2. Peterson Equipment Company Inc: www.petesplug.com/#sle.
 3. Sisco Manufacturing Company Inc: www.siscomfg.com/#sle.
 4. or approved equal.
- B. Construction: Brass body designed to receive temperature or pressure probe with removable protective cap, and Neoprene rated for minimum 200 degrees F (93 degrees C).
- C. Application: Use extended length plugs to clear insulated piping.

2.08 BALANCING VALVES

- A. Manufacturers:
 1. Armstrong International, Inc: www.armstronginternational.com/#sle.
 2. ITT Bell & Gossett: www.bellgossett.com/#sle.
 3. Taco, Inc: www.taco-hvac.com/#sle.
 4. or approved equal.
- B. Size 2 inch (50 mm) and Smaller:
 1. Provide ball or globe style with flow balancing, flow measurement, and shut-off capabilities, memory stops, minimum of two metering ports and NPT threaded or soldered connections.
 2. Metal construction materials consist of bronze or brass.
 3. Non-metal construction materials consist of Teflon, EPDM, or engineered resin.
- C. Size 2.5 inch (64 mm) and Larger:
 1. Provide ball, globe, or butterfly style with flow balancing, flow measurement, and shut-off capabilities, memory stops, minimum of two metering ports and flanged, grooved, or weld end connections.
 2. Valve body construction materials consist of cast iron, carbon steel, or ductile iron.
 3. Internal components construction materials consist of brass, aluminum bronze, bronze, Teflon, EPDM, or NORYL.

2.09 FLOW METERS

- A. Manufacturers:
 - 1. Dwyer Instruments, Inc: www.dwyer-inst.com/#sle.
 - 2. EMCO Flow Systems: www.emcoflow.com/#sle.
 - 3. or approved equal.
- B. Direct reading with insert pitot tube, threaded coupling, for 150 psi (1034 kPa) working pressure, maximum 240 degrees F (115 degrees C), 5 percent accuracy.

2.10 RELIEF VALVES

- A. Manufacturers:
 - 1. Armstrong International, Inc: www.armstronginternational.com/#sle.
 - 2. ITT Bell & Gossett: www.bellgossett.com/#sle.
 - 3. Conbraco Industries: www.apollovalves.com/#sle.
 - 4. or approved equal.
- B. Bronze body, teflon seat, stainless steel stem and springs, automatic, direct pressure actuated, capacities ASME certified and labelled.

PART 3 EXECUTION

3.01 INSTALLATION

- A. Install specialties in accordance with manufacturer's instructions.
- B. Where large air quantities can accumulate, provide enlarged air collection standpipes.
- C. Provide manual air vents at system high points and as indicated.
- D. Provide air separator on suction side of system circulation pump and connect to expansion tank.
- E. Provide valved drain and hose connection on strainer blowdown connection.
- F. Provide pump suction fitting on suction side of base mounted centrifugal pumps. Remove temporary strainers after cleaning systems.
- G. Provide combination pump discharge valve on discharge side of base mounted centrifugal pumps.
- H. Support pump fittings with floor-mounted pipe and flange supports.
- I. Provide relief valves on pressure tanks, low-pressure side of reducing valves, heat exchangers, and expansion tanks.
- J. Select system relief valve capacity so that it is greater than make-up pressure reducing valve capacity. Select equipment relief valve capacity to exceed rating of connected equipment.
- K. Pipe relief valve outlet to nearest floor drain.
- L. Where one line vents several relief valves, make cross-sectional area equal to sum of individual vent areas.

END OF SECTION

SECTION 23 2123
HYDRONIC PUMPS

PART 1 GENERAL

1.01 SECTION INCLUDES

- A. In-line circulators.
- B. Base-mounted pumps.

1.02 RELATED REQUIREMENTS

- A. Section 03 3000 - Cast-in-Place Concrete.

1.03 REFERENCE STANDARDS

- A. NEMA MG 1 - Motors and Generators; 2017.
- B. NEMA OS 1 - Sheet-Steel Outlet Boxes, Device Boxes, Covers, and Box Supports; 2013.
- C. NFPA 70 - National Electrical Code; Most Recent Edition Adopted by Authority Having Jurisdiction, Including All Applicable Amendments and Supplements.
- D. UL 778 - Standard for Motor-Operated Water Pumps; Current Edition, Including All Revisions.

1.04 SUBMITTALS

- A. See Section 01 3000 - Administrative Requirements, for submittal procedures.
- B. Product Data: Provide certified pump curves showing performance characteristics with pump and system operating point plotted. Include NPSH curve when applicable. Include electrical characteristics and connection requirements.

PART 2 PRODUCTS

2.01 MANUFACTURERS

- A. Armstrong Fluid Technology, Inc: www.armstrongfluidtechnology.com/#sle.
- B. Bell & Gossett, a Xylem Inc. brand: www.bellgossett.com.
- C. SIHI Group: www.sterlingsihi.com.
- D. or approved equal.

2.02 HVAC PUMPS - GENERAL

- A. Provide pumps that operate at specified system fluid temperatures without vapor binding and cavitation, are non-overloading in parallel or individual operation, and operate within 25 percent of midpoint of published maximum efficiency curve.
- B. Minimum Quality Standard: UL 778.
- C. Products Requiring Electrical Connection: Listed and classified by UL or testing agency acceptable to Authority Having Jurisdiction as suitable for the purpose specified and indicated.

2.03 IN-LINE CIRCULATORS

- A. Type: Horizontal shaft, single stage, direct connected, with resiliently mounted motor for in-line mounting, oil lubricated, for 125 psi (860 kPa) maximum working pressure.
- B. Casing: Cast iron, with flanged pump connections.
- C. Impeller: Non-ferrous keyed to shaft.
- D. Bearings: Oil-lubricated bronze sleeve.
- E. Shaft: Alloy steel with bronze sleeve, integral thrust collar.
- F. Seal: Mechanical seal, 225 degrees F (107 degrees C) maximum continuous operating temperature.
- G. Drive: Flexible coupling.
- H. Electrical Characteristics:
 - 1. Wiring Terminations: Provide terminal lugs to match branch circuit conductor quantities, sizes, and materials indicated. Enclose terminal lugs in terminal box sized to NFPA 70.

2.04 BASE-MOUNTED PUMPS

- A. Type: Horizontal shaft, single stage, direct connected, radially or horizontally split casing, for 125 psi (860 kPa) maximum working pressure.
- B. Casing: Cast iron, or ductile iron with suction and discharge gauge ports, renewable bronze casing wearing rings, seal flush connection, drain plug, flanged suction and discharge.
- C. Impeller: Bronze, fully enclosed, keyed to shaft.
- D. Bearings: Oil lubricated roller or ball bearings.
- E. Shaft: Alloy steel with copper, bronze, or stainless steel shaft sleeve.
- F. Seal: Mechanical seal, 225 degrees F (107 degrees C) maximum continuous operating temperature.
- G. Drive: Flexible coupling with coupling guard.
- H. Baseplate: Cast iron or fabricated steel with integral drain rim.
- I. Electrical Characteristics:
 - 1. Wiring Terminations: Provide terminal lugs to match branch circuit conductor quantities, sizes, and materials indicated. Enclose terminal lugs in terminal box sized to NFPA 70.

PART 3 EXECUTION

3.01 PREPARATION

- A. Verify that electric power is available and of the correct characteristics.

3.02 INSTALLATION

- A. Install in accordance with manufacturer's instructions.
- B. Provide access space around pumps for service. Provide no less than minimum space recommended by manufacturer.
- C. Decrease from line size with long radius reducing elbows or reducers. Support piping adjacent to pump such that no weight is carried on pump casings. For close-coupled or base-mounted pumps, provide supports under elbows on pump suction and discharge line sizes 4 inches (102 mm) and over.
- D. Provide line sized shut-off valve and strainer on pump suction, and line sized combination pump discharge valve on pump discharge.
- E. Check, align, and certify alignment of base-mounted pumps prior to start-up.
- F. Install close-coupled and base-mounted pumps on concrete housekeeping base, with anchor bolts, set and level, and grout in place. Refer to Section 03 3000.
- G. Lubricate pumps before start-up.

END OF SECTION

SECTION 23 3100
HVAC DUCTS AND CASINGS

PART 1 GENERAL

1.01 SECTION INCLUDES

- A. Metal ductwork.
- B. Nonmetal ductwork.

1.02 REFERENCE STANDARDS

- A. ASHRAE (FUND) - ASHRAE Handbook - Fundamentals; 2017.
- B. ASTM A36/A36M - Standard Specification for Carbon Structural Steel; 2014.
- C. ASTM A480/A480M - Standard Specification for General Requirements for Flat-Rolled Stainless and Heat-Resisting Steel Plate, Sheet, and Strip; 2016b.
- D. ASTM A653/A653M - Standard Specification for Steel Sheet, Zinc-Coated (Galvanized) or Zinc-Iron Alloy-Coated (Galvannealed) by the Hot-Dip Process; 2015.
- E. NFPA 90A - Standard for the Installation of Air-Conditioning and Ventilating Systems; 2015.
- F. SMACNA (DCS) - HVAC Duct Construction Standards Metal and Flexible; 2005 (Rev. 2009).

1.03 SUBMITTALS

- A. See Section 01 3000 - Administrative Requirements, for submittal procedures.
- B. Product Data: Provide data for duct materials.
- C. Project Record Documents: Record actual locations of ducts and duct fittings. Record changes in fitting location and type. Show additional fittings used.

1.04 FIELD CONDITIONS

- A. Do not install duct sealants when temperatures are less than those recommended by sealant manufacturers.
- B. Maintain temperatures within acceptable range during and after installation of duct sealants.

PART 2 PRODUCTS

2.01 DUCT ASSEMBLIES

- A. Regulatory Requirements: Construct ductwork to NFPA 90A standards.
- B. Ducts: Galvanized steel, unless otherwise indicated.
- C. Low Pressure Supply (Heating Systems): 1/2 inch w.g. (125 Pa) pressure class, galvanized steel.
- D. Return and Relief: 1/2 inch w.g. (125 Pa) pressure class, galvanized steel.
- E. General Exhaust: 1/2 inch w.g. (125 Pa) pressure class, galvanized steel.
- F. Outside Air Intake: 1/2 inch w.g. (125 Pa) pressure class, galvanized steel.

2.02 MATERIALS

- A. Galvanized Steel for Ducts: Hot-dipped galvanized steel sheet, ASTM A653/A653M FS Type B, with G60/Z180 coating.

2.03 DUCTWORK FABRICATION

- A. Fabricate and support in accordance with SMACNA (DCS) and as indicated.
- B. Provide duct material, gages, reinforcing, and sealing for operating pressures indicated.
- C. Increase duct sizes gradually, not exceeding 15 degrees divergence wherever possible; maximum 30 degrees divergence upstream of equipment and 45 degrees convergence downstream.
- D. Fabricate continuously welded round and oval duct fittings in accordance with SMACNA (DCS).

2.04 MANUFACTURED DUCTWORK AND FITTINGS

PART 3 EXECUTION

3.01 INSTALLATION

- A. Install, support, and seal ducts in accordance with SMACNA (DCS).
- B. Install in accordance with manufacturer's instructions.
- C. During construction provide temporary closures of metal or taped polyethylene on open ductwork to prevent construction dust from entering ductwork system.
- D. Duct sizes indicated are inside clear dimensions. For lined ducts, maintain sizes inside lining.
- E. Locate ducts with sufficient space around equipment to allow normal operating and maintenance activities.

END OF SECTION

SECTION 23 3300
AIR DUCT ACCESSORIES

PART 1 GENERAL

1.01 SECTION INCLUDES

- A. Duct access doors.
- B. Flexible duct connections.

1.02 RELATED REQUIREMENTS

- A. Section 23 3100 - HVAC Ducts and Casings.

1.03 REFERENCE STANDARDS

- A. NFPA 90A - Standard for the Installation of Air-Conditioning and Ventilating Systems; 2015.
- B. SMACNA (DCS) - HVAC Duct Construction Standards Metal and Flexible; 2005 (Rev. 2009).

1.04 SUBMITTALS

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

PART 2 PRODUCTS

2.01 DUCT ACCESS DOORS

- A. Manufacturers:
 - 1. Acudor Products Inc, a Division of Nelson Industrial Inc: www.acudor.com.
 - 2. Elgen Manufacturing, Inc: www.elgenmfg.com.
 - 3. Lloyd Industries, Inc: www.firedamper.com/#sle.
 - 4. Nailor Industries, Inc: www.nailor.com.
 - 5. Ruskin Company, a brand of Johnson Controls: www.ruskin.com.
 - 6. SEMCO LLC: www.semcohvac.com.
 - 7. Ward Industries, a brand of Hart and Cooley, Inc: www.wardind.com.
 - 8. or approved equal.

2.02 FLEXIBLE DUCT CONNECTIONS

- A. Manufacturers:
 - 1. Carlisle HVAC Products; Dynair Connector Plus G90 Steel Offset Seam Neoprene Fabric: www.carlislehvac.com/#sle.
 - 2. Elgen Manufacturing, Inc: www.elgenmfg.com.
 - 3. or approved equal.
- B. Fabricate in accordance with SMACNA (DCS) and as indicated.
- C. Flexible Duct Connections: Fabric crimped into metal edging strip.

PART 3 EXECUTION

3.01 PREPARATION

- A. Verify that electric power is available and of the correct characteristics.

3.02 INSTALLATION

- A. Install accessories in accordance with manufacturer's instructions, NFPA 90A, and follow SMACNA (DCS). Refer to Section 23 3100 for duct construction and pressure class.

END OF SECTION

SECTION 23 3422

DEMAND CONTROL VENTILATION DVC- USING CO2 SENSORS

PART 1 GENERAL

1.01 SECTION INCLUDES

- A. Demand Control Ventilation DCV Operational Requirement and Sensor Requirements
- B. DCV Sensors
- C. Variable Frequency Drives

1.02 REFERENCE STANDARDS

- A. NYS Building Code
- B. NYS State Education Department Facilities Planning Standards
- C. UL 705 - Power Ventilators; Underwriters Laboratories Inc.; Current Edition, Including All Revisions.

1.03 SUBMITTALS

- A. See Section 01 3000 - Administrative Requirements, for submittal procedures.
- B. Product Data: Provide data on fans and accessories including fan curves with specified operating point clearly plotted, power, RPM, sound power levels at rated capacity, and electrical characteristics and connection requirements.
- C. 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 Fan Belts: One set for each individual fan.

PART 2 PRODUCTS

2.01 VARIABLE FREQUENCY DRIVES

- A. HONEYWELL Smart VFD
- B. Performance Ratings: Determined in accordance with AMCA 210 and bearing the AMCA Certified Rating Seal.
- C. Sound Ratings: AMCA 301, tested to AMCA 300 and bearing AMCA Certified Sound Rating Seal.
- D. Fabrication: Conform to AMCA 99.
- E. UL Compliance: UL listed and labeled, designed, manufactured, and tested in accordance with UL 705.

2.02 CARBON DIOXIDE SENSORS

- A. Honeywell C7232A,B Sensor and Controller

PART 3 EXECUTION

3.01 INSTALLATION, OPERATIONS AND QUALITY ASSURANCE

- A. Install in accordance with manufacturer's instructions.
- B. Location of indoor sensors - Locate sensors within the breathing zone 36 inches to 60 inches above finished floor and 2 feet from any wall, door, window air handling system
- C. Sensor must be have an sensitivity of less than 50ppm and drift not to exceed 20ppm .
- D. Redundant sensors are required at each location, if sensor reading deviate 10% than sensors shall be calibrated.
- E. Sensors shall take measurements at 1 minute intervals or less
- F. Non-Classroom: If not providing make-up air to other spaces requiring greater flow rates of outside air, the minimum volumetric flow rate of outside air shall be at least 20% of volumetric flow rate of the outside air for the maximum occupant load of the space..
- G. Pre Occupancy Purge- If the sequence does not include a provision for a minimum ventilation rate, 24 hours per day, 365 days year, a purge of the space is required prior to occupancy. A preoccupancy purge

cycle shall consist of a 30 minute operation of the air handling systems, serving the area, with all the dampers (outside air, return air, exhaust air, relief air) positioned, and all fans running to provide the quantity of outside air for the maximum occupant loading of the space.

- H. Post Occupancy Flush - Air handling systems, serving the area, must operate after the occupied times to reduce the CO2 concentrations in the space to outside air levels, prior to shutting down. Dampers (outside air, return air, exhaust air, relief air) must be positioned, and all fans must run at speeds to provide at least the minimum flow rate of outside air during the post occupancy flush.
- I. Provide provisions of economizer override of CO2 control when conditions permit natural cooling of spaces served.
- J. Upper Limit of CO2 (ppm) must be provided. The upper limit (control point) must be based on the metabolic rate of activities in the area and the volumetric flow rate required by code of the area served.
- K. Air Handling system control during occupied times: all dampers and fans serving a space shall modulate from the minimum setting, starting at interior CO2 concentration of not greater than 100 ppm over the outside air. Damper and fans shall modulate such that concentration never exceed the upper limit of the space.
- L. Provide provisions for proportional-integral or proportional-integral-derivative CO2 controller.
- M. DCV through the use of CO2 sensors may not be used where there is a provision to remove CO2 by any other method other than dilution.
- N. Commissioning of system must continue and be completed again at one 1 year after installation to check calibration of CO2 sensors, monitor/tests CO2 levels to ensure target per person ventilation rates are met and maintained.
- O. Record keeping: The following must be provided to the Engineer and Owners: CO2 concentration readings from all sensors serving each space must be recorded and not greater than 15 minute intervals.

END OF SECTION

SECTION 23 3423

HVAC POWER VENTILATORS

PART 1 GENERAL

1.01 SECTION INCLUDES

- A. Roof exhausters.
- B. Kitchen hood up blast roof exhausters.
- C. Utility fans

1.02 REFERENCE STANDARDS

- A. AMCA (DIR) - (Directory of) Products Licensed Under AMCA International Certified Ratings Program; <http://www.amca.org/certified/search/company.aspx>.
- B. AMCA 99 - Standards Handbook; 2010.
- C. AMCA 204 - Balance Quality and Vibration Levels for Fans; 2005.
- D. AMCA 210 - Laboratory Methods of Testing Fans for Certified Aerodynamic Performance Rating; 2007.
- E. AMCA 260 - Laboratory Methods of Testing Induced Flow Fans for Rating; 2016.
- F. AMCA 300 - Reverberant Room Method for Sound Testing of Fans; 2014.
- G. AMCA 301 - Methods for Calculating Fan Sound Ratings from Laboratory Test Data; 2014.
- H. NEMA 250 - Enclosures for Electrical Equipment (1000 Volts Maximum); 2014.
- I. UL 705 - Power Ventilators; Current Edition, Including All Revisions.

1.03 SUBMITTALS

- A. See Section 01 3000 - Administrative Requirements, for submittal procedures.
- B. Product Data: Provide data on fans and accessories including fan curves with specified operating point clearly plotted, power, RPM, sound power levels at rated capacity, and electrical characteristics and connection requirements.
- C. Maintenance Materials: Furnish the following for East Ramapo Central School District's use in maintenance of project.
 - 1. See Section 01 6000 - Product Requirements, for additional provisions.
 - 2. Extra Fan Belts: One set for each individual fan.

PART 2 PRODUCTS

2.01 POWER VENTILATORS - GENERAL

- A. Static and Dynamically Balanced: AMCA 204 - Balance Quality and Vibration Levels for Fans.
- B. Performance Ratings: Determined in accordance with AMCA 210 and bearing the AMCA Certified Rating Seal.
- C. Sound Ratings: AMCA 301, tested to AMCA 300 and bearing AMCA Certified Sound Rating Seal.
- D. Fabrication: Conform to AMCA 99.
- E. UL Compliance: UL listed and labeled, designed, manufactured, and tested in accordance with UL 705.
- F. Electrical Components: Listed and classified by Underwriters Laboratories Inc. as suitable for the purpose specified and indicated.

2.02 ROOF EXHAUSTERS

- A. Fan Unit: V-belt or direct driven as indicated, with spun aluminum housing; resilient mounted motor; 1/2 inch mesh, 0.62 inch thick aluminum wire birdscreen; square base to suit roof curb with continuous curb gaskets.
- B. Disconnect Switch: Factory wired, non-fusible, in housing for thermal overload protected motor.
- C. Backdraft Damper: Gravity actuated, aluminum multiple blade construction, felt edged with offset hinge pin, nylon bearings, blades linked, and line voltage motor drive, power open, spring return.

- D. Sheaves: Cast iron or steel, dynamically balanced, bored to fit shafts and keyed; variable and adjustable pitch motor sheave selected so required rpm is obtained with sheaves set at mid-position; fan shaft with self-aligning pre-lubricated ball bearings.

2.03 KITCHEN HOOD UPBLAST ROOF EXHAUSTERS

- A. Direct Drive Fan:
1. Fan Wheel:
 - a. Type: Non-overloading, backward inclined centrifugal.
 - b. Material: Aluminum.
 2. Statically and dynamically balanced.
 3. Motors:
 - a. Open drip-proof (ODP).
 - b. Heavy duty ball bearing type.
 - c. Mount on vibration isolators or resilient cradle mounts, out of air stream.
 - d. Fully accessible for maintenance.
 4. Housing:
 - a. Construct of heavy gage aluminum including curb cap, windband, and motor compartment.
 - b. Rigid internal support structure.
 - c. One-piece fabricated or fully welded curb-cap base to windband for leak proof construction.
 - d. Construct drive frame assembly of heavy gage steel, mounted on vibration isolators.
 - e. Provide breather tube for fresh air motor cooling and wiring.
- B. Shafts and Bearings:
1. Fan Shaft:
 - a. Ground and polished steel with anti-corrosive coating.
 - b. First critical speed at least 25 percent over maximum cataloged operating speed.
 2. Bearings:
 - a. Permanently sealed or pillow block type.
 - b. Minimum L10 life in excess of 100,000 hours (equivalent to L50 average life of 500,000 hours), at maximum cataloged operating speed.
 - c. 100 percent factory tested.
- C. Drive Assembly:
1. Belts, pulleys, and keys oversized for a minimum of 150 percent of driven horsepower.
 2. Belts: Static free and oil resistant.
 3. Fully machined cast iron type, keyed and securely attached to the wheel and motor shafts.
 4. Motor pulley adjustable for final system balancing.
 5. Readily accessible for maintenance.
- D. Drain Trough: Allows for single-point drainage of water, grease, and other residues.

2.04 UTILITY FAN

- A. Manufacturers:
1. Greenheck Fan Corporation: www.greenheck.com.
 2. Loren Cook Company: www.lorencook.com.
 3. PennBarry, Division of Air System Components: www.pennbarry.com.
 4. Substitutions: See Section 01 6000 - Product Requirements.
- B. Direct Drive Fan:
1. Fan Wheel:
 - a. Type: Non-overloading, backward inclined centrifugal.
 - b. Material: Aluminum.
 2. Statically and dynamically balanced.
 3. Motors:
 - a. Open drip-proof (ODP).
 - b. Heavy duty ball bearing type.
 - c. Mount on vibration isolators or resilient cradle mounts, out of air stream.

- d. Fully accessible for maintenance.
- 4. Housing:
 - a. Construct of heavy gage aluminum including curb cap, windband, and motor compartment.
 - b. Rigid internal support structure.
 - c. One-piece fabricated or fully welded curb-cap base to windband for leak proof construction.
 - d. Construct drive frame assembly of heavy gage steel, mounted on vibration isolators.
 - e. Provide breather tube for fresh air motor cooling and wiring.
- C. Shafts and Bearings:
 - 1. Fan Shaft:
 - a. Ground and polished steel with anti-corrosive coating.
 - b. First critical speed at least 25 percent over maximum cataloged operating speed.
 - 2. Bearings:
 - a. Permanently sealed or pillow block type.
 - b. Minimum L10 life in excess of 100,000 hours (equivalent to L50 average life of 500,000 hours), at maximum cataloged operating speed.
 - c. 100 percent factory tested.
- D. Drive Assembly:
 - 1. Belts, pulleys, and keys oversized for a minimum of 150 percent of driven horsepower.
 - 2. Belts: Static free and oil resistant.
 - 3. Fully machined cast iron type, keyed and securely attached to the wheel and motor shafts.
 - 4. Motor pulley adjustable for final system balancing.
 - 5. Readily accessible for maintenance.
- E. Disconnect Switches:
 - 1. Factory mounted and wired.
 - 2. Finish for Painted Steel Enclosures: Provide manufacturer's standard or factory applied gray unless otherwise indicated.
 - 3. Positive electrical shutoff.
 - 4. Wired from fan motor to junction box installed within motor compartment.
- F. Roof Curb: 8 inch high; self-flashing of galvanized steel with continuously welded seams, built-in cant strips, insulation and curb bottom, and factory installed nailer strip.
- G. Drain Trough: Allows for single-point drainage of water, grease, and other residues.
- H. Options/Accessories:
 - 1. Automatic Belt Tensioner: Automatic device that adjusts for correct belt tension for single drives.
 - 2. Birdscreen:
 - a. Provide galvanized steel construction.
 - b. Protects fan discharge.
 - 3. Dampers: Provide motorized type.

PART 3 EXECUTION

3.01 INSTALLATION

- A. Install in accordance with manufacturer's instructions.
- B. Secure roof exhausters with cadmium plated steel lag screws to roof curb.
- C. Extend ducts to roof exhausters into roof curb. Counter flash duct to roof opening.
- D. Provide sheaves required for final air balance.
- E. Install back draft dampers motorized on inlet to roof exhausters.

END OF SECTION

SECTION 23 7223

AIR HANDLING UNIT / DEDICATED OUTDOOR AIR SYSTEM / ENERGY RECOVERY UNIT

PART I – GENERAL

1.01 WORK INCLUDED

- A. This specification is based on an Energy Recovery model as manufactured by Annexair Inc. Manufacturers of alternate equipment must be approved to bid via addendum, in writing by the specifying engineer, at least two weeks prior to bid time in order for their bid to be accepted by the contractor. If the equipment is not pre-approved then under no circumstances shall the contractor invest any time or money in receiving submittals or considering the equipment. Costs associated with dimensional, performance or other deviations from the specified equipment, including engineering costs to evaluate such deviations, shall be paid by the contractor
- B. The unit(s) shall be installed in strict accordance with the specifications. Unit(s) shall be complete with all components and accessories as specified. All units shall be factory assembled, internally wired, and 100% run tested to check operation, fan/blower rotation and control sequence before leaving the factory. Wiring internal to the unit shall be numbered for simplified identification. Units shall be ETL listed and labeled, classified in accordance with ANSI-UL 1995 / CAN/CSA C22.2 No.236. Equipment start-up and project inspection by qualified factory trained representative.

1.02 QUALITY ASSURANCE

- A. All unit(s) shall be factory run tested before shipping. A proof copy of the test shall be placed in the unit electrical power & control panel.
- B. Unit(s) shall bear the ETL label, tested in accordance to UL 1995. Electrical components shall be UL listed.
- C. Fans shall be tested in an AMCA certified laboratory; insulation shall comply with NFPA 90A.
- D. Coils shall be tested in accordance to AHRI 410.
- E. Energy recovery exchangers shall be in accordance to AHRI 1060, "Rating Air-to-Air Energy Recovery Equipment" and Eurovent standards.
- F. Filters shall be tested in accordance to ASHRAE 52.
- G. The unit manufacturers construction shall have an independent testing agency test the air leakage, panel deflection and sound pressure levels for supply airflows of minimum 20,000 CFM. The air leakage of the unit(s) shall not exceed 1% at 8" inches H2O positive static pressure and a copy of the report must be submitted upon request. Unit shall be constructed to limit frame and panel deflection to 1/250th of the panel length at 8" inches H2O positive static pressure and a copy of the report must be submitted upon request. The unit shall also be tested in accordance with ANSI S12.34-1998 and instrumentation used must be in compliance with the requirements of AMCA 300 for sound readings. The sound tests conducted shall report overall sound power and pressure readings for supply air outlet, return air inlet and casing radiated.
- H. Products shall be supported with a warranty that ensures the product will be free from defects in materials and workmanship for a period of one year after shipment.

1.03 SUBMITTALS

- A. Submit product data under provisions of Section 15XXX. Include product description, model, dimensions, component sizes, rough-in requirements, service sizes, and finishes. Include rated capacities, operating weights, furnished specialties, and accessories.
- B. Submit manufacturer's installation instructions.
- C. Submit operation and maintenance data.
- D. Submit coordination drawings. Include unit details, plans, elevations, sections, details of components. Show support locations, type of support, weight and required clearances.
- E. Submit wiring diagrams including power, signal, and control wiring.

1.04 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.

1.05 WARRANTY

- A. Annexair warrants each product to be free from defects in material and workmanship under normal and proper use, and will within twelve (12) months from date of start up and not exceed eighteen (18) months from shipment, repair or replace any part which, when returned to our factory transportation charges prepaid, and upon inspection by Annexair, proves to be defective. This warranty does not include any labor or service charges that occur under this warranty. Minimum (5) five year compressor warranty shall be provided, parts only – labor not included
- B. The installing contractor must be responsible for warranty service and maintenance after the equipment is placed into operation.
- C. NOTIFICATION: Any modification to the Annexair equipment, including the controls and sequence of operation, without specific approval in writing by Annexair, will result in a violation of the equipment warranty

1.06 REFERENCES

All components selected for this project shall conform to the following Standards:

- A. AFBMA 9: Load Ratings and Fatigue Life for Ball Bearings
- B. AMCA Standard 99: Standards Handbook
- C. AMCA /ANSI Standard 204: Balance Quality and Vibration Levels for Fans
- D. AMCA Standard 210: Laboratory Methods of Testing Fans for Ratings
- E. AMCA Standard 300: Reverberant Room Method for Sound Testing of Fans
- F. AMCA 320; Laboratory Method for Sound Testing of Fans Using Sound Intensity
- G. AMCA Standard 500: Test Methods for Louvers, Dampers and Shutters
- H. AHRI Standard 1060: Air-to-Air Energy Recovery Ventilation Equipment
- I. AHRI Standard 410: Forced-Circulation Air-Cooling and Air-Heating Coil
- J. ASHRAE Standard 52: Gravimetric and Dust Spot Procedures for Testing Air Cleaning Devices Used in General Ventilation for Removing Particulate Matter
- K. ASHRAE 52.2: Procedures for Testing Air Cleaning Devices Used for Removing Particulate Matter
- L. ASHRAE 84-91: Method of Testing Air-to-Air Heat Exchangers
- M. ASHRAE/ANSI Standard 111: Practices for Measurement, Testing, Adjusting and Balancing of Building Heating, Ventilation, Air-Conditioning and Refrigeration Systems
- N. ASTM A-525: Specification for General Requirements for Steel Sheet, Zinc-Coated (Galvanized) by the Hot-Dip Process
- O. NEMA MG-1: National Electrical Manufacturers Association Motor Standards
- P. NFPA 90A: Standard for the Installation of Air Conditioning and Ventilating Systems
- Q. SMACNA: Sheet Metal and Air Conditioning Contractors National Association
- R. UL Standard 1995: Heating and Cooling Equipment
- S. UL Standard 900: Test Performance of Air Filter Units

1.07 COORDINATION

- A. Coordinate location and installation of air-handling units. Revise locations and elevations to suit field conditions and to ensure proper operation.
- B. Coordinate location and installation of air handling units with the electrical, mechanical, and plumbing contractors.

PART II – PRODUCTS

2.01 HOUSING

A. THERMO-COMPOSITE PANELS

1. The unit housing shall be no-through metal with 2” Thermo-Composite and foam panel construction - interior and exterior or an all-aluminum 4” Foam thermal break construction - interior and exterior. Thermal break construction using a gasket to insulate two panels is not an acceptable equivalent to a no-through metal constructed casing. No-through metal construction will be inherent to all the component construction in the assembly.
2. All panels and access doors shall be double wall construction with R14 foam insulation for every 2” of construction. All foam insulation must be Greenguard certified®. Any insulation incorporating CFCs or HCFCs in its construction is strictly prohibited from this application.
3. Unit casing will have no exterior condensation at interior AHU temperatures down to 43F while unit exterior conditions are maintained at 95 F dry bulb / 85 F wet bulb. The air handling unit manufacturer general construction shall be tested to demonstrate the thermal performance of the unit casing. The test shall include placing the entire test unit in a climate controlled environment and exposing the unit to the conditions mentioned previously. If the manufacturer does not have access to such equipment, an independent testing agent must be hired to transport the test unit to a qualified test facility, and perform the test at the expense of the manufacturer. Inability to provide this option to the engineer will make the manufacturer ineligible to bid on this project the unit housing shall be constructed from a frame, base and panel assembly. Unit shall be completely factory assembled and shipped in one piece as shown on drawings.
4. The panels shall be tested in accordance with SMACNA and ASHRAE 111 to have a deflection of no more than L/1150 at 10” and withstand air pressures up to 8” w.c with less than 1% leakage. Fire resistance of the panel will be in compliance with UL 94 rated at 5VA; and a flame spread / smoke development in compliance with UL 723 ASTM E84 Class 1 rating.
5. Thermo-Composite or aluminum panels shall be provided for the entire unit construction, including but not limited to, walls, doors, floors, roof, interior partitions, and electrical compartment. Panels shall be non-load bearing type.
6. The frame shall consist of anodized extruded aluminum profiles; welded together for reinforcement and insulated for superior thermal performance.
7. Base structure shall be fully welded G-90, painted exterior, and have integral lifting lugs which can be removed once the unit is installed.
8. All roof and side wall seams shall be positively sealed to prevent water and air leakage. The OA and EA compartment shall have 1” PVC drains extended to exterior of unit
9. Access doors shall be provided to all major components to facilitate quick and easy access. Access doors will be made from the same material as the unit casing and shall incorporate thermal break construction. Fan access door(s) shall have Allegis type handles, with one handle interlinking multiple latches and threaded insert fastening handles for all remaining doors. If access doors do not open against unit operating pressure, provide safety latches that allow access doors to partially open after first handle movement and fully open after second handle movement. Removable panels provided for equipment pull out for coil(s), and air to air heat exchanger section(s) shall have key tooled threaded insert fasteners. Hinges shall be Nylon hinge type designed to open 180 degrees.
10. Unit shall have the entire exterior finished with a PVDF coating designed for UV resistance. Panels shall be painted Annexair standard color white gray RAL 9002. If custom color is required, please specify the associated RAL color code. Panels shall pass ASTM B117 3000-hour salt fog resistance test and ASTM D4585 3000-hour moisture condensation resistance test. In addition, paint must meet AAMA 620-02 standard for color, chalking, gloss retention, and abrasion resistance.
11. The air handler unit casing shall be provided with a lifetime warranty against corrosion resistance under normal use.

B. WEATHER HOODS

1. The outdoor intake weather hood shall be completely constructed in aluminum for superior corrosion resistance. The hood shall ship loose for field installation by the installing contractor. Painted galvanized hoods shall not be acceptable due to its susceptibility to corrosion. The outdoor

air hood shall be designed with a 4" extruded aluminum louver, bird screen and a plenum enclosure with drain holes. The louver blades shall be drainable type with a maximum 45 degree angle and curved with integral rain baffle. The louver design shall not allow more than 0.03 oz/ft² water penetration when tested in accordance to AMCA 500. The pressure drop of the complete hood assembly shall not exceed 0.05"wc at a maximum 500 fpm face velocity. A Pre-filter rack system shall be installed within the weather hood enclosure to prevent outdoor air dust and debris from entering the damper and unit casing plenum. Pre-filters installed inside the unit casing plenum and downstream of the outdoor damper will not be acceptable as this will increase overall maintenance on the damper, reduce indoor air quality and promote mold and bacteria growth. Filter access in the hood shall be accomplished via the louver that is installed with a stainless steel piano hinge and spring loaded latch. No tools or ladders shall be required to access the pre-filters in the weather hood assembly and header insulation constructed from 304 stainless steel shielding for increased energy efficiency and reduced airstream heat gain. Stainless steel shields to be isolated from distributor using plenum rated synthetic foam strips. Insulation to provide air-gap to minimize conduction and The unit housing

C. EXHAUST AIR LOUVER

1. The exhaust air outlet louvers shall be 2" extruded aluminum, with non-restricting blade design and bird screen.

2.02 HEAT RECOVERY WHEEL

A. ENTHALPY WHEEL (SILICA GEL)

1. The enthalpy wheel shall recover both sensible and latent heat and be AHRI 1060 certified.
2. The matrix shall be a minimum of 8" thick to achieve optimal performance and be constructed from a corrugated aluminum alloy. The corrugation shall be uniform to obtain minimum pressure drops through the wheel. Wheels with varying flute sizes are not acceptable. Wheels with non-metallic matrices will not be considered for this application.
3. Wheels with varying flute sizes are not acceptable. Wheels with non-metallic matrices will not be considered for this application.
4. The media shall be specifically treated and coated with Silica Gel desiccant to assist and enhance latent heat transfer. Any other types of desiccants, including 3A or 4A Molecular Sieves will not be considered for HVAC applications.
5. A heavy duty wheel hub will contain the bearings in a closed compartment for wheel sizes up to 96" diameter. These shall be maintenance free while larger sizes require periodic lubrication. In addition, segmented wheel shall be provided on diameter sizes above 96".
6. The seal shall be made from a dual band ultra-high molecular weight polyethylene and be self-lubricating, wear resistant, and air tight against prolonged use. Seals shall be full contact compression type, on both sides of the wheel to ensure minimal leakage. Specially designed stainless steel clips are used to position the seal across the face of the wheel. Any seal that is non-contact is not to be considered a seal and will not be acceptable. Labyrinth type seals do not operate properly under different air stream pressures therefore shall not be acceptable in any circumstances.
7. Drive system shall be operated by a fractional horsepower motor (maximum 1 HP), reducing gearbox, pulley and V-belt. Belts shall be made of multi-link high-tech urethane/polyester composite. An access panel shall be provided for maintenance on the drive system. A double purge sector (2 x 5°) shall be factory installed to reduce cross contamination to under 0.04%. Frost control prevention shall be provided by the unit manufacturer and accounted for if outdoor air temperatures are below 10°F at equal airflows and return relative humidity below 30%. Frost control shall be accomplished by a variable speed drive and controlling the leaving air condition of the exhaust air. Other methods of frost control will not be considered for this application. Wheel speed shall not rotate faster than 20 RPM. Any rotational speed above 20 RPM will be unacceptable since this will reduce the efficiency of the purge section.
8. Media cleaning shall be accomplished with any of the following methods: compressed air, low pressure steam, hot water or light detergent without degrading the latent recovery

2.03 FANS

A. PLENUM FANS (ER model)

1. Fans shall be direct drive radial centrifugal fans with free running impeller. No fan belts will be acceptable for this application. Fans shall be compact, optimized and construction made of galvanized sheet steel with backward curved 7-blade high efficiency impeller, protected by an epoxy powder coating.
 2. To reduce vibration, the impeller shall be balanced with hub to an admissible vibration severity of less than 2.8 mm/s in conformity with DIN ISO 14694 and proof shall be supplied for each individual impeller. Tests shall be made according to DIN ISO 1940 Part 1, quality of balancing G2.5/6.3.
 3. The single inlet shall be mounted onto constant speed direct drive motor, equipped with an air flow optimized inlet cone from galvanized sheet steel.
 4. Fans shall be completely certified as per ISO 5801 and in accordance to AMCA standards.
 5. Fan/ fan bank will require to be operated by a Variable speed drive.
 6. Optional: Plenum fan shall come equipped with guard grilles for the air intake side.
- B. FAN ISOLATIONS
1. The fan housing and motor assembly shall be isolated from the unit cabinetry with a minimum 95% efficient spring isolators or high efficiency rubber isolators or seismic isolators.
 2. In addition, fans shall have flexible canvas to reduce vibration transmission.
- C. SOUND ATTENUATION IN FAN COMPARTMENT (OPTIONAL)
1. The fan section shall be constructed with a perforated interior liner, same construction as the housing interior lining and shall be insulated with Permacote anti-microbial coating fiber glass. The perforated lining shall be installed on fixed panels only, with exception on the interior Ceiling

2.04 FAN MOTORS

- A. The fan motors shall meet NEMA standard dimensions and comply with the Energy policy Act of 1997.
- B. Motors shall have premium efficiencies with low noise and vibration output. Motors shall be certified and built in accordance to ISO 9001 quality control system
- C. Motors shall have ODP enclosure with Premium efficiency performance.
- D. Units shall be designed for constant application. Please refer to the unit schedule for the application type.
- E. Option: A shaft grounding brush kit will be provided to prevent electrical damage to motor bearings by safely channeling harmful shaft currents to ground.

2.05 VARIABLE FREQUENCY DRIVE (VFD)-ABB

- A. VFDs will be used to set or regulate the fan speed and airflow for these units.
- B. The VFD shall have PID function for constant flow applications
- C. The VFDs will be installed with integral brake transistor, overload protection, and adjustable pulse width modulation (PWM).
- D. The VFD shall use Insulated Gate Bipolar Transistor (IGBT) technology to convert three phase input power to coded PWM output and have 4-20mA analog output terminals that are fully programmable for variable flow applications.
- E. The VFD shall be equipped with a keypad with status indicators, easy access functions, and monitoring functions during motor operation.
- F. In the event of a momentary power failure or fault the VFD shall read the inverter speed and direction of a coasting motor and shall automatically restart the motor smoothly.
- G. Technical support will be provided by the VFD manufacturer.
- H. VFDs shall be installed as shown on drawings with contactors, relays, and all specified accessories.
- I. VFDs will be installed WITHOUT by-pass.

2.06 FILTERS

- A. PRE-FILTERS (HIGH CAPACITY SERIES 400 2" MERV 13))
 1. Filters shall be factory installed upstream of the heat exchanger and coils, in both airstreams.
 2. The filters shall be Filtration Group Series 400, MERV 13.

3. Each filter shall consist of 100% synthetic media, expanded metal on the downstream and enclosing with high wet-strength beverage board with diagonal support bonded on air entering and air exiting side of each pleat.
4. MERV 13 model High Capacity Series 400 filters, UL 900 classified are rated as per ASHRAE test 52.2.2012 at 88% efficiency initial (based on Minimum Average Efficiency) at 3-10 microns.
5. The model High Capacity Serie 400 could be operated at 500 FPM, surface area 18 FT² of media based on 24 x 24 x 2 initial static pressure at 0.24", final will be 1".
6. Filters shall be placed in a completely sealed, galvanized holding frame with quick release latches for easy replacement.

2.07 DAMPERS

A. NON-INSULATED TAMCO SERIES 1000

1. Dampers shall be installed where shown on the drawings.
2. Dampers shall be low leak type with rubber edges, opposed blades, and constructed from extruded aluminum.
3. Galvanized dampers will not be acceptable.
4. The exhaust air outlet shall have a standard aluminum gravity type damper, unless otherwise noted below.
5. Dampers shall be installed in the compartments (as shown on the drawings) with linkage rod for actuators
6. Actuators shall be 24V factory installed: two-position or modulating (please refer to the unit schedule).
7. All actuators shall have spring return mechanism and auxiliary switches. Dampers will be installed in the failed close positions unless otherwise noted

2.08 CONDENSING UNIT

A. AIR COOLED CONDENSING UNIT WITH VARIABLE SPEED COMPRESSORS (AEROMOD AZ)

1. Provide an integral air cooled condensing section with variable speed compressors. The condensing section shall be factory piped, wired, and charged with R-410A refrigerant. The section shall be from the same manufacturer as the air handling unit. Factory mounting and piping an air cooled condensing unit, provided by a third party is not acceptable. Furthermore, the exterior cabinet of the air cooled section shall be of the same construction and paint color as the air handling unit.
2. Compressors shall be variable speed scroll type that can modulate from 30% to 100% capacity per compressor. Variable capacity compressors which do not modulate the speed of the scrolls are not considered equal to a variable speed scroll since they consume more energy at the same capacity output. Mechanically stepped scrolls which are unloaded via a digital signal to a solenoid valve, in a timed sequence, will not be acceptable for this application. The variable speed scrolls shall be operated via a factory supplied variable speed controller per compressor, and all tandem compressors will modulate in unison. Using a single variable speed controller on the lead circuit alone is not efficient during part load conditions, therefore will not be acceptable for this application. Each compressor and controller assembly shall be equipped with the following features: PERMANENT MAGNET MOTOR, electronic expansion valve, a crankcase heater function, anti-short cycling, built-in phase loss detector, EMC filter, oil return management system, and reverse rotation protection. All refrigeration parts, including the compressor and the speed controller will be located in a closed and vented service compartment, separate from the condenser coil airflow. Compressors located in compartments open to the outside are not acceptable. Compressors shall be mounted on rubber isolators to limit vibration transmission and shall include flexible hoses on both the suction and discharge refrigeration lines.
3. All air cooled condensing units above 23T will have a minimum of two compressors.
4. Condenser fans shall have 7 air foil type blades with external mounted asynchronous motors that are class F insulated, IP54 and 100% variable speed. Each condenser fan bank shall be provided with a variable voltage controller which modulates via refrigerant head pressure control for superior part load performance. All the condenser fans in a fan bank shall modulate in unison for each respective circuit. Staging condenser fans are not an acceptable mode of control for head pressure control. Protective guards shall be included on all condenser fans, and condenser coils. The coil protective guards shall be ideal to keep coil at maximum operating performance, protect

the condenser from hail damage and allow for easy cleaning with quick release latches. The condenser coils shall be micro-channel design for maximum efficiency performance, consist of a single pass arrangement with integral receiver, and be efficiency performance, consist of a single pass arrangement with integral receiver, and be pressure tested at 650 psig. Coil construction shall consist of aluminum alloys for the fins, tubes and manifolds. Copper tube, aluminum fin condenser coils are not acceptable as they require more refrigeration charge for the same capacity output.

5. The following components shall be included in each refrigeration circuit: Liquid line filter dryer, high and low pressure switch, high and low pressure transducers, suction and liquid lines shutoff valves and suction line accumulators. In addition, refrigeration piping must use Shrader type connections for all components, including but not limited to valves and transducers. Under no circumstances shall the units leave the factory without a complete run test and a copy of the QC report shall be provided upon request.
6. Minimum (5) five year compressor warranties shall be provided

2.09 COILS

A. DX COILS

1. Coils shall be factory installed in the unit.
2. Coils shall be designed with respective circuits to match the design requirements. All coils shall have a distributor per circuit connection. Coils shall be circuited for counter-flow heat transfer to provide maximum mean effective temperature difference for maximum heat transfer rates.
3. Primary surface shall be round seamless (3/8" O.D.) copper tube staggered in the direction of airflow. Secondary surface shall consist of rippled aluminum plate fins for higher capacity and structural strength. Fins shall have full drawn collars to provide a continuous surface cover over the entire tube for maximum heat transfer. Tubes shall be mechanically expanded into the fins to provide a continuous primary to secondary compression bond over the entire finned length for maximum heat transfer rates. Headers shall have intruded tube holes to provide a large brazing surface for maximum strength and inherent flexibility.
4. Casing shall be constructed of continuous galvanized steel.
5. The complete coil shall be tested with 315 pounds air pressure under warm water and be suitable for operation at 250 psig working pressures. Maximum finned coil height shall be 60" and shall not exceed 500 FPM face velocity.
6. Drain pan shall be provided on cooling coils. Cooling coils shall sit on stainless steel tubular support rails, which shall stand a minimum of (2) two inches above the highest point of the floor drain pan. Stacked coils shall be provided for larger airflows and intermediate drain pans shall be provided for each coil bank. Drain pans shall be stainless steel with 1.25" stainless steel drain connections on one side only. Pan shall be sloped in two planes.
7. All coils shall be rated in accordance with AHRI standard 410.

B. DX HOT GAS REHEAT

1. Coils shall be factory installed in the unit.
2. The hot gas reheat coil shall be installed at minimum 8" from the moisture producing DX cooling coil. A plexi glass between the two items shall be required to visually inspect the DX cooling coil surface area, and also have the ability to clean the coils when necessary.
3. A modulating valve shall be provided to control air leaving temperature for dehumidification.
4. Coils shall be designed with respective circuits to match the design requirements. Coils shall be circuited for counter-flow heat transfer to provide maximum mean effective temperature difference for maximum heat transfer rates.
5. Primary surface shall be round seamless (3/8" O.D.) copper tube staggered in the direction of airflow. Secondary surface shall consist of rippled aluminum plate fins for higher capacity and structural strength. Fins shall have full drawn collars to provide a continuous surface cover over the entire tube for maximum heat transfer. Tubes shall be mechanically expanded into the fins to provide a continuous primary to secondary compression bond over the entire finned length for maximum heat transfer rates. Headers shall have intruded tube holes to provide a large brazing surface for maximum strength and inherent flexibility.
6. Casing shall be constructed of continuous galvanized steel.

7. The complete coil shall be tested with 315 pounds air pressure under warm water and be suitable for operation at 250 psig working pressures.
8. All coils shall be rated in accordance with AHRI standard 410.

2.10 BURNERS

A. INDIRECT GAS FIRED FURNACE (HMSERIES)

1. Furnish and install where shown on plans Gas-fired Duct Furnace Heat Module(s).
2. The module shall be a Recognized Component by Intertek Testing Services (ITS / ETL). All modules will have a minimum thermal efficiency of 80%.
3. The module shall employ a tubular heat exchanger and a draft inducer assembly to provide for positive venting of flue gases. Burner assemblies shall employ in-shot type burners constructed of aluminized steel body and sintered metal flame holder with integral carryover plenum.
4. The ignition system will include a 6000 V Igniter and flame rod detection. Ceramic hot surface ignition systems are unacceptable.
5. Gas-fired duct furnace(s) provided shall employ a tubular heat exchanger constructed of 18-gauge minimum, type 409 stainless steel, and 1 3/4" to 2 1/4" diameter having a minimum wall thickness of 0.047". Tubes shall be produced to ASTM A249 standards for heat exchanger application. Tubes shall employ integral formed-dimple restrictors to eliminate noise associated with expansion and contraction of internal baffles during heating cycles, and to provide for unobstructed drainage of condensate that occurs in the tubes during cooling operation. Drainage shall be configured so that burners and burner surfaces are not exposed to condensate during cooling system operation.
6. Full Modulation control shall be provided. On a call for heat and subsequent safe burner light OFF, the burner modulation shall be minimum 10:1 as noted on the schedule. Stepped modulation is not acceptable. Controls shall include an ignition control with alarm capable contact and one hour auto reset on lockout, roll out switch, high limit switch and a proving switch of loss of the induced draft fan. Additionally, on modulating and 2-stage systems all timing and switching functions shall be controlled through an electronic timer relay control. Staging controller available for 0 to 10VDC or 4 to 20mA input from building management control.
7. Burners will use Natural Gas (with gas pressure min 7"-max 14"wc) unless otherwise specified. Gas train compartment shall be provided with 1" PVC drain.

2.11 ROOF CURB

- A. A insulated, pre-fabricated roof curb shall be provided and shipped knocked down. The roof curb will be made of 16-gauge galvanized steel with 4" flanges, minimum 17" high with a factory installed 2" x 3" wood nailer strip.

2.12 POWER AND SAFETY CONTROL

- A. The power and control center shall be integral to the unit housing and rated equivalent to NEMA 3R.
- B. Under no circumstances shall any wiring or parts be field installed. If units show up at the job site without wiring by the manufacturer, the contractor will have to send back units to the manufacturer at the contractors' expense to get them factory wired and re-tested.
- C. Panels that are externally mounted to the unit shall not be accepted, regardless of the NEMA rating they may have. A separate access door shall be provided with an approved locking device.
- D. All electrical components contained in the panel shall be UL/CSA certified and labeled. The unit shall be complete with VFDs, fuses, relays, phase protection for compressorized units, terminals for main ON/OFF and step-down transformer. All components shall be factory wired for single point power connection by the manufacturer of the unit. A non-fused safety disconnect switch shall be factory installed for ON/OFF servicing.
- E. An electrical pipe chase for power and control feeding shall be provided next to the control panel.
- F. Any power or control wiring that is field installed shall not be accepted under any circumstances. The Short Circuit Current Rating (SCCR) is 5 kA rms symmetrical, 600V Maximum or as noted on schedule.
- G. GFI, lights, and switches shall be factory installed and wired to a common junction box. A separate power connection 120V/1 will be required (powered by others).

2.13 AIR TEMPERATURE CONTROL PACKAGE

- A. The unit shall be delivered with factory installed control system. Under no circumstances shall control be provided by other than the manufacturer of the equipment. Field installed control package by the ATC will not be acceptable.
- B. The control system shall consist of a microprocessor with LCD display, 7 day time clock, 20 day holiday schedule, occupied/unoccupied mode switch, warm up mode, cool down mode, hi-lo limit discharge control, fan status, temperature and humidity sensors when applicable, scroll buttons to change settings as required and alarm history.
- C. Supply air temperature and humidity sensors shall be provided by Annexair and field mounted in the supply duct and wired by others. Optional - Space temperature and humidity wall mounted sensors shall be field wired and installed by others.
- D. Refer to the Sequence of Operation and control schematic for detailed description and options.
- E. Communication Interface Card: The microprocessor shall be capable of communicating with the following protocol language: Select one of the following: Bacnet MS/TP RS-485.

3. PART III – EXECUTION

3.01 EXAMINATION

- A. Examine ducts, and conditions for compliance with requirements for installation tolerances and other conditions affecting performance.
- B. Examine roughing-in for piping systems to verify actual locations of piping connections before installation.
- C. Proceed with installation only after unsatisfactory conditions have been corrected.

3.02 INSTALLATION

- A. Install Air Handling Unit per manufacturers' instructions.
- B. Install with required clearance for service and maintenance.

3.03 TESTING

- A. System verification testing is part of the commissioning process. Verification testing shall be performed by the Contractor and witnessed and documented by the Commissioning Authority. Refer to section 01810, Commissioning, for system verification tests and commissioning requirements.
- B. Manufacturer's Field Service: Engage a factory-authorized service representative to inspect field assembled components and equipment installation, including piping and electrical connections. Report results in writing.
 - 1. Leak Test: After installation, charge system and test for leaks. Repair leaks and retest until no leaks exist.
 - 2. Operational Test: After electrical circuitry has been energized, start units to confirm proper unit operation. Remove malfunctioning units, replace with new units, and retest.
 - 3. Test and adjust controls and safeties. Replace damaged and malfunctioning controls and equipment.

3.04 TRAINING

- A. Training of the Owner's operation and maintenance personnel is required in cooperation with the Commissioning Authority. Provide competent, factory-authorized personnel to provide instruction to operation and maintenance personnel concerning the location, operation, and troubleshooting of the installed systems. The instruction shall be scheduled in coordination with the Commissioning Authority after submission and approval of formal training plans. Refer to System Demonstrations, section 01670, for contractor training requirements. Refer to section 01810, Commissioning, for further contractor training requirements.
- B. Contact Annexair to request pricing to include factory-authorized service representative to train Owner's maintenance personnel to adjust, operate, and maintain humidifiers.
 - 1. Train Owner's maintenance personnel on procedures and schedules for starting and stopping, troubleshooting, servicing, and maintaining equipment and schedules.
 - 2. Review data in maintenance manuals. Refer to Division 1 Section "Contract Closeout."

3. Review data in maintenance manuals. Refer to Division 1 Section "Operation and Maintenance Data."
4. Schedule training with Owner, through Architect, with at least seven days advance

END OF SECTION

SECTION 23 7413

PACKAGED OUTDOOR CENTRAL-STATION AIR-HANDLING UNITS

PART 1 GENERAL

1.01 SECTION INCLUDES

- A. Packaged roof top unit.
- B. Unit controls.
- C. Roof mounting curb and base.
- D. Maintenance service.

1.02 REFERENCE STANDARDS

- A. AHRI 210/240 - Standard for Performance Rating of Unitary Air-Conditioning and Air-Source Heat Pump Equipment; 2008, Including All Addenda.
- B. AHRI 270 - Sound Performance Rating of Outdoor Unitary Equipment; 2015.
- C. NFPA 90A - Standard for the Installation of Air-Conditioning and Ventilating Systems; 2018.

1.03 SUBMITTALS

- A. See Section 01 3000 - Administrative Requirements, for submittal procedures.
- B. Product Data: Provide capacity and dimensions of manufactured products and assemblies required for this project. Indicate electrical service with electrical characteristics and connection requirements, and duct connections.

PART 2 PRODUCTS

2.01 MANUFACTURERS

- A. Carrier, a part of UTC Building and Industrial Systems, a unit of United Technologies Corp: www.carrier.com/#sle.
- B. Trane, a brand of Ingersoll Rand: www.trane.com/#sle.
- C. York International Corporation/Johnson Controls Inc: www.johnsoncontrols.com/#sle.
- D. Aeon
- E. or approved equal

2.02 MANUFACTURED UNITS

- A. General: Roof mounted units having gas burner and electric refrigeration.
- B. Description: Self-contained, packaged, factory assembled and prewired, consisting of cabinet and frame, supply fan, return fan, heat exchanger and burner, heat recovery coil, controls, air filters, refrigerant cooling coil and compressor, condenser coil and condenser fan.

2.03 FABRICATION

- A. Cabinet: Steel with baked enamel finish, including access panels with screwdriver operated flush cam type fasteners. Structural members shall be minimum 18 gauge, 0.0478 inch (1.21 mm), with access doors or panels of minimum 20 gauge, 0.0359 inch (0.91 mm).
- B. Heat Exchangers: Aluminized steel, of welded construction.
- C. Supply and Return Fan: Forward curved centrifugal type, resiliently mounted with V-belt drive, adjustable variable pitch pulley, and rubber isolated hinge mounted high efficiency motor or direct drive as indicated. Isolate complete fan assembly. Refer to Section 23 0548.
- D. Roof Mounting Curb: 24 inches (610 mm) high galvanized steel, channel frame with gaskets, nailer strips.

2.04 BURNER

- A. Gas Burner: Atmospheric type burner with adjustable combustion air supply, pressure regulator, gas valves, manual shut-off, intermittent spark or glow coil ignition, flame sensing device, and automatic 100 percent shut-off pilot.

- B. Gas Burner Safety Controls: Energize ignition, limit time for establishment of flame, prevent opening of gas valve until pilot flame is proven, stop gas flow on ignition failure, energize blower motor, and after air flow proven and slight delay, allow gas valve to open.

2.05 OPERATING CONTROLS

- A. Provide low voltage, adjustable room thermostat to control burner operation, compressor and condenser fan, and supply fan to maintain temperature setting.
 - 1. Include system selector switch (heat-off-cool) and fan control switch (auto-on).

2.06 OPERATING CONTROLS - SINGLE ZONE UNITS

- A. Electric solid state microcomputer based room thermostat, located as indicated in service area with remote sensor located as indicated.

2.07 HEAT RECOVERY COIL

- A. Provide copper tube aluminum fin coil assembly with multiple circuits arranged to provide heat recovery.

PART 3 EXECUTION

3.01 EXAMINATION

- A. Verify that roof is ready to receive work and opening dimensions are as indicated on shop drawings.
- B. Verify that proper power supply is available.

3.02 INSTALLATION

- A. Install in accordance with manufacturer's instructions.
- B. Mount units on factory built roof mounting curb providing watertight enclosure to protect ductwork and utility services. Install roof mounting curb level.

3.03 SYSTEM STARTUP

- A. Prepare and start equipment. Adjust for proper operation.

3.04 MAINTENANCE

- A. Provide service and maintenance of packaged roof top units for one year year from Date of Substantial Completion.
- B. Provide routine maintenance service with a two month interval as maximum time period between calls.
- C. Include maintenance items as outlined in manufacturer's operating and maintenance data, including minimum of six filter replacements, minimum of one fan belt replacement, and controls check-out, adjustments, and recalibration.
- D. After each service call, submit copy of service call work order or report that includes description of work performed.

END OF SECTION

SECTION 23 8119

SELF-CONTAINED AIR-CONDITIONERS

<<<< UPDATE NOTES

PART 1 GENERAL

2.01 SECTION INCLUDES

- A. Packaged terminal air conditioning units.
- B. Controls.

2.02 REFERENCE STANDARDS

- A. AHRI 210/240 - Standard for Performance Rating of Unitary Air-Conditioning and Air-Source Heat Pump Equipment; 2008, Including All Addenda.
- B. AHRI 270 - Sound Performance Rating of Outdoor Unitary Equipment; 2015.

2.03 SUBMITTALS

- A. See Section 01 3000 - Administrative Requirements, for submittal procedures.
- B. Product Data: Provide drawings indicating dimensions, rough-in connections, and electrical characteristics and connection requirements.

PART 2 PRODUCTS

3.01 MANUFACTURERS

- A. Carrier, a part of UTC Building and Industrial Systems, a unit of United Technologies Corp: www.carrier.com/#sle.
- B. Trane, a brand of Ingersoll Rand: www.trane.com/#sle.
- C. York International Corporation/Johnson Controls Inc: www.york.com/#sle.
- D. Friedrich Corporation.
- E. or approved equal

3.02 AIR CONDITIONING UNITS

- A. Description: Packaged, self-contained, through-the-wall air cooled terminal air conditioning units, with wall sleeve, room cabinet, electric refrigeration system, electric heating, outside air louvers, built-in temperature controls; fully charged with refrigerant and filled with oil.
- B. Electrical Characteristics:
- C. Energy Efficiency:

3.03 CABINET

- A. Discharge Grille and Access Door: Removable punched louver discharge grilles, allowing 4-way discharge air pattern with hinged door in top of cabinet for access to controls.

3.04 CHASSIS

- A. Refrigeration System:
 - 1. Direct expansion cooling coil.
 - 2. Hermetically sealed compressor with internal spring isolation, external isolation, permanent split capacitor motor and overload protection.
 - 3. Accumulator.
- B. Air System: Centrifugal forward curved tangential evaporator fans with two speed permanent split capacitor motor, permanent washable filters, positive pressure ventilation damper with concealed manual operator.
- C. Condensate Drain: Drain pan to direct condensate to condenser coil for re-evaporation.

3.05 CONTROLS

- A. Control Module: Unit mounted adjustable thermostat with heat anticipator, heat-off-cool switch, high-low fan switch.

PART 3 EXECUTION

4.01 INSTALLATION

- A. Install in accordance with manufacturer's instructions.
- B. Coordinate installation of units with architectural, mechanical, and electrical work.

END OF SECTION

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SECTION 23 8125

COMPUTER ROOM AIR CONDITIONERS - CEILING MOUNTED

PART 1 GENERAL

1.01 SECTION INCLUDES

- A. Air conditioning units.
- B. Controls.

1.02 SUBMITTALS

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

PART 2 PRODUCTS

2.01 MANUFACTURERS

- A. American Power Conversion Corporation, a brand of Schneider Electric: www.apcc.com/#sle.
- B. Compu-Aire, Inc: www.compu-aire.com/#sle.
- C. Liebert, a brand of Vertiv Co: www.vertivco.com/#sle.
- D. or approved equal.

2.02 AIR CONDITIONING UNITS

- A. Description: Self contained air cooled, factory assembled, pre-wired and pre-piped unit, consisting of cabinet, fan, filters, humidifier, controls.
- B. Assembly: For horizontal ceiling mounting to fit 24 by 48 inches (610 by 1220 mm) T-bar ceiling opening.
- C. Cabinet: 10 gauge, 0.1345 inch (3.42 mm) welded steel with baked enamel finish, and lined with 1/2 inch (15 mm) thick acoustic duct liner.
- D. Evaporator Fan: Forward curved centrifugal, directly driven by two speed motor.
- E. Compressor: Hermetic with resilient suspension system, oil strainer, internal motor overload protection, low pressure switch, manual reset high pressure switch.
- F. Evaporator Coil: Direct expansion cooling coil of seamless copper tubes expanded into aluminum fins, with thermal expansion valve with external equalizer, liquid line filter-drier, service shut-off valves and charging valves. Mount coil assembly in stainless steel drain pan.

2.03 CONTROL SYSTEM

- A. Controls: Solid state wall mounted with start/stop switch, adjustable humidity setpoint, adjustable temperature setpoint.

PART 3 EXECUTION

3.01 INSTALLATION

- A. Install in accordance with manufacturer's instructions.
- B. Coordinate installation of air conditioning unit with computer room ceiling installer.

END OF SECTION

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SECTION 26 0500
COMMON WORK RESULTS – ELECTRICAL

PART 1 - GENERAL

1.1 EXECUTION OF THE WORK

- A. These specifications call out certain duties of the Electrical Contractor and his Subcontractors. They are not intended as a material list of items required by the Contract. Any reference in these specifications and on the accompanying drawings to the Contractor, Electrical Contractor, Electrical Subcontractor or abbreviation "E.C.", shall be construed to mean the Contractor responsible for all electrical construction (Division 26) work for this project.
- B. This division of the specifications covers the electrical systems of the project. It includes work performed by the electrical trades as well as trades not normally considered as electrical trades.
- C. Provide all items and work indicated on the Drawings and all items and work called for in this division of the specifications in accordance with the conditions of Contract (Division 01 General Requirements Documents). This includes all incidentals, equipment, appliances services, hoisting, scaffolding, supports, tools supervision, labor consumable items, fees licenses, etc., necessary to provide complete systems. Perform start-up and checkout on each item and system to provide fully operable systems.
- D. Comply with all provisions of the Contract Documents including the General Conditions, and Division 01 General Requirements of the specifications.
- E. Certain terms such as "shall, provide, install, complete, start-up" 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.
- F. Examine and compare the Electrical Drawings with these specifications, and report any discrepancies between them to the Architect/Engineer and obtain from him written instructions for changes necessary in the work. At time of bid the most stringent requirements must be included in said bid.
- G. Examine and compare the Electrical Drawings and Specifications with the Drawings and Specifications of other trades, and report any discrepancies between them to the Architect/Engineer and obtain from him written instructions for changes necessary in the work. At time of bid, the most stringent requirements must be included in said bid.
- H. Install and coordinate the electrical work in cooperation with other trades installing interrelated work. Before installation, make proper provisions to avoid interferences in a manner approved by the Architect/Engineer. All changes required in the work of the Contractor, caused by his neglect to do so, shall be made by him at his own expense.
- H. It is the intent of the Drawings and Specifications to provide a complete workable system ready for the Owner's operation. Any item not specifically shown on the Drawings or called for in the Specifications, but normally required to conform to the intent, are to be considered a part of the Contract.
- J. These specifications are basically equipment, installation, and performance Specifications. Some installation details are indicated on the Drawings. Where these differ from the Specifications, apply the more stringent at time of bid. Upon award of bid, contact Architect/Engineer for definite instructions.
- K. All materials furnished by the Contractor shall be new and unused (temporary lighting and power products are excluded) and free from defects. All materials used shall bear the Underwriter's Laboratory, Inc. label provided a standard has been established for the material in question.

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- L. All products and materials shall be new, clean, free of defects and free of damage and corrosion.
- M. The exclusion from, or limitation in, the symbolism used on the Drawings or the language used in the Specifications for electrical work shall not be interpreted as a reason for omitting the accessories necessary to complete any required system or item of equipment.
- N. The use of words in the singular shall not be considered as limiting where other indications denote that more than one item is referred to.
- O. Except for conduit, conduit fittings, outlet boxes, wire and cable, all items of equipment or material shall be the product of one manufacturer throughout. Multiple manufacturers will not be permitted.
- P. Receive, inspect, store, install and wire Owner-furnished equipment where Owner furnished equipment is supplied.
- Q. Painting
 - 1. All manufactured electrical equipment such as switchgear, panelboards, control equipment, lighting fixtures, etc., shall have factory-applied finish as specified in the appropriate article in the Electrical Parts of the Specification.
 - 2. All other uncoated steel items such as boxes supports, hanger, rods, etc., shall be galvanized or have a shop coat of paint applied under this Part of the Specification. Normally shop coats shall be an approved primer containing at least 50 percent rust inhibitive pigment, applied before assembling the different parts.
 - 3. Including painting and retouching of:
 - a. Pre-finished enclosures of panelboards, switches, wireways, etc., where the finish has been slightly damaged in transit before assembling the different parts.
 - b. Any woodwork furnished in the electrical work.
 - c. Fixture hangers, except those received from manufacturers that are prefinished.
 - d. Miscellaneous iron brackets and supports.
 - e. Steel conduits buried in earth.
 - 4. Woodwork installed under this part of the specification shall be finished with filler sealer plus two (2) coats of PPG "Water Spar" gloss varnish.

1.2 COORDINATION OF THE WORK

- A. Certain materials will be provided by other trades. Examine the Contract Documents to ascertain these requirements.
- B. Carefully check space requirements with other trades and the physical confines of the area to ensure that all material can be installed in the spaces allotted thereto including finished suspended ceilings and the spaces within the existing building. Make modifications thereto as required and approved.
- C. No items foreign to the electrical system shall be run in the dedicated space of the electrical equipment. Dedicated space shall be defined as the width and depth of the equipment from the floor to the bottom of the structural ceiling. Foreign systems include but are not limited to ductwork, piping, sprinklers, drip trays, etc. Contractor shall be responsible to coordinate the locations of the dedicated spaces with all trades as required.

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- D. Transmit to other trades all information required for work to be provided under their respective Sections in ample time for installation.
- E. Wherever work interconnects with 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 ceiling trade will know where to install access doors and panels.
- F. Due to the type of installation, a fixed sequence of operation is required to properly install the complete systems. Coordinate, project and schedule work with other trades in accordance with the construction sequence.
- G. The locations of lighting fixtures, outlets, panels and other equipment indicated on the Drawings are approximately correct, but they are understood to be subject to such revision as may be found necessary or desirable at the time the work is installed in consequence of increase or reduction of the number of outlets, or in order to meet field conditions or to coordinate with modular requirements of ceilings, or to simplify the work, or for other legitimate causes.
- H. Exercise particular caution with reference to the location of panels, outlets, switches, etc., and have precise and definite locations approved by the Architect/Engineer before proceeding with the installation.
- I. The Drawings show only the general run of raceways and approximate location of outlets. Any significant changes in location of outlets, cabinets, etc., necessary in order to meet field conditions shall be brought to the immediate attention of the Architect/Engineer and receive his approval before such alterations are made. All such modifications shall be made without additional cost to the Owner.
- J. Obtain from the Architect/Engineer in the field, the location of such outlets or equipment not definitively located on the Drawings.
- K. Circuit "tags" in the form of arrows are used where shown to indicate the home runs of raceways to electrical distribution points. These tags show the circuits in each home run and the panel designation. Show the actual circuits numbers on the finished record tracing and on panel directory card. Where circuiting is not indicated, Electrical Contractor must provide required circuiting in accordance with the loading indicated on the drawings and/or as directed.
- L. The Drawings generally do not indicate the exact number wires in each conduit for the branch circuit wiring of fixtures, and outlets, or the actual circuiting. Provide the correct wire size and quantity as required by the indicated circuiting and/or circuit numbers indicated and control, wiring diagrams, if any, specified voltage drop or maximum distance limitations, and the applicable requirements of the NEC.
- M. Adjust location of conduits, panels, equipment, pull boxes, fixtures, etc. to accommodate the work to prevent interferences, both anticipated and encountered. Determine the exact route and location of each raceway (and bus duct) prior to fabrication.

1. Right-of-Way:

- a. Lines which pitch have the right-of-way over those which do not pitch. For example: steam, condensate, and plumbing drains normally have right-of way. Lines whose elevations cannot be changed to have right-of-way over lines whose elevations can be changed.
- b. Make offsets, transitions and changes in direction in raceways (and bus duct) as required to maintain proper headroom in pitch of sloping lines whether or not indicated on the Drawings.

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- N. Wherever the work is of sufficient complexity, prepare additional Detail Drawings to scale similar to that of the bidding Drawings, prepared on tracing medium of the same size as Contract Drawings. With these layouts, coordinate the work with the work of other trades. Such detailed work shall be clearly identified on the Drawings as to the area to which it applies. Submit for review Drawings clearly showing the work and its relation to the work of other trades before commencing shop fabrication or erection in the field.
- O. Contractor shall furnish services of an experienced Superintendent, who shall be in constant charge of all work, and who shall coordinate his work with the work of other trades. No work shall be installed before coordinating with other trades.
- P. Coordinate with contractors for work under other Divisions of this specification for all work necessary to accomplish this contractor's work.
- Q. Where electrical connections are required, to equipment provided by the Owner or by other trades, this Contractor shall verify the exact requirements for these connections prior to ordering any materials or laying out any work. Where there is a discrepancy between the equipment being furnished and that shown on the Contract Drawings, the Contractor shall notify the Architect/Engineer for direction. Failure to comply with this coordination shall not constitute a reason for extra monies for equipment ordered or installed. Restocking charges will not be paid.

1.3 EXAMINATION OF SITE

- A. Prior to the submitting of bids, the Contractor shall visit the site of the job and shall familiarize himself with all conditions affecting the proposed installation and shall make provisions as to the cost thereof. Failure to comply with the intent of this paragraph will in no way relieve the contractor of performing all necessary work shown on the Drawings.

1.4 PROGRESS OF WORK

- A. The Contractor shall order the progress of his work so as to conform to the progress of the work of other trades and shall complete the entire installation as soon as the conditions of the building will permit. Any cost resulting from the defective or ill-timed work performed under this section shall be borne by the Contractor.

1.5 DELIVERY, STORAGE, AND HANDLING

- A. Ship and store all products and materials in a manner which will protect them from damage, weather and entry of debris. If items are damaged, do not install, but take immediate steps to obtain replacement or repair. Any such repairs shall be subject to review and acceptance of the Architect/Engineer.
- B. Delivery of Materials: Deliver materials in manufacturer's unopened container fully identified with manufacturer's name, trade name, type, class, grade, size and color.
- C. Storage of Materials, Equipment and Fixtures: Store materials suitably sheltered from the elements, but readily accessibly for inspection by the Architect/Engineer until installed. Store all items, susceptible to moisture damage, in dry, heated spaces.

1.6 EQUIPMENT ACCESSORIES

- A. Provide supports, hangers and auxiliary structural members required for support of the work according to Section 26 05 29 "Hangers and Supports for Electrical Systems."
- B. Furnish and set all sleeves for passage of raceways through structural, masonry and concrete walls or floors and elsewhere as will be required for the proper protection of each raceway (and bus duct) passing through building surfaces.

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- C. Wall mounted equipment may be directly secured to wall by means of steel bolts. Maintain at least 1" air space between equipment and supporting wall. Groups or arrays of equipment may be mounted on adequately sized steel angles, channels, or bars. Prefabricated steel channels providing a high degree of mounting flexibility, such as those manufactured by Kindorf, Glob-Strutt and Unistrut, may be used for mounting arrays of equipment.

1.7 CUTTING, PATCHING

- A. The work shall be carefully laid out in advance. Where cutting, channeling, chasing or drilling of floors, walls, partitions, ceilings or other surfaces is necessary for the proper installation, support or anchorage of raceway, outlets or other equipment, the work shall be carefully done. Any damage to the building, piping, equipment or defaced finish plaster, woodwork, metalwork, etc. shall be repaired by skilled mechanics or the trades involved at no additional cost to the Owner.
- B. The Contractor shall do no cutting, channeling, chasing or drilling of unfinished masonry, tile, etc., unless he first obtains permission from the Architect/Engineer. If permission is granted, the Contractor shall perform this work in a manner approved by the Architect/Engineer
- C. Where conduits, mounting channels, outlet, junction, or pull boxes are mounted on a painted surface, or a surface to be painted, they shall be painted to match the surface. Whenever support channels are cut, the bare metal shall be cold galvanized.
- D. Slots, chases, openings and recesses through floors, walls, ceilings, and roofs will be provided by the various trades in their respective materials. The trade requiring them to properly locate such openings and be responsible for any cutting and patching caused by the neglect to do so.
- E. Structural steel fabricator and installer shall be responsible for the coordination of all framed openings in roof with approved equipment manufacturers. (Openings such as, but not limited to mechanical units, exhaust fans, curb mounted equipment, roof drains, skylights, stair openings, roof hatches, smoke hatches, duct thru roof penetrations, expansion joints, etc.)

Exact sizes and exact locations of all openings are to be verified with the approved shop drawings issued for the installation. The exact sizes shall be coordinated prior to any fabrication and installation by any/all trades. (Sizes and locations indicated on contract drawings are diagrammatic and for information only.)

Any fabrication and/or installation which have not been properly coordinated with approved equipment manufacturer and must be repaired, relocated, altered, replaced, re-installed or modified in any manner will be done to the satisfaction of the Owner with no additional cost to the Owner or design professional.

1.8 FIRESTOPPING

- A. Apply firestopping to cable and raceway penetrations of fire-rated floor and wall assemblies to achieve fire resistance of the assembly. Firestopping materials and installation requirements are specified in Division 7 Section "Firestopping".

1.9 NORMAL VOLTAGES (Unless Otherwise Noted)

- A. Primary Distribution – above 120/208 volts.
- B. Secondary Distribution – 120/208 Volt, 3 phase, 4 wire.

1.10 MOUNTING HEIGHTS

- A. Unless otherwise noted or required because of special conditions the mounting heights of all equipment shall match that in the existing building, if those mounting heights comply with A.D.A.

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1.11 DEMOLITION AND CONTINUANCE OF EXISTING SERVICES – REFER TO SECTION 26 07 00

- A. All existing electrical services not specifically indicated to be removed or altered shall remain as they presently exist.
- B. Should any existing services, etc., interfere with new construction, the Contractor shall (after obtaining written approval from the Architect/Engineer) alter or reroute such existing equipment to facilitate new construction.
- C. Shut down of existing services shall be coordinated with the Owner prior to altering any existing situation. The Contractor shall notify the Owner in writing giving two (2) weeks advance notice of planned alteration. The Electrical Contractor and Owner shall develop a sequence necessary to shutdown existing services and provide temporary power to those items which must remain active.
- D. It shall be solely the Contractor's responsibility to guarantee continuity of present facilities (with respect to damage or alteration due to new construction) and any unauthorized alteration to existing equipment shall be corrected by the Contractor to the Architect/Engineer's satisfaction at the Contractor's expense.

1.12 CLEANING UP

- A. Contractor shall take care to avoid accumulation of debris, boxes, crates, etc., resulting from the installation of his work. Contractor shall remove from the premises each day all debris, boxes, etc., and keep the premises clean, subject to the Architect/Engineer's instructions, which shall be promptly carried out.
- B. Contractor shall clean all fixtures and equipment at the completion of the project.
- C. All switchboards, panelboards, wireways, trench ducts, cabinets, enclosures, etc. shall be thoroughly vacuumed clean prior to energizing equipment and at the completion of the project. Equipment shall be opened for observation by the Architect/Engineer as required.

1.13 WATERPROOFING

- A. Avoid, if possible, the penetration of any waterproof membranes such as roofs, machine room floors, basement walls, and the like. If such penetration is necessary, perform it prior to the waterproofing and furnish all sleeves or pitch-pockets required. Advise the Architect/Engineer and obtain written permission before penetrating any waterproof membrane, even where such penetration is shown on the Drawings.
- B. If Contractor penetrates any walls or surfaces after they have been waterproofed, he shall restore the waterproof integrity of that surface as directed by the Architect/Engineer at his own expense, using workmen skilled in that trade.

1.14 SUPPORTS AND FASTENERS

- A. Provide supports, hangers and auxiliary structural members required for support of the work according to Section 26 05 29 "Hangers and Supports for Electrical Systems" and Section 26 05 48 "Vibration and Seismic Control for Electrical Components."
- B. Furnish and set all sleeves for passage of raceways through structural, masonry and concrete walls or floors and elsewhere as will be required for the proper protection of each raceway (and bus duct) passing through building surfaces.

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- C. Wall mounted equipment may be directly secured to wall by means of steel bolts. Maintain at least 1" air space between equipment and supporting wall. Groups or arrays of equipment may be mounted on adequately sized steel angles, channels, or bars. Prefabricated steel channels providing a high degree of mounting flexibility, such as those manufactured by Kindorf, Glob-Strutt and Unistrut, may be used for mounting arrays of equipment.

1.15 PROHIBITED LABELS AND IDENTIFICATIONS

- A. Prohibited Markings: In all public areas, tenant areas and similar locations within the project, the inclusion or installation of any item, element or assembly which bears on any exposed surface any name, trademark, or other insignia which is intended to identify the manufacturer, the vendor, or other source(s) from which such object has been obtained, is prohibited. Also prohibited is the inclusion or installation of any article which bears visible evidence that an insignia, name, label, or other device had been removed.
- B. Exception: Required Underwriter's Laboratory labels shall not be removed nor shall identification specifically required under the various technical sections of the specifications be removed.

1.16 CONNECTION TO EXISTING UTILITIES AND SYSTEMS

- A. If connecting to an existing system, the Electrical Contractor shall be responsible to verify the integrity of the system being connected to. All applicable testing and acceptance will apply.

PART 2 - PRODUCTS

2.1 MATERIALS

- A. If products and materials are specified or indicated on the Drawings for a specific item or system, use those products or materials. If products and materials are not listed in either of the above, use first class products and materials, subject to approval of Shop Drawings where Shop Drawings are required or as approved in writing where Shop Drawings are not required.
- B. All equipment capacities, etc. are listed for job site operating conditions. All equipment sensitive to altitudes or ambient temperatures shall be derated and method of derating shown on Shop Drawings. Where operating conditions shown differ from the laboratory test conditions, the equipment shall be derated and the method of derating shown on Shop Drawings.

PART 3 - EXECUTION

3.1 INSTALLATION

- A. Follow manufacturer's instructions for installing, connecting, and adjusting all equipment. Provide one copy of such instructions to the Architect/Engineer before installing any equipment. Provide a copy of such instructions at the equipment during any work on the equipment. Provide all special supports, connections, wiring, accessories, etc.
- B. Use mechanics skilled in their trade for all work.
- C. Keep all items protected before and after installation. Clean up all debris.
- D. Perform all tests required by local authorities in addition to tests specified herein, such as life safety systems.

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- E. Applicable equipment and materials to be listed by Underwriters' Laboratories and Manufactured in accordance with ASME, NEMA, ANSI or IEEE standards, and as approved by local authorities having jurisdiction as mentioned in Division 1.
- F. Before commencing Work, examine all adjoining, underlying. Work on which this Work is in any way dependent for perfect workmanship and report any condition which prevents performance of first class work. Become thoroughly familiar with actual existing conditions to which connections must be made or which must be changed or altered.

3.2 PREMIUM TIME WORK

- A. The following Work shall be performed at night or weekend other than holiday weekends as directed and coordinated with the Owner.
 - 1. All tie-in, cut-over and modifications to the existing electrical system and other existing system requiring tie-ins or modifications shall be arranged and scheduled with the Owner to be done at a time as to maintain continuity of the service and not interfere with normal building operations.

3.3 PROJECT MANAGEMENT AND COORDINATION

- A. Coordination: Coordinate construction operations included in different Sections of the Specification to ensure efficient and orderly installation of each part of the work. Coordinate construction operations, included in different Sections that depend on each other for proper installation, connection, and operation.
 - 1. Schedule construction operations in sequence required to obtain the best results where installation of one part of the work depends on installation of other components, before or after its own installation.
 - 2. Coordinate installation of different components with other contractors to ensure maximum accessibility for required maintenance, service, and repair.
 - 3. Make adequate provisions to accommodate items scheduled for later installation.
 - 4. Where availability of space is limited, coordinate installation of different components to ensure maximum performance and accessibility for required maintenance, service, and repair of all components, including mechanical and electrical.
- B. Prepare memoranda for distribution to each party involved, outlining special procedures required for coordination. Include such items as required notices, reports, and list of attendees at meetings.
 - 1. Prepare similar memoranda for Owner and separate contractors if coordination of their work is required.
- C. Administrative Procedures: Coordinate scheduling and timing of required administrative procedures with other construction activities and activities of other contractors to avoid conflicts and to ensure orderly progress of the work. Such administrative activities include, but are not limited to, the following:
 - 1. Preparation of Contractor's Construction Schedule
 - 2. Preparation of the Schedule of Values
 - 3. Installation and removal of temporary facilities and controls
 - 4. Delivery and processing of submittals
 - 5. Progress meetings
 - 6. Pre-installation conferences

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7. Project closeout activities
8. Startup and adjustment of systems
9. Project closeout activities

- D. Conservation: Coordinate construction activities to ensure that operations are carried out with consideration given to conservation of energy, water, and materials.
1. Salvage materials and equipment involved in performance of, but not actually incorporated into the work. Refer to other Sections for disposition of salvaged materials that are designated as Owner's property.

3.4 SUBMITTALS

- A. Coordination Drawings: Prepare Coordination Drawings if limited space availability necessitates maximum utilization of space for efficient installation of different components or if coordination is required for installation of products and materials fabricated by separate entities.
1. Content: Project-specific information, drawn accurately to scale. Do not base Coordination Drawings on reproductions of the Contract Documents or standard printed data. Include the following information, as applicable:
 - a. Indicate functional and spatial relationships of components of architectural, structural, civil, mechanical, and electrical systems.
 - b. Indicate required installation sequence.
 - c. Indicate dimensions shown on the Contract Drawings and make specific note of dimensions that appear to be in conflict with submitted equipment and minimum clearance requirements. Provide alternate sketches to Architect for resolution of such conflicts. Minor dimension changes and difficult installations will not be considered changes to the Contract.
 2. Number of Copies: Submit three opaque copies of each submittal. Architect, through Construction Manager, will return one copy.
 - a. Submit five copies where Coordination Drawings are required for operation and maintenance manuals. Architect and Construction Manager will retain two copies; remainder will be returned. Markup and retain one returned copy as a Project Record Drawing.
 3. Refer to individual Sections for Coordination Drawing requirements for work in those Sections.
- B. Key Personnel Names: Within 15 days of starting construction operations, submit a list of key personnel assignments, including superintendent and other personnel in attendance at Project Site. Identify individuals and their duties and responsibilities; list addresses and telephone numbers, including home and office telephone numbers. Provide names, addresses, and telephone numbers of individuals assigned as standbys in the absence of individuals assigned to Project.
1. Post copies of list in Project meeting room, in temporary field office, and by each temporary telephone. Keep list current at all times.

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3.5 ADMINISTRATIVE AND SUPERVISORY PERSONNEL

- A. General: In addition to Project Superintendent, provide other administrative and supervisory personnel as required for proper performance of the work.

3.6 PROJECT MEETINGS

- A. General: Attend meetings and conferences at Project Site, unless otherwise indicated.
- B. Preconstruction Conference: Attend a preconstruction conference before starting construction, at a time convenient to Owner, Construction Manager, and Architect, but no later than 15 days after execution of the Agreement.

END OF SECTION

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SECTION 26 0505

SELECTIVE DEMOLITION FOR ELECTRICAL

PART 1 GENERAL

1.01 SECTION INCLUDES

- A. Electrical demolition.

1.02 SUBMITTALS

- A. See Section 01 3000 - Administrative Requirements, for submittal procedures.
- B. Sustainable Design Documentation: Submit certification of removal and appropriate disposal of abandoned cables containing lead stabilizers.

PART 2 PRODUCTS

2.01 MATERIALS AND EQUIPMENT

- A. Materials and equipment for patching and extending work: As specified in individual sections.

PART 3 EXECUTION

3.01 EXAMINATION

- A. Verify that abandoned wiring and equipment serve only abandoned facilities.
- B. Demolition drawings are based on casual field observation and existing record documents.
- C. Report discrepancies to Engineer before disturbing existing installation
- D. Beginning of demolition means installer accepts existing conditions.

3.02 PREPARATION

- A. Disconnect electrical systems in walls, floors, and ceilings to be removed.
- B. Coordinate utility service outages with utility company.
- C. Provide temporary wiring and connections to maintain existing systems in service during construction. When work must be performed on energized equipment or circuits, use personnel experienced in such operations.
- D. Existing Electrical Service: Disable system only to make switchovers and connections. Minimize outage duration.
- E. Existing Fire Alarm System: Disable system only to make switchovers and connections. Minimize outage duration.
 - 1. Notify Owner before partially or completely disabling system.
 - 2. Make temporary connections to maintain service in areas adjacent to work area.

3.03 DEMOLITION AND EXTENSION OF EXISTING ELECTRICAL WORK

- A. Remove, relocate, and extend existing installations to accommodate new construction.
- B. Remove abandoned wiring to source of supply.
- C. Remove exposed abandoned conduit, including abandoned conduit above accessible ceiling finishes. Cut conduit flush with walls and floors, and patch surfaces.
- D. Disconnect abandoned outlets and remove devices. Remove abandoned outlets if conduit servicing them is abandoned and removed. Provide blank cover for abandoned outlets that are not removed.
- E. Disconnect and remove electrical devices and equipment serving utilization equipment that has been removed.
- F. Repair adjacent construction and finishes damaged during demolition and extension work.
- G. Maintain access to existing electrical installations that remain active. Modify installation or provide access panel as appropriate.

3.04 CLEANING AND REPAIR

- A. Clean and repair existing materials and equipment that remain or that are to be reused.
- B. Panelboards: Clean exposed surfaces and check tightness of electrical connections. Replace damaged circuit breakers and provide closure plates for vacant positions. Provide typed circuit directory showing revised circuiting arrangement.

END OF SECTION

SECTION 26 0519

LOW-VOLTAGE ELECTRICAL POWER CONDUCTORS AND CABLES

PART 1 GENERAL

1.01 SECTION INCLUDES

- A. Single conductor building wire.
- B. Metal-clad cable.
- C. Wiring connectors.
- D. Electrical tape.
- E. Wire pulling lubricant.
- F. Cable ties.

1.02 REFERENCE STANDARDS

- A. ASTM B3 - Standard Specification for Soft or Annealed Copper Wire; 2013.
- B. ASTM B8 - Standard Specification for Concentric-Lay-Stranded Copper Conductors, Hard, Medium-Hard, or Soft; 2011 (Reapproved 2017).
- C. ASTM B33 - Standard Specification for Tin-Coated Soft or Annealed Copper Wire for Electrical Purposes; 2010 (Reapproved 2014).
- D. ASTM B787/B787M - Standard Specification for 19 Wire Combination Unilay-Stranded Copper Conductors for Subsequent Insulation; 2004 (Reapproved 2014).
- E. ASTM D3005 - Standard Specification for Low-Temperature Resistant Vinyl Chloride Plastic Pressure-Sensitive Electrical Insulating Tape; 2017.
- F. NECA 1 - Standard for Good Workmanship in Electrical Construction; 2015.
- G. NEMA WC 70 - Power Cables Rated 2000 Volts or Less for the Distribution of Electrical Energy; 2009.
- H. NFPA 70 - National Electrical Code; Most Recent Edition Adopted by Authority Having Jurisdiction, Including All Applicable Amendments and Supplements.
- I. UL 44 - Thermoset-Insulated Wires and Cables; Current Edition, Including All Revisions.
- J. UL 83 - Thermoplastic-Insulated Wires and Cables; Current Edition, Including All Revisions.
- K. UL 486A-486B - Wire Connectors; Current Edition, Including All Revisions.
- L. UL 486C - Splicing Wire Connectors; Current Edition, Including All Revisions.
- M. UL 510 - Polyvinyl Chloride, Polyethylene, and Rubber Insulating Tape; Current Edition, Including All Revisions.

1.03 ADMINISTRATIVE REQUIREMENTS

- A. Coordination:
 - 1. Coordinate sizes of raceways, boxes, and equipment enclosures installed under other sections with the actual conductors to be installed, including adjustments for conductor sizes increased for voltage drop.
 - 2. Coordinate with electrical equipment installed under other sections to provide terminations suitable for use with the conductors to be installed.

1.04 SUBMITTALS

- A. See Section 01 3000 - Administrative Requirements, for submittal procedures.
- B. Product Data: Provide manufacturer's standard catalog pages and data sheets for conductors and cables, including detailed information on materials, construction, ratings, listings, and available sizes, configurations, and stranding.

1.05 QUALITY ASSURANCE

- A. Comply with requirements of NFPA 70.

PART 2 PRODUCTS

2.01 CONDUCTOR AND CABLE APPLICATIONS

- A. Do not use conductors and cables for applications other than as permitted by NFPA 70 and product listing.
- B. Provide single conductor building wire installed in suitable raceway unless otherwise indicated, permitted, or required.
- C. Nonmetallic-sheathed cable is not permitted.
- D. Underground feeder and branch-circuit cable is not permitted.
- E. Service entrance cable is not permitted.
- F. Metal-clad cable is permitted for final connections..
 - 1. Where not otherwise restricted, may be used:
 - a. For final connections from junction boxes to equipment.
 - 1) Maximum Length: 6 feet (1.8 m).

2.02 CONDUCTOR AND CABLE GENERAL REQUIREMENTS

- A. Provide products that comply with requirements of NFPA 70.
- B. Provide products listed, classified, and labeled as suitable for the purpose intended.
- C. Unless specifically indicated to be excluded, provide all required conduit, boxes, wiring, connectors, etc. as required for a complete operating system.
- D. Comply with NEMA WC 70.
- E. Thermoplastic-Insulated Conductors and Cables: Listed and labeled as complying with UL 83.
- F. Thermoset-Insulated Conductors and Cables: Listed and labeled as complying with UL 44.
- G. Conductor Material:
 - 1. Provide copper conductors only. Aluminum conductors are not acceptable for this project. Conductor sizes indicated are based on copper.
 - 2. Copper Conductors: Soft drawn annealed, 98 percent conductivity, uncoated copper conductors complying with ASTM B3, ASTM B8, or ASTM B787/B787M unless otherwise indicated.
 - 3. Tinned Copper Conductors: Comply with ASTM B33.
- H. Minimum Conductor Size:
 - 1. Branch Circuits: 12 AWG.
 - a. Exceptions:
 - 1) 20 A, 120 V circuits longer than 75 feet (23 m): 10 AWG, for voltage drop.
 - 2) 20 A, 120 V circuits longer than 150 feet (46 m): 8 AWG, for voltage drop.
 - 2. Control Circuits: 14 AWG.
- I. Where conductor size is not indicated, size to comply with NFPA 70 but not less than applicable minimum size requirements specified.
- J. Conductor Color Coding:
 - 1. Color code conductors as indicated unless otherwise required by the authority having jurisdiction. Maintain consistent color coding throughout project.
 - 2. Color Coding Method: Integrally colored insulation.
 - 3. Color Code:
 - a. 208Y/120 V, 3 Phase, 4 Wire System:
 - 1) Phase A: Black.
 - 2) Phase B: Red.
 - 3) Phase C: Blue.
 - 4) Neutral/Grounded: White.
 - b. Equipment Ground, All Systems: Green.
 - c. For modifications or additions to existing wiring systems, comply with existing color code when existing code complies with NFPA 70 and is approved by the authority having jurisdiction.

- d. For control circuits, comply with manufacturer's recommended color code.

2.03 SINGLE CONDUCTOR BUILDING WIRE

- A. Manufacturers:
 - 1. Copper Building Wire:
 - a. Cerro Wire LLC: www.cerrowire.com/#sle.
 - b. Encore Wire Corporation: www.encorewire.com/#sle.
 - c. General Cable Technologies Corporation: www.generalcable.com/#sle.
 - d. Southwire Company: www.southwire.com/#sle.
 - e. Substitutions: See Section 01 6000 - Product Requirements.
- B. Description: Single conductor insulated wire.
- C. Conductor Stranding:
 - 1. Feeders and Branch Circuits:
 - a. Size 10 AWG and Smaller: Solid.
 - b. Size 8 AWG and Larger: Stranded.
- D. Insulation Voltage Rating: 600 V.
- E. Insulation:
 - 1. Copper Building Wire: Type THHN/THWN or THHN/THWN-2, except as indicated below.

2.04 WIRING CONNECTORS

- A. Description: Wiring connectors appropriate for the application, suitable for use with the conductors to be connected, and listed as complying with UL 486A-486B or UL 486C as applicable.
- B. Do not use insulation-piercing or insulation-displacement connectors designed for use with conductors without stripping insulation.
- C. Do not use push-in wire connectors as a substitute for twist-on insulated spring connectors.

2.05 ACCESSORIES

- A. Electrical Tape:
 - 1. Vinyl Color Coding Electrical Tape: Integrally colored to match color code indicated; listed as complying with UL 510; minimum thickness of 7 mil (0.18 mm); resistant to abrasion, corrosion, and sunlight; suitable for continuous temperature environment up to 221 degrees F (105 degrees C).
 - 2. Vinyl Insulating Electrical Tape: Complying with ASTM D3005 and listed as complying with UL 510; minimum thickness of 7 mil (0.18 mm); resistant to abrasion, corrosion, and sunlight; conformable for application down to 0 degrees F (-18 degrees C) and suitable for continuous temperature environment up to 221 degrees F (105 degrees C).
- B. Wire Pulling Lubricant: Listed; suitable for use with the conductors or cables to be installed and suitable for use at the installation temperature.
- C. Cable Ties: Material and tensile strength rating suitable for application.

PART 3 EXECUTION

3.01 INSTALLATION

- A. Install products in accordance with manufacturer's instructions.
- B. Perform work in accordance with NECA 1 (general workmanship).
- C. Installation in Raceway:
 - 1. Tape ends of conductors and cables to prevent infiltration of moisture and other contaminants.
 - 2. Pull all conductors and cables together into raceway at same time.
 - 3. Do not damage conductors and cables or exceed manufacturer's recommended maximum pulling tension and sidewall pressure.
 - 4. Use suitable wire pulling lubricant where necessary, except when lubricant is not recommended by the manufacturer.
- D. Paralleled Conductors: Install conductors of the same length and terminate in the same manner.

- E. Secure and support conductors and cables in accordance with NFPA 70 using suitable supports and methods approved by the authority having jurisdiction. Provide independent support from building structure. Do not provide support from raceways, piping, ductwork, or other systems.
- F. Install conductors with a minimum of 12 inches (300 mm) of slack at each outlet.
- G. Neatly train and bundle conductors inside boxes, wireways, panelboards and other equipment enclosures.
- H. Group or otherwise identify neutral/grounded conductors with associated ungrounded conductors inside enclosures in accordance with NFPA 70.
- I. Make wiring connections using specified wiring connectors.
 - 1. Make splices and taps only in accessible boxes. Do not pull splices into raceways or make splices in conduit bodies or wiring gutters.
 - 2. Remove appropriate amount of conductor insulation for making connections without cutting, nicking or damaging conductors.
 - 3. Do not remove conductor strands to facilitate insertion into connector.
 - 4. Clean contact surfaces on conductors and connectors to suitable remove corrosion, oxides, and other contaminates. Do not use wire brush on plated connector surfaces.
- J. Insulate splices and taps that are made with uninsulated connectors using methods suitable for the application, with insulation and mechanical strength at least equivalent to unspliced conductors.
- K. Insulate ends of spare conductors using vinyl insulating electrical tape.
- L. Install firestopping to preserve fire resistance rating of partitions and other elements, using materials and methods specified in Section 07 8400.
- M. Unless specifically indicated to be excluded, provide final connections to all equipment and devices, including those furnished by others, as required for a complete operating system.

END OF SECTION

SECTION 26 0526

GROUNDING AND BONDING FOR ELECTRICAL SYSTEMS

PART 1 GENERAL

1.01 SECTION INCLUDES

- A. Grounding and bonding requirements.
- B. Conductors for grounding and bonding.
- C. Connectors for grounding and bonding.

1.02 RELATED REQUIREMENTS

- A. Section 26 0519 - Low-Voltage Electrical Power Conductors and Cables: Additional requirements for conductors for grounding and bonding, including conductor color coding.
- B. Section 26 0553 - Identification for Electrical Systems: Identification products and requirements.

1.03 REFERENCE STANDARDS

- A. NECA 1 - Standard for Good Workmanship in Electrical Construction; 2015.
- B. NETA ATS - Acceptance Testing Specifications for Electrical Power Equipment and Systems; 2017.
- C. NFPA 70 - National Electrical Code; Most Recent Edition Adopted by Authority Having Jurisdiction, Including All Applicable Amendments and Supplements.
- D. UL 467 - Grounding and Bonding Equipment; Current Edition, Including All Revisions.

1.04 SUBMITTALS

- A. See Section 01 3000 - Administrative Requirements for submittals procedures.

1.05 QUALITY ASSURANCE

- A. Comply with requirements of NFPA 70.

PART 2 PRODUCTS

2.01 GROUNDING AND BONDING REQUIREMENTS

- A. Existing Work: Where existing grounding and bonding system components are indicated to be reused, they may be reused only where they are free from corrosion, integrity and continuity are verified, and where acceptable to the authority having jurisdiction.
- B. Do not use products for applications other than as permitted by NFPA 70 and product listing.
- C. Unless specifically indicated to be excluded, provide all required components, conductors, connectors, conduit, boxes, fittings, supports, accessories, etc. as necessary for a complete grounding and bonding system.
- D. Where conductor size is not indicated, size to comply with NFPA 70 but not less than applicable minimum size requirements specified.

2.02 GROUNDING AND BONDING COMPONENTS

- A. General Requirements:
 - 1. Provide products listed, classified, and labeled as suitable for the purpose intended.
 - 2. Provide products listed and labeled as complying with UL 467 where applicable.
- B. Conductors for Grounding and Bonding, in Addition to Requirements of Section 26 0526:
 - 1. Use insulated copper conductors unless otherwise indicated.
 - a. Exceptions:
 - 1) Use bare copper conductors where installed underground in direct contact with earth.
 - 2) Use bare copper conductors where directly encased in concrete (not in raceway).
- C. Connectors for Grounding and Bonding:
 - 1. Description: Connectors appropriate for the application and suitable for the conductors and items to be connected; listed and labeled as complying with UL 467.
 - 2. Unless otherwise indicated, use exothermic welded connections for underground, concealed and other inaccessible connections.

3. Unless otherwise indicated, use mechanical connectors, compression connectors, or exothermic welded connections for accessible connections.

PART 3 EXECUTION

3.01 INSTALLATION

- A. Install products in accordance with manufacturer's instructions.
- B. Perform work in accordance with NECA 1 (general workmanship).
- C. Make grounding and bonding connections using specified connectors.
 1. Remove appropriate amount of conductor insulation for making connections without cutting, nicking or damaging conductors. Do not remove conductor strands to facilitate insertion into connector.
 2. Remove nonconductive paint, enamel, or similar coating at threads, contact points, and contact surfaces.
 3. Exothermic Welds: Make connections using molds and weld material suitable for the items to be connected in accordance with manufacturer's recommendations.
 4. Mechanical Connectors: Secure connections according to manufacturer's recommended torque settings.
 5. Compression Connectors: Secure connections using manufacturer's recommended tools and dies.
- D. Identify grounding and bonding system components in accordance with Section 26 0553.

3.02 FIELD QUALITY CONTROL

- A. Inspect and test in accordance with NETA ATS except Section 4.
- B. Perform inspections and tests listed in NETA ATS, Section 7.13.

END OF SECTION

SECTION 26 0529

HANGERS AND SUPPORTS FOR ELECTRICAL SYSTEMS

PART 1 GENERAL

1.01 SECTION INCLUDES

- A. Support and attachment requirements and components for equipment, conduit, cable, boxes, and other electrical work.

1.02 RELATED REQUIREMENTS

- A. Section 03 3000 - Cast-in-Place Concrete: Concrete equipment pads.

1.03 REFERENCE STANDARDS

- A. ASTM A123/A123M - Standard Specification for Zinc (Hot-Dip Galvanized) Coatings on Iron and Steel Products; 2017.
- B. ASTM A153/A153M - Standard Specification for Zinc Coating (Hot-Dip) on Iron and Steel Hardware; 2016a.
- C. ASTM B633 - Standard Specification for Electrodeposited Coatings of Zinc on Iron and Steel; 2015.
- D. MFMA-4 - Metal Framing Standards Publication; 2004.
- E. NECA 1 - Standard for Good Workmanship in Electrical Construction; 2015.
- F. NFPA 70 - National Electrical Code; Most Recent Edition Adopted by Authority Having Jurisdiction, Including All Applicable Amendments and Supplements.

1.04 ADMINISTRATIVE REQUIREMENTS

- A. Coordination:
 - 1. Coordinate sizes and arrangement of supports and bases with the actual equipment and components to be installed.
 - 2. Coordinate the work with other trades to provide additional framing and materials required for installation.
 - 3. Coordinate compatibility of support and attachment components with mounting surfaces at the installed locations.
 - 4. Coordinate the arrangement of supports with ductwork, piping, equipment and other potential conflicts installed under other sections or by others.
- B. Sequencing:
 - 1. Do not install products on or provide attachment to concrete surfaces until concrete has fully cured in accordance with Section 03 3000.

1.05 SUBMITTALS

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

1.06 QUALITY ASSURANCE

- A. Comply with NFPA 70.
- B. Comply with applicable building code.

PART 2 PRODUCTS

2.01 SUPPORT AND ATTACHMENT COMPONENTS

- A. General Requirements:
 - 1. Provide all required hangers, supports, anchors, fasteners, fittings, accessories, and hardware as necessary for the complete installation of electrical work.
 - 2. Provide products listed, classified, and labeled as suitable for the purpose intended, where applicable.

3. Where support and attachment component types and sizes are not indicated, select in accordance with manufacturer's application criteria as required for the load to be supported. Include consideration for vibration, equipment operation, and shock loads where applicable.
4. Do not use products for applications other than as permitted by NFPA 70 and product listing.
5. Do not use wire, chain, perforated pipe strap, or wood for permanent supports unless specifically indicated or permitted.
6. Steel Components: Use corrosion resistant materials suitable for the environment where installed.
 - a. Indoor Dry Locations: Use zinc-plated steel unless otherwise indicated.
 - b. Zinc-Plated Steel: Electroplated in accordance with ASTM B633.
 - c. Galvanized Steel: Hot-dip galvanized after fabrication in accordance with ASTM A123/A123M or ASTM A153/A153M.
- B. Conduit and Cable Supports: Straps, clamps, etc. suitable for the conduit or cable to be supported.
 1. Conduit Straps: One-hole or two-hole type; steel or malleable iron.
 2. Conduit Clamps: Bolted type unless otherwise indicated.
- C. Outlet Box Supports: Hangers, brackets, etc. suitable for the boxes to be supported.
- D. Metal Channel (Strut) Framing Systems: Factory-fabricated continuous-slot metal channel (strut) and associated fittings, accessories, and hardware required for field-assembly of supports.
 1. Comply with MFMA-4.
 2. Minimum Channel Thickness: Steel sheet, 12 gage, 0.1046 inch (2.66 mm).
 3. Minimum Channel Dimensions: 1-5/8 inch (41 mm) width by 13/16 inch (21 mm) height.
- E. Hanger Rods: Threaded zinc-plated steel unless otherwise indicated.
 1. Minimum Size, Unless Otherwise Indicated or Required:
 - a. Equipment Supports: 1/2 inch (13 mm) diameter.
 - b. Single Conduit up to 1 inch (27 mm) trade size: 1/4 inch (6 mm) diameter.
 - c. Single Conduit larger than 1 inch (27 mm) trade size: 3/8 inch (10 mm) diameter.
- F. Anchors and Fasteners:
 1. Unless otherwise indicated and where not otherwise restricted, use the anchor and fastener types indicated for the specified applications.
 2. Concrete: Use preset concrete inserts, expansion anchors, or screw anchors.
 3. Hollow Stud Walls: Use toggle bolts.
 4. Steel: Use beam clamps, machine bolts, or welded threaded studs.
 5. Sheet Metal: Use sheet metal screws.
 6. Wood: Use wood screws.
 7. Preset Concrete Inserts: Continuous metal channel (strut) and spot inserts specifically designed to be cast in concrete ceilings, walls, and floors.
 - a. Comply with MFMA-4.
 - b. Channel Material: Use galvanized steel.
 - c. Manufacturer: Same as manufacturer of metal channel (strut) framing system.

PART 3 EXECUTION

3.01 EXAMINATION

- A. Verify that field measurements are as indicated.
- B. Verify that mounting surfaces are ready to receive support and attachment components.
- C. Verify that conditions are satisfactory for installation prior to starting work.

3.02 INSTALLATION

- A. Install products in accordance with manufacturer's instructions.
- B. Perform work in accordance with NECA 1 (general workmanship).
- C. Provide independent support from building structure. Do not provide support from piping, ductwork, or other systems.

- D. Unless specifically indicated or approved by Engineer, do not provide support from suspended ceiling support system or ceiling grid.
- E. Unless specifically indicated or approved by Engineer, do not provide support from roof deck.
- F. Do not penetrate or otherwise notch or cut structural members without approval of Structural Engineer.
- G. Equipment Support and Attachment:
 - 1. Use metal fabricated supports or supports assembled from metal channel (strut) to support equipment as required.
 - 2. Use metal channel (strut) secured to studs to support equipment surface-mounted on hollow stud walls when wall strength is not sufficient to resist pull-out.
 - 3. Use metal channel (strut) to support surface-mounted equipment in wet or damp locations to provide space between equipment and mounting surface.
 - 4. Securely fasten floor-mounted equipment. Do not install equipment such that it relies on its own weight for support.
- H. Preset Concrete Inserts: Use manufacturer provided closure strips to inhibit concrete seepage during concrete pour.
- I. Secure fasteners according to manufacturer's recommended torque settings.
- J. Remove temporary supports.

END OF SECTION

SECTION 26 0533.13
CONDUIT FOR ELECTRICAL SYSTEMS

PART 1 GENERAL

1.01 SECTION INCLUDES

- A. Galvanized steel rigid metal conduit (RMC).
- B. Liquidtight flexible metal conduit (LFMC).
- C. Electrical metallic tubing (EMT).
- D. Conduit fittings.
- E. Accessories.

1.02 REFERENCE STANDARDS

- A. ANSI C80.1 - American National Standard for Electrical Rigid Steel Conduit (ERSC); 2015.
- B. ANSI C80.3 - American National Standard for Electrical Metallic Tubing -- Steel (EMT-S); 2015.
- C. ANSI C80.6 - American National Standard for Electrical Intermediate Metal Conduit (EIMC); 2005.
- D. NECA 1 - Standard for Good Workmanship in Electrical Construction; 2015.
- E. NECA 101 - Standard for Installing Steel Conduits (Rigid, IMC, EMT); 2013.
- F. NEMA FB 1 - Fittings, Cast Metal Boxes, and Conduit Bodies for Conduit, Electrical Metallic Tubing, and Cable; 2014.
- G. NFPA 70 - National Electrical Code; Most Recent Edition Adopted by Authority Having Jurisdiction, Including All Applicable Amendments and Supplements.
- H. UL 6 - Electrical Rigid Metal Conduit-Steel; Current Edition, Including All Revisions.
- I. UL 360 - Liquid-Tight Flexible Steel Conduit; Current Edition, Including All Revisions.
- J. UL 514B - Conduit, Tubing, and Cable Fittings; Current Edition, Including All Revisions.
- K. UL 797 - Electrical Metallic Tubing-Steel; Current Edition, Including All Revisions.
- L. UL 1242 - Electrical Intermediate Metal Conduit-Steel; Current Edition, Including All Revisions.

1.03 ADMINISTRATIVE REQUIREMENTS

- A. Coordination:
 - 1. Coordinate minimum sizes of conduits with the actual conductors to be installed, including adjustments for conductor sizes increased for voltage drop.
 - 2. Coordinate the arrangement of conduits with structural members, ductwork, piping, equipment and other potential conflicts installed under other sections or by others.
 - 3. Verify exact conduit termination locations required for boxes, enclosures, and equipment installed under other sections or by others.
 - 4. Coordinate the work with other trades to provide roof penetrations that preserve the integrity of the roofing system and do not void the roof warranty.
 - 5. Notify Engineer of any conflicts with or deviations from Contract Documents. Obtain direction before proceeding with work.
- B. Sequencing:
 - 1. Do not begin installation of conductors and cables until installation of conduit is complete between outlet, junction and splicing points.

1.04 SUBMITTALS

- A. See Section 01 3000 - Administrative Requirements for submittals procedures.
- B. Product Data: Provide manufacturer's standard catalog pages and data sheets for conduits and fittings.

1.05 QUALITY ASSURANCE

- A. Comply with requirements of NFPA 70.

PART 2 PRODUCTS

2.01 CONDUIT APPLICATIONS

- A. Do not use conduit and associated fittings for applications other than as permitted by NFPA 70 and product listing.
- B. Unless otherwise indicated and where not otherwise restricted, use the conduit types indicated for the specified applications. Where more than one listed application applies, comply with the most restrictive requirements. Where conduit type for a particular application is not specified, use galvanized steel rigid metal conduit.
- C. Connections to Vibrating Equipment:
 - 1. Dry Locations: Use flexible metal conduit.
 - 2. Damp, Wet, or Corrosive Locations: Use liquidtight flexible metal conduit.
 - 3. Maximum Length: 6 feet (1.8 m) unless otherwise indicated.
 - 4. Vibrating equipment includes, but is not limited to:
 - a. Motors.

2.02 CONDUIT REQUIREMENTS

- A. Existing Work: Where existing conduits are indicated to be reused, they may be reused only where they comply with specified requirements, are free from corrosion, and integrity is verified by pulling a mandrel through them.
- B. Provide all conduit, fittings, supports, and accessories required for a complete raceway system.
- C. Provide products listed, classified, and labeled as suitable for the purpose intended.
- D. Minimum Conduit Size, Unless Otherwise Indicated:
 - 1. Branch Circuits: 1/2 inch (16 mm) trade size.
 - 2. Branch Circuit Homeruns: 3/4 inch (21 mm) trade size.
 - 3. Control Circuits: 1/2 inch (16 mm) trade size.
- E. Where conduit size is not indicated, size to comply with NFPA 70 but not less than applicable minimum size requirements specified.

2.03 GALVANIZED STEEL RIGID METAL CONDUIT (RMC)

- A. Description: NFPA 70, Type RMC galvanized steel rigid metal conduit complying with ANSI C80.1 and listed and labeled as complying with UL 6.
- B. Fittings:
 - 1. Non-Hazardous Locations: Use fittings complying with NEMA FB 1 and listed and labeled as complying with UL 514B.
 - 2. Material: Use steel or malleable iron.
 - 3. Connectors and Couplings: Use threaded type fittings only. Threadless set screw and compression (gland) type fittings are not permitted.

2.04 LIQUIDTIGHT FLEXIBLE METAL CONDUIT (LFMC)

- A. Description: NFPA 70, Type LFMC polyvinyl chloride (PVC) jacketed steel flexible metal conduit listed and labeled as complying with UL 360.
- B. Fittings:
 - 1. Description: Fittings complying with NEMA FB 1 and listed and labeled as complying with UL 514B.
 - 2. Material: Use steel or malleable iron.

2.05 ELECTRICAL METALLIC TUBING (EMT)

- A. Description: NFPA 70, Type EMT steel electrical metallic tubing complying with ANSI C80.3 and listed and labeled as complying with UL 797.
- B. Fittings:
 - 1. Description: Fittings complying with NEMA FB 1 and listed and labeled as complying with UL 514B.
 - 2. Material: Use steel or malleable iron.

3. Connectors and Couplings: Use compression (gland) or set-screw type.
 - a. Do not use indenter type connectors and couplings.

2.06 ACCESSORIES

- A. Corrosion Protection Tape: PVC-based, minimum thickness of 20 mil (0.51 mm).
- B. Conduit Joint Compound: Corrosion-resistant, electrically conductive; suitable for use with the conduit to be installed.
- C. Solvent Cement for PVC Conduit and Fittings: As recommended by manufacturer of conduit and fittings to be installed.

PART 3 EXECUTION

3.01 EXAMINATION

- A. Verify that field measurements are as indicated.
- B. Verify that mounting surfaces are ready to receive conduits.
- C. Verify that conditions are satisfactory for installation prior to starting work.

3.02 INSTALLATION

- A. Install products in accordance with manufacturer's instructions.
- B. Perform work in accordance with NECA 1 (general workmanship).
- C. Install galvanized steel rigid metal conduit (RMC) in accordance with NECA 101.
- D. Conduit Routing:
 1. Unless dimensioned, conduit routing indicated is diagrammatic.
 2. When conduit destination is indicated without specific routing, determine exact routing required.
 3. Conduits in the following areas may be exposed, unless otherwise indicated:
 - a. Electrical rooms.
 - b. Mechanical equipment rooms.
 4. Unless otherwise approved, do not route conduits exposed:
 - a. Across floors.
 5. Arrange conduit to maintain adequate headroom, clearances, and access.
 6. Arrange conduit to provide no more than the equivalent of four 90 degree bends between pull points.
 7. Arrange conduit to provide no more than 150 feet (46 m) between pull points.
 8. Route conduits above water and drain piping where possible.
 9. Arrange conduit to prevent moisture traps. Provide drain fittings at low points and at sealing fittings where moisture may collect.
 10. Maintain minimum clearance of 6 inches (150 mm) between conduits and piping for other systems.
 11. Maintain minimum clearance of 12 inches (300 mm) between conduits and hot surfaces. This includes, but is not limited to:
 - a. Hot water piping.
 - b. Flues.
- E. Conduit Support:
 1. Secure and support conduits in accordance with NFPA 70 and Section 26 0529 using suitable supports and methods approved by the authority having jurisdiction.
 2. Provide independent support from building structure. Do not provide support from piping, ductwork, or other systems.
 3. Use conduit strap to support single surface-mounted conduit.
 - a. Use clamp back spacer with conduit strap for damp and wet locations to provide space between conduit and mounting surface.
 4. Use metal channel (strut) with accessory conduit clamps to support multiple parallel surface-mounted conduits.
 5. Use conduit clamp to support single conduit from beam clamp or threaded rod.
 6. Use trapeze hangers assembled from threaded rods and metal channel (strut) with accessory conduit clamps to support multiple parallel suspended conduits.

7. Use of spring steel conduit clips for support of conduits is not permitted.
 8. Use of wire for support of conduits is not permitted.
 9. Where conduit support intervals specified in NFPA 70 and NECA standards differ, comply with the most stringent requirements.
- F. Connections and Terminations:
1. Use approved zinc-rich paint or conduit joint compound on field-cut threads of galvanized steel conduits prior to making connections.
 2. Where two threaded conduits must be joined and neither can be rotated, use three-piece couplings or split couplings. Do not use running threads.
 3. Use suitable adapters where required to transition from one type of conduit to another.
 4. Provide drip loops for liquidtight flexible conduit connections to prevent drainage of liquid into connectors.
 5. Terminate threaded conduits in boxes and enclosures using threaded hubs or double lock nuts for dry locations and raintight hubs for wet locations.
 6. Provide insulating bushings or insulated throats at all conduit terminations to protect conductors.
 7. Secure joints and connections to provide maximum mechanical strength and electrical continuity.
- G. Penetrations:
1. Do not penetrate or otherwise notch or cut structural members, including footings and grade beams, without approval of Structural Engineer.
 2. Make penetrations perpendicular to surfaces unless otherwise indicated.
 3. Provide sleeves for penetrations as indicated or as required to facilitate installation. Set sleeves flush with exposed surfaces unless otherwise indicated or required.
 4. Conceal bends for conduit risers emerging above ground.
 5. Seal interior of conduits entering the building from underground at first accessible point to prevent entry of moisture and gases.
 6. Where conduits penetrate waterproof membrane, seal as required to maintain integrity of membrane.
 7. Make penetrations for roof-mounted equipment within associated equipment openings and curbs where possible to minimize roofing system penetrations. Where penetrations are necessary, seal as indicated or as required to preserve integrity of roofing system and maintain roof warranty. Include proposed locations of penetrations and methods for sealing with submittals.
 8. Install firestopping to preserve fire resistance rating of partitions and other elements, using materials and methods specified in Section 07 8400.
- H. Conduit Movement Provisions: Where conduits are subject to movement, provide expansion and expansion/deflection fittings to prevent damage to enclosed conductors or connected equipment. This includes, but is not limited to:
1. Where conduits cross structural joints intended for expansion, contraction, or deflection.
- I. Condensation Prevention: Where conduits cross barriers between areas of potential substantial temperature differential, provide sealing fitting or approved sealing compound at an accessible point near the penetration to prevent condensation. This includes, but is not limited to:
1. Where conduits pass from outdoors into conditioned interior spaces.
 2. Where conduits pass from unconditioned interior spaces into conditioned interior spaces.

3.03 FIELD QUALITY CONTROL

- A. See Section 01 4000 - Quality Requirements, for additional requirements.
- B. Repair cuts and abrasions in galvanized finishes using zinc-rich paint recommended by manufacturer. Replace components that exhibit signs of corrosion.
- C. Correct deficiencies and replace damaged or defective conduits.

3.04 PROTECTION

- A. Immediately after installation of conduit, use suitable manufactured plugs to provide protection from entry of moisture and foreign material and do not remove until ready for installation of conductors.

END OF SECTION

SECTION 26 0533.16
BOXES FOR ELECTRICAL SYSTEMS

PART 1 GENERAL

1.01 SECTION INCLUDES

- A. Outlet and device boxes up to 100 cubic inches (1,650 cu cm), including those used as junction and pull boxes.
- B. Cabinets and enclosures, including junction and pull boxes larger than 100 cubic inches (1,650 cu cm).

1.02 RELATED REQUIREMENTS

- A. Section 08 3100 - Access Doors and Panels: Panels for maintaining access to concealed boxes.
- B. Section 26 0529 - Hangers and Supports for Electrical Systems.
- C. Section 26 2726 - Wiring Devices:
 - 1. Wall plates.

1.03 REFERENCE STANDARDS

- A. NECA 1 - Standard for Good Workmanship in Electrical Construction; 2015.
- B. NECA 130 - Standard for Installing and Maintaining Wiring Devices; 2010.
- C. NEMA FB 1 - Fittings, Cast Metal Boxes, and Conduit Bodies for Conduit, Electrical Metallic Tubing, and Cable; 2014.
- D. NEMA OS 1 - Sheet-Steel Outlet Boxes, Device Boxes, Covers, and Box Supports; 2013.
- E. NEMA 250 - Enclosures for Electrical Equipment (1000 Volts Maximum); 2014.
- F. NFPA 70 - National Electrical Code; Most Recent Edition Adopted by Authority Having Jurisdiction, Including All Applicable Amendments and Supplements.
- G. UL 50 - Enclosures for Electrical Equipment, Non-Environmental Considerations; Current Edition, Including All Revisions.
- H. UL 50E - Enclosures for Electrical Equipment, Environmental Considerations; Current Edition, Including All Revisions.
- I. UL 508A - Industrial Control Panels; 2013.
- J. UL 514A - Metallic Outlet Boxes; Current Edition, Including All Revisions.

1.04 ADMINISTRATIVE REQUIREMENTS

- A. Coordination:
 - 1. Coordinate the work with other trades to avoid placement of ductwork, piping, equipment, or other potential obstructions within the dedicated equipment spaces and working clearances for electrical equipment required by NFPA 70.
 - 2. Coordinate arrangement of electrical equipment with the dimensions and clearance requirements of the actual equipment to be installed.
 - 3. Coordinate minimum sizes of boxes with the actual installed arrangement of conductors, clamps, support fittings, and devices, calculated according to NFPA 70.
 - 4. Coordinate minimum sizes of pull boxes with the actual installed arrangement of connected conduits, calculated according to NFPA 70.
 - 5. Coordinate the placement of boxes with millwork, furniture, devices, equipment, etc. installed under other sections or by others.
 - 6. Coordinate the work with other trades to preserve insulation integrity.
 - 7. Coordinate the work with other trades to provide walls suitable for installation of flush-mounted boxes where indicated.

1.05 SUBMITTALS

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

1.06 QUALITY ASSURANCE

- A. Comply with requirements of NFPA 70.

PART 2 PRODUCTS

2.01 BOXES

- A. General Requirements:
1. Do not use boxes and associated accessories for applications other than as permitted by NFPA 70 and product listing.
 2. Provide all boxes, fittings, supports, and accessories required for a complete raceway system and to accommodate devices and equipment to be installed.
 3. Provide products listed, classified, and labeled as suitable for the purpose intended.
 4. Where box size is not indicated, size to comply with NFPA 70 but not less than applicable minimum size requirements specified.
 5. Provide grounding terminals within boxes where equipment grounding conductors terminate.
- B. Outlet and Device Boxes Up to 100 cubic inches (1,650 cu cm), Including Those Used as Junction and Pull Boxes:
1. Use sheet-steel boxes for dry locations unless otherwise indicated or required.
 2. Use cast iron boxes or cast aluminum boxes for damp or wet locations unless otherwise indicated or required; furnish with compatible weatherproof gasketed covers.
 3. Use cast iron boxes or cast aluminum boxes where exposed galvanized steel rigid metal conduit is used.
 4. Use suitable concrete type boxes where flush-mounted in concrete.
 5. Use suitable masonry type boxes where flush-mounted in masonry walls.
 6. Use raised covers suitable for the type of wall construction and device configuration where required.
 7. Use shallow boxes where required by the type of wall construction.
 8. Do not use "through-wall" boxes designed for access from both sides of wall.
 9. Sheet-Steel Boxes: Comply with NEMA OS 1, and list and label as complying with UL 514A.
 10. Cast Metal Boxes: Comply with NEMA FB 1, and list and label as complying with UL 514A; furnish with threaded hubs.
 11. Boxes for Ganged Devices: Use multigang boxes of single-piece construction. Do not use field-connected gangable boxes unless specifically indicated or permitted.
 12. Wall Plates: Comply with Section 26 2726.
- C. Cabinets and Enclosures, Including Junction and Pull Boxes Larger Than 100 cubic inches (1,650 cu cm):
1. Comply with NEMA 250, and list and label as complying with UL 50 and UL 50E, or UL 508A.
 2. NEMA 250 Environment Type, Unless Otherwise Indicated:
 3. Junction and Pull Boxes Larger Than 100 cubic inches (1,650 cu cm):
 - a. Provide screw-cover or hinged-cover enclosures unless otherwise indicated.

PART 3 EXECUTION

3.01 EXAMINATION

- A. Verify that mounting surfaces are ready to receive boxes.
- B. Verify that conditions are satisfactory for installation prior to starting work.

3.02 INSTALLATION

- A. Install products in accordance with manufacturer's instructions.
- B. Install boxes in accordance with NECA 1 (general workmanship) and, where applicable, NECA 130, including mounting heights specified in those standards where mounting heights are not indicated.
- C. Arrange equipment to provide minimum clearances in accordance with manufacturer's instructions and NFPA 70.
- D. Unless otherwise indicated, provide separate boxes for line voltage and low voltage systems.

- E. Box Locations:
 - 1. Locate boxes to be accessible. Provide access panels in accordance with Section 08 3100 as required.
 - 2. Locate boxes so that wall plates do not span different building finishes.
 - 3. Locate boxes so that wall plates do not cross masonry joints.
 - 4. Fire Resistance Rated Walls: Install flush-mounted boxes such that the required fire resistance will not be reduced.
- F. Box Supports:
 - 1. Secure and support boxes in accordance with NFPA 70 and Section 26 0529 using suitable supports and methods approved by the authority having jurisdiction.
 - 2. Provide independent support from building structure except for cast metal boxes (other than boxes used for fixture support) supported by threaded conduit connections in accordance with NFPA 70. Do not provide support from piping, ductwork, or other systems.
- G. Install boxes plumb and level.
- H. Flush-Mounted Boxes:
 - 1. Install boxes in noncombustible materials such as concrete, tile, gypsum, plaster, etc. so that front edge of box or associated raised cover is not set back from finished surface more than 1/4 inch (6 mm) or does not project beyond finished surface.
 - 2. Install boxes in combustible materials such as wood so that front edge of box or associated raised cover is flush with finished surface.
 - 3. Repair rough openings around boxes in noncombustible materials such as concrete, tile, gypsum, plaster, etc. so that there are no gaps or open spaces greater than 1/8 inch (3 mm) at the edge of the box.
- I. Install boxes as required to preserve insulation integrity.
- J. Install permanent barrier between ganged wiring devices when voltage between adjacent devices exceeds 300 V.
- K. Install firestopping to preserve fire resistance rating of partitions and other elements, using materials and methods specified in Section 07 8400.
- L. Close unused box openings.
- M. Install blank wall plates on junction boxes and on outlet boxes with no devices or equipment installed or designated for future use.
- N. Provide grounding and bonding in accordance with Section 26 0526.

END OF SECTION

SECTION 26 0553
IDENTIFICATION FOR ELECTRICAL SYSTEMS

PART 1 GENERAL

1.01 SECTION INCLUDES

- A. Electrical identification requirements.
- B. Identification nameplates and labels.
- C. Voltage markers.
- D. Warning signs and labels.

1.02 RELATED REQUIREMENTS

- A. Section 26 0519 - Low-Voltage Electrical Power Conductors and Cables: Color coding for power conductors and cables 600 V and less; vinyl color coding electrical tape.

1.03 REFERENCE STANDARDS

- A. ANSI Z535.2 - American National Standard for Environmental and Facility Safety Signs; 2011.
- B. ANSI Z535.4 - American National Standard for Product Safety Signs and Labels; 2011.
- C. NFPA 70 - National Electrical Code; Most Recent Edition Adopted by Authority Having Jurisdiction, Including All Applicable Amendments and Supplements.
- D. UL 969 - Marking and Labeling Systems; Current Edition, Including All Revisions.

1.04 SUBMITTALS

- A. See Section 01 3000 - Administrative Requirements for submittals procedures.

1.05 FIELD CONDITIONS

- A. Do not install adhesive products when ambient temperature is lower than recommended by manufacturer.

PART 2 PRODUCTS

2.01 IDENTIFICATION REQUIREMENTS

- A. Existing Work: Unless specifically excluded, identify existing elements to remain that are not already identified in accordance with specified requirements.
- B. Identification for Equipment:
 - 1. Use identification nameplate to identify each piece of electrical distribution and control equipment and associated sections, compartments, and components.
 - 2. Use voltage marker to identify highest voltage present for each piece of electrical equipment.
 - 3. Use identification nameplate to identify equipment utilizing series ratings, where permitted, in accordance with NFPA 70.
 - 4. Use identification nameplate to identify switchboards and panelboards utilizing a high leg delta system in accordance with NFPA 70.
 - 5. Use identification nameplate to identify disconnect location for equipment with remote disconnecting means.
 - 6. Available Fault Current Documentation: Use identification label to identify the available fault current and date calculations were performed at locations requiring documentation by NFPA 70, including but not limited to the following.
 - a. Service equipment.
 - b. Industrial control panels.
 - c. Motor control centers.
 - d. Elevator control panels.
 - e. Industrial machinery.
- C. Identification for Conductors and Cables:
 - 1. Color Coding for Power Conductors 600 V and Less: Comply with Section 26 0519.
 - 2. Use identification nameplate or identification label to identify color code for ungrounded and grounded power conductors inside door or enclosure at each piece of feeder or branch-circuit

distribution equipment when premises has feeders or branch circuits served by more than one nominal voltage system.

2.02 IDENTIFICATION NAMEPLATES AND LABELS

- A. Identification Nameplates:
 - 1. Materials:
 - a. Indoor Clean, Dry Locations: Use plastic nameplates.
 - 2. Plastic Nameplates: Two-layer or three-layer laminated acrylic or electrically non-conductive phenolic with beveled edges; minimum thickness of 1/16 inch (1.6 mm); engraved text.
 - 3. Stainless Steel Nameplates: Minimum thickness of 1/32 inch (0.8 mm); engraved or laser-etched text.
 - 4. Mounting Holes for Mechanical Fasteners: Two, centered on sides for sizes up to 1 inch (25 mm) high; Four, located at corners for larger sizes.
- B. Identification Labels:
 - 1. Materials: Use self-adhesive laminated plastic labels; UV, chemical, water, heat, and abrasion resistant.
 - 2. Text: Use factory pre-printed or machine-printed text. Do not use handwritten text unless otherwise indicated.
- C. Format for General Information and Operating Instructions:
 - 1. Minimum Size: 1 inch (25 mm) by 2.5 inches (64 mm).
 - 2. Legend: Include information or instructions indicated or as required for proper and safe operation and maintenance.
 - 3. Text: All capitalized unless otherwise indicated.
 - 4. Minimum Text Height: 1/4 inch (6 mm).
 - 5. Color: Black text on white background unless otherwise indicated.
- D. Format for Caution and Warning Messages:
 - 1. Minimum Size: 2 inches (51 mm) by 4 inches (100 mm).
 - 2. Legend: Include information or instructions indicated or as required for proper and safe operation and maintenance.
 - 3. Text: All capitalized unless otherwise indicated.
 - 4. Minimum Text Height: 1/2 inch (13 mm).
 - 5. Color: Black text on yellow background unless otherwise indicated.

2.03 VOLTAGE MARKERS

- A. Markers for Boxes and Equipment Enclosures: Use factory pre-printed self-adhesive vinyl or self-adhesive vinyl cloth type markers.
- B. Minimum Size:
 - 1. Markers for Equipment: 1 1/8 by 4 1/2 inches (29 by 110 mm).
- C. Legend:
 - 1. Markers for Voltage Identification: Highest voltage present.
- D. Color: Black text on orange background unless otherwise indicated.

2.04 WARNING SIGNS AND LABELS

- A. Comply with ANSI Z535.2 or ANSI Z535.4 as applicable.
- B. Warning Signs:
 - 1. Materials:
 - 2. Minimum Size: 7 by 10 inches (178 by 254 mm) unless otherwise indicated.
- C. Warning Labels:
 - 1. Materials: Use factory pre-printed or machine-printed self-adhesive polyester or self-adhesive vinyl labels; UV, chemical, water, heat, and abrasion resistant; produced using materials recognized to UL 969.
 - 2. Machine-Printed Labels: Use thermal transfer process printing machines and accessories recommended by label manufacturer.

3. Minimum Size: 2 by 4 inches (51 mm by 102 mm) unless otherwise indicated.

PART 3 EXECUTION

3.01 PREPARATION

- A. Clean surfaces to receive adhesive products according to manufacturer's instructions.

3.02 INSTALLATION

- A. Install products in accordance with manufacturer's instructions.
- B. Install identification products to be plainly visible for examination, adjustment, servicing, and maintenance. Unless otherwise indicated, locate products as follows:
 1. Surface-Mounted Equipment: Enclosure front.
 2. Flush-Mounted Equipment: Inside of equipment door.
 3. Free-Standing Equipment: Enclosure front; also enclosure rear for equipment with rear access.
 4. Elevated Equipment: Legible from the floor or working platform.
 5. Interior Components: Legible from the point of access.
 6. Conductors and Cables: Legible from the point of access.
- C. Install identification products centered, level, and parallel with lines of item being identified.
- D. Secure nameplates to exterior surfaces of enclosures using stainless steel screws and to interior surfaces using self-adhesive backing or epoxy cement.
- E. Install self-adhesive labels and markers to achieve maximum adhesion, with no bubbles or wrinkles and edges properly sealed.

END OF SECTION

SECTION 26 0583
WIRING CONNECTIONS

PART 1 GENERAL

1.01 SECTION INCLUDES

- A. Electrical connections to equipment.

1.02 RELATED REQUIREMENTS

- A. Section 26 0519 - Low-Voltage Electrical Power Conductors and Cables.
- B. Section 26 0533.13 - Conduit for Electrical Systems.
- C. Section 26 0533.16 - Boxes for Electrical Systems.
- D. Section 26 2726 - Wiring Devices.

1.03 REFERENCE STANDARDS

- A. NEMA WD 1 - General Color Requirements for Wiring Devices; 1999 (Reaffirmed 2015).
- B. NEMA WD 6 - Wiring Devices - Dimensional Specifications; 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. See Section 01 3000 - Administrative Requirements, for submittal procedures.
- B. Product Data: Provide wiring device manufacturer's catalog information showing dimensions, configurations, and construction.
- C. Manufacturer's Instructions: Indicate application conditions and limitations of use stipulated by product testing agency. Include instructions for storage, handling, protection, examination, preparation, and installation of product.

1.05 QUALITY ASSURANCE

- A. Comply with requirements of NFPA 70.
- B. Products: Listed, classified, and labeled as suitable for the purpose intended.

PART 2 PRODUCTS

2.01 EQUIPMENT CONNECTIONS

PART 3 EXECUTION

3.01 ELECTRICAL CONNECTIONS

- A. Make electrical connections in accordance with equipment manufacturer's instructions.
- B. Make conduit connections to equipment using flexible conduit. Use liquidtight flexible conduit with watertight connectors in damp or wet locations.
- C. Connect heat producing equipment using wire and cable with insulation suitable for temperatures encountered.
- D. Provide receptacle outlet to accommodate connection with attachment plug.
- E. Provide cord and cap where field-supplied attachment plug is required.
- F. Install suitable strain-relief clamps and fittings for cord connections at outlet boxes and equipment connection boxes.
- G. Install disconnect switches, controllers, control stations, and control devices to complete equipment wiring requirements.
- H. Install terminal block jumpers to complete equipment wiring requirements.
- I. Install interconnecting conduit and wiring between devices and equipment to complete equipment wiring requirements.

END OF SECTION

SECTION 26 0923
LIGHTING CONTROL DEVICES

PART 1 GENERAL

1.01 SECTION INCLUDES

- A. Occupancy sensors.
- B. Lighting contactors.
- C. Accessories.

1.02 RELATED REQUIREMENTS

- A. Section 26 0529 - Hangers and Supports for Electrical Systems.
- B. Section 26 0533.16 - Boxes for Electrical Systems.
- C. Section 26 2726 - Wiring Devices: Devices for manual control of lighting, including wall switches, wall dimmers, and fan speed controllers.

1.03 REFERENCE STANDARDS

- A. NECA 1 - Standard for Good Workmanship in Electrical Construction; 2015.
- B. NECA 130 - Standard for Installing and Maintaining Wiring Devices; 2010.
- C. NEMA 250 - Enclosures for Electrical Equipment (1000 Volts Maximum); 2014.
- D. NEMA ICS 2 - Industrial Control and Systems Controllers, Contactors and Overload Relays Rated 600 Volts; 2000, with Errata (2008).
- E. NEMA ICS 5 - Industrial Control and Systems: Control Circuit and Pilot Devices; 2017.
- F. NEMA ICS 6 - Industrial Control and Systems: Enclosures; 1993 (Reaffirmed 2016).
- G. NFPA 70 - National Electrical Code; Most Recent Edition Adopted by Authority Having Jurisdiction, Including All Applicable Amendments and Supplements.
- H. UL 60947-1 - Low-Voltage Switchgear and Controlgear - Part 1: General Rules; Current Edition, Including All Revisions.
- I. UL 60947-4-1 - Low-Voltage Switchgear and Controlgear - Part 4-1: Contactors and Motor-starters - Electromechanical Contactors and Motor-starters; Current Edition, Including All Revisions.

1.04 SUBMITTALS

- A. See Section 01 3000 - Administrative Requirements, for submittal procedures.
- B. Product Data: Include ratings, configurations, standard wiring diagrams, dimensions, colors, service condition requirements, and installed features.

1.05 QUALITY ASSURANCE

- A. Comply with requirements of NFPA 70.

PART 2 PRODUCTS

2.01 LIGHTING CONTROL DEVICES - GENERAL REQUIREMENTS

- A. Provide products listed, classified, and labeled as suitable for the purpose intended.
- B. Unless specifically indicated to be excluded, provide all required conduit, wiring, connectors, hardware, components, accessories, etc. as required for a complete operating system.

2.02 OCCUPANCY SENSORS

- A. Manufacturers:
 - 1. Hubbell Incorporated: www.hubbell.com/#sle.
 - 2. Lutron Electronics Company, Inc: www.lutron.com/#sle.
 - 3. Sensor Switch Inc: www.sensorswitch.com/#sle.
 - 4. WattStopper: www.wattstopper.com/#sle.
 - 5. or approved equal.

B. All Occupancy Sensors:

1. Description: Factory-assembled commercial specification grade devices for indoor use capable of sensing both major motion, such as walking, and minor motion, such as small desktop level movements, according to published coverage areas, for automatic control of load indicated.
2. Sensor Technology:
 - a. Passive Infrared (PIR) Occupancy Sensors: Designed to detect occupancy by sensing movement of thermal energy between zones.
3. Provide LED to visually indicate motion detection with separate color LEDs for each sensor type in dual technology units.
4. Operation: Unless otherwise indicated, occupancy sensor to turn load on when occupant presence is detected and to turn load off when no occupant presence is detected during an adjustable turn-off delay time interval.
5. Turn-Off Delay: Field adjustable, with time delay settings up to 30 minutes.
6. Compatibility (Non-Dimming Sensors): Suitable for controlling incandescent lighting, low-voltage lighting with electronic and magnetic transformers, fluorescent lighting with electronic and magnetic ballasts, and fractional motor loads, with no minimum load requirements.

2.03 LIGHTING CONTACTORS

A. Manufacturers:

1. ABB/GE: www.geindustrial.com/#sle.
2. Eaton Corporation: www.eaton.com/#sle.
3. Rockwell Automation Inc; Allen-Bradley Products: ab.rockwellautomation.com/#sle.
4. Schneider Electric; Square D Products: www.schneider-electric.us/#sle.
5. Siemens Industry, Inc: www.usa.siemens.com/#sle.
6. or approved equal.

B. Description: Magnetic lighting contactors complying with NEMA ICS 2, and listed and labeled as complying with UL 60947-1 and UL 60947-4-1; noncombination type unless otherwise indicated; ratings, configurations and features as indicated on the drawings.

C. Short Circuit Current Rating:

1. Provide contactors with listed short circuit current rating not less than the available fault current at the installed location as indicated on the drawings.

D. Enclosures:

1. Comply with NEMA ICS 6.
2. Environment Type per NEMA 250: Unless otherwise indicated, as specified for the following installation locations:
3. Finish: Manufacturer's standard unless otherwise indicated.

2.04 ACCESSORIES

A. Auxiliary Contacts:

1. Comply with NEMA ICS 5.
2. Provide number and type of contacts indicated or required to perform necessary functions, including holding (seal-in) circuit and interlocking, plus one normally open (NO) and one normally closed (NC) spare contact for each lighting contactor, minimum.

B. Control and Timing Relays:

1. Comply with NEMA ICS 5.
2. Provide number and type of relays indicated or required to perform necessary functions.

PART 3 EXECUTION

3.01 EXAMINATION

- A. Verify that field measurements are as indicated.
- B. Verify that outlet boxes are installed in proper locations and at proper mounting heights and are properly sized to accommodate devices and conductors in accordance with NFPA 70.
- C. Verify that openings for outlet boxes are neatly cut and will be completely covered by devices or wall plates.

- D. Verify that final surface finishes are complete, including painting.
- E. Verify that branch circuit wiring installation is completed, tested, and ready for connection to lighting control devices.
- F. Verify that the service voltage and ratings of lighting control devices are appropriate for the service voltage and load requirements at the location to be installed.
- G. Verify that conditions are satisfactory for installation prior to starting work.

3.02 INSTALLATION

- A. Install lighting control devices in accordance with NECA 1 (general workmanship) and, where applicable, NECA 130, including mounting heights specified in those standards unless otherwise indicated.
- B. Coordinate locations of outlet boxes provided under Section 26 0533.16 as required for installation of lighting control devices provided under this section.
- C. Install lighting control devices in accordance with manufacturer's instructions.
- D. Unless otherwise indicated, connect lighting control device grounding terminal or conductor to branch circuit equipment grounding conductor and to outlet box with bonding jumper.
- E. Install lighting control devices plumb and level, and held securely in place.
- F. Where required and not furnished with lighting control device, provide wall plate in accordance with Section 26 2726.
- G. Provide required supports in accordance with Section 26 0529.
- H. Where applicable, install lighting control devices and associated wall plates to fit completely flush to mounting surface with no gaps and rough opening completely covered without strain on wall plate. Repair or reinstall improperly installed outlet boxes or improperly sized rough openings. Do not use oversized wall plates in lieu of meeting this requirement.

3.03 CLOSEOUT ACTIVITIES

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

END OF SECTION

SECTION 26 2416

PANELBOARDS

PART 1 GENERAL

1.01 SECTION INCLUDES

- A. Power distribution panelboards.
- B. Overcurrent protective devices for panelboards.

1.02 RELATED REQUIREMENTS

- A. Section 26 0529 - Hangers and Supports for Electrical Systems.
- B. Section 26 0553 - Identification for Electrical Systems: Identification products and requirements.

1.03 REFERENCE STANDARDS

- A. FS W-C-375 - Circuit Breakers, Molded Case; Branch Circuit and Service; 2013e (Amended 2017).
- B. NECA 1 - Standard for Good Workmanship in Electrical Construction; 2015.
- C. NECA 407 - Standard for Installing and Maintaining Panelboards; 2015.
- D. NEMA 250 - Enclosures for Electrical Equipment (1000 Volts Maximum); 2014.
- E. NEMA PB 1 - Panelboards; 2011.
- F. NEMA PB 1.1 - General Instructions for Proper Installation, Operation and Maintenance of Panelboards Rated 600 Volts or Less; 2013.
- G. NETA ATS - Acceptance Testing Specifications for Electrical Power Equipment and Systems; 2017.
- H. NFPA 70 - National Electrical Code; Most Recent Edition Adopted by Authority Having Jurisdiction, Including All Applicable Amendments and Supplements.
- I. UL 50 - Enclosures for Electrical Equipment, Non-Environmental Considerations; Current Edition, Including All Revisions.
- J. UL 50E - Enclosures for Electrical Equipment, Environmental Considerations; Current Edition, Including All Revisions.
- K. UL 67 - Panelboards; Current Edition, Including All Revisions.
- L. UL 489 - Molded-Case Circuit Breakers, Molded-Case Switches and Circuit Breaker Enclosures; Current Edition, Including All Revisions.
- M. UL 1053 - Ground-Fault Sensing and Relaying Equipment; Current Edition, Including All Revisions.

1.04 ADMINISTRATIVE REQUIREMENTS

- A. Coordination:
 - 1. Coordinate the work with other trades to avoid placement of ductwork, piping, equipment, or other potential obstructions within the dedicated equipment spaces and working clearances for electrical equipment required by NFPA 70.
 - 2. Coordinate arrangement of electrical equipment with the dimensions and clearance requirements of the actual equipment to be installed.
 - 3. Verify with manufacturer that conductor terminations are suitable for use with the conductors to be installed.
 - 4. Notify Engineer of any conflicts with or deviations from the contract documents. Obtain direction before proceeding with work.

1.05 SUBMITTALS

- A. See Section 01 3000 - Administrative Requirements, for submittal procedures.
- B. Product Data: Provide manufacturer's standard catalog pages and data sheets for panelboards, enclosures, overcurrent protective devices, and other installed components and accessories.

1.06 QUALITY ASSURANCE

- A. Comply with requirements of NFPA 70.

PART 2 PRODUCTS

2.01 MANUFACTURERS

- A. ABB/GE: www.geindustrial.com/#sle.
- B. Eaton Corporation: www.eaton.com/#sle.
- C. Schneider Electric; Square D Products: www.schneider-electric.us/#sle.
- D. Siemens Industry, Inc: www.usa.siemens.com/#sle.
- E. or approved equal.
- F. Substitutions: See Section 01 6000 - Product Requirements.

2.02 PANELBOARDS - GENERAL REQUIREMENTS

- A. Provide products listed, classified, and labeled as suitable for the purpose intended.
- B. Unless otherwise indicated, provide products suitable for continuous operation under the following service conditions:
 - 1. Altitude: Less than 6,600 feet (2,000 m).
 - 2. Ambient Temperature:
 - a. Panelboards Containing Circuit Breakers: Between 23 degrees F (-5 degrees C) and 104 degrees F (40 degrees C).
- C. Short Circuit Current Rating:
 - 1. Provide panelboards with listed short circuit current rating not less than the available fault current at the installed location as indicated on the drawings.
- D. Mains: Configure for top or bottom incoming feed as indicated or as required for the installation.
- E. Branch Overcurrent Protective Devices: Replaceable without disturbing adjacent devices.
- F. Bussing: Sized in accordance with UL 67 temperature rise requirements.
 - 1. Provide solidly bonded equipment ground bus in each panelboard, with a suitable lug for each feeder and branch circuit equipment grounding conductor.
- G. Conductor Terminations: Suitable for use with the conductors to be installed.
- H. Enclosures: Comply with NEMA 250, and list and label as complying with UL 50 and UL 50E.
 - 1. Environment Type per NEMA 250: Unless otherwise indicated, as specified for the following installation locations:
 - a. Indoor Clean, Dry Locations: Type 1.
 - 2. Boxes: Galvanized steel unless otherwise indicated.
 - a. Provide wiring gutters sized to accommodate the conductors to be installed.
 - 3. Fronts:
 - a. Fronts for Surface-Mounted Enclosures: Same dimensions as boxes.
 - 4. Lockable Doors: All locks keyed alike unless otherwise indicated.
- I. Future Provisions: Prepare all unused spaces for future installation of devices including bussing, connectors, mounting hardware and all other required provisions.
- J. Ground Fault Protection: Where ground-fault protection is indicated, provide system listed and labeled as complying with UL 1053.

2.03 POWER DISTRIBUTION PANELBOARDS

- A. Description: Panelboards complying with NEMA PB 1, power and feeder distribution type, circuit breaker type, and listed and labeled as complying with UL 67; ratings, configurations and features as indicated on the drawings.
- B. Conductor Terminations:
 - 1. Main and Neutral Lug Material: Copper, suitable for terminating copper conductors only.
 - 2. Main and Neutral Lug Type: Mechanical.
- C. Bussing:
 - 1. Phase and Neutral Bus Material: Copper.
 - 2. Ground Bus Material: Copper.
- D. Circuit Breakers:

1. Provide bolt-on type or plug-in type secured with locking mechanical restraints.
- E. Enclosures:
 1. Provide surface-mounted enclosures unless otherwise indicated.
 2. Fronts: Provide lockable hinged door with concealed hinges for access to overcurrent protective device handles without exposing live parts.
 3. Provide clear plastic circuit directory holder mounted on inside of door.

2.04 OVERCURRENT PROTECTIVE DEVICES

- A. Molded Case Circuit Breakers:
 1. Description: Quick-make, quick-break, over center toggle, trip-free, trip-indicating circuit breakers listed and labeled as complying with UL 489, and complying with FS W-C-375 where applicable; ratings, configurations, and features as indicated on the drawings.
 2. Interrupting Capacity:
 - a. Provide circuit breakers with interrupting capacity as required to provide the short circuit current rating indicated, but not less than:
 - b. Fully Rated Systems: Provide circuit breakers with interrupting capacity not less than the short circuit current rating indicated.
 3. Conductor Terminations:
 - a. Lug Material: Copper, suitable for terminating copper conductors only.
 4. Multi-Pole Circuit Breakers: Furnish with common trip for all poles.

2.05 SOURCE QUALITY CONTROL

- A. Factory test panelboards according to NEMA PB 1.

PART 3 EXECUTION

3.01 INSTALLATION

- A. Perform work in accordance with NECA 1 (general workmanship).
- B. Install products in accordance with manufacturer's instructions.
- C. Install panelboards in accordance with NECA 407 and NEMA PB 1.1.
- D. Arrange equipment to provide minimum clearances in accordance with manufacturer's instructions and NFPA 70.
- E. Provide required support and attachment in accordance with Section 26 0529.
- F. Install panelboards plumb.
- G. Mount panelboards such that the highest position of any operating handle for circuit breakers or switches does not exceed 79 inches (2000 mm) above the floor or working platform.
- H. Install all field-installed branch devices, components, and accessories.
- I. Set field-adjustable ground fault protection pickup and time delay settings as indicated.
- J. Provide filler plates to cover unused spaces in panelboards.

3.02 FIELD QUALITY CONTROL

- A. Inspect and test in accordance with NETA ATS, except Section 4.
- B. Ground Fault Protection Systems: Test in accordance with manufacturer's instructions as required by NFPA 70.
- C. Correct deficiencies and replace damaged or defective panelboards or associated components.

3.03 ADJUSTING

- A. Adjust tightness of mechanical and electrical connections to manufacturer's recommended torque settings.
- B. Adjust alignment of panelboard fronts.
- C. Load Balancing: For each panelboard, rearrange circuits such that the difference between each measured steady state phase load does not exceed 20 percent and adjust circuit directories accordingly. Maintain proper phasing for multi-wire branch circuits.

END OF SECTION

SECTION 26 2726

WIRING DEVICES

PART 1 GENERAL

1.01 SECTION INCLUDES

- A. Receptacles.
- B. Wall plates.

1.02 RELATED REQUIREMENTS

- A. Section 26 0519 - Low-Voltage Electrical Power Conductors and Cables: Manufactured wiring systems for use with access floor boxes with compatible pre-wired connectors.
- B. Section 26 0526 - Grounding and Bonding for Electrical Systems.
- C. Section 26 0533.16 - Boxes for Electrical Systems.
- D. Section 26 0553 - Identification for Electrical Systems: Identification products and requirements.
- E. Section 26 0583 - Wiring Connections: Cords and plugs for equipment.

1.03 REFERENCE STANDARDS

- A. NECA 1 - Standard for Good Workmanship in Electrical Construction; 2015.
- B. NECA 130 - Standard for Installing and Maintaining Wiring Devices; 2010.
- C. NFPA 70 - National Electrical Code; Most Recent Edition Adopted by Authority Having Jurisdiction, Including All Applicable Amendments and Supplements.

1.04 ADMINISTRATIVE REQUIREMENTS

- A. Coordination:
 - 1. Coordinate the placement of outlet boxes with millwork, furniture, equipment, etc. installed under other sections or by others.
 - 2. Coordinate wiring device ratings and configurations with the electrical requirements of actual equipment to be installed.
 - 3. Coordinate the installation and preparation of uneven surfaces, such as split face block, to provide suitable surface for installation of wiring devices.
 - 4. Notify Engineer of any conflicts or deviations from Contract Documents to obtain direction prior to proceeding with work.

1.05 SUBMITTALS

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

1.06 QUALITY ASSURANCE

- A. Comply with requirements of NFPA 70.
- B. Products: Listed, classified, and labeled as suitable for the purpose intended.

PART 2 PRODUCTS

2.01 WIRING DEVICE APPLICATIONS

- A. Provide wiring devices suitable for intended use and with ratings adequate for load served.
- B. Provide weather resistant GFCI receptacles with specified weatherproof covers for receptacles installed outdoors or in damp or wet locations.
- C. Provide GFCI protection for receptacles installed within 6 feet (1.8 m) of sinks.

PART 3 EXECUTION

3.01 EXAMINATION

- A. Verify that field measurements are as indicated.
- B. Verify that outlet boxes are installed in proper locations and at proper mounting heights and are properly sized to accommodate devices and conductors in accordance with NFPA 70.

- C. Verify that wall openings are neatly cut and will be completely covered by wall plates.
- D. Verify that final surface finishes are complete, including painting.
- E. Verify that branch circuit wiring installation is completed, tested, and ready for connection to wiring devices.
- F. Verify that conditions are satisfactory for installation prior to starting work.

3.02 PREPARATION

- A. Provide extension rings to bring outlet boxes flush with finished surface.
- B. Clean dirt, debris, plaster, and other foreign materials from outlet boxes.

3.03 INSTALLATION

- A. Perform work in accordance with NECA 1 (general workmanship) and, where applicable, NECA 130, including mounting heights specified in those standards unless otherwise indicated.
- B. Coordinate locations of outlet boxes provided under Section 26 0533.16 as required for installation of wiring devices provided under this section.
- C. Install wiring devices in accordance with manufacturer's instructions.
- D. Install permanent barrier between ganged wiring devices when voltage between adjacent devices exceeds 300 V.
- E. Where required, connect wiring devices using pigtails not less than 6 inches (150 mm) long. Do not connect more than one conductor to wiring device terminals.
- F. Connect wiring devices by wrapping conductor clockwise 3/4 turn around screw terminal and tightening to proper torque specified by the manufacturer. Where present, do not use push-in pressure terminals that do not rely on screw-actuated binding.
- G. Unless otherwise indicated, connect wiring device grounding terminal to branch circuit equipment grounding conductor and to outlet box with bonding jumper.
- H. Install wiring devices plumb and level with mounting yoke held rigidly in place.
- I. Install wall switches with OFF position down.
- J. Install wall plates to fit completely flush to wall with no gaps and rough opening completely covered without strain on wall plate. Repair or reinstall improperly installed outlet boxes or improperly sized rough openings. Do not use oversized wall plates in lieu of meeting this requirement.
- K. Install blank wall plates on junction boxes and on outlet boxes with no wiring devices installed or designated for future use.

3.04 CLEANING

- A. Clean exposed surfaces to remove dirt, paint, or other foreign material and restore to match original factory finish.

END OF SECTION

SECTION 26 2816.13
ENCLOSED CIRCUIT BREAKERS

PART 1 GENERAL

1.01 SECTION INCLUDES

- A. Enclosed circuit breakers.

1.02 REFERENCE STANDARDS

- A. NECA 1 - Standard for Good Workmanship in Electrical Construction; 2015.
- B. NEMA 250 - Enclosures for Electrical Equipment (1000 Volts Maximum); 2014.
- C. NFPA 70 - National Electrical Code; Most Recent Edition Adopted by Authority Having Jurisdiction, Including All Applicable Amendments and Supplements.
- D. UL 50 - Enclosures for Electrical Equipment, Non-Environmental Considerations; Current Edition, Including All Revisions.
- E. UL 50E - Enclosures for Electrical Equipment, Environmental Considerations; Current Edition, Including All Revisions.
- F. UL 489 - Molded-Case Circuit Breakers, Molded-Case Switches and Circuit Breaker Enclosures; Current Edition, Including All Revisions.

1.03 SUBMITTALS

- A. Product Data: Provide manufacturer's standard catalog pages and data sheets for circuit breakers, enclosures, and other installed components and accessories.

1.04 QUALITY ASSURANCE

- A. Conform to requirements of NFPA 70.

1.05 FIELD CONDITIONS

- A. Maintain ambient temperature between 23 degrees F (-5 degrees C) and 104 degrees F (40 degrees C) during and after installation of enclosed circuit breakers.

PART 2 PRODUCTS

2.01 MANUFACTURERS

- A. Eaton Corporation: www.eaton.com.
- B. General Electric Company: www.geindustrial.com.
- C. Schneider Electric; Square D Products: www.schneider-electric.us.
- D. Siemens Industry, Inc: www.usa.siemens.com.
- E. or approved equal.

2.02 ENCLOSED CIRCUIT BREAKERS

- A. Description: Units consisting of molded case circuit breakers individually mounted in enclosures.
- B. Provide products listed, classified, and labeled as suitable for the purpose intended.
- C. Unless otherwise indicated, provide products suitable for continuous operation under the following service conditions:
 - 1. Altitude: Less than 6,600 feet (2,000 m).
 - 2. Ambient Temperature: Between 23 degrees F (-5 degrees C) and 104 degrees F (40 degrees C).
- D. Short Circuit Current Rating:
 - 1. Provide enclosed circuit breakers with listed short circuit current rating not less than the available fault current at the installed location indicated on the drawings.
- E. Conductor Terminations: Suitable for use with the conductors to be installed.

- F. Provide solidly bonded equipment ground bus in each enclosed circuit breaker, with a suitable lug for terminating each equipment grounding conductor.
- G. Enclosures: Comply with NEMA 250, and list and label as complying with UL 50 and UL 50E.
 - 1. Environment Type per NEMA 250: Unless otherwise indicated, as specified for the following installation locations:
- H. Provide externally operable handle with means for locking in the OFF position.

2.03 MOLDED CASE CIRCUIT BREAKERS

- A. Description: Quick-make, quick-break, over center toggle, trip-free, trip-indicating circuit breakers listed and labeled as complying with UL 489, and complying with FS W-C-375 where applicable; ratings, configurations, and features as indicated on the drawings.
- B. Interrupting Capacity:
 - 1. Provide circuit breakers with interrupting capacity as required to provide the short circuit current rating indicated, but not less than:
 - 2. Fully Rated Systems: Provide circuit breakers with interrupting capacity not less than the short circuit current rating indicated.
- C. Conductor Terminations:
 - 1. Lug Material: Aluminum, suitable for terminating aluminum or copper conductors.
- D. Multi-Pole Circuit Breakers: Furnish with common trip for all poles.

PART 3 EXECUTION

3.01 EXAMINATION

- A. Verify that the ratings of the enclosed circuit breakers are consistent with the indicated requirements.
- B. Verify that mounting surfaces are ready to receive enclosed circuit breakers.
- C. Verify that conditions are satisfactory for installation prior to starting work.

3.02 INSTALLATION

- A. Install products in accordance with manufacturer's instructions.
- B. Perform work in accordance with NECA 1 (general workmanship).
- C. Arrange equipment to provide minimum clearances in accordance with manufacturer's instructions and NFPA 70.
- D. Install enclosed circuit breakers plumb.

3.03 FIELD QUALITY CONTROL

- A. Test GFCI circuit breakers to verify proper operation.
- B. Correct deficiencies and replace damaged or defective enclosed circuit breakers.

END OF SECTION

SECTION 26 2923

VARIABLE-FREQUENCY MOTOR CONTROLLERS

PART 1 GENERAL

1.01 SECTION INCLUDES

- A. Variable frequency controllers.

1.02 REFERENCE STANDARDS

- A. NEMA ICS 7.1 - Safety Standards for Construction and Guide for Selection, Installation, and Operation of Adjustable-Speed Drive Systems; 2014.
- B. NEMA ICS 7 - Industrial Control and Systems: Adjustable-Speed Drives; 2014.
- C. NEMA 250 - Enclosures for Electrical Equipment (1000 Volts Maximum); 2014.
- D. NFPA 70 - National Electrical Code; Most Recent Edition Adopted by Authority Having Jurisdiction, Including All Applicable Amendments and Supplements.

1.03 SUBMITTALS

- A. Product Data: Provide catalog sheets showing voltage, controller size, ratings and size of switching and overcurrent protective devices, short circuit ratings, dimensions, and enclosure details.

1.04 QUALITY ASSURANCE

- A. Conform to requirements of NFPA 70.

PART 2 PRODUCTS

2.01 MANUFACTURERS

- A. Reliance Electric/Rockwell Automation: www.reliance.com.
- B. Siemens Energy & Automation: www.sea.siemens.com.
- C. Schneider Electric; Square D Products: www.schneider-electric.us.
- D. Bell & Gossett Xylem
- E. or approved equal.

2.02 DESCRIPTION

- A. Variable Frequency Controllers: Enclosed controllers suitable for operating the indicated loads, in conformance with requirements of NEMA ICS 7. Select unspecified features and options in accordance with NEMA ICS 3.1.

2.03 OPERATING REQUIREMENTS

- A. Rated Input Voltage: 208 volts, three phase, 60 Hertz.
- B. Volts Per Hertz Adjustment: Plus or minus 10 percent.
- C. Current Limit Adjustment: 60 to 110 percent of rated.
- D. Acceleration Rate Adjustment: 0.5 to 30 seconds.
- E. Deceleration Rate Adjustment: 1 to 30 seconds.

2.04 COMPONENTS

- A. Display: Provide integral digital display to indicate output voltage, output frequency, and output current.
- B. Status Indicators: Separate indicators for overcurrent, overvoltage, ground fault, overtemperature, and input power ON.
- C. Furnish HAND-OFF-AUTOMATIC selector switch and manual speed control.

2.05 SOURCE QUALITY CONTROL

- A. Shop inspect and perform standard productions tests for each controller.

PART 3 EXECUTION

3.01 EXAMINATION

- A. Verify that surface is suitable for controller installation.
- B. Do not install controller until building environment can be maintained within the service conditions required by the manufacturer.

3.02 INSTALLATION

- A. Install in accordance with NEMA ICS 7.1 and manufacturer's instructions.
- B. Tighten accessible connections and mechanical fasteners after placing controller.

3.03 ADJUSTING

- A. Make final adjustments to installed controller to assure proper operation of load system. Obtain performance requirements from installer of driven loads.

3.04 CLOSEOUT ACTIVITIES

- A. Demonstrate operation of controllers in automatic and manual modes.

3.05 MAINTENANCE

- A. Provide service and maintenance of controllers for one year from Date of Substantial Completion.

END OF SECTION

SECTION 26 5100
INTERIOR LIGHTING

PART 1 GENERAL

1.01 SECTION INCLUDES

- A. Interior luminaires.
- B. Accessories.

1.02 RELATED REQUIREMENTS

- A. Section 26 0529 - Hangers and Supports for Electrical Systems.
- B. Section 26 0533.16 - Boxes for Electrical Systems.

1.03 REFERENCE STANDARDS

- A. IES LM-80 - Approved Method: Measuring Luminous Flux and Color Maintenance of LED Packages, Arrays, and Modules; 2015, with Errata (2017).
- B. NECA 1 - Standard for Good Workmanship in Electrical Construction; 2015.
- C. NECA/IESNA 500 - Standard for Installing Indoor Commercial Lighting Systems; 2006.
- D. NECA/IESNA 502 - Standard for Installing Industrial Lighting Systems; 2006.
- E. NFPA 70 - National Electrical Code; Most Recent Edition Adopted by Authority Having Jurisdiction, Including All Applicable Amendments and Supplements.
- F. UL 1598 - Luminaires; Current Edition, Including All Revisions.

1.04 SUBMITTALS

- A. See Section 01 3000 - Administrative Requirements, for submittal procedures.
- B. Shop Drawings:
- C. Product Data: Provide manufacturer's standard catalog pages and data sheets including detailed information on luminaire construction, dimensions, ratings, finishes, mounting requirements, listings, service conditions, photometric performance, installed accessories, and ceiling compatibility; include model number nomenclature clearly marked with all proposed features.
 - 1. LED Luminaires:
 - a. Include estimated useful life, calculated based on IES LM-80 test data.
- D. Field quality control reports.

1.05 QUALITY ASSURANCE

- A. Comply with requirements of NFPA 70.

PART 2 PRODUCTS

2.01 LUMINAIRE TYPES

- A. Furnish products as indicated in luminaire schedule included on the drawings.

2.02 LUMINAIRES

- A. Manufacturers:
 - 1. Acuity Brands, Inc: www.acuitybrands.com/#sle.
 - 2. Alloy LED; www.alloyled.com/#sle.
 - 3. Cooper Lighting, a division of Cooper Industries: www.cooperindustries.com/#sle.
 - 4. Electro-Matic Visual, Inc; www.empvisual.com.
 - 5. Hubbell Lighting, Inc: www.hubbelllighting.com/#sle.
 - 6. or approved equal.
- B. Provide products that comply with requirements of NFPA 70.
- C. Provide products that are listed and labeled as complying with UL 1598, where applicable.
- D. Provide products listed, classified, and labeled as suitable for the purpose intended.

- E. Unless otherwise indicated, provide complete luminaires including lamp(s) and all sockets, ballasts, reflectors, lenses, housings and other components required to position, energize and protect the lamp and distribute the light.
- F. Unless specifically indicated to be excluded, provide all required conduit, boxes, wiring, connectors, hardware, supports, trims, accessories, etc. as necessary for a complete operating system.
- G. Provide products suitable to withstand normal handling, installation, and service without any damage, distortion, corrosion, fading, discoloring, etc.

2.03 ACCESSORIES

- A. Stems for Suspended Luminaires: Steel tubing, minimum 1/2" size, factory finished to match luminaire or field-painted as directed.
- B. Threaded Rods for Suspended Luminaires: Zinc-plated steel, minimum 1/4" size, field-painted as directed.

PART 3 EXECUTION

3.01 EXAMINATION

- A. Verify that field measurements are as indicated.
- B. Verify that outlet boxes are installed in proper locations and at proper mounting heights and are properly sized to accommodate conductors in accordance with NFPA 70.
- C. Verify that suitable support frames are installed where required.
- D. Verify that branch circuit wiring installation is completed, tested, and ready for connection to luminaires.

3.02 INSTALLATION

- A. Coordinate locations of outlet boxes provided under Section 26 0533.16 as required for installation of luminaires provided under this section.
- B. Perform work in accordance with NECA 1 (general workmanship).
- C. Install products in accordance with manufacturer's instructions.
- D. Install luminaires securely, in a neat and workmanlike manner, as specified in NECA 500 (commercial lighting) and NECA 502 (industrial lighting).
- E. Provide required support and attachment in accordance with Section 26 0529.
- F. Install luminaires plumb and square and aligned with building lines and with adjacent luminaires.
- G. Install accessories furnished with each luminaire.
- H. Bond products and metal accessories to branch circuit equipment grounding conductor.
- I. Install lamps in each luminaire.

END OF SECTION

SECTION 26 5600
EXTERIOR LIGHTING

PART 1 GENERAL

1.01 SECTION INCLUDES

- A. Exterior luminaires.
- B. Luminaire accessories.

1.02 RELATED REQUIREMENTS

- A. Section 26 0529 - Hangers and Supports for Electrical Systems.
- B. Section 26 0533.16 - Boxes for Electrical Systems.

1.03 REFERENCE STANDARDS

- A. NECA 1 - Standard for Good Workmanship in Electrical Construction; 2015.
- B. NECA/IESNA 501 - Standard for Installing Exterior Lighting Systems; 2006.
- C. NFPA 70 - National Electrical Code; Most Recent Edition Adopted by Authority Having Jurisdiction, Including All Applicable Amendments and Supplements.
- D. UL 1598 - Luminaires; Current Edition, Including All Revisions.

1.04 SUBMITTALS

- A. See Section 01 3000 - Administrative Requirements, for submittal procedures.
- B. Shop Drawings:
 - 1. Indicate dimensions and components for each luminaire that is not a standard product of the manufacturer.
 - 2. Provide photometric calculations where luminaires are proposed for substitution upon request.
 - 3. Provide structural calculations for each pole proposed for substitution.
- C. Product Data: Provide manufacturer's standard catalog pages and data sheets including detailed information on luminaire construction, dimensions, ratings, finishes, mounting requirements, listings, service conditions, photometric performance, weight, effective projected area (EPA), and installed accessories; include model number nomenclature clearly marked with all proposed features.

1.05 QUALITY ASSURANCE

- A. Comply with requirements of NFPA 70.
- B. Maintain at the project site a copy of each referenced document that prescribes execution requirements.
- C. Manufacturer Qualifications: Company specializing in manufacturing the products specified in this section with minimum three years documented experience.

PART 2 PRODUCTS

2.01 LUMINAIRE TYPES

- A. Furnish products as indicated in luminaire schedule included on the drawings.

2.02 LUMINAIRES

- A. Manufacturers:
 - 1. Acuity Brands, Inc: www.acuitybrands.com/#sle.
 - 2. Alloy LED; www.alloyled.com/#sle.
 - 3. Cooper Lighting, a division of Cooper Industries: www.cooperindustries.com/#sle.
 - 4. Electro-Matic Visual, Inc; www.empvisual.com/#sle.
 - 5. Hubbell Lighting, Inc: www.hubbelllighting.com/#sle.
 - 6. Philips Lighting North America Corporation; www.lightingproducts.philips.com/#sle.
 - 7. or approved equal.
- B. Provide products that comply with requirements of NFPA 70.
- C. Provide products that are listed and labeled as complying with UL 1598, where applicable.

- D. Provide products listed, classified, and labeled as suitable for the purpose intended.
- E. Unless otherwise indicated, provide complete luminaires including lamp(s) and all sockets, ballasts, reflectors, lenses, housings and other components required to position, energize and protect the lamp and distribute the light.
- F. Unless specifically indicated to be excluded, provide all required conduit, boxes, wiring, connectors, hardware, poles, foundations, supports, trims, accessories, etc. as necessary for a complete operating system.
- G. Provide products suitable to withstand normal handling, installation, and service without any damage, distortion, corrosion, fading, discoloring, etc.
- H. Provide luminaires listed and labeled as suitable for wet locations unless otherwise indicated.

PART 3 EXECUTION

3.01 EXAMINATION

- A. Verify that field measurements are as indicated.
- B. Verify that outlet boxes are installed in proper locations and at proper mounting heights and are properly sized to accommodate conductors in accordance with NFPA 70.
- C. Verify that suitable support frames are installed where required.
- D. Verify that branch circuit wiring installation is completed, tested, and ready for connection to luminaires.
- E. Verify that conditions are satisfactory for installation prior to starting work.

3.02 INSTALLATION

- A. Coordinate locations of outlet boxes provided under Section 26 0533.16 as required for installation of luminaires provided under this section.
- B. Install products in accordance with manufacturer's instructions.
- C. Install luminaires in accordance with NECA/IESNA 501.
- D. Provide required support and attachment in accordance with Section 26 0529.
- E. Install luminaires plumb and square and aligned with building lines and with adjacent luminaires.
- F. Install accessories furnished with each luminaire.
- G. Bond products and metal accessories to branch circuit equipment grounding conductor.
- H. Install lamps in each luminaire.

3.03 CLOSEOUT ACTIVITIES

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

END OF SECTION

SECTION 28 4600
FIRE DETECTION AND ALARM

PART 1 GENERAL

1.01 SECTION INCLUDES

- A. Fire alarm system revisions, including all components, wiring, and conduit.
- B. Replacement and removal of existing fire alarm system components, wiring, and conduit indicated.

1.02 REFERENCE STANDARDS

- A. 36 CFR 1191 - Americans with Disabilities Act (ADA) Accessibility Guidelines for Buildings and Facilities; Architectural Barriers Act (ABA) Accessibility Guidelines; current edition.
- B. ADA Standards - Americans with Disabilities Act (ADA) Standards for Accessible Design; 2010.
- C. IEEE C62.41.2 - IEEE Recommended Practice on Characterization of Surges in Low-Voltage (1000 V and less) AC Power Circuits; 2002 (Corrigendum 2012).
- D. NFPA 70 - National Electrical Code; Most Recent Edition Adopted by Authority Having Jurisdiction, Including All Applicable Amendments and Supplements.
- E. NFPA 72 - National Fire Alarm and Signaling Code; 2016.

1.03 SUBMITTALS

- A. See Section 01 3000 - Administrative Requirements, for submittal procedures.
- B. Proposal Documents: Submit the following with cost/time proposal:
 - 1. NFPA 72 "Record of Completion", filled out to the extent known at the time.
 - 2. Manufacturer's detailed data sheet for each control unit, initiating device, and notification appliance.
 - 3. Certification by Contractor that the system design will comply with Contract Documents.
- C. Evidence of maintenance contractor qualifications, if different from installer.
- D. Inspection and Test Reports:
 - 1. Submit NFPA 72 "Inspection and Test Form," filled out.
- E. Project Record Documents: See Section 01 7800 for additional requirements; have one set available during closeout demonstration:
 - 1. Complete set of floor plans showing actual installed locations of components, conduit, and zones.
 - 2. "As installed" wiring and schematic diagrams, with final terminal identifications.
 - 3. "As programmed" operating sequences, including control events by device, updated input/output chart, and voice messages by event.
- F. Closeout Documents:
 - 1. Certification by manufacturer that the equipment has been installed in compliance with manufacturer's installation requirements, is complete, and is in satisfactory operating condition.
 - 2. NFPA 72 "Record of Completion", filled out completely and signed by installer and authorized representative of authority having jurisdiction.

1.04 QUALITY ASSURANCE

- A. Installer Qualifications: Firm with minimum 3 years documented experience installing fire alarm equipment of the specified type and providing contract maintenance service as a regular part of their business.
- B. Maintenance Contractor Qualifications: Same entity as installer or different entity with specified qualifications.

1.05 WARRANTY

- A. Provide installer's warranty that the installation is free from defects and will remain so for 1 year after date of Substantial Completion.

PART 2 PRODUCTS

2.01 FIRE ALARM SYSTEM

- A. Fire Alarm System: Provide modifications and extensions to the existing automatic fire detection and alarm system:
 - 1. Provide all components necessary, regardless of whether shown in Contract Documents or not.

2.02 EXISTING COMPONENTS

- A. Existing Fire Alarm System: Remove existing components indicated and incorporate remaining components into new system, under warranty as if they were new; do not take existing portions of system out of service until new portions are fully operational, tested, and connected to existing system.
- B. Clearly label components that are "Not In Service."

2.03 COMPONENTS

- A. General:
 - 1. Provide flush mounted units where installed in finish areas; in unfinished areas, surface mounted unit are acceptable.
 - 2. Provide legible, permanent labels for each control device, using identification used in operation and maintenance data.
- B. Fire Alarm Control Units: Analog, addressable type; listed, classified, and labeled as suitable for the purpose intended.
- C. Initiating Devices:
 - 1. Addressable Systems:
 - a. Addressable Devices: Individually identifiable by addressable fire alarm control unit.
 - b. Provide suitable addressable interface modules as indicated or as required for connection to conventional (non-addressable) devices and other components that provide a dry closure output.
- D. Notification Appliances:
 - 1. StrobesE. Circuit Conductors: Copper or optical fiber; provide 200 feet (60 m) extra; color code and label.
- F. Surge Protection: In accordance with IEEE C62.41.2 category B combination waveform and NFPA 70; except for optical fiber conductors.
- G. Instruction Charts: Printed instruction chart for operators, showing steps to be taken when a signal is received (normal, alarm, supervisory, and trouble); easily readable from normal operator's station.
 - 1. Frame: Stainless steel or aluminum with polycarbonate or glass cover.
 - 2. Provide one for each control unit where operations are to be performed.
 - 3. Obtain approval of Owner prior to mounting; mount in location acceptable to Owner.
 - 4. Provide extra copy with operation and maintenance data submittal.
- H. CARBON MONOXIDE DETECTORS
 - 1. General: Carbon monoxide detector listed for connection to fire-alarm system.
 - a. Mounting: Adapter plate for outlet box mounting.
 - b. Testable by introducing test carbon monoxide into the sensing cell.
 - c. Detector shall provide alarm contacts and trouble contacts.
 - d. Detector shall send trouble alarm when nearing end-of-life, power supply problems, or internal faults.
 - e. Comply with UL 2075.
 - f. Locate, mount, and wire according to manufacturer's written instructions.
 - g. Provide means for addressable connection to fire-alarm system.
 - h. Test button simulates an alarm condition.

PART 3 EXECUTION

3.01 INSTALLATION

- A. Install in accordance with applicable codes, NFPA 72, NFPA 70, and Contract Documents.
- B. Conceal all wiring, conduit, boxes, and supports where installed in finished areas.

3.02 INSPECTION AND TESTING FOR COMPLETION

- A. Notify Owner 7 days prior to beginning completion inspections and tests.
- B. Notify authorities having jurisdiction and comply with their requirements for scheduling inspections and tests and for observation by their personnel.
- C. Provide the services of the installer's supervisor or person with equivalent qualifications to supervise inspection and testing, correction, and adjustments.
- D. Prepare for testing by ensuring that all work is complete and correct; perform preliminary tests as required.
- E. Provide all tools, software, and supplies required to accomplish inspection and testing.
- F. Perform inspection and testing in accordance with NFPA 72 and requirements of local authorities; document each inspection and test.
- G. Correct defective work, adjust for proper operation, and retest until entire system complies with Contract Documents.

3.03 CLOSEOUT

- A. Closeout Demonstration: Demonstrate proper operation of all functions to Owner.
 - 1. Be prepared to conduct any of the required tests.
 - 2. Have at least one copy of operation and maintenance data, preliminary copy of project record drawings, input/output matrix, and operator instruction chart(s) available during demonstration.
 - 3. Have authorized technical representative of control unit manufacturer present during demonstration.
 - 4. Demonstration may be combined with inspection and testing required by authority having jurisdiction; notify authority having jurisdiction in time to schedule demonstration.
 - 5. Repeat demonstration until successful.

3.04 MAINTENANCE

- A. See Section 01 7000 - Execution and Closeout Requirements, for additional requirements relating to maintenance service.
- B. Comply with Owner's requirements for access to facility and security.

END OF SECTION

SECTION 32 3113
CHAIN LINK FENCES AND GATES

PART 1 GENERAL

1.1 RELATED DOCUMENTS

- A. Drawings and general provisions of the Contract, including School Facilities Management Contract Manual and Specifications and Division 1 Specification Sections, apply to this Section.
- B. In the event of discrepancies between the specifications and School Facilities Management Contract Manual and Specifications the School Facilities Management Contract Manual and Specifications shall prevail.

1.2 SECTION INCLUDES

- A. Posts, rails, and frames.
- B. Wire fabric.
- C. Accessories.

1.3 RELATED REQUIREMENTS

1.4 REFERENCE STANDARDS

- A. ASTM A123/A123M - Standard Specification for Zinc (Hot-Dip Galvanized) Coatings on Iron and Steel Products; 2017.
- B. ASTM A153/A153M - Standard Specification for Zinc Coating (Hot-Dip) on Iron and Steel Hardware; 2023.
- C. ASTM A392 - Standard Specification for Zinc-Coated Steel Chain-Link Fence Fabric; 2011a (Reapproved 2022).
- D. ASTM C94/C94M - Standard Specification for Ready-Mixed Concrete; 2023.
- E. ASTM F567 - Standard Practice for Installation of Chain-Link Fence; 2023.
- F. ASTM F668 - Standard Specification for Polyvinyl Chloride (PVC), Polyolefin and Other Polymer-Coated Steel Chain Link Fence Fabric; 2017 (Reapproved 2022).
- G. ASTM F1083 - Standard Specification for Pipe, Steel, Hot-Dipped Zinc-Coated (Galvanized) Welded, for Fence Structures; 2018 (Reapproved 2022).
- H. CLFMI WLG 2445 - Wind Load Guide for the Selection of Line Post and Line Post Spacing; 2023.
- I. FS RR-F-191/1D - Fencing, Wire and Post Metal (Chain-Link Fence Fabric); 1990.

1.5 SUBMITTALS

- A. See Section 01 3000 - Administrative Requirements, for submittal procedures.
- B. Product Data: Provide data on fabric, posts, accessories, fittings and hardware.
- C. Shop Drawings: Indicate plan layout, spacing of components, post foundation dimensions, hardware anchorage, and schedule of components. See CLFMI CLF-SFR0111 for planning and design recommendations.
- D. Samples: Submit two samples of fence fabric, 12 inch by 12 inch in size illustrating construction and colored finish.
- E. Manufacturer's Installation Instructions: Indicate installation requirements
- F. Field Inspection Records: Provide installation inspection records that include post settings, framework, fabric, barbed wire, fittings and accessories, gates, and workmanship.

1.6 QUALITY ASSURANCE

- A. Manufacturer Qualifications: Company specializing in manufacturing products specified in this section, with not less than five (5) years of documented experience.
- B. Fence Installer: Company with demonstrated successful experience installing similar projects and products, with not less than five years of documented experience.

1.7 WARRANTY

- A. See Section 01 7800 - Closeout Submittals, for additional warranty requirements.

PART 2 PRODUCTS

2.1 COMPONENTS

- A. Line Posts: 1.9 inch diameter.
- B. Corner and Terminal Posts: 2.38 inch diameter.
- C. Top and Brace Rail: 1.66 inch diameter, plain end, sleeve coupled.
- D. Bottom Rail: 1.66 inch diameter, plain end, sleeve coupled.
- E. Fabric: 2 inch diamond mesh interwoven wire, 6 gage, 0.1920 inch thick, top selvage knuckle end closed, bottom selvage twisted tight.

2.2 MATERIALS

- A. Posts and rails shall be standard weight galvanized steel pipe of the sizes shown on the plans and shall conform to ASTM Serial Designation F-1083, Schedule 40. Posts and rails shall be galvanized in YPS Office of Facilities Management accordance with ASTM Serial Designation 1-123.
 - 1. All posts and rails shall have a minimum 10 mil polyvinyl chloride coating meeting the requirements below. As selected by Eisenbach and Runhke, Engineers.
- B. Line Posts: Type I round in accordance with FS RR-F-191/1D
- C. Terminal, Corner, Rail, Brace, and Gate Posts: Type I round in accordance with FS RR-F-191/1D.
- D. Wire Fabric: 1 polymer-coated galvanized steel chain link fabric.
- E. Concrete: Ready-mixed, complying with ASTM C94/C94M; normal Portland cement; 4000 psi strength at 28 days, 3 inch slump.

2.3 COMPONENTS

2.4 ACCESSORIES

- A. Caps: Molded rigid vinyl; sized to post diameter, set screw retainer.
- B. Fittings: Sleeves, bands, clips, rail ends, tension bars, fasteners and fittings; steel.

2.5 FINISHES

- A. Components and Fabric: 5 ga. Bonded Vinyl coated, over coating of 1.8 oz/sq ft galvanizing, on 6 ga. core.
- B. Hardware: Hot-dip galvanized to weight required by ASTM A153/A153M.
- C. Accessories: Same finish as framing.
- D. Color(s): Black.

PART 3 EXECUTION

3.1 EXAMINATION

- A. Verification of Conditions: Verify that areas are clear of obstructions or debris.

3.2 PREPARATION

- A. Removal: Obstructions or debris.

3.3 INSTALLATION

- A. Install framework, fabric, accessories in accordance with ASTM F567.
- B. Set intermediate posts plumb. Slope top of concrete for water runoff.
- C. Brace each gate and corner post to adjacent line post with horizontal center brace rail and diagonal truss rods. Install brace rail one bay from end and gate posts.
- D. Provide top rail through line post tops and splice with 6 inch long rail sleeves.
- E. Do not stretch fabric until concrete foundation has cured 28 days.
- F. Stretch fabric between terminal posts or at intervals of 100 feet maximum, whichever is less.
- G. Position bottom of fabric 2 inches above concrete.
- H. Fasten fabric to top rail, line posts, braces, and bottom tension wire with tie wire at maximum 15 inches on centers.
- I. Attach fabric to end, corner, and gate posts with tension bars and tension bar clips.
- J. Install bottom tension wire stretched taut between terminal posts.
- K. Do not attach the hinged side of gate to building wall; provide gate posts.
- L. Install gate with fabric to match fence. Install hardware.
- M. Provide concrete center drop to footing depth and drop rod retainers at center of double gate openings.
- N. Perform three random field inspections confirming proper installation.

3.4 TOLERANCES

- A. Maximum Variation From Plumb: 1/4 inch.
- B. Maximum Offset From True Position: 1 inch.
- C. Do not infringe on adjacent property lines.

3.5 FIELD QUALITY CONTROL

- A. See Section 01 4000 - Quality Requirements, for additional requirements.
- B. Layout: Verify that fence installation markings are accurate to design, paying attention to gate locations, underground utilities, and property lines.
- C. Workmanship: Verify neat installation free of defects. See CLFMI CLF-FIG0111 for field inspection guidance.

3.6 CLEANING

- A. Clean jobsite of excess materials; scatter excess material from post hole excavations uniformly away from posts. Remove excess material.
- B. Clean fence with mild household detergent and clean water rinse well.

3.7 CLOSEOUT ACTIVITIES

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

END OF SECTION