

SECTION 01 1000
SUMMARY OF CONTRACTS

PART 1 GENERAL

1.01 PROJECT

- A. Project Name: Cross Hill Academy
- B. Owner's Name: Yonkers Public Schools.
- C. Engineer's Name: Eisenbach & Ruhnke Engineering, P.C.
- D. The Project consists of the following Prime Contracts:
 - 1. CONTRACT 1 - GENERAL CONSTRUCTION
 - a. Renovate the room damaged by the fire.
 - b. Replace the corridor ceilings as indicated.
 - c. Provide the furnishings for the renovated classroom.
 - d. Renovate the sidewalk and drainage area washed out by the storm.
 - e. Renovate the adjacent spaces where the fire clean up required removals.
 - f. Perform the asbestos and PCB abatement indicated.
 - 2. CONTRACT 2 - HVAC
 - a. Provide the HVAC work indicated on the drawings
 - 3. CONTRACT 3 - ELECTRICAL
 - a. Provide the Electrical renovations in the rooms damaged by the fire.
 - b. Provide the Electrical work indicated on the drawings.
 - 4. CONTRACT 4 - PLUMBING
 - a. Provide the plumbing work for the new sinks in the room being renovated.

1.02 DESCRIPTION OF ALTERATIONS WORK

- A. Scope defined above and indicated on Drawings.
- B. The project includes renovations to the building.
- C. The schedule is to be coordinated with the YPS with the work to be done during the summer of 2022.

1.03 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.

1.04 CONTRACTOR USE OF SITE AND PREMISES

- A. Arrange use of site and premises to allow:
 - 1. Owner occupancy.
 - 2. Work by Others.
- B. 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 permit.
- C. Utility Outages and Shutdown:
 1. Limit disruption of utility services to 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.

1.05 WORK SEQUENCE

- A. See Phasing Plan provided on the Drawings. Coordinate with Engineer, Construction Manager and District Representative.

1.06 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 1090

RFI FORM

CONTRACTOR'S REQUEST FOR INFORMATION NO. _____

E&R RFI NO: _____

NAME OF PROJECT:

CROSS HILL ACADEMY – FIRE RESTORATION

NAME OF OWNER: Yonkers Public School District
DATE: _____
A/E PROJECT NO: Y21CH01
ARCHITECT/ENGINEER: Eisenbach & Ruhnke Engineering, P.C.
291 Genesee Street
Utica, New York 13501
315.735.1916 Fax: 315.735.6365
JACK EISENBACH – jeisenbach@erengpc.com

FROM (CO. NAME): _____
EMAIL/FAX NO. _____
CONTACT NAME: _____
SUBJECT: _____
DISCIPLINE/TRADE: _____
DWG./SPEC. REFERENCE: _____
QUESTION: _____

ANSWER: _____

ARCHITECT'S/ENGINEERS SIGNATURE: _____

DATE: _____

Note: review and any responses to this request for information by the architect/engineer is strictly for design intent only and does not constitute acknowledgement or acceptance of any cost or schedule implications unless specifically presented by the contractor. By submission of this request for information, the contractor assumes all responsibility in the absence of an approved change order or work directive.

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. CONTRACT 1 - GENERAL CONSTRUCTION
 - 1. ALLOWANCE
 - a. Include an allowance for use according to the Owner' instructions
Twenty Thousand (\$20,000) DOLLARS
- B. CONTRACT 2 - HVAC
 - 1. ALLOWANCE
 - a. Include an allowance for use according to the Owner' instructions
Twenty Thousand (\$20,000) DOLLARS
- C. CONTRACT 3 - ELECTRICAL
 - 1. ALLOWANCE
 - a. Include an allowance for use according to the Owner' instructions
Fifteen Thousand (\$15,000) DOLLARS
- D. CONTRACT 4 - PLUMBING
 - 1. ALLOWANCE
 - a. Include an allowance for use according to the Owner' instructions
Five Thousand (\$5,000) DOLLARS

PART 2 PRODUCTS - NOT USED

PART 3 EXECUTION - NOT USED

END OF SECTION

SECTION 01 30 00
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 do 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 work day 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 non combustible 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 provided 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 course of 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 amount 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 amount 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
Cross Hill Academy
Fire Restoration
E&R Project No.: Y21CH01 YPS#10929

Contractor:

Project Manager:
Address:
Phone:

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

Project Manager: Jack Eisenbach, jeisenbach@erengpc.com
Address: 291 Genesee Street
Utica, NY 13501
Phone: 315-735-1916

Owner:

Yonkers Public Schools
One Larkin Center
Yonkers, NY 10701

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: _____
EISENBACH & RUHNKE ENGINEERING

SECTION 01 3553
SECURITY PROCEDURES

PART 1 GENERAL

1.01 SECTION INCLUDES

- A. Security measures including formal security program, entry control, personnel identification, and miscellaneous restrictions.

1.02 RELATED REQUIREMENTS

- A. Section 01 1000 - Summary: use of premises and occupancy.
- B. Section 01 5000 - Temporary Facilities and Controls: Temporary lighting.

1.03 SECURITY PROGRAM

- A. Protect Work, existing premises and Owner's operations from theft, vandalism, and unauthorized entry.
- B. Initiate program at project mobilization.
- C. Maintain program throughout construction period until Owner occupancy.

1.04 ENTRY CONTROL

- A. Restrict entrance of persons and vehicles into Project site and existing facilities.
- B. Allow entrance only to authorized persons with proper identification.
- C. Maintain log of workers and visitors, make available to Owner on request.
- D. Coordinate access of Owner's personnel to site in coordination with Owner's security forces.

1.05 PERSONNEL IDENTIFICATION

- A. Provide identification badge to each person authorized to enter premises.
- B. Badge To Include: Personal photograph, name, assigned number, expiration date and employer.
- C. Require return of badges at expiration of their employment on the Work.

1.06 RESTRICTIONS

- A. Do not allow cameras on site or photographs taken except by written approval of Owner.

PART 2 PRODUCTS - NOT USED

PART 3 EXECUTION - NOT USED

END OF SECTION

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 work place.
- 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

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 RELATED REQUIREMENTS

- A. Section 01 5100 - Temporary Utilities.

1.03 TEMPORARY UTILITIES - SEE SECTION 01 5100

- A. Owner will provide the following:
 - 1. Electrical power, consisting of connection to existing facilities.

1.04 TEMPORARY SANITARY FACILITIES

- A. Provide and maintain required facilities and enclosures. Provide at time of project mobilization.
- B. Maintain daily in clean and sanitary condition.

1.05 BARRIERS

- A. Provide barriers to prevent unauthorized entry to construction areas, to prevent access to areas that could be hazardous to workers or the public, to allow for owner's use of site and to protect existing facilities and adjacent properties from damage from construction operations and demolition.
- B. Provide barricades and covered walkways required by governing authorities for public rights-of-way and for public access to existing building.
- C. Protect non-owned vehicular traffic, stored materials, site, and structures from damage.

1.06 FENCING

- A. Provide 6 foot (1.8 m) high fence around construction site; equip with vehicular and pedestrian gates with locks.

1.07 INTERIOR ENCLOSURES

- A. Provide temporary partitions as indicated to separate work areas from Owner-occupied areas, to prevent penetration of dust and moisture into Owner-occupied areas, and to prevent damage to existing materials and equipment.
- B. Construction: Framing and reinforced polyethylene sheet materials with closed joints and sealed edges at intersections with existing surfaces:

1.08 VEHICULAR ACCESS AND PARKING

- A. Coordinate access and haul routes with governing authorities and Owner.
- B. Provide and maintain access to fire hydrants, free of obstructions.
- C. Provide temporary parking areas to accommodate construction personnel. When site space is not adequate, provide additional off-site parking.

1.09 WASTE REMOVAL

- A. Provide waste removal facilities and services as required to maintain the site in clean and orderly condition.
- B. Provide containers with lids. Remove trash from site periodically.

- C. If materials to be recycled or re-used on the project must be stored on-site, provide suitable non-combustible containers; locate containers holding flammable material outside the structure unless otherwise approved by the authorities having jurisdiction.
- D. Open free-fall chutes are not permitted. Terminate closed chutes into appropriate containers with lids.

1.10 PROJECT IDENTIFICATION

- 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.

1.11 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.

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 Yonkers Public Schools, or otherwise indicated as to remain the property of the Yonkers Public Schools, 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 Yonkers Public Schools.
 - 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 70 00

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 Yonkers Public Schools prior to final completion before Yonkers Public Schools 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 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 Yonkers Public Schools 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 01 7900
DEMONSTRATION AND TRAINING

PART 1 GENERAL

1.01 SUMMARY

- A. Demonstration of products and systems to be commissioned and where indicated in specific specification sections.
- B. Training of Owner personnel in operation and maintenance is required for:
 - 1. HVAC systems and equipment.

1.02 RELATED REQUIREMENTS

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

1.03 SUBMITTALS

- A. See Section 01 3000 - Administrative Requirements, for submittal procedures; except:
 - 1. Make all submittals specified in this section, and elsewhere where indicated for commissioning purposes, directly to the Commissioning Authority.
 - 2. Submit one copy to the Commissioning Authority, not to be returned.
 - 3. Make commissioning submittals on time schedule specified by Commissioning Authority.
 - 4. Submittals indicated as "Draft" are intended for the use of the Commissioning Authority in preparation of overall Training Plan; submit in editable electronic format, Microsoft Word 2003 preferred.
- B. Draft Training Plans: Owner will designate personnel to be trained; tailor training to needs and skill-level of attendees.
 - 1. Submit to Commissioning Authority for review and inclusion in overall training plan.
 - 2. Submit not less than four weeks prior to start of training.
 - 3. Revise and resubmit until acceptable.
 - 4. Provide an overall schedule showing all training sessions.
 - 5. Include at least the following for each training session:
 - a. Identification, date, time, and duration.
 - b. Description of products and/or systems to be covered.
 - c. Name of firm and person conducting training; include qualifications.
 - d. Intended audience, such as job description.
 - e. Objectives of training and suggested methods of ensuring adequate training.
 - f. Methods to be used, such as classroom lecture, live demonstrations, hands-on, etc.
 - g. Media to be used, such as slides, hand-outs, etc.
 - h. Training equipment required, such as projector, projection screen, etc., to be provided by Contractor.
- C. Training Manuals: Provide training manual for each attendee; allow for minimum of two attendees per training session.
 - 1. Include applicable portion of O&M manuals.
 - 2. Include copies of all hand-outs, slides, overheads, video presentations, etc., that are not included in O&M manuals.
 - 3. Provide one extra copy of each training manual to be included with operation and maintenance data.

1.04 QUALITY ASSURANCE

- A. Instructor Qualifications: Familiar with design, operation, maintenance and troubleshooting of the relevant products and systems.
 - 1. Provide as instructors the most qualified trainer of those contractors and/or installers who actually supplied and installed the systems and equipment.
 - 2. Where a single person is not familiar with all aspects, provide specialists with necessary qualifications.

PART 2 PRODUCTS - NOT USED

PART 3 EXECUTION

3.01 DEMONSTRATION - GENERAL

- A. Demonstrations conducted during system start-up do not qualify as demonstrations for the purposes of this section, unless approved in advance by Owner.
- B. Demonstrations conducted during Functional Testing need not be repeated unless Owner personnel training is specified.
- C. Demonstration may be combined with Owner personnel training if applicable.
- D. Operating Equipment and Systems: Demonstrate operation in all modes, including start-up, shut-down, seasonal changeover, emergency conditions, and troubleshooting, and maintenance procedures, including scheduled and preventive maintenance.
 - 1. Perform demonstrations not less than two weeks prior to Substantial Completion.
 - 2. For equipment or systems requiring seasonal operation, perform demonstration for other season within six months.
- E. Non-Operating Products: Demonstrate cleaning, scheduled and preventive maintenance, and repair procedures.
 - 1. Perform demonstrations not less than two weeks prior to Substantial Completion.

3.02 TRAINING - GENERAL

- A. Commissioning Authority will prepare the Training Plan based on draft plans submitted.
- B. Conduct training on-site unless otherwise indicated.
- C. Owner will provide classroom and seating at no cost to Contractor.
- D. Do not start training until Functional Testing is complete, unless otherwise specified or approved by the Commissioning Authority.
- E. Provide training in minimum two hour segments.
- F. The Commissioning Authority is responsible for determining that the training was satisfactorily completed and will provide approval forms.
- G. Training schedule will be subject to availability of Owner's personnel to be trained; re-schedule training sessions as required by Owner; once schedule has been approved by Owner failure to conduct sessions according to schedule will be cause for Owner to charge Contractor for personnel "show-up" time.
- H. Review of Facility Policy on Operation and Maintenance Data: During training discuss:
 - 1. The location of the O&M manuals and procedures for use and preservation; backup copies.
 - 2. Typical contents and organization of all manuals, including explanatory information, system narratives, and product specific information.
 - 3. Typical uses of the O&M manuals.
- I. Product- and System-Specific Training:
 - 1. Review the applicable O&M manuals.
 - 2. For systems, provide an overview of system operation, design parameters and constraints, and operational strategies.
 - 3. Review instructions for proper operation in all modes, including start-up, shut-down, seasonal changeover and emergency procedures, and for maintenance, including preventative maintenance.
 - 4. Provide hands-on training on all operational modes possible and preventive maintenance.
 - 5. Emphasize safe and proper operating requirements; discuss relevant health and safety issues and emergency procedures.
 - 6. Discuss common troubleshooting problems and solutions.
 - 7. Discuss any peculiarities of equipment installation or operation.
 - 8. Discuss warranties and guarantees, including procedures necessary to avoid voiding coverage.
 - 9. Review recommended tools and spare parts inventory suggestions of manufacturers.
 - 10. Review spare parts and tools required to be furnished by Contractor.
 - 11. Review spare parts suppliers and sources and procurement procedures.

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

END OF SECTION

SECTION 02 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 Cross Hill Academy.
- B. The Scope of Work is as defined on the Drawing(s).
- C. Asbestos & PCB containing materials to be removed include the Window/Louver Caulk.

1.02 CONTRACTS

- A. Division of Work
 - 1. Asbestos & PCB Abatement Contractor
 - 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. None

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

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

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: YONKERS CROSS HILL ACADEMY FIRE RESTORATION
E&R PROJ NUMBER: Y21CH01 CIP#10929 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>
--	-------------------------

HAZARDOUS MATERIALS
SUBMITTAL COVER SHEET

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

- 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.**

- If airborne fiber counts exceed allowed limits additional samples will be taken as necessary to monitor fiber levels.
- Clearance Air Monitoring
 - Air sample locations shall be the same as the locations of the samples collected before the start of work.
 - All air samples will be taken using aggressive sampling techniques as follows:
 - 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.
 - 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
EACH WORK AREA	5	POLYCARBONAT E (0.4 MICRONS) (37 MM) MIXED CELLULOSE ESTER (0.45 MICRONS) (25 MM)	0.05	2799 1199	2-10

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 and require worker training, managing 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 than 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

**SECTION 06 1000
ROUGH CARPENTRY**

PART 1 GENERAL

1.1 SECTION INCLUDES

- A. Concealed wood blocking, nailers, and supports.

1.2 RELATED REQUIREMENTS

- A. Section 09 2116 - Gypsum Board Assemblies: Gypsum-based sheathing.

1.3 REFERENCE STANDARDS

- A. ASTM A153/A153M - Standard Specification for Zinc Coating (Hot-Dip) on Iron and Steel Hardware; 2009.
- B. ASTM A653/A653M - Standard Specification for Steel Sheet, Zinc-Coated (Galvanized) or Zinc-Iron Alloy-Coated (Galvannealed) by the Hot-Dip Process; 2015.
- C. PS 1 - Structural Plywood; 2009.
- D. PS 2 - Performance Standard for Wood-Based Structural-Use Panels; 2010.
- E. PS 20 - American Softwood Lumber Standard; 2010.

1.4 SUBMITTALS

- A. See Section 01 3000 - Administrative Requirements for submittal procedures.
- B. Product Data: Provide technical data on insulated sheathing, wood preservative materials, and application instructions.

1.5 DELIVERY, STORAGE, AND HANDLING

- A. General: Cover wood products to protect against moisture. Support stacked products to prevent deformation and to allow air circulation.

PART 2 PRODUCTS

2.1 GENERAL REQUIREMENTS

- A. Dimension Lumber: Comply with PS 20 and requirements of specified grading agencies.
 - 1. If no species is specified, provide species graded by the agency specified; if no grading agency is specified, provide lumber graded by grading agency meeting the specified requirements.
 - 2. Grading Agency: Grading agency whose rules are approved by the Board of Review, American Lumber Standard Committee at www.alsc.org, and who provides grading service for the species and grade specified; provide lumber stamped with grade mark unless otherwise indicated.
- B. Lumber fabricated from old growth timber is not permitted.

2.2 DIMENSION LUMBER FOR CONCEALED APPLICATIONS

- A. Sizes: Nominal sizes as indicated on drawings, S4S.
- B. Moisture Content: S-dry or MC19.
- C. Miscellaneous Framing, Blocking, Nailers, Grounds, and Furring:
 - 1. Lumber: S4S, No. 2 or Standard Grade.
 - 2. Boards: Standard or No. 3.

2.3 CONSTRUCTION PANELS

- A. Blocking/Underlayment Combination: PS 2 type,
 - 1. Bond Classification: Exterior.
 - 2. Span Rating: 48.
 - 3. Performance Category: 1-1/8 PERF CAT.

2.4 ACCESSORIES

- A. Fasteners and Anchors:
 - 1. Metal and Finish: Hot-dipped galvanized steel complying with ASTM A153/A153M for high humidity and preservative-treated wood locations, unfinished steel elsewhere.
 - 2. Drywall Screws: Bugle head, hardened steel, power driven type, length three times thickness of sheathing.

PART 3 EXECUTION

3.1 INSTALLATION - GENERAL

- A. Select material sizes to minimize waste.
- B. Reuse scrap to the greatest extent possible; clearly separate scrap for use on site as accessory components, including: shims, bracing, and blocking.

3.2 BLOCKING, NAILERS, AND SUPPORTS

- A. Provide framing and blocking members as indicated or as required to support finishes, fixtures, specialty items, and trim.
- B. In walls, provide blocking attached to studs as backing and support for wall-mounted items, unless item can be securely fastened to two or more studs or other method of support is explicitly indicated.

3.3 TOLERANCES

- A. Framing Members: 1/4 inch (6 mm) from true position, maximum.
- B. Variation from Plane, Other than Floors: 1/4 inch in 10 feet (2 mm/m) maximum, and 1/4 inch in 30 feet (7 mm in 10 m) maximum.

3.4 CLEANING

- A. Waste Disposal: See Section 01 7419 - Construction Waste Management and Disposal.
 - 1. Comply with applicable regulations.
 - 2. Do not burn scrap on project site.
- B. Do not leave wood, shavings, sawdust, etc. on the ground or buried in fill.
- C. Prevent sawdust and wood shavings from entering the storm or sanitary drainage system.

END OF SECTION

**SECTION 07 8400
FIRESTOPPING**

PART 1 GENERAL

1.1 SECTION INCLUDES

- A. Firestopping systems.
- B. Firestopping of all penetrations in fire resistance rated and smoke resistant assemblies, whether indicated on drawings or not.

1.2 RELATED REQUIREMENTS

- A. Section 09 2116 - Gypsum Board Assemblies: Gypsum wallboard fireproofing.

1.3 REFERENCE STANDARDS

- A. ASTM E119 - Standard Test Methods for Fire Tests of Building Construction and Materials; 2015.
- B. ASTM E814 - Standard Test Method for Fire Tests of Through-Penetration Fire Stops; 2013a.
- C. FM 4991 - Approval Standard for Firestop Contractors; 2013.
- D. UL 1479 - Standard for Fire Tests of Penetration Firestops; Current Edition, Including All Revisions.
- E. UL (FRD) - Fire Resistance Directory; current edition.

1.4 SUBMITTALS

- A. See Section 01 3000 - Administrative Requirements for submittal procedures.
- B. Product Data: Provide data on product characteristics, performance ratings, and limitations.

1.5 FIELD CONDITIONS

- A. Comply with firestopping manufacturer's recommendations for temperature and conditions during and after installation; maintain minimum temperature before, during, and for three days after installation of materials.

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 (HW) 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 wall assembly.
- B. 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.
 - 1. Temperature Rise: Provide systems that have been tested to show T Rating as indicated.
 - 2. Air Leakage: Provide systems that have been tested to show L Rating as indicated.

2.3 FIRESTOPPING PENETRATIONS THROUGH GYPSUM BOARD WALLS

- A. Penetrations By:
 - 1. Uninsulated Metallic Pipe, Conduit, and Tubing:
 - a. 1 Hour Construction: UL System W-L-1054; Hilti FS-ONE MAX Intumescent Firestop Sealant.
 - 2. Electrical Cables Not In Conduit:
 - a. 1 Hour Construction: UL System W-L-3065; Hilti FS-ONE MAX Intumescent Firestop Sealant, CP 606 Flexible Firestop Sealant, CD 601S Elastomeric Firestop Sealant, or CP 618 Firestop Putty Stick.
 - 3. Insulated Pipes:

- a. 1 Hour Construction: UL System W-L-5028; Hilti FS-ONE MAX Intumescent Firestop Sealant.
- 4. HVAC Ducts, Insulated:
 - a. 1 Hour Construction: UL System W-L-7156; Hilti FS-ONE MAX Intumescent Firestop Sealant.

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.

3.3 INSTALLATION

- A. Install materials in manner described in fire test report and in accordance with manufacturer's instructions, completely closing openings.

3.4 CLEANING

- A. Clean adjacent surfaces of firestopping materials.

3.5 PROTECTION

- A. Protect adjacent surfaces from damage by material installation.

END OF SECTION

**SECTION 07 9005
JOINT SEALERS**

PART 1 GENERAL

1.1 SECTION INCLUDES

- A. Sealants and joint backing.

1.2 RELATED REQUIREMENTS

- A. Section 07 8400 - Firestopping: Firestopping sealants.
- B. Section 08 8000 - Glazing: Glazing sealants and accessories.
- C. Section 09 2116 - Gypsum Board Assemblies: Acoustic sealant.

1.3 REFERENCE STANDARDS

- A. ASTM C920 - Standard Specification for Elastomeric Joint Sealants; 2014.
- B. ASTM C1193 - Standard Guide for Use of Joint Sealants; 2016.
- C. ASTM D1667 - Standard Specification for Flexible Cellular Materials--Poly(Vinyl Chloride) Foam (Closed-Cell); 2005 (Reapproved 2011).

1.4 ADMINISTRATIVE REQUIREMENTS

- A. Coordinate the work with other sections referencing this section.

1.5 SUBMITTALS

- A. See Section 01 3000 - Administrative Requirements, for submittal procedures.
- B. Product Data: Provide data indicating sealant chemical characteristics.

1.6 QUALITY ASSURANCE

- A. Manufacturer Qualifications: Company specializing in manufacturing the Products specified in this section with minimum three years documented experience.

1.7 FIELD CONDITIONS

- A. Maintain temperature and humidity recommended by the sealant manufacturer during and after installation.

PART 2 PRODUCTS

2.1 SEALANTS

- A. Sealants and Primers - General: Provide products having volatile organic compound (VOC) content as specified in Section 01 6116.
- B. General Purpose Exterior Sealant: Polyurethane; ASTM C920, Grade NS, Class 25 minimum; Uses M, G, and A; single component.
 - 1. Color: Match adjacent finished surfaces.
 - 2. Applications: Use for:
 - a. Control, expansion, and soft joints in masonry.
 - b. Joints between metal frames and other materials.
 - 3. Polyurethane Products:
 - a. Pecora Corporation; DynaTrol I-XL General Purpose One Part Polyurethane Sealant: www.pecora.com.
 - b. Sika Corporation; Sikaflex-1a: www.usa-sika.com.
- C. General Purpose Interior Sealant: Acrylic emulsion latex; ASTM C834, Type OP, Grade NF single component, paintable.
 - 1. Color: Match adjacent finished surfaces.
 - 2. Applications: Use for:
 - a. Interior wall and ceiling control joints.

3. Products:
 - a. Pecora Corporation; AC-20 + Silicone Acrylic Latex Caulking Compound:
www.pecora.com.
- D. Plumbing Fixture Sealant: White silicone; ASTM C920, Uses I, M and A; single component, mildew resistant.
 1. Applications: Use for:
 - a. Joints between plumbing fixtures and floor and wall surfaces.
 2. Products:
 - a. Pecora Corporation; 898NST Sanitary Silicone Sealant - Class 50: www.pecora.com.

2.2 ACCESSORIES

- A. Primer: Non-staining type, recommended by sealant manufacturer to suit application.
- B. Joint Backing: Round foam rod compatible with sealant; ASTM D1667, closed cell PVC; oversized 30 to 50 percent larger than joint width.
- C. Bond Breaker: Pressure sensitive tape recommended by sealant manufacturer to suit application.

PART 3 EXECUTION

3.1 EXAMINATION

- A. Verify that substrate surfaces are ready to receive work.
- B. Verify that joint backing and release tapes are compatible with sealant.

3.2 PREPARATION

- A. Remove loose materials and foreign matter that could impair adhesion of sealant.
- B. Clean and prime joints in accordance with manufacturer's instructions.
- C. Perform preparation in accordance with manufacturer's instructions and ASTM C1193.
- D. Protect elements surrounding the work of this section from damage or disfigurement.

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. Install bond breaker where joint backing is not used.
- D. Install sealant free of air pockets, foreign embedded matter, ridges, and sags.
- E. Apply sealant within recommended application temperature ranges. Consult manufacturer when sealant cannot be applied within these temperature ranges.
- F. Tool joints concave.

3.4 CLEANING

- A. Clean adjacent soiled surfaces.

3.5 PROTECTION

- A. Protect sealants until cured.

END OF SECTION

**SECTION 08 1113
HOLLOW METAL DOORS AND FRAMES**

PART 1 GENERAL

1.1 SECTION INCLUDES

- A. Fire-rated hollow metal doors.

1.2 RELATED REQUIREMENTS

- A. Section 08 7100 - Door Hardware.
- B. Section 08 8000 - Glazing: Glass for doors .

1.3 ABBREVIATIONS AND ACRONYMS

- A. ANSI: American National Standards Institute.
- B. ASCE: American Society of Civil Engineers.
- C. HMMA: Hollow Metal Manufacturers Association.
- D. NFPA: National Fire Protection Association.
- E. SDI: Steel Door Institute.
- F. UL: Underwriters Laboratories.

1.4 REFERENCE STANDARDS

- A. ADA Standards - Americans with Disabilities Act (ADA) Standards for Accessible Design; 2010.
- B. ANSI/SDI A250.4 - Test Procedure and Acceptance Criteria for Physical Endurance for Steel Doors, Frames and Frame Anchors; 2011.
- C. ANSI/SDI A250.6 - Recommended Practice for Hardware Reinforcing on Standard Steel Doors and Frames; 2003 (R2009).
- D. ANSI/SDI A250.8 - Specifications for Standard Steel Doors and Frames (SDI-100); 2014.
- E. ANSI/SDI A250.10 - Test Procedure and Acceptance Criteria for Prime Painted Steel Surfaces for Steel Doors and Frames; 2011.
- F. ASTM A653/A653M - Standard Specification for Steel Sheet, Zinc-Coated (Galvanized) or Zinc-Iron Alloy-Coated (Galvannealed) by the Hot-Dip Process; 2015.
- G. ASTM A1008/A1008M - Standard Specification for Steel, Sheet, Cold-Rolled, Carbon, Structural, High-Strength Low-Alloy, High-Strength Low-Alloy with Improved Formability, Solution Hardened, and Bake Hardenable; 2015.
- H. 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; 2014.
- I. ICC A117.1 - Accessible and Usable Buildings and Facilities; 2009.
- J. ITS (DIR) - Directory of Listed Products; current edition.
- K. NAAMM HMMA 861 - Guide Specifications for Commercial Hollow Metal Doors and Frames; 2006.
- L. NFPA 80 - Standard for Fire Doors and Other Opening Protectives; 2016.
- M. NFPA 252 - Standard Methods of Fire Tests of Door Assemblies; 2012.
- N. SDI 117 - Manufacturing Tolerances for Standard Steel Doors and Frames; 2013.
- O. UL (DIR) - Online Certifications Directory; current listings at database.ul.com.
- P. UL 10B - Standard for Fire Tests of Door Assemblies; Current Edition, Including All Revisions.
- Q. UL 10C - Standard for Positive Pressure Fire Tests of Door Assemblies; Current Edition, Including All Revisions.

1.5 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; and one copy of referenced standards/guidelines.

1.6 QUALITY ASSURANCE

- A. Manufacturer Qualifications: Provide hollow metal doors and frames from SDI Certified manufacturer: <https://steeldoor.org/sdi-certified/#sle>.
- B. Maintain at project site copies of reference standards relating to installation of products specified.

PART 2 PRODUCTS

2.1 PERFORMANCE REQUIREMENTS

- A. Requirements for Hollow Metal Doors :
 - 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.

2.2 HOLLOW METAL DOORS

- A. Door Finish: Factory primed and field finished.
- B. Fire-Rated Doors:
 - 1. Based on SDI Standards: ANSI/SDI A250.8 (SDI-100).
 - a. Level 4 - Maximum-duty.
 - b. Physical Performance Level A, 1,000,000 cycles; in accordance with ANSI/SDI A250.4.
 - c. Model 2 - Seamless., fully welded
 - d. Door Face Metal Thickness: 14 gauge, 0.067 inch (1.7 mm), minimum.
 - 2. Fire Rating: 1 hour, tested in accordance with UL 10C and NFPA 252 ("positive pressure fire tests").
 - 3. Provide units listed and labeled by UL (DIR) or ITS (DIR).
 - a. Attach fire rating label to each fire rated unit.
 - 4. Door Core Material: Vertical steel stiffeners. Max. 6" o.c. spot welded to face sheets. Provide sound insulation between stiffeners
 - 5. Door Thickness: 1-3/4 inches (44.5 mm), nominal.

PART 3 EXECUTION

3.1 EXAMINATION

- A. Verify existing conditions before starting work.
- B. Verify existing opening sizes and that opening sizes and tolerances are acceptable.
- C. Verify that finished walls and existing frames are in plane to ensure proper door alignment.

3.2 INSTALLATION

- A. Install doors in accordance with manufacturer's instructions and related requirements of specified door and frame standards or custom guidelines indicated.
- B. Install fire rated units in accordance with NFPA 80.
- C. Coordinate frame anchor placement with wall construction.
- D. Install door hardware as specified in Section 08 7100.
- E. Comply with glazing installation requirements of Section 08 8000.

- F. Touch up damaged factory finishes.

3.3 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 (1.6 mm) measured with straight edge, corner to corner.

3.4 ADJUSTING

- A. Adjust for smooth and balanced door movement.

END OF SECTION

SECTION 08 5113
ALUMINUM WINDOWS

PART 1 GENERAL

1.1 RELATED DOCUMENTS

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

1.2 SECTION INCLUDES

- A. Extruded aluminum windows with fixed sash and operating sash.
- B. Factory glazing.
- C. Operating hardware.

1.3 RELATED REQUIREMENTS

- A. Division 02 Existing Conditions And Hazardous Materials Remediation Asbestos/Lead Abatement for requirements for window removal.
- B. Section 01 7000 - Execution for cutting and patching requirements.
- C. Section 07 9200 - Joint Sealants: Sealing joints between window frames and adjacent construction.

1.4 DEFINITIONS

- A. Performance class designations according to AAMA/WDMA/CSA 101/I.S.2/A440-05:
 - 1. AW: Architectural.
- B. Performance grade number according to AAMA/WDMA/CSA 101/I.S.2/A440-05:
 - 1. Design pressure number in pounds force per square foot (pascals) used to determine the structural test pressure and water test pressure.
- C. Structural Test Pressure: For uniform load structural test, is equivalent to 150 percent of the design pressure.
- D. Minimum Test Size: Smallest size permitted for performance class (gateway test size) or as specified elsewhere in this section, whichever is more stringent. Products must be tested at minimum test size or at a size larger than minimum test size to comply with requirements for performance class. Downsized test reports will not be considered acceptable.

1.5 REFERENCE STANDARDS

- A. AAMA/WDMA/CSA 101/I.S.2/A440 - North American Fenestration Standard/Specification for windows, doors, and skylights; 2011.
- B. AAMA CW-10 - Care and Handling of Architectural Aluminum From Shop to Site; 2015.
- C. AAMA 611 - Voluntary Specification for Anodized Architectural Aluminum; 2012.
- D. AAMA 701/702.
- E. AAMA 1503 - Voluntary Test Method for Thermal Transmittance and Condensation Resistance of Windows, Doors and Glazed Wall Sections; 2009.
- F. AAMA 2604 - Voluntary Specification, Performance Requirements and Test Procedures for High Performance Organic Coatings on Aluminum Extrusions and Panels; 2013.
- G. AAMA 2605 - Voluntary Specification, Performance Requirements and Test Procedures for Superior Performing Organic Coatings on Aluminum Extrusions and Panels; 2013.
- H. ASTM B209 - Standard Specification for Aluminum and Aluminum-Alloy Sheet and Plate; 2014.
- I. ASTM B221 - Standard Specification for Aluminum and Aluminum-Alloy Extruded Bars, Rods, Wire, Profiles, and Tubes; 2014.
- J. ASTM B221M - Standard Specification for Aluminum and Aluminum-Alloy Extruded Bars, Rods, Wire, Profiles, and Tubes (Metric); 2013.

- K. ASTM E330 - Standard Test Method for Structural Performance of Exterior Windows, Doors, Skylights and Curtain Walls by Uniform Static Air Pressure Difference; 2002 (Reapproved 2010).
- L. ASTM F588 - Standard Test Methods for Measuring the Forced Entry Resistance of Window Assemblies, Excluding Glazing Impact; 2014.
- M. GANA: Comply with published recommendations of glass manufacturers and with GANA's "Glazing Manual" unless more stringent requirements are indicated

1.6 DEFINITIONS

- A. Performance class designations according to AAMA/WDMA/CSA 101/I.S.2/A440-05:
 - 1. AW: Architectural.
- B. Performance grade number according to AAMA/WDMA/CSA 101/I.S.2/A440-05:
 - 1. Design pressure number in pounds force per square foot (pascals) used to determine the structural test pressure and water test pressure.
- C. Structural Test Pressure: For uniform load structural test, is equivalent to 150 percent of the design pressure.

1.7 PERFORMANCE REQUIREMENTS

- A. General: Provide aluminum windows capable of complying with performance requirements indicated, based on testing manufacturer's windows that are representative of those specified, and that are of minimum test size indicated below:
 - 1. Projected Windows: 60" x 144" (F/PO/F/PI)
 - 2. Outswing Casement Windows: 36" x 60"
- B. AAMA/WDMA Performance Requirements: Provide aluminum windows of performance indicated that comply with AAMA/WDMA/CSA 101/I.S.2/A440-05
 - 1. Performance Class: AW.
 - 2. Performance Grade: 70, Minimum for Series 2542i projected vents.
- C. Component Testing: Window components shall be tested in accordance with procedures described in ANSI/AAMA 101-2005 for AW grade windows
- D. Air Infiltration: Maximum rate not more than indicated when tested according to AAMA/WDMA/CSA 101/I.S.2/A440-05, Air Infiltration Test.
 - 1. Maximum Rate: 0.10 cfm/sq. ft. of area at an inward test pressure of 6.24 lbf/sq. ft. (300 Pa).
- E. Water Resistance: No water leakage as defined in AAMA/NWWDA referenced test methods at a water test pressure equaling that indicated, when tested according to AAMA/NWWDA 101/I.S.2-97, Water Resistance Test.
 - 1. Test Pressure: 20 percent of positive design pressure, but not less than 15 lbf/s.f.
- F. Forced-Entry Resistance: Comply with Performance Level 10 requirements when tested according to ASTM F 588.
- G. Life-Cycle Testing: Test according to AAMA 910 and comply with AAMA/WDMA/CSA 101/I.S.2/A440-05.
- H. Operating Force and Auxiliary (Durability) Tests: Comply with AAMA/WDMA/CSA 101/I.S.2/A440-05 for operating window types indicated.
- I. Condensation-Resistance Factor: Provide aluminum windows tested for thermal performance according to AAMA 1503, showing a minimum CRF of:
 - 1. 63 for projected windows
 - 2. 60 for casement units.
- J. Thermal Transmittance: Provide aluminum windows with a whole-window U-value maximum indicated at 15-mph exterior wind velocity and winter condition temperatures when tested according to AAMA 1503.

1. U-Value: 0.38 Btu/sq. ft. x h x deg F minimum.(fixed); 0.45 Btu/sq. ft. x h x deg F minimum.(operable)
- K. Thermal Movements: Provide aluminum windows, including anchorage, that accommodate thermal movements of units without buckling, distortion, opening of joints, failure of joint sealants, damaging loads and stresses on glazing and connections.
- L. Projected Windows: Must be flush vent type (overlapping vents will not be acceptable) and must comply with AAMA/NWDA 101/I.S.2-97 for the following tests, in addition to Gateway Performance Requirements:
 1. Hardware Load Test.
 2. Sash Torsion Test.
 3. Torsion Test.
 4. Horizontal Concentrated Load Test on Latch Rail.
 5. Vertical Concentrated Load Test on Latch Rail.
 6. Torsion Load Test on Intermediate Frame Rails.
 7. Vertical Concentrated Load Test on Intermediate Frame Rails.
 8. Balance Arm Load Test.
 9. Life Cycle Testing: When tested in accordance with AAMA 910.

1.8 SUBMITTALS

- A. See Section 01 3000 - Administrative Requirements for submittal procedures.
- B. Product Data: Provide component dimensions, information on glass and glazing, internal drainage details, descriptions of hardware and accessories, finishes, and operating instructions for each type of aluminum window indicated.
- C. Shop Drawings: **Shop drawings shall be prepared by the manufacturer.** Include plans, elevations, sections, details, hardware, attachments to other work, operational clearances, installation details, and the following:
 1. Mullion details, including reinforcement and stiffeners.
 2. Wall thicknesses and joinery details.
 3. Weather-stripping details.
 4. Thermal-break details.
 5. Glazing details.
 6. Frame and sash details.
 7. Glazing and hardware options specified.
- D. Manufacturer's Installation Instructions: Include complete preparation, installation, and cleaning requirements.
- E. Warranty: Submit manufacturer warranty and ensure that forms have been completed in Yonkers Public Schools's name and registered with manufacturer.
- F. Product Test Reports: Provide comprehensive test reports not more than four years old prepared by a qualified testing agency for each window type being used on the project. Test reports based on the use of downsized test units will not be accepted.
- G. Maintenance Data: For operable window sash, operating hardware and finishes to include in maintenance manuals.
- H. Warranty: Special warranty specified in this Section.

1.9 QUALITY ASSURANCE

- A. Source Limitations: Obtain aluminum windows through one source from a single manufacturer.
- B. Fenestration Standard: Comply with AAMA/WDMA/CSA 101/I.S.2/A440-05, "Standard/Specification for Windows, Doors, and Unit Skylights" for definitions and minimum standards of performance,

materials, components, accessories, and fabrication. Comply with more stringent requirements if indicated.

1. Provide AAMA-certified aluminum windows.
- C. Manufacturer Qualifications: Company specializing in manufacturing products specified in this section with minimum five(5) years of documented experience.
- D. Installer Qualifications: Company specializing in performing work of type specified and with at least three years of documented experience and approved by manufacturer.
- E. Product Requirements: For maximum performance, windows for this project must meet both the testing requirements as contained herein and the minimum material requirements specified. Windows that carry the applicable AAMA rating but do not meet the material thicknesses, depths, etc. shall not be acceptable for use on this project.

1.10 DELIVERY, STORAGE, AND HANDLING

- A. Comply with requirements of AAMA CW-10.
- B. Protect finished surfaces with wrapping paper or strippable coating during installation. Do not use adhesive papers or sprayed coatings that bond to substrate when exposed to sunlight or weather.

1.11 FIELD CONDITIONS

- A. Field Measurements: Verify aluminum window openings by field measurements before fabrication and indicate measurements on Shop Drawings.
- B. Do not install sealants when ambient temperature is less than 40 degrees F (5 degrees C).
- C. Maintain this minimum temperature during and 24 hours after installation of sealants.

1.12 WARRANTY

- A. See Section 01 7800 - Closeout Submittals for additional warranty requirements.
- B. Special Warranty: Manufacturer's standard form in which manufacturer agrees to repair or replace aluminum windows that fail in materials or workmanship within specified warranty period. Failures include, but are not limited to, the following:
 1. Failure to meet performance requirements.
 2. Structural failures including excessive deflection.
 3. Water leakage and air infiltration.
 4. Faulty operation of movable sash and hardware.
 5. Deterioration of metals, metal finishes, and other materials beyond normal weathering.
 6. Insulating glass failure.
 7. Correct defective Work within a five year period after Date of Substantial Completion. Provide 10 year manufacturer warranty against failure of glass seal on insulating glass units, including interpane dusting or misting. Include provision for replacement of failed units.
- C. Provide 10 year manufacturer warranty against excessive degradation of exterior finish. Include provision for replacement of units with excessive fading, chalking, or flaking.

PART 2 PRODUCTS

2.1 MANUFACTURERS

- A. Basis-of-Design Product: The basis of design for these specifications is the Architectural Window Manufacturing Series 3000i GT Project-out, Outswinging Casement and related fixed aluminum windows to meet the AAMA performance criteria for AP-AW100 (projected), C-AW100 Casement and F-AW100 (fixed), Rutherford, NJ, 07070 Tel (201) 939-2200 Fax (201); 939-2201, awsales@architecturalwindow.com
- B. Equivalents: Subject to compliance with all material and performance requirements outlined in these specifications, "or equal" products by other manufacturers will be considered for use subject to review by the Engineer. The Engineer's decision regarding equivalency is final.
 1. Substitutions: See Section 01 6000 - Product Requirements.

2.2 ALUMINUM WINDOWS

- A. Windows: Tubular aluminum sections, factory fabricated, factory finished, thermally broken, vision glass, related flashings, anchorage and attachment devices.
 - 1. Life Cycle Requirements: No damage to fasteners, hardware parts or other components that would render operable windows in operable and not reduction in air and water infiltration resistance when tested according to AAMA 910.
 - 2. Frame Depth: 3-1/2 inch (89 mm).
 - 3. System Internal Drainage: Drain to the exterior by means of a weep drainage network any water entering joints, condensation occurring in glazing channel, and migrating moisture occurring within system.
- B. Performance Requirements: Provide products that comply with the following:
 - 1. Grade: AAMA/WDMA/CSA 101/I.S.2/A440 requirements for specific window type:
 - a. Performance Class (PC): AW.
 - 2. Design Pressure (DP):
 - a. Positive Design Wind Load: 40 psf (___ Pa).
 - b. Negative Design Wind Load: 40 psf (___ Pa).
- C. Fixed, Non-Operable Type:
 - 1. Construction: Thermally broken.
 - 2. Glazing: Insulated; clear; Refer to Section 08 8000 Glazing.
- D. Outswinging Casement Type:
 - 1. Construction: Thermally broken.
 - 2. Glazing: Insulated; ; Refer to Section 08 8000 0 Glazing.

2.3 COMPONENTS

- A. Anchors, Clips, and Accessories: Aluminum, nonmagnetic stainless steel, or zinc-coated steel or iron complying with ASTM B 633 for SC 3 severe service conditions; provide sufficient strength to withstand design pressure indicated
- B. Sills: 0.125 inch (3.18 mm) thick, extruded aluminum; sloped for positive wash; fit under sash leg to 1/2 inch (12 mm) beyond wall face; one piece full width of opening..
- C. Trim as required.
- D. Compression-Type Weather Stripping: Provide compressible weather stripping designed for permanently resilient sealing under bumper or wiper action and for complete concealment when aluminum window is closed.
 - 1. Weather-Stripping Material: Manufacturer's standard system and materials complying with AAMA/WDMA/CSA 101/I.S.2/A440-05.
- E. Operable Sash Weatherstripping: Wool pile; permanently resilient, profiled to achieve effective weather seal.
- F. Fasteners: Stainless steel.
- G. Glazing Materials: See Section 08 8000.
- H. Sealant for Setting Sills and Sill Flashing: As specified in Section 07 9200 - Joint Sealants.

2.4 ACCESSORIES

- A. Rescue Labels: Windows designated on drawings as "EEW" emergency escape and rescue windows shall meet all applicable codes and shall include two (2) conforming label as follows:
 - "RESCUE WINDOW
FOR EMERGENCY USE ONLY"
 - 1. Signs shall be 3" x 5" with bright yellow background with black letter.
Text shall be read from both sides

2. One label shall be placed on the window and one place on the roller shades and visible when the shade is drawn.

2.5 MATERIALS

- A. Aluminum Extrusions: Alloy and temper recommended by aluminum window manufacturer for strength, corrosion resistance, and application of required finish, but not less than 22,000-psi ultimate tensile strength, not less than 16,000-psi minimum yield strength, and not less than 0.080-inch thickness at any location for the main frame and sash members, except the frame sill which shall be a minimum of 0.125-inch.
 1. Extruded Aluminum: ASTM B 221 (ASTM B 221M) 6063-T5 and temper (ASTM B221 G.S. 10A-T5).
- B. Concealed Steel Items: Profiled to suit mullion sections; galvanized in accordance with ASTM A123/A123M.

2.6 HARDWARE

- A. General: Provide manufacturer's standard hardware fabricated from aluminum, stainless steel, carbon steel complying with AAMA 907, or other corrosion-resistant material compatible with aluminum; designed to smoothly operate, tightly close, and securely lock aluminum windows and sized to accommodate sash or ventilator weight and dimensions. Do not use aluminum in frictional contact with other metals
- B. Locks and Latches: Designed to allow unobstructed movement of the sash across adjacent sash in direction indicated and operated from the inside only.
- C. Casement Windows:
 1. Shall be designed as per the requirements of New York State Education Department for emergency egress.
 2. Lock Lift type cam action lock 2 point lift locking, single action.
 3. Operating Device: 2 point Combination lever handle and cam-type latch.
 4. Hinges: Exposed 5-knuckle butt hinges with reinforced nylon bushings and stainless steel pin, painted to match window frame color.
 - a. Limit Device: 2-(top and bottom) stay bars with friction adjustable hold-open device.
 5. Pull Handle: Auxiliary pull handle mounted to lower sash frame close to hinge side.
- D. Limit Stops: Resilient rubber.

2.7 FABRICATION

- A. General: Fabricate aluminum windows, in sizes indicated, that comply with requirements and that meet or exceed AAMA/NWWDA 101/I.S.2 performance requirements for the following window type and performance class. Include a complete system for assembling components and anchoring windows.
 1. Projected Windows: AW
- B. Windows must be flush vent design (overlapping vents will not be acceptable).
- C. Fabricate aluminum windows in sizes indicated. Include a complete system for assembling components and anchoring windows
- D. Fabricate aluminum windows that are reglazable without dismantling sash or ventilator framing.
- E. Thermally Improved Construction: Fabricate aluminum windows with an integral, concealed (products with exposed thermal barriers will not be acceptable), conductance thermal barrier; located between exterior materials and window members exposed on interior side; in a manner that eliminates direct metal-to-metal contact.
 1. All exterior aluminum shall be separated from interior aluminum by a rigid, structural thermal barrier. For purposes of this specification, a structural thermal barrier is defined as a system that shall transfer shear during bending and, therefore, promote composite action between the exterior and interior extrusions.
 2. No thermal short circuits shall occur between the exterior and interior.

3. The thermal barrier shall be Ensinger's INSULBAR® or equal, and consist of two glass reinforced polyamide nylon 6/6 struts mechanically crimped in raceways extruded in the exterior and interior extrusions.
4. Poured and debridged urethane thermal barriers shall not be permitted.
- F. Weather Stripping: Provide full-perimeter weather stripping for each operable sash and ventilator.
- G. Weep Holes: Provide weep holes with hinged covers and internal passages to conduct infiltrating water to exterior.
- H. Mullions: Provide mullions and cover plates as shown, matching window units, complete with anchors for support to structure and installation of window units. Allow for erection tolerances and provide for movement of window units due to thermal expansion and building deflections, as indicated. Provide mullions and cover plates capable of withstanding design loads of window units.
- I. Subframes: Provide drainable subframes with anchors for window units as shown, of profile and dimensions indicated but not less than 0.093-inch thick extruded aluminum. Finish to match window units. Provide subframes capable of withstanding design loads of window units.
- J. Factory-Glazed Fabrication: Glaze aluminum windows in the factory where practical and possible for applications indicated. Comply with requirements in Division 8 Section "Glazing" and with AAMA/NWWDA 101/I.S.2/a440-05.
- K. Glazing Stops: Provide snap-on glazing stops coordinated with Division 8 Section "Glazing" and glazing system indicated. Provide glazing stops to match sash and ventilator frames.
- L. Fabricate components with smallest possible clearances and shim spacing around perimeter of assembly that will enable window installation and dynamic movement of perimeter seal.
- M. Accurately fit and secure joints and corners. Make joints flush, hairline, and weatherproof.
- N. Prepare components to receive anchor devices.
- O. Arrange fasteners and attachments to ensure concealment from view.
- P. Prepare components with internal reinforcement for operating hardware.
- Q. Provide steel internal reinforcement in mullions as required to meet loading requirements.
- R. Provide internal drainage of glazing spaces to exterior through weep holes.
- S. Assemble insect screen frames with mitered and reinforced corners. Secure wire mesh tautly in frame. Fit frame with four, spring loaded steel pin retainers.
- T. Factory glaze window units. Glaze aluminum windows in the factory where practical and possible for applications indicated. Comply with requirements in Division 8 Section "Glazing" and with AAMA/NWWDA 101/I.S.2/a440-05

2.8 FINISHES

- A. Class II Natural Anodized Finish: AAMA 611 AA-M12C22A31, clear anodic coating not less than 0.4 mil (0.01 mm) thick.
- B. Apply one coat of bituminous coating to concealed aluminum and steel surfaces in contact with dissimilar materials.
- C. Touch-Up Primer for Galvanized Steel Surfaces: SSPC-Paint 20, zinc rich.

PART 3 EXECUTION

3.1 EXAMINATION

- A. Verify that wall openings and adjoining water-resistive barrier materials are ready to receive aluminum windows; see Section 07 2500.
- B. Examine openings, substrates, structural support, anchorage, and conditions, with installer present, for compliance with requirements for installation tolerances; rough opening dimensions; levelness of sill plate; coordination with wall flashings, vapor retarders, and other built-in components; operational clearances and other conditions affecting performance of work.

1. Masonry Surfaces: Visibly dry and free of excess mortar, sand, and other construction debris.
2. Wood Frame Walls: Dry, clean, sound, well nailed, free of voids, and without offsets at joints. Ensure that nail heads are driven flush with surfaces in opening and within 3 inches (76 mm) of opening.
3. Metal Surfaces: Dry; clean; free of grease, oil, dirt, rust, corrosion, and welding slag; without sharp edges or offsets at joints.

C. Proceed with installation only after unsatisfactory conditions have been corrected.

3.2 REMOVALS

- A. The following procedures shall be followed when existing window are removed:
1. Asbestos and lead caulking, putty, sealant, paint and window components shall be removed as per asbestos and lead abatement sections of the specifications.
 2. Work must be in compliance with OSHA Construction Standard (29 CFR 1926.62)..
 3. Provide tarps on the outside of the building to catch all dust, debris and paint chips when windows are being removed and installed.

3.3 INSTALLATION

- A. Install windows in accordance with manufacturer's instructions.
- B. Install window assembly in accordance with AAMA/WDMA/CSA 101/I.S.2/A440.
- C. Attach window frame and shims to perimeter opening to accommodate construction tolerances and other irregularities.
- D. Align window plumb and level, free of warp or twist. Maintain dimensional tolerances and alignment with adjacent work.
- E. Set sill members and sill flashing in continuous bead of sealant.
- F. Install windows and components to drain condensation, water penetrating joints, and moisture migrating within windows to the exterior.
- G. Coordinate attachment and seal of perimeter air barrier and vapor retarder materials.
- H. Provide thermal isolation where components penetrate or disrupt building insulation. Pack fibrous insulation in shim spaces at perimeter of assembly to maintain continuity of thermal barrier.
- I. Install operating hardware not pre-installed by manufacturer.
- J. Separate aluminum and other corrodible surfaces from sources of corrosion or electrolytic action at points of contact with other materials
- K. Install perimeter foam seal in accordance with requirements specified in Section 07 9005.
1. Fill all exterior spaces and joint between windows and doors solid with foam in accordance with manufacture's instructions.
 2. Cut back to permit application of joint sealant.

3.4 TOLERANCES

- A. Maximum Variation from Level or Plumb: 1/16 inches every 3 ft (1.5 mm/m) non-cumulative or 1/8 inches per 10 ft (3 mm/3 m), whichever is less.

3.5 ADJUSTING

- A. Adjust hardware for smooth operation and secure weathertight closure.
- B. Adjust operating sashes and ventilators, screens, hardware, and accessories for a tight fit at contact points and weather stripping for smooth operation and weathertight closure. Lubricate hardware and moving parts.

3.6 CLEANING

- A. Manufacturer shall clean all glass and aluminum prior to shipment.
- B. Remove protective material from factory finished aluminum surfaces.

- C. Wash surfaces by method recommended and acceptable to window manufacturer; rinse and wipe surfaces clean.
- D. Remove excess glazing sealant by moderate use of mineral spirits or other solvent acceptable to sealant and window manufacturer.
- E. Protection of newly installed windows and/or final cleaning of glass and aluminum (to remove any accumulations which may have occurred during the construction period) is to be the responsibility of the Contractor.
- F. Comply with manufacturer's written recommendations for final cleaning and maintenance.

END OF SECTION

**SECTION 08 7101
DOOR HARDWARE**

PART 1 GENERAL

1.1 RELATED DOCUMENTS

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

1.2 SUMMARY

- A. This Section includes 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.
- C. Related Sections:
 - 1. Section 08 11 13 – Hollow Metal Doors .
- 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 80 - Fire Doors and Windows.
 - 4. 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 DELIVERY, STORAGE, AND HANDLING

- A. Inventory door hardware on receipt and provide secure lock-up and shelving for door hardware delivered to Project site. Do not store electronic access control hardware, software or accessories at Project site without prior authorization.
- B. Tag each item or package separately with identification related to the final Door Hardware Schedule, and include basic installation instructions with each item or package.
- C. Deliver, as applicable, permanent keys, cylinders, cores, access control credentials, software and related accessories directly to Owner via registered mail or overnight package service. Instructions for delivery to the Owner shall be established at the "Keying Conference".

1.4 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: Related Division 08 Sections (Steel, Aluminum and Wood) doors and corresponding frames are to be prepared, reinforced and pre-wired (if applicable) to receive the installation of the specified electrified, monitoring, signaling and access control system hardware without additional in-field modifications.

1.5 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. Ten years for manual door closers.
 4. Two years for electromechanical door hardware.

1.6 MAINTENANCE SERVICE

- A. Maintenance Tools and Instructions: Furnish a complete set of specialized tools and maintenance instructions as needed for Owner's continued adjustment, maintenance, and removal and replacement of door hardware.
- B. Continuing Service: Beginning at Substantial Completion, and running concurrent with the specified warranty period, provide continuous (6) months full maintenance including repair and replacement of worn or defective components, lubrication, cleaning, and adjusting as required for proper door opening operation. Provide parts and supplies as used in the manufacture and installation of original products.

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.
1. 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:
 - a. 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.
 2. Products furnished, but not installed, under this Section include the following. Coordinating, purchasing, delivering, and scheduling remain requirements of this Section.
 - a. Permanent cylinders, cores, and keys to be installed by Owner.
- B. 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 Division 01, Substitution Procedures. Approval of requests is at the discretion of the architect, owner, and their designated consultants.

2.2 HANGING DEVICES

- A. Butt 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. Three Hinges: For doors with heights 61 to 90 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" heavy weight.
 - b. Sizes from 3'1" to 4'0": 5" heavy weight .
 3. Hinge Weight and Base Material: Unless otherwise indicated, provide the following:

- a. Interior Doors: Standard weight, steel, ball bearing hinges unless Hardware Sets indicate heavy weight.
- 4. Acceptable Manufacturers:
 - a. McKinney Products (MK).

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.
- C. Cylinders: Original manufacturer cylinders complying with the following:
 - 1. Mortise Type: Threaded cylinders with rings and straight- or clover-type cam.
 - 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.
- D. Permanent Cores: Manufacturer's standard; finish face to match lockset; complying with the following:
 - 1. Interchangeable Cores: Large Format Interchangeable Core insert, removable by use of a special key; usable with other manufacturers' cylinders.
- E. Keying System: Each type of lock and cylinders to be factory keyed. Conduct specified "Keying Conference" to define and document keying system instructions and requirements. Furnish factory cut, nickel-silver large bow permanently inscribed with a visual key control number as directed by Owner. Incorporate decisions made in keying conference, and as follows:
 - 1. Master Key System: Cylinders are operated by a change key and a master key.
 - 2. Grand Master Key System: Cylinders are operated by a change key, a master key, and a grand master key.
 - 3. Great-Grand Master Key System: Cylinders are operated by a change key, a master key, a grand master key, and a great-grand master key.
 - 4. Existing System: Master key or grand master key locks to Owner's existing system.
 - 5. Keyed Alike: Key all cylinders to same change key.
- F. Construction Keying: Provide construction master keyed cylinders or temporary keyed construction cores where specified. Provide construction master keys in quantity as required by project Contractor. Replace construction cores with permanent cores. Furnish permanent cores for installation as directed under specified "Keying Conference".

2.4 MECHANICAL LOCKS AND LATCHING DEVICES

- A. Cylindrical Locksets, Grade 1 (Heavy Duty): ANSI/BHMA A156.2, Series 4000, Grade 1 certified cylindrical (bored) 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. Locks are to be non-handed and fully field reversible.
 - 1. Acceptable Manufacturers:
 - a. Corbin Russwin Hardware (RU) – CL3300 Series.
- B. Lock Trim Design: As specified in Hardware Sets.

2.5 DOOR CLOSERS

- A. 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 and metal covers standard. Install all closers to allow full 180 degree door swing.

1. Acceptable Manufacturers:
 - a. Corbin Russwin Hardware (RU) – DC6000 Series.
 - b. Norton Door Controls (NO) - 7500 Series.

2.6 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. Rockwood Manufacturing (RO).
 - b. Trimco (TC).

2.7 ARCHITECTURAL SEALS

- A. General: Thresholds, weatherstripping, and gasket seals to be of type and design as specified below or in the Hardware Sets. Provide continuous weatherstrip gasketing on exterior doors and provide smoke, light, or sound gasketing on interior doors where indicated. At exterior applications provide non-corrosive fasteners and elsewhere where indicated.
- B. Replaceable Seal Strips: Provide only those units where resilient or flexible seal strips are easily replaceable and readily available from stocks maintained by manufacturer.
- C. Acceptable Manufacturers:
 1. Pemko Manufacturing (PE).
 2. Reese Enterprises, Inc. (RS).

2.8 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.

2.9 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.
- D. Antimicrobial Finishes: Where specified, finishes on locksets, latchsets, exit devices and push/pull trim to incorporate an FDA recognized. Silver Ion, antimicrobial coating (MicroShield™) listed for use on equipment as a suppressant to the growth and spread of a broad range of bacteria, algae, fungus, mold and mildew.

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 architect 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.
- B. Wood Doors: Comply with ANSI/DHI A115-W 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.
- 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 Division 7 Section "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 report 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.

3.8 DOOR HARDWARE SCHEDULE

- A. The hardware sets represent the design intent and direction of the owner and architect. They are a guideline only and should not be considered a detailed hardware schedule. Discrepancies, conflicting hardware and missing items should be brought to the attention of the architect with corrections made prior to the bidding process. Omitted items not included in a hardware set should be scheduled with the appropriate additional hardware required for proper application and functionality.
- B. Manufacturer's Abbreviations:
1. MK - McKinney
 2. RU - Corbin Russwin
 3. MC - Medeco
 4. RO - Rockwood
 5. PE - Pemko
 6. MA - Markar
 7. IVE - Ives
 8. HS - HES

3.9 Hardware Schedule

SET: 1.0

CLASSROOM DOOR

3	Hinge	TA 3786	628	MK
1	Cylindrical Lock (intruder)	CL3352 PZD CT7D	626	RU
2	LFIC Core	8000 IC		RU
1	Closer (surface)	DC6200 A10/DC6210 A3	689	RU
1	Kick Plate	K1050 10" x 2" LDW	US32D	RO
1	Door Stop	400 (441H as needed)	US26D	RO

END OF SECTION

**SECTION 08 8000
GLAZING**

PART 1 GENERAL

1.1 SECTION INCLUDES

- A. Glass.
- B. Fire Rated Glazing
- C. Replacement Glazing in existing window units.
- D. Glazing compounds and accessories.

1.2 RELATED REQUIREMENTS

- A. Section 08 1113 - Hollow Metal Doors and Frames: Glazed lites in doors.
- B. Section 08 5113 - Aluminum Windows: Glazing furnished by window manufacturer.

1.3 REFERENCE STANDARDS

- A. 16 CFR 1201 - Safety Standard for Architectural Glazing Materials; current edition.
- B. ASTM C920 - Standard Specification for Elastomeric Joint Sealants; 2014.
- C. ASTM C1048 - Standard Specification for Heat-Strengthened and Fully Tempered Flat Glass; 2012.
- D. ASTM C1172 - Standard Specification for Laminated Architectural Flat Glass; 2014.

1.4 SUBMITTALS

- A. See Section 01 3000 - Administrative Requirements, for submittal procedures.
- B. Product Data on Glass Types: Provide structural, physical and environmental characteristics, size limitations, special handling or installation requirements.

1.5 QUALITY ASSURANCE

- A. Perform Work in accordance with GANA Glazing Manual and GANA Sealant Manual for glazing installation methods.
- B. Installer Qualifications: Company specializing in performing the work of this section with minimum three years documented experience.

1.6 FIELD CONDITIONS

- A. Do not install glazing when ambient temperature is less than 50 degrees F (10 degrees C).
- B. Maintain minimum ambient temperature before, during and 24 hours after installation of glazing compounds.
- C. Verify existing conditions and existing opening dimensions.

1.7 WARRANTY

- A. Laminated Glass: Provide a five (5) year warranty to include coverage for delamination, including replacement of failed units.

PART 2 PRODUCTS

2.1 INSULATING GLASS UNITS

- A. Type IG-1 - Sealed Insulating Glass Units: Vision glass, double glazed.
 - 1. Application: All exterior glazing unless otherwise indicated.
 - 2. Outboard Lite: Fully tempered float glass, 1/4 inch (6 mm) thick, minimum.
 - a. Tint: Clear.
 - b. Coating: Low-E (passive type), on #2 surface.
 - 3. Inboard Lite: Laminated float glass, 1/4 inch (6 mm) thick, minimum.
 - a. Tint: Clear.
 - 4. Total Thickness: 1 inch (25 mm).

2.2 GLAZING UNITS

- A. Type E-1 - Single Exterior Vision Glazing:
 - 1. Application: All new exterior glazing in existing frames.
 - 2. Type: Laminated float glass.
 - 3. Tint: Clear.
 - 4. Thickness: 1/4 inch (6 mm).
 - 5. Glazing Method: Install in existing frames. Match existing method..
- B. Type S-2 - Fire-Protection-Rated Glazing:
 - 1. IBC Fire Protection Rating: D-H-T-90, minimum.
 - 2. Safety Certification: 16 CFR 1201 Category II.
 - 3. Application: Provide this type of glazing in the following locations:
 - a. Glazed lites in fire doors.
 - 4. Thickness: 1/4 inch (6 mm).
 - 5. Glazing Method: As required for fire rating.

2.3 GLASS MATERIALS

- A. Float Glass: Provide float glass based glazing unless noted otherwise.
 - 1. Heat-Strengthened and Fully Tempered Types: ASTM C1048, Kind HS and Kind FT.
 - 2. Thicknesses: As indicated; for exterior glazing comply with requirements indicated for wind load design regardless of thickness indicated.
- B. Laminated Glass: Float glass laminated in accordance with ASTM C1172.
 - 1. Laminated Safety Glass: Comply with 16 CFR 1201 test requirements for Category II.
 - 2. Plastic Interlayer:
 - a. Polyvinyl Butyral (PVB) Interlayer: 0.030 inch (0.762 mm) thick, minimum.

2.4 GLAZING COMPOUNDS

- A. Polysulfide Sealant: Two component; chemical curing, non-sagging type; ASTM C920, Type M, Grade NS, Class 25, Uses M, A, and G; with cured Shore A hardness range of 15 to 25; color as selected.
- B. Polyurethane Sealant: Single component, chemical curing, non-staining, non-bleeding; ASTM C920, Type S, Grade NS, Class 25, Uses M, A, and G; with cured Shore A hardness range of 20 to 35; _____ color.

PART 3 EXECUTION

3.1 EXAMINATION

- A. Verify that openings for glazing are correctly sized and within tolerance.
- B. Verify that surfaces of glazing channels or recesses are clean, free of obstructions that may impede moisture movement, weeps are clear, and ready to receive glazing.

3.2 PREPARATION

- A. Clean contact surfaces with solvent and wipe dry.
- B. Seal porous glazing channels or recesses with substrate compatible primer or sealer.
- C. Prime surfaces scheduled to receive sealant.
- D. Install sealants in accordance with ASTM C1193 and GANA Sealant Manual.
- E. Install sealants in accordance with manufacturer's instructions.

3.3 CLEANING

- A. Remove glazing materials from finish surfaces.
- B. Remove labels after Work is complete.
- C. Clean glass and adjacent surfaces.

3.4 PROTECTION

END OF SECTION

**SECTION 09 2116
GYPSUM BOARD ASSEMBLIES**

PART 1 GENERAL

1.1 SECTION INCLUDES

- A. Metal stud wall framing.
- B. Metal stud and channel ceiling and soffit framing.
- C. Gypsum wallboard.
- D. Joint treatment and accessories.

1.2 RELATED REQUIREMENTS

- A. Section 07 9200 - Joint Sealants: Sealing gaps in construction other than gypsum board or plaster work.

1.3 REFERENCE STANDARDS

- A. ASTM A1003/A1003M - Standard Specification for Steel Sheet, Carbon, Metallic- and Nonmetallic-Coated for Cold-Formed Framing Members; 2015.
- B. ASTM C475/C475M - Standard Specification for Joint Compound and Joint Tape for Finishing Gypsum Board; 2015.
- C. ASTM C665 - Standard Specification for Mineral-Fiber Blanket Thermal Insulation for Light Frame Construction and Manufactured Housing; 2012.
- D. ASTM C840 - Standard Specification for Application and Finishing of Gypsum Board; 2013.
- E. ASTM C954 - Standard Specification for Steel Drill Screws for the Application of Gypsum Panel Products or Metal Plaster Bases to Steel Studs From 0.033 in. (0.84 mm) to 0.112 in. (2.84 mm) in Thickness; 2015.
- F. ASTM C1047 - Standard Specification for Accessories For Gypsum Wallboard and Gypsum Veneer Base; 2014a.
- G. ASTM C1396/C1396M - Standard Specification for Gypsum Board; 2014.
- H. ASTM D3273 - Standard Test Method for Resistance to Growth of Mold on the Surface of Interior Coatings in an Environmental Chamber; 2012.
- I. GA-216 - Application and Finishing of Gypsum Board; 2013.

1.4 SUBMITTALS

- A. See Section 01 3000 - Administrative Requirements for submittal procedures.
- B. Product Data: Provide data on gypsum board, accessories, and joint finishing system.

PART 2 PRODUCTS

2.1 METAL FRAMING MATERIALS

- A. Non-structural Framing System Components: ASTM C645; galvanized sheet steel, of size and properties necessary to comply with ASTM C754 for the spacing indicated, with maximum deflection of wall framing of L/120 at 5 psf (L/120 at 240 Pa).
 - 1. Studs: C-shaped with knurled or embossed faces.
 - 2. Runners: U shaped, sized to match studs.
 - 3. Thickness: 20ga.
 - 4. Furring Members: Hat-shaped sections, minimum depth of 7/8 inch (22 mm).
- B. Non-structural Framing Accessories:
 - 1. Ceiling Hangers: Type and size as specified in ASTM C754 for spacing required.

2.2 BOARD MATERIALS

- A. Gypsum Wallboard: Paper-faced gypsum panels as defined in ASTM C1396/C1396M; sizes to minimize joints in place; ends square cut.

1. Application: Use for vertical surfaces and ceilings, unless otherwise indicated.
 2. At Assemblies Indicated with Fire-Resistance Rating: Use type required by indicated tested assembly; if no tested assembly is indicated, use Type X board, UL or WH listed.
- B. Abuse Resistant Wallboard:
1. Application: All locations.
 2. Mold Resistance: Score of 10, when tested in accordance with ASTM D3273.
 3. Type: Fire-resistance-rated Type X, UL or WH listed.
 4. Thickness: 5/8 inch (16 mm).
 5. Edges: Tapered.
 6. Paper-Faced Products:
 - a. American Gypsum Company; M-Bloc AR Type X: www.americangypsum.com/#sle.
 - b. Georgia-Pacific Gypsum; ToughRock Fireguard X Mold Guard Abuse-Resistant: www.gpgypsum.com/#sle.
 - c. National Gypsum Company; Gold Bond Hi-Abuse XP Gypsum Board: www.nationalgypsum.com/#sle.

2.3 Gypsum Wallboard ACCESSORIES

- A. Acoustic Insulation: ASTM C665; preformed mineral fiber, friction fit type, unfaced. Thickness: 4 inch (101.6 mm).
1. Mineral fiber blanket thermal insulation: Type 1; ASTM C665
 2. Flame Spread and Smoke Developed Index: 0; ASTM E84
 3. Density: 2.2 lbs/cu.ft.; ASTM C167
 4. Product: Rockwool AFB, or approved equal.
- B. Acoustic Sealant: Acrylic emulsion latex or water-based elastomeric sealant; do not use solvent-based non-curing butyl sealant.
- C. Beads, Joint Accessories, and Other Trim: ASTM C1047, galvanized steel or rolled zinc, unless noted otherwise.
1. Rigid Corner Beads: Low profile, for 90 degree outside corners.
 2. L-Trim with Tear-Away Strip: Sized to fit 5/8 inch (20 mm) thick gypsum wallboard.
- D. Joint Materials: ASTM C475/C475M and as recommended by gypsum board manufacturer for project conditions.
1. Paper Tape: 2 inch (50 mm) wide, creased paper tape for joints and corners, except as otherwise indicated.
 2. Ready-mixed vinyl-based joint compound.
 3. Chemical hardening type compound.
- E. Screws for Fastening of Gypsum Panel Products to Cold-Formed Steel Studs Less than 0.033 inches (0.84 mm) in Thickness and Wood Members: ASTM C1002; self-piercing tapping screws, corrosion-resistant.

PART 3 EXECUTION

3.1 EXAMINATION

- A. Verify that project conditions are appropriate for work of this section to commence.

3.2 FRAMING INSTALLATION

- A. Metal Framing: Install in accordance with ASTM C754 and manufacturer's instructions.
- B. Suspended Ceilings and Soffits: Space framing and furring members as indicated.
1. Level ceiling system to a tolerance of 1/1200.
- C. Studs: Space studs at 16 inches on center (at 406 mm on center).

1. Partitions Terminating at Structure: Attach extended leg top runner to structure, maintain clearance between top of studs and structure, and brace both flanges of studs with continuous bridging.

3.3 ACOUSTIC ACCESSORIES INSTALLATION

- A. Acoustic Insulation: Place tightly within spaces, around cut openings, behind and around electrical and mechanical items within partitions, and tight to items passing through partitions.
- B. Acoustic Sealant: Install in accordance with manufacturer's instructions.
 1. Place one bead continuously on substrate before installation of perimeter framing members.
 2. Place continuous bead at perimeter of each layer of gypsum board.
 3. Seal around all penetrations by conduit, pipe, ducts, and rough-in boxes, except where firestopping is provided.

3.4 BOARD INSTALLATION

- A. Comply with ASTM C840, GA-216, and manufacturer's instructions. Install to minimize butt end joints, especially in highly visible locations.
- B. Single-Layer Nonrated: Install gypsum board in most economical direction, with ends and edges occurring over firm bearing.
 1. Exception: Tapered edges to receive joint treatment at right angles to framing.
- C. Double-Layer, Nonrated: Use gypsum board for first layer, placed parallel to framing or furring members, with ends and edges occurring over firm bearing. Use glass mat faced gypsum board at exterior walls and at other locations as indicated. Place second layer perpendicular to framing or furring members. Offset joints of second layer from joints of first layer.
- D. Fire-Resistance-Rated Construction: Install gypsum board in strict compliance with requirements of assembly listing.

3.5 INSTALLATION OF TRIM AND ACCESSORIES

- A. Control Joints: Place control joints consistent with lines of building spaces and as indicated.
- B. Corner Beads: Install at external corners, using longest practical lengths.
- C. Edge Trim: Install at locations where gypsum board abuts dissimilar materials.

3.6 JOINT TREATMENT

- A. Finish gypsum board in accordance with levels defined in ASTM C840, as follows:
 1. Level 4: Walls and ceilings to receive paint finish or wall coverings, unless otherwise indicated.
 2. Level 1: Wall and soffit areas above finished ceilings, whether or not accessible in the completed construction.
- B. Tape, fill, and sand exposed joints, edges, and corners to produce smooth surface ready to receive finishes.
 1. Feather coats of joint compound so that camber is maximum 1/32 inch (0.8 mm).

END OF SECTION

SECTION 09 5100
ACOUSTICAL CEILINGS

PART 1 GENERAL

1.1 SECTION INCLUDES

- A. Suspended metal grid ceiling system.
- B. Acoustical units.

1.2 REFERENCE STANDARDS

- A. ASTM A653/A653M - Standard Specification for Steel Sheet, Zinc-Coated (Galvanized) or Zinc-Iron Alloy-Coated (Galvannealed) by the Hot-Dip Process; 2015.
- B. ASTM C635/C635M - Standard Specification for the Manufacture, Performance, and Testing of Metal Suspension Systems for Acoustical Tile and Lay-in Panel Ceilings; 2013a.
- C. ASTM C636/C636M - Standard Practice for Installation of Metal Ceiling Suspension Systems for Acoustical Tile and Lay-In Panels; 2013.
- D. 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; 2014.
- E. UL (FRD) - Fire Resistance Directory; current edition.

1.3 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.

1.4 SUBMITTALS

- A. Product Data: Provide data on suspension system components and acoustical units.

PART 2 PRODUCTS

2.1 ACOUSTICAL UNITS

- A. Acoustical Panels: Painted mineral fiber, with the following characteristics:
 - 1. Classification: ASTM E1264 Type III.
 - a. Form: 2, water felted.
 - b. Pattern: "D" - fissured.
 - 2. Size: 24 by 24 inches (610 by 610 mm) .or 24 x 48 inches as indicated.
 - 3. Thickness: 3/4 inch (19 mm).
 - 4. Tile Edge: Square.
 - 5. Color: White.
 - 6. Suspension System: Exposed grid.
 - 7. Products:
 - a. Armstrong World Industries, Inc; Cirrus High NRC: www.armstrongceilings.com/#sle.

2.2 SUSPENSION SYSTEM(S)

- A. Suspension Systems - General: Complying with ASTM C635/C635M; die cut and interlocking components, with clips, splices, and perimeter moldings as required.
 - 1. Materials:
 - a. Steel Grid: ASTM A653/A653M, G30 coating, unless otherwise indicated.
- B. Exposed Suspension System: Hot-dipped galvanized steel grid with cap.
 - 1. Structural Classification: Intermediate-duty, when tested in accordance with ASTM C635/C635M.
 - 2. Profile: Tee; 15/16 inch (24 mm) face width.
 - 3. Finish: Baked enamel.
 - 4. Color: White.

5. Products:
 - a. USG Corporation; Donn Brand ZXLA 15/16 inch Acoustical Suspension System:
www.usg.com/ceilings/#sle.

2.3 ACCESSORIES

- A. Hanger Wire: 12 gauge, 0.08 inch (2 mm) galvanized steel wire.
- B. Perimeter Moldings: Same metal and finish as grid.
 1. Size: As required for installation conditions.
 2. Angle Molding: L-shaped, for mounting at same elevation as face of grid.

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. Remove any loose, damaged or unsecure components of original installation back to splice point or cross joint.
- B. Install after major above-ceiling work is complete.
- C. Coordinate the location of hangers with other work.
- D. Provide hanger clips during steel deck erection. Provide additional hangers and inserts as required.

3.3 INSTALLATION - SUSPENSION SYSTEM

- A. Install suspension system in accordance with ASTM C636/C636M, ASTM E580/E580M, and manufacturer's instructions and as supplemented in this section.
- B. Rigidly secure system, including integral mechanical and electrical components, for maximum deflection of 1:360.
- C. Extend existing system layout. Secure new components to existing grid.
- D. Lay out system to a balanced grid design with edge units no less than 50 percent of acoustical unit size.
- E. Perimeter Molding: Install at intersection of ceiling and vertical surfaces and at junctions with other interruptions.
 1. Use longest practical lengths.
- F. 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.
- G. Do not eccentrically load system or induce rotation of runners.
- H. Perimeter Molding: Install at intersection of ceiling and vertical surfaces and at junctions with other interruptions.
 1. Use longest practical lengths.

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 units after above-ceiling work is complete.
- E. Install acoustical units level, in uniform plane, and free from twist, warp, and dents.
- F. Cutting Acoustical Units:

1. Cut to fit irregular grid and perimeter edge trim.

3.5 TOLERANCES

- A. Maximum Variation from Flat and Level Surface: 1/8 inch in 10 feet (3 mm in 3 m).
- B. Maximum Variation from Plumb of Grid Members Caused by Eccentric Loads: 2 degrees.

END OF SECTION

SECTION 09 6500 RESILIENT FLOORING

PART 1 GENERAL

1.1 SECTION INCLUDES

- A. Resilient tile flooring.
- B. Resilient base.
- C. Installation accessories.

1.2 REFERENCE STANDARDS

- A. ASTM E648 - Standard Test Method for Critical Radiant Flux of Floor-Covering Systems Using a Radiant Heat Energy Source; 2014c.
- B. ASTM F1700 - Standard Specification for Solid Vinyl Tile; 2013a.
- C. ASTM F1861 - Standard Specification for Resilient Wall Base; 2008 (Reapproved 2012).
- D. NFPA 253 - Standard Method of Test for Critical Radiant Flux of Floor Covering Systems Using a Radiant Heat Energy Source; 2015.
- E. RFCI (RWP) - Recommended Work Practices for Removal of Resilient Floor Coverings; Resilient Floor Covering Institute; October 2011.

1.3 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. Maintenance Data: Include maintenance procedures, recommended maintenance materials, and suggested schedule for cleaning, stripping, and re-waxing.

1.4 QUALITY ASSURANCE

- A. Installer Qualifications: Company specializing in installing specified flooring with minimum three years documented experience.

1.5 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.

PART 2 PRODUCTS

2.1 TILE FLOORING

- A. Plank Vinyl Tile: Surface-decorated, with wear layer.
 - 1. Manufacturers:
 - a. Armstrong Flooring Inc; Natural Creations with Diamond 10 Technology ArborArt: www.armstrong.com/#sle.
 - b. Raskin Floors; Elevations Loft.
 - 2. Minimum Requirements: Comply with ASTM F1700, of Class III, Type B, Embossed surface.
 - 3. Critical Radiant Flux (CRF): Minimum 0.45 watt per square centimeter, when tested in accordance with ASTM E648 or NFPA 253.
 - 4. Plank Tile Size: 7 by 47 inch (179 by 1199 mm).
 - 5. Wear Layer Thickness: 0.012 inch (.3 mm).
 - 6. Total Thickness: 0.166 inch (4 mm).
 - 7. Pattern: Wood Grain.
 - 8. Color: To be selected by Engineer from manufacturer's full range.

2.2 RESILIENT BASE

- A. Resilient Base - Type ____: ASTM F1861, Type TS rubber, vulcanized thermoset; style as scheduled.
 - 1. Height: 6 inch (150 mm).
 - 2. Thickness: 0.125 inch (3.2 mm).
 - 3. Finish: Satin.
 - 4. Color: To be selected by Engineer from manufacturer's full range.
 - 5. Accessories: Premolded external corners and internal corners.

2.3 ACCESSORIES

- A. Subfloor Patching/Leveling Compound: White premix latex; type recommended by adhesive material manufacturer.
- B. Primers and Adhesives: Waterproof; types recommended by flooring manufacturer.
- C. Adhesive for Transition strips and mouldings : Premium Contact Adhesive.
- D. Moldings, Transition and Edge Strips: Rubber.

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. Obtain instructions if test results are not within limits recommended by resilient flooring manufacturer and adhesive materials manufacturer.

3.2 PREPARATION

- A. Remove existing resilient flooring and flooring adhesives; follow the recommendations of RFCI (RWP).
- B. Prepare floor substrates as recommended by flooring and adhesive manufacturers.
- C. Remove any sub-floor ridges and bumps. Fill minor low spots, cracks, joints, holes, and other defects with sub-floor filler to achieve smooth, flat, hard surface.
- D. Provide surface patching/leveling compound over 100% of all floor substrates.
- E. Prohibit traffic until leveling compound is fully cured.
- F. Screen final floor substrate to remove any trowel marks, ridges or imperfections.
- G. Clean substrate.

3.3 Installation - General

- A. Starting installation constitutes acceptance of subfloor conditions.
- B. Install in accordance with manufacturer's written instructions.
- C. Adhesive-Applied Installation:
 - 1. Spread only enough adhesive to permit installation of materials before initial set.
 - 2. Fit joints and butt seams tightly.
 - 3. Set flooring in place, press with heavy roller to attain full adhesion.
- D. Install edge strips at unprotected or exposed edges, where flooring terminates, and where indicated.
 - 1. Resilient Strips: Attach to substrate using adhesive.
- E. Scribe flooring to walls, columns, cabinets, floor outlets, and other appurtenances to produce tight joints.

- F. Spread only enough adhesive to permit installation of materials before initial set.
- G. Fit joints and butt seams tightly.
- H. Set flooring in place, press with heavy roller to attain full adhesion.
- I. Where type of floor finish, pattern, or color are different on opposite sides of door, terminate flooring under centerline of door.
- J. Install edge strips at unprotected or exposed edges, where flooring terminates, and where indicated.
- K. Scribe flooring to walls, columns, cabinets, floor outlets, and other appurtenances to produce tight joints.
- L. Install transitions and mouldings where indicated and at any transitions to differing materials. Apply contact adhesive to trim and substrate. Install in accordance with manufacturer's instructions.

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 flooring with joints and seams parallel to building lines to produce symmetrical pattern.
- C. Install plank tile with a random offset of at least 6 inches (152 mm) from adjacent rows.

3.5 Installation - Resilient Base

- A. Fit joints tightly and make vertical. Maintain minimum dimension of 18 inches (45 mm) 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. Provide 3 wax coats, allowing full drying between each coat, in accordance with manufacturer's application requirements.

3.7 PROTECTION

- A. Prohibit traffic on resilient flooring for 48 hours after installation.

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. Paint all Finish surfaces exposed to view in spaces indicated, unless fully factory-finished and unless otherwise indicated, including the following:
 - a. Exterior:
 - a) Metal, Miscellaneous: Iron, ornamental iron, structural iron and steel, ferrous metal.
 - b. Interior:
 - a) Masonry CMU: 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 ferrous metal.
 - c) Drywall: Walls, ceilings, gypsum board, and similar items.

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.

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 (4 L) 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 (7 degrees C) and a maximum of 90 degrees F (32 degrees C), in ventilated area, and as required by manufacturer's instructions.

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 of 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.

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.
- 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. Metal, Miscellaneous: Iron, ornamental iron, structural iron and steel, 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: Concrete, split face, scored, smooth, high density, low density, and fluted.
 - 1. Latex Systems:
 - a. Eg-Shel/Satin Finish:
 - a) 1st Coat: Sherwin-Williams PrepRite Block Filler, B25W25: www.sherwin-williams.com/#sle.
 - b) 2nd and 3rd Coat: Sherwin-Williams ProMar 200 Zero VOC Eg-Shel, B20-2600 Series: www.sherwin-williams.com/#sle.
- B. Metal: Structural steel columns, doors, door frames, and ferrous metal.
 - 1. Latex Systems:
 - a. Semi-Gloss High Performance:
 - a) 1st Coat: Sherwin-Williams Pro Industrial Pro-Cryl Universal Primer, B66-1310 Series: www.sherwin-williams.com/#sle. if not factory primed.
 - (a) 5 mils wet, 2 mils dry per coat.

- b) 2nd and 3rd Coat: Sherwin-Williams Pro Industrial Acrylic Semi-Gloss, B66-650
Series: www.sherwin-williams.com/#sle.
 - (a) 2 to 4 mils dry per coat.
- C. Drywall: Walls, ceilings, gypsum board, and similar items.
 - 1. Latex Systems:
 - a. Eg-Shel Finish:
 - a) 1st Coat: Sherwin-Williams ProMar 200 Zero VOC Interior Latex Primer, B28W2600: www.sherwin-williams.com/#sle.
 - (a) 4 mils wet, 1.5 mils dry per coat.
 - 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.

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 effect 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. Gypsum Board: Fill minor defects with filler compound; sand smooth and remove dust prior to painting.
- D. Ferrous Metal:
 - 1. Solvent clean according to SSPC-SP 1.
 - 2. Remove rust, loose mill scale, and other foreign substances using methods recommended by paint manufacturer. Hand tool cleaning in accordance with SSPC-SP3. 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 that are factory primed or factory finished 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 1100
VISUAL DISPLAY UNITS

PART 1 GENERAL

1.1 SECTION INCLUDES

- A. Porcelain enamel steel markerboards.
- B. Tackboards.

1.2 RELATED REQUIREMENTS

- A. Section 06 1000 - Rough Carpentry: Blocking and supports.

1.3 REFERENCE STANDARDS

- A. ANSI A135.4 - American National Standard for Basic Hardboard; 2012.
- B. ANSI A208.1 - American National Standard for Particleboard; 2009.
- C. ASTM A424/A424M - Standard Specification for Steel, Sheet, for Porcelain Enameling; 2009a.
- D. ASTM E84 - Standard Test Method for Surface Burning Characteristics of Building Materials; 2015a.
- E. ASTM F793 - Standard Classification of Wall Covering by Use Characteristics; 2010a.

1.4 SUBMITTALS

- A. See Section 01 3000 - Administrative Requirements, for submittal procedures.
- B. Product Data: Provide manufacturer's data on chalkboard, porcelain enamel steel markerboard, glass markerboard, tackboard, tackboard surface covering, trim, and accessories.
- C. Shop Drawings: Indicate wall elevations, dimensions, joint locations, special anchor details.
- D. Manufacturer's printed installation instructions.
- E. Maintenance Data: Include data on regular cleaning, stain removal.

1.5 QUALITY ASSURANCE

- A. Manufacturer Qualifications: Company specializing in manufacturing the products specified in this section with minimum three years documented experience.

1.6 WARRANTY

- A. See Section 01 7800 - Closeout Submittals, for additional warranty requirements.
- B. Provide five year warranty for chalkboard and markerboard to include warranty against discoloration due to cleaning, crazing or cracking, and staining.

PART 2 PRODUCTS

2.1 VISUAL DISPLAY UNITS

- A. Porcelain Enamel Steel Markerboards:
 - 1. Color: White.
 - 2. Steel Face Sheet Thickness: 24 gauge, 0.0239 inch (0.61 mm).
 - 3. Core: Particleboard, manufacturer's standard thickness, laminated to face sheet.
 - 4. Backing: Aluminum foil, laminated to core.
 - 5. Height: 48 inches (1220 mm).
 - 6. Length: As indicated on drawings.
 - 7. Frame: Extruded aluminum, with concealed fasteners.
 - 8. Frame Finish: Anodized, natural.
 - 9. Accessories: Provide marker tray and map rail.
- B. Tackboards: Fabric laminated to fiberboard.
 - 1. Fabric: Vinyl coated fabric.
 - 2. Color: As selected from manufacturer's full range.

3. Backing: Hardboard, 1/4 inch (6 mm) thick, laminated to tack surface.
4. Surface Burning Characteristics: Flame spread index of 25, maximum, and smoke developed index of 450, maximum, when tested in accordance with ASTM E84.
5. Height: 48 inches (1220 mm).
6. Length: As indicated on drawings.
7. Frame: Same type and finish as for chalkboard.
8. Frame Finish: Anodized, natural.
9. Accessories: Provide map rail.

2.2 MATERIALS

- A. Porcelain Enameled Steel Sheet: ASTM A424/A424M, Type I, Commercial Steel, with fired-on vitreous finish.
- B. Vinyl Coated Fabric: ASTM F793 Category VI.
- C. Particleboard: ANSI A208.1; wood chips, set with waterproof resin binder, sanded faces.
- D. Foil Backing: Aluminum foil sheet, 0.005 inch (0.13 mm) thick.
- E. Adhesives: Type used by manufacturer.

2.3 ACCESSORIES

- A. Map Rail: Extruded aluminum, manufacturer's standard profile, with cork insert and runners for accessories; 1 inch (25 mm) wide overall, full width of frame.
- B. Temporary Protective Cover: Sheet polyethylene, 8 mil (0.2 mm) thick.
- C. Marker Tray: Aluminum, manufacturer's standard formed profile, one piece full length of chalkboard, molded ends, concealed fasteners, same finish as frame.
- D. Mounting Brackets: Concealed.

PART 3 EXECUTION

3.1 EXAMINATION

- A. Verify that field measurements are as indicated.
- B. Verify that internal wall blocking is ready to receive work and positioning dimensions are as indicated on shop drawings.

3.2 PREPARATION

- A. Acclimatize tackable wall panels by removing from packaging in installation area not less than 24 hours before application.
- B. Prepare surfaces using the methods recommended by the manufacturer for achieving the best result for the substrate under the project conditions.

3.3 INSTALLATION

- A. Install boards in accordance with manufacturer's instructions.
- B. Install with top of chalk tray at 36 inches (914 mm) above finished floor.
- C. Secure units level and plumb.
- D. Butt Joints: Install with tight hairline joints.

3.4 CLEANING

- A. Clean board surfaces in accordance with manufacturer's instructions.
- B. Cover with protective cover, taped to frame.
- C. Remove temporary protective cover at Date of Substantial Completion.

END OF SECTION

SECTION 12 2400 WINDOW SHADES

PART 1 GENERAL

1.1 SECTION INCLUDES

- A. Manual roller shades and accessories.

1.2 REFERENCE STANDARDS

- A. ASTM G21 - Standard Practice for Determining Resistance of Synthetic Polymeric Materials to Fungi; 2015.
- B. NFPA 701 - Standard Methods of Fire Tests for Flame Propagation of Textiles and Films; 2015.
- C. WCMA A100.1 - Safety of Corded Window Covering Products; Current Edition, Including All Revisions.

1.3 ADMINISTRATIVE REQUIREMENTS

- A. Sequencing:
 - 1. Do not fabricate shades until field dimensions for each opening have been taken with finished conditions in place. "Hold to" dimensions are not acceptable.
 - 2. Do not install shades until final surface finishes and painting are complete.

1.4 SUBMITTALS

- A. See Section 01 3000 - Administrative Requirements, for submittal procedures.
- B. Product Data: Provide manufacturer's standard catalog pages and data sheets for each product to be used including materials, finishes, fabrication details, dimensions, profiles, mounting requirements, and accessories.
- C. Shop Drawings: Include shade schedule indicating size, location and keys to details.
- D. Selection Samples: Include fabric samples in full range of available colors and patterns.

1.5 QUALITY ASSURANCE

- A. Manufacturer Qualifications: Company specializing in manufacturing products specified in this section, with not less than ten years of documented experience.
- B. Installer Qualifications: Company specializing in performing work of this type with minimum ten years of documented experience with shading systems of similar size, type, and complexity; manufacturer's authorized representative.

1.6 DELIVERY, STORAGE, AND HANDLING

- A. Deliver shades in manufacturer's unopened packaging, labeled to identify each shade for each opening.
- B. Handle and store shades in accordance with manufacturer's recommendations.

1.7 FIELD CONDITIONS

- A. Do not install products under environmental conditions outside manufacturer's absolute limits.

1.8 WARRANTY

- A. See Section 01 7800 - Closeout Submittals, for additional warranty requirements.
- B. Provide manufacturer's standard, non-depreciating warranty, for interior shading only, covering the following:
 - 1. Shade Hardware: 10 years unless otherwise indicated.
 - 2. Shade Fabric: 10 years unless otherwise indicated.

PART 2 PRODUCTS

2.1 MANUFACTURERS

- A. Basis of Design: MechoShade Systems LLC; www.mechoshade.com/#sle.
- B. Substitutions: See Section 01 6000 - Product Requirements.

1. Products other than basis of design are subject to compliance with specified requirements. By using products other than basis of design, Contractor accepts responsibility for costs associated with any necessary modifications to related work, including any design fees.

2.2 ROLLER SHADES

- A. General:
 1. Provide shade system components that are capable of being removed or adjusted without removing mounted shade brackets or cassette support channel.
 2. Provide shade system that operates smoothly when shades are raised or lowered.
- B. Roller Shades - Basis of Design: MechoShade Systems LLC; Mecho/5 System; www.mechoshade.com/#sle.
 1. Description: Single roller, manually operated fabric window shades.
 - a. Provide universal drive capability to offset drive chain for reverse roll or regular roll shades.
 - b. Drop Position: Regular roll.
 - c. Mounting: Window jamb mounted.
 2. Brackets and Mounting Hardware: As recommended by manufacturer for mounting indicated and to accommodate shade fabric roll-up size and weight.
 3. Roller Tubes:
 - a. Material: Extruded aluminum.
 - b. Size: As recommended by manufacturer; selected for suitability for installation conditions, span, and weight of shades.
 - c. Fabric Attachment: Utilize extruded channel in tube to accept vinyl spline welded to fabric edge. Shade band to be removable and replaceable without removing roller tube from brackets or inserting spline from the side of the roller tube.
 - d. Roller tubes to be capable of being removed and reinstalled without affecting roller shade limit adjustments.
 4. Hembars: Designed to maintain bottom of shade straight and flat.
 - a. Style: Full wrap fabric covered bottom bar, flat profile with heat sealed closed ends.
 5. Clutch Operator: Manufacturer's standard material and design integrated with bracket/brake assembly.
 - a. Provide a permanently lubricated brake assembly mounted on a oil-impregnated hub with wrapped spring clutch.
 - b. Brake must withstand minimum pull force of 50 pounds (22.7 kg) in the stopped position.
 - c. Mount clutch/brake assembly on the support brackets, fully independent of the roller tube components.
 6. Drive Chain: Continuous loop stainless steel beaded ball chain, 95 pound (43 kg) minimum breaking strength. Provide upper and lower limit stops.
 - a. Chain Retainer: Chain tensioning device complying with WCMA A100.1.
 7. Accessories:
 - a. Fascia: Removable extruded aluminum fascia, size as required to conceal shade mounting, attachable to brackets without exposed fasteners; clear anodized finish.
 - a) Fascia to be capable of installation across two or more shade bands in one piece.
 - b) Provide single fascia to accommodate regular roll shades.
 - c) Configuration: Captured, fascia stops at captured bracket end.

2.3 Shade FABRIC

- A. Fabric for Light Filtering Shades: Non-flammable, color-fast, impervious to heat and moisture, and able to retain its shape under normal operation.
 1. Material Composition:
 - a. 100 percent TPO coated polyolefin yarn.

2. Performance Requirements:
 - a. Flammability: Pass NFPA 701 large or small scale test.
3. Openness Factor: 3%, nominal.
4. Color: As selected by Engineer from manufacturer's full range of colors.
5. Products:
 - a. MechoShade Systems LLC Inc; ThermoVeil Basket Weave - 1500 Series (3% open):
www.mechoshade.com/#sle.

2.4 Roller Shade FABRICATION

- A. Field measure finished openings prior to ordering or fabrication.
- B. Dimensional Tolerances: Fabricate shades to fit openings within specified tolerances.
 1. Vertical Dimensions: Fill openings from head to sill with 1/2 inch (13 mm) space between bottom bar and window stool.
 2. Horizontal Dimensions - Inside Mounting: Provide symmetrical light gaps on both sides of shade not to exceed 3/4 inch (19.05 mm) total.

PART 3 EXECUTION

3.1 EXAMINATION

- A. Examine finished openings for deficiencies that may preclude satisfactory installation.
- B. Start of installation shall be considered acceptance of substrates.

3.2 PREPARATION

- A. Prepare surfaces using methods recommended by manufacturer for achieving best result for substrate under the project conditions.

3.3 INSTALLATION

- A. Install in accordance with manufacturer's instructions and approved shop drawings, using mounting devices as indicated.
- B. Adjust level, projection, and shade centering from mounting bracket. Verify there is no telescoping of shade fabric. Ensure smooth shade operation.

3.4 CLEANING

- A. Clean soiled shades and exposed components as recommended by manufacturer.
- B. Replace shades that cannot be cleaned to "like new" condition.

3.5 PROTECTION

- A. Protect installed products from subsequent construction operations.
- B. Touch-up, repair or replace damaged products before Substantial Completion.

END OF SECTION

SECTION 12 3200
PLASTIC LAMINATED CASEWORK

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 SUMMARY

- A. Provide all plastic laminated casework and accessory items as specified herein. Refer to drawings for specific details, requirements, types and locations.
 - 1. All casework shall be plastic laminate, unless noted otherwise and shall include but not be limited to the following:
 - a. Base cabinets
 - b. Wall cabinets
 - c. Tall cabinets
 - d. Solid-surfacing-material countertops and window sills
- B. Related Work Specified Elsewhere
 - 1. Base molding: Furnished and installed under Finishes Division 9.
 - 2. Blocking within walls: Furnished and installed under Division 6.
 - 3. Fixture installation/services connections: Setting and installation of equipment and fixtures, and related utility connections, are provided under the other sections of the Project Specification governing that utility.

1.3 QUALITY ASSURANCE

- A. System Structural Performance: Casework and support framing system shall withstand the effects of the following gravity loads and stresses without permanent deformation, excessive deflection, or binding of drawers and doors:
 - 1. Work Surfaces (Including Tops of Suspended Base Cabinets): 160 lb/ft
 - 2. Wall Cabinets (Upper Cabinets): 160 lb/ft .
 - 3. Shelves: 40 lbb/ft .
 - 4. Delegated Design: Design laboratory casework, including comprehensive engineering analysis by a qualified professional engineer, using seismic performance requirements and design criteria indicated.
 - 5. Seismic Performance: Laboratory casework and support framing system or including attachments to other work and shall withstand the effects of earthquake motions determined according to New York State Building Code.
- B. Installer Qualifications: A single installer shall perform the work of this section, and shall be a firm with not less than 5 continuous years of successful experience in the installation of this work, similar to that required for this project and approved by the manufacturer..
 - 1. The installer shall provide a list of at least five projects of comparable size and similar in design within a fifty mile radius of this project, which may be observed by the representative of the Architect, and or Owner.
 - 2. Provide laminate clad casework and countertops furnished and installed by the same supplier for single responsibility and integration with other building trades.
- C. Manufacturer shall show evidence of a minimum of five (5) years experience in providing manufactured casework systems for similar types of projects, produce evidence of financial stability, bonding capacity, and adequate facilities and personnel required to perform on this project
- D. Casework must conform to design quality of materials, workmanship and function of casework specified and shown on drawings.

- E. ADA, Americans with Disabilities Act Requirements: The special requirements specified herein shall be met and shall be in compliance with Federal Register Volume 56, No. 144, Rules and Regulations.
- F. Design: Door/Drawer to set flush between cabinet end panels, flush inset design. Door/Drawer and all cabinet body edges to be 3mm PVC as specified herein. Overlay door designs and/or edging other than specified are not acceptable.
- G. Electrical Components, Devices, and Accessories: Listed and labeled as defined in NFPA 70, by a qualified testing agency, and marked for intended location and application.
- H. Preinstallation Conference: Conduct conference at Project site.

1.4 SUBMITTALS

- A. Test data performed and certified by an independent testing agency, covering the following areas of product performance:
 - 1. Base cabinet construction racking test: 800 lbs.
 - a. Cabinet front joint loading test: 425 lbs.
 - b. Wall cabinet static load test: 2,200 lbs.
 - c. Drawer front joint loading test: 600 lbs.
 - d. Drawer construction/static load test: 600 lbs.
 - e. Cabinet adjustable shelf support device/
 - a) Static load test: 300 lbs.
 - b) Particleboard screws holding power: 350 lbs.
 - 2. Product Test Reports for Casework: Based on evaluation of comprehensive tests performed by a qualified testing agency, indicating compliance of laboratory casework with requirements of specified product standard .
 - a. Product Test Reports for epoxy resin countertop surface material: Based on evaluation of comprehensive tests performed by a qualified testing agency, indicating compliance of laboratory countertop surface materials with requirements specified for chemical and physical resistance.
- B. Samples:
 - 1. Submit 2-2" x 3" samples of casework manufacturer's standard decorative laminate colors, patterns and textures, for exposed and semi-exposed materials for architect's selection. Samples will be reviewed by architect for color, texture, and pattern only. Compliance with other specified requirements is the exclusive responsibility of the, contractor.
- C. Shop Drawings:
 - 1. Submit CAD production shop drawings prepared by manufacturer for laminate clad casework and countertops showing layout, elevations, ends, cross-sections, service run spaces, and location of services. Show details and location of all anchorages.
 - 2. Verify all dimensions and conditions in field.
 - 3. Include layout of units with relation to surrounding walls, doors, windows, and other building components.
 - 4. Indicate locations of hardware and keying of locks.
 - 5. Indicate locations and types of service fittings.
 - 6. Indicate locations of blocking and reinforcements required for installing casework.
 - 7. Include details of utility spaces showing supports for conduits and piping.
 - 8. Include details of support framing system.
 - a. Indicate locations of and clearances from adjacent walls, doors, windows, other building components, and other laboratory equipment.
 - 9. Coordinate shop drawings with other work involved.

1.5 PRODUCT HANDLING:

- A. Deliver laminate clad casework and countertops only after wet operations in building are completed.

- B. Store completed laminate clad casework and countertops in a ventilated place, protected from the weather, with relative humidity range of 20% to 50%.
- C. Protect finished surfaces from soiling and damage during handling and installation. Keep covered with a protective covering.

1.6 JOB CONDITIONS:

- A. Advise contractor of requirements for maintaining heating, cooling and ventilation in installation areas as required to reach relative humidity necessary to maintain optimum moisture content.

1.7 WARRANTY:

- A. All materials shall be guaranteed for a period of 5 years from manufacturer's defects and workmanship from date of acceptance.

PART 2 - PRODUCTS

2.1 ACCEPTABLE MANUFACTURERS:

- A. For purpose of determining minimum performance and quality standards this specification is based upon LSI Corp of America Inc., NewCentury L44 Design Series, overlay door Design, fixed modular casework as manufactured by LSI Corp of America Inc. a member of the Architectural Woodwork Institute (membership #8913) and Approved Quality Certification Program.
- B. Regardless of manufacturer or model numbers indicated, construction shall be in accordance with LSI Corporation of America Inc. and AWI Standard Specifications for modular cabinets except where modified by these specifications. Where standard manufacturers' units do not conform to layout and/or dimensions indicated, custom fabricate unit to conform to these specifications unless such non-conformance is specifically approved by the Architect.
 - 1. Submit proof of ability to provide Certificate of Compliance in AWI, Architectural Woodwork Institute Quality Certification Program, including QCP labels on finished goods.

2.2 MATERIALS:

- A. Definitions: Identification of casework parts by surface visibility.
- B. Unit Body Open Interiors: Any storage unit surface without solid door or drawer fronts and units with glass sliding or glass framed doors.
- C. Unit Body Closed Interiors: Any storage unit surface behind solid door or drawer fronts.
- D. Unit Body Exposed Side: Any storage unit exterior side surface that is visible.
- E. Concealed surfaces: Any surface not normally visible after installation.
- F. Other Exposed Surfaces: Faces of doors and drawers when closed, tops of cabinets less than 72" above finished floor.
- G. Semi-Exposed Surfaces: Interior surfaces which are visible, bottoms of wall cabinets and tops of cabinets 72" or more above finished floor.
- H. Core Materials:
 - 1. All core material shall be a blended bio fiber composition with non-formaldehyde binders. Board shall exceed performance requirements for ANSI A208.1-1999 M3 standards. Further board shall contribute to LEED Certification in categories of indoor air quality, annually renewable source, and use of recycled materials. Casework manufacturer shall provide documentation and certification of use within the entire cabinet. No formaldehyde, no exceptions.
 - a. At sink areas provide moisture resistant core material.
- I. Decorative Laminates:
 - 1. High pressure decorative laminates shall be as follows:
 - a. Horizontal Surfaces: (Countertops etc.)
 - a) 107HW, matte finish, nominal thickness .048 + .005 HIGH WEAR as manufactured by Wilsonart Brand Decorative laminate

- b) HCS – High Pressure ColorCore2 (Standard grade) as manufactured by Formica or equal
 - b. Vertical Surfaces;
 - a) 335HW, matte finish, nominal thickness .028 + .005 HIGH WEAR as manufactured by Wilsonart Brand Decorative laminate.
 - c. High pressure cabinet liner CL 20 (.020), NEMA Test LD-3.
 - d. All laminate shall be counter balanced with heavy gauge neutral colored backing sheet.
 - e. Melamine laminate tested to meet NEMA Test LD-3.
 - f. Flame Spread: 50; Smoke Development: 95.
- J. Laminate Color Selection as indicated on drawings are as selected by the Architect. Final acceptance of colors by other manufacturer(s) even if listed, as “acceptable manufactures” shall be at the sole discretion of the Architect.
- K. Plastic Edging: 3mm PVC banding, machine applied with waterproof hot melt adhesive with external edges and outside corners of door and drawer fronts, window stools and countertops, machine profiled to 1/8" radius for safety.
- L. Metal Parts: Countertop support brackets, legs and miscellaneous metal parts shall be furniture steel, welded, degreased, cleaned, treated and powder painted in color selected by the architect.

2.3 CABINET HARDWARE:

- A. Hinges:
- 1. Shall be five knuckle, institutional grade, 2 3/4" overlay type with hospital tip. Steel shall be minimum .095" thick and have minimum of nine (9) edge and leaf fastenings. Hinges shall pass ANSI-BHMA standard A156.9, Grade 1 requirement for both vertical and horizontal set and sag (pair of hinges will hold minimum of 310 pounds); copy of test result shall be provided upon request. Casework manufacturer shall use specifically engineered screws for attachment of hinges; wood screws shall not be permitted. Doors 48" and over in height shall have three (3) hinges per door.
 - a. Color as selected by the Architect. Providemagnetic door catch with minimum seven (7) pound pull, attached with screws and slotted for adjustment.
 - 2. Finish: LH-301 ChromeCoat Powder Finish,
 - 3. Color: Light Beige
 - 4. Provide magnetic door catch with minimum seven (7) pound pull, attached with screws and slotted for adjustment.
- B. Pulls:
- 1. Door and drawer front pull shall be ABS plastic, semi recessed. Pull design shall be compatible with Americans with Disability Act (ADA), Federal Register Volume 56, No. 144, specifically paragraph 4.27.4. Other pulls may be acceptable pending architect approval.
 - a. Color: Light Beige
 - 2. Wire design, LH-321, 4 inches (101.6 mm), in ChromeCoat powder finish, High-Polish Chrome
 - 3. Wire design, LH-325 nylon, 4 inches (101.6 mm), in White, Dove Grey, or Black.
 - a. Color: Black, Dove Grey, or White
- C. Drawer Slides:
- 1. Standard use and knee space drawers shall be Accuride 3600 series or equal with epoxy finish. Slides will have a 100 pound load rating at full extension and a built-in, positive stop both directions, with self closing feature. Slides shall have a lifetime warranty as offered by the slide manufacturer.
 - a. File drawer slides shall be full extension. Slides shall have a lifetime warranty as offered by the slide manufacturer.
 - b. Pencil drawers shall be equipped under counter or support frame mounting.
- D. Shelf Supports:

1. Adjustable Shelf Supports: Shall be LH-354.1 twin pin design with anti tip-up shelf restraints for both 3/4 inch (19.1 mm) and 1 inch (25.4 mm) shelves. Design shall include slot for ability to mechanically attach shelf to clip. Load rating shall be minimum 300 lbs. (136 kg) each support without failure. Cabinet interior sides shall be flush, without shelf system permanent projection.

E. Locks:

1. Provide for all doors and drawers. Locks shall be National Lock #M4 7054C, removable core, disc tumbler, cam style lock with strike. Each lock shall be furnished with two (2) keys.
2. Locks for sliding 3/4" doors shall be a disc type plunger lock, sliding door type with strike. Locks for sliding glass/acrylic doors shall be a ratchet type sliding showcase lock.
3. 1/4 inch (6.4 mm) sliding panel doors, National Lock No. M2-0225.
4. Locks shall be keyed alike for each room and MASTERKEYED. Keying shall be reviewed with Owner and approved in writing by the Owner.
5. Chain bolts shall be 3" long, shall have a 18" pull and an angle strike to secure inactive door on cabinets over 72" in height. Elbow catches shall be used on inactive doors-up to and including 72" in height.

2.4 FABRICATION

A. Detailed Requirements for Cabinet Construction:

1. Sub-Base: Cabinet Subbase: To be separate and continuous (no cabinet body sides-to-floor), water-resistant exterior grade plywood with concealed fastening to cabinet bottom. Ladder-type construction, of front, back and intermediates, to form a secure and level platform to which cabinets attach.
2. Sub-base at exposed cabinet end panels shall be recessed 1/4 inch (6.4 mm) from face of finished end, for flush installation of finished base material by other trades.

B. Fabricate casework to dimensions, profiles, and details shown.

1. Cabinet Body Construction:
 - a. Solid sub-top shall be furnished for all base and tall cabinets.
 - b. At cabinets over 36 inches (914 mm), bottoms and tops shall be mechanically joined by a fixed divider.
 - c. Exterior exposed wall cabinet bottoms shall be white pressure fused laminate both sides. Assembly devices shall be concealed on bottom side of wall cabinets
 - d. Tops and bottoms shall be joined to cabinet ends and internal cabinet components such as fixed horizontals, rails and verticals shall be joined using 10mm diameter industrial grade hardwood dowels, laterally fluted with chamfered ends, securely glued and clamped under pressure during assembly to secure joints and cabinet squareness. Use minimum of six (6) dowels at each joint for 24" deep cabinets and minimum of four (4) dowels at each joint for 12" deep cabinets.
 - e. Unless specifically indicated, core shall be 3/4" thick particleboard. Edging and surface finishes as indicated herein.
 - f. Cabinet back shall be fully bound (dadoed) into sides, top, and bottom, recessed 7/8 inch (22.2 mm) from cabinet rear. Rear, unexposed, side of back shall be toe-nailed to cabinet body with mechanical fasteners and solidified with a continuous bead of industrial grade hot melt adhesive
 - a) Exposed back on fixed or movable cabinets to be 3/4" particleboard, color matched to cabinet interior, exterior surface GP28 laminate as selected.
 - b) Hang rails shall be located at rear of cabinet back and fastened to cabinet sides. Provide minimum of 2 at base, 2 at wall, and 3 at tall cabinets.
 - g. All fixed under counter and tall units shall have individual factory applied base, constructed of 3/4" moisture resistant plywood. Base shall be 96mm (nominal 4") high unless otherwise indicated on the drawings.

- h. All under counter units except sink base units, shall be provided with full sub top. Sink base units shall be provided with open top, front welded steel/epoxy painted sink rail full width at top front edge concealed behind face rail/doors, split back removable access panels and bottom panel to have CL20 high pressure cabinet liner both faces, color to match interior color. No exceptions will be permitted.
 - i. All end panels and vertical dividers, except sink base units, shall be prepared to receive adjustable shelf hardware at 32mm (approximately 1-1/4") centers. Door hinges, drawer slides and pull-out shelves shall mount on line boring to maintain vertical alignment of components and provide for future relocation of doors, drawers, shelves and/or pull-out shelves.
 - j. All exposed and semi exposed edges of basic cabinet components shall be factory edged with 3 mm PVC banding, machine applied with waterproof hot melt adhesive. Color as selected by the Architect.
 - k. Adjustable shelf core shall be 3/4" thick particleboard up to 30" wide, 1" thick particleboard over 30" wide.
 - a) Front edge shall have factory applied 3 mm PVC, color to match shelf color.
 - l. Interior Finish, Units with Open Interiors:
 - a) Sides, top, bottom, horizontal, and vertical members, and adjustable shelving faced high pressure plastic laminate with matching back.
 - m. Interior Finish, Units with Closed interiors:
 - a) Sides, top, bottom, horizontal, and vertical members, and adjustable shelving faced with melamine laminate with matching prefinished back in color as selected by the Architect.
 - n. Exposed Ends:
 - a) Shall be faced with high pressure decorative laminate GP28 (.028) color from casework manufacturer's full range offering of at least 120 colors.
 - o. Wall Unit Bottom:
 - a) Shall be faced with melamine laminate in color as selected by the Architect.
 - p. Wall and Tall Unit Tops:
 - a) The top edge of all wall and tall unit end panels shall be factory edged with 3mm PVC to match basic cabinet body color; raw edges at top of wall and tall end panels will not be permitted.
 - (a) Top surface will be laminated with melamine in color as selected by the Architect.
 - q. Balanced construction of all laminated panels is mandatory. Unfinished core stock surfaces, even on concealed surfaces (excluding edges), will not be permitted. No exceptions.
- C. Door/Drawer Fronts:
- 1. Laminated door and drawer fronts shall be 13/16 inch (20.6 mm) thick for all hinged and sliding doors. Drawer fronts and hinged doors shall overlay the cabinet body. Maintain a maximum 1/8 inch (3.2 mm) reveal between pairs of doors, between door and drawer front, or between multiple drawer fronts within the cabinet.
 - 2. Stile and Rail doors shall be 13/16 inch (20.6 mm) thick with full 1/4 inch (6.4 mm) plate glass. Available hinged or sliding. All exposed lite-opening edges shall be trimmed and glazed with extruded glazing bead.
 - 3. Frameless sliding glass doors shall be 1/4 inch (6.4 mm) thick plate glass with ground and polished edges. Fit with anodized aluminum shoes and nylon rollers
 - 4. Double doors shall be used on all cabinets in excess of 24" wide.
 - 5. Exterior faces shall be laminated with high pressure decorative laminate GP28, color as selected. Interior face shall be high pressure cabinet liner CL20.
 - 6. All edges shall be finished with 3mm PVC available in color as selected by the Architect. External edges and outside corners shall be machine profiled to 1/8" radius.

- D. Vertical and Horizontal Dividers: One of the following as indicated by cabinet number:
 - 1. Natural hardboard 1/4 inch (6.4 mm) thick, smooth both faces. Secured in cabinet with molded plastic clips.
 - 2. Pressure Fused laminate 3/4 inch (19.1 mm) thickness. Sub-dividers secured in cabinet with molded plastic clips or dowels. Structural dividers in cabinets over 36 inches (914 mm) wide secured in cabinet with mechanical euro fasteners.
- E. Door/Drawer Front Rail: Provide minimum 3/4 inch (19.1 mm) x 6 inch (152 mm) x full width cabinet body rails immediately behind all door/drawer and multiple drawer horizontal joints to maintain exact body dimensions, close off reveal, and be locator for lock strikes.

2.5 ADA AMERICANS WITH DISABILITIES ACT REQUIREMENTS:

- A. The following special requirements shall be met, where specifically indicated on architectural plans as "ADA" or by General Note. To be in compliance with Federal Register Volume 56, No. 144, Rules and Regulations:
 - 1. Countertop height: with or without cabinet below not to exceed a height of 34 inches A.F.F. (Above Finished Floor), at a surface depth of 24 inches.
 - a. Knee space clearance: to be a minimum 27 inches A.F.F., and 30 inches clear span width.
 - b. 12 inch deep shelving, adjustable or fixed: not to exceed a range from 9 inches A.F.F. to 54 inches A.F.F.
 - c. Wardrobe cabinets: to be furnished with rod/shelf adjustable to 48 inches A.F.F., and a maximum 21 inch shelf depth.
 - d. Sink cabinet clearances: in addition to above, upper knee space frontal depth to be no less than 8 inches, and lower toe frontal depth to be no less than 11 inches, at a point 9 inches A.F.F. and as further described in Volume 56, Section 4.19.
 - e. No cabinets shall be install closer than 18" to the pull side of any door. Co-ordinate with electrical drawings for electrical devices.

2.6 WORKMANSHIP:

- A. All exposed exterior cabinet surfaces to be decorative high pressure plastic laminate, color as selected by the Architect. Laminate surface/backer to core under controlled conditions, by approved and regulated laminating methods to assure a premium lamination. Natural-setting P.V.A. Type III water resistant adhesives that cure through chemical reaction, containing no health or environmentally hazardous ingredients, are required. Methods requiring heat are not allowed: "contact" , methods of laminating are not allowed.
 - 1. Cabinet parts shall be accurately machined and bored for premium grade quality joinery construction utilizing automatic machinery to insure consistent sizing of modular components. End panels shall be doweled to receive bottom and top.
 - 2. Back panel to be housed per AWI Standards using concealed dado or dowel matched or interlocking mechanical fasteners. Concealed dado and dowel methods shall be assembled utilizing glue and pressure. Dado method must be reinforced with blind nailing or screwing.
 - 3. Drawer bottom shall be fully housed into sides, back and subfront. Sides of drawer shall be fully dadoed to receive drawer back, locked in fully to subfront, fastened with glue and mechanical fasteners. Recessed construction methods to utilize blind nailing hang rails as required per AWI specifications.
 - 4. 3/4 inch thick hang rails shall be glued to backside and mechanically fastened to end panels of all wall, base and tall cabinets for extra rigidity and to facilitate installation.
 - 5. Rear of cabinet back and underside of drawer bottom joints to receive a continuous bead of hot melt adhesive to add to unit body strength and develop moisture and vermin seal.
 - 6. All cases shall be square, plumb, and true.
 - 7. Case body and drawer workmanship and quality of construction shall be further evidenced by Independent Testing Laboratory results as described in 1.04 D.
 - 8. Provide removable back panels and closure panels for plumbing access where shown on drawings.

2.7 ACCESS PANELS:

- A. Provide removal full width, back panels and closure panels with tamper proof screws cam lock for access to heating and/or plumbing valves, traps, etc. as required. Coordinate with mechanical/electrical drawings and prime contracts.

2.8 Solid-Surfacing Material:

- A. Homogeneous solid sheets of filled plastic resin complying with ISSFA-2.
 - 1. Manufacturers: Subject to compliance with requirements, provide products by one of the following:
 - a. E. I. du Pont de Nemours and Company "Corian".
 - a) Colors and Patterns: As selected by Architect from manufacturer's full range.

PART 3 - EXECUTION

3.1 INSPECTION:

- A. The installer must examine the jobsite and the conditions under which the work under this section is to be performed, and notify the contractor in writing of unsatisfactory conditions. Do not proceed with work under this section until unsatisfactory conditions have been corrected in a manner acceptable to the installer.

3.2 PREPARATION:

- A. Condition laminate clad casework to average prevailing humidity conditions in installation areas prior to installing.

3.3 COORDINATION:

- A. Coordinate this work with related work of other sections as required to obtain proper installation of all items.
- B. Verify site dimensions of cabinet locations in building prior to fabrication

3.4 PROTECTION

- A. Storage and Protection: Casework shall be protected in storage. Store under cover in a ventilated building not exposed to extreme temperature and humidity changes. Store off the floor to prevent chipping of laminate. Do not store or install casework in building until concrete, masonry or other wet trades are dry.

3.5 INSTALLATION OF CABINETS

- A. Install all base cabinets on a separate wood base.
- B. Install insulation to rear of cabinets as detailed.
- C. Install level, plumb, and true; shim as required, using concealed shims. Where casework abuts other finished work, apply filler strips and scribe for accurate fit, with fasteners concealed where practical. Do not exceed the following tolerances:
 - 1. Variation of Tops of Base Cabinets from Level: 1/16 inch in 10 feet.
 - 2. Variation of Bottoms of Upper Cabinets from Level: 1/8 inch in 10 feet.
 - 3. Variation of Faces of Cabinets from a True Plane: 1/8 inch in 10 feet.
 - 4. Variation of Adjacent Surfaces from a True Plane (Lippage): 1/32 inch.
 - 5. Variation in Alignment of Adjacent Door and Drawer Edges: 1/16 inch.
 - 6. Base Cabinets: Fasten cabinets to utility-space framing, partition framing, wood blocking, or reinforcements in partitions with fasteners spaced not more than 24 inches o.c. Bolt adjacent cabinets together with joints flush, tight, and uniform.
 - a. Where base cabinets are installed away from walls, fasten to floor at toe space at not more than 24 inches o.c. and at sides of cabinets with not less than 2 fasteners per side.
 - 7. Wall Cabinets: Fasten to hanging strips, masonry, partition framing, blocking, or reinforcements in partitions. Fasten each cabinet through back, near top, at not less than 24 inches o.c.
 - 8. Install hardware uniformly and precisely. Set hinges snug and flat in mortises.

9. Adjust laboratory casework and hardware so doors and drawers align and operate smoothly without warp or bind and contact points meet accurately. Lubricate operating hardware as recommended by manufacturer.
- D. Erect casework, plumb, level, true and straight with no distortions. Shim as required. Where laminate clad casework abuts other finished work, scribe and cut to accurate fit.
- E. All fasteners shall be approved by the architect and provide with screw caps or approved washers. Gypsum board screws are not permitted.

3.6 INSTALLATION OF COUNTERTOPS

- A. Abut top and edge surfaces in one true plane with flush hairline joints and with internal supports placed to prevent deflection. Locate joints only where shown on Shop Drawings.
 1. Field Jointing: Where possible, make in same manner as shop-made joints using dowels, splines, fasteners, adhesives, and sealants recommended by manufacturer. Prepare edges in shop for field-made joints.
 - a. Use concealed clamping devices for field-made joints in plastic-laminate countertops. Locate clamping devices within 6 inches of front and back edges and at intervals not exceeding 24 inches (600 mm). Tighten according to manufacturer's written instructions to exert a uniform heavy pressure at joints.
 2. Fastening:
 - a. Secure countertops, except for epoxy countertops, to cabinets with Z-type fasteners or equivalent, using two or more fasteners at each cabinet front, end, and back.
 - b. Secure epoxy countertops to cabinets with epoxy cement, applied at each corner and along perimeter edges at not more than 48 inches o.c.
 - a) Where necessary to penetrate countertops with fasteners, countersink heads approximately 1/8 inch and plug hole flush with material equal to countertop in chemical resistance, hardness, and appearance.
 3. Provide required holes and cutouts for service fittings.
 - a. Seal unfinished edges and cutouts in plastic-laminate countertops with heavy coat of polyurethane varnish.
 - b. Provide scribe moldings for closures at junctures of countertop, curb, and splash with walls as recommended by manufacturer for materials involved. Match materials and finish to adjacent laboratory casework. Use chemical-resistant, permanently elastic sealing compound where recommended by manufacturer.
 - c. Carefully dress joints smooth, remove surface scratches, and clean entire surface.
- B. Adjust casework and hardware so that doors and drawers operate smoothly without warp or bind. Lubricate operating hardware as recommended by manufacturer.

3.7 ADJUSTING

- A. Repair or remove and replace defective work, as directed by (Architect/Owner) upon completion of installation.
- B. Adjust doors, drawers, hardware, fixtures and other moving or operating parts to function smoothly.

3.8 CLEANING AND PROTECTION:

- A. Repair or remove and replace defective work as directed upon completion of installation.
 1. Clean plastic surfaces, repair minor damage per plastic laminate manufacturer's recommendations. Replace other damaged parts or units.
 2. Remove all cartons, debris, sawdust, scraps, etc. and leave space ready for final cleaning.
 3. Protect all casework and tops from damage by other trades until acceptance of the work by the Owner.

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.

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. 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.

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. NBR: Acrylonitrile-butadiene, Buna-N, or nitrile rubber.
- D. NRS: Non-rising stem.
- E. OS&Y: Outside screw and yoke.
- F. PTFE: Polytetrafluoroethylene.
- G. RS: Rising stem.
- H. SWP: Steam working pressure.
- I. TFE: Tetrafluoroethylene.
- J. WOG: Water, oil, and gas.

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. Potable Water Use:
1. Certified: Approved for use in compliance with NSF 61 and NSF 372.
 2. Lead-Free Certified: Wetted surface material includes less than 0.25 percent lead content.

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), WOG.
 4. Body: Forged brass.
 5. Ends: Threaded.
 6. Seats: PTFE.

2.04 BRONZE, BALL VALVES

- A. General:
1. Fabricate from dezincification resistant material.
 2. Copper alloys containing more than 15 percent zinc are not permitted.

- B. One Piece, Reduced Port with Bronze Trim:
 - 1. Comply with MSS SP-110.
 - 2. SWP Rating: 400 psig (2760 kPa).
 - 3. CWP Rating: 600 psig (4140 kPa).
 - 4. Body: Bronze.
 - 5. Ends: Press.
 - 6. Seats: PTFE.
- C. 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: Forged bronze or dezincified-brass alloy.
 - 5. Ends: Threaded.
 - 6. Seats: PTFE.

2.05 BRONZE, SWING CHECK VALVES

- A. General:
 - 1. Fabricate from dezincification resistant material.
 - 2. Copper alloys containing more than 15 percent zinc are not permitted.
- B. Class 125: CWP Rating: 200 psig (1380 kPa).
 - 1. Comply with MSS SP-80, Type 3.
 - 2. Design: Y-pattern, horizontal or vertical flow.
 - 3. Body: Bronze, ASTM B62.
 - 4. Ends: Threaded.
 - 5. Disc: Bronze.

2.06 BRONZE, GATE VALVES

- A. General:
 - 1. Fabricate from dezincification resistant material.
 - 2. Copper alloys containing more than 15 percent zinc are not permitted.
- B. 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 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. Sanitary waste piping, above grade.
- B. Domestic water piping, above grade.
- C. 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. Butterfly valves.

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, 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.

2.03 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.

2.04 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.

2.05 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.

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 4000
PLUMBING FIXTURES

PART 1 GENERAL

1.01 SECTION INCLUDES

- A. Sinks.

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 A112.18.9 - 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 A112.19.1 - Enamelled Cast Iron and Enamelled Steel Plumbing Fixtures; 2018.
- M. ASME A112.19.3 - Stainless Steel Plumbing Fixtures; 2017.
- N. ASME A112.19.4M - Porcelain Enameled Formed Steel Plumbing Fixtures; 1994 (R2009).
- O. ASME A112.19.5 - Flush Valves and Spuds for Water Closets, Urinals, and Tanks; 2017.
- P. ASME A112.19.15 - Bathtub/Whirlpool Bathtubs with Pressure Sealed Doors; 2012.
- Q. ASSE 1014 - Performance Requirements for Backflow Prevention Devices for Hand-Held Showers; 2005.
- R. ASSE 1070 - Performance Requirements for Water Temperature Limiting Devices; 2015.
- S. ASTM D570 - Standard Test Method for Water Absorption of Plastics; 1998 (Reapproved 2010).
- T. ASTM D638 - Standard Test Method for Tensile Properties of Plastics; 2014.
- U. 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.
- V. ASTM D785 - Standard Test Method for Rockwell Hardness of Plastics and Electrical Insulating Materials; 2008 (Reapproved 2015).
- W. ASTM E84 - Standard Test Method for Surface Burning Characteristics of Building Materials; 2018.
- X. IAPMO Z124 - Plastic Plumbing Fixtures; 2017.
- Y. ICC A117.1 - Accessible and Usable Buildings and Facilities; 2017.
- Z. ISFA 2-01 - Classification and Standards for Solid Surfacing Material; 2013.

- AA. ITS (DIR) - Directory of Listed Products; current edition.
- AB. NEMA LD 3 - High-Pressure Decorative Laminates; 2005.
- AC. NSF 61 - Drinking Water System Components - Health Effects; 2017.
- AD. NSF 372 - Drinking Water System Components - Lead Content; 2016.
- AE. 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 SINKS

- A. Sink Manufacturers:
 - 1. American Standard, Inc: www.americanstandard-us.com/#sle.
 - 2. Kohler Company: www.kohler.com/#sle.
 - 3. Meganite, Inc: www.meganite.com/#sle.
 - 4. Relang International, LLC; DURASEIN: www.duraseinusa.com/#sle.
 - 5. or approved equal.
 - 6. Substitutions: See Section 01 6000 - Product Requirements.

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 for 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 Safely 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 ANP 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 it's 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 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 any 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 considered 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 accessible 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 FURNISH 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 THE ARCHITECT/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 alarm 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 EXHAUST FAN INSTALLATION

- A. Inspection
 - 1. Inspect equipment space locations before beginning installation. Verify that the space is correct for entry and access. Do not proceed with installation of the equipment until unsatisfactory conditions have been corrected.
- B. Installation
 - 1. Comply with manufacturer's instructions and recommendations for installation of equipment, accessories and components.
 - 2. All heating, ventilating and air conditioning equipment shall be carefully designed, constructed and installed so as to prevent any objectionable noise or vibration reaching any part of the building outside of the mechanical equipment room. Care shall also be taken to prevent transmission of noise or odor through ductwork into other spaces. The Contractor shall be required to rectify or replace at his own expense, any equipment not complying with the foregoing requirements.
- C. Cleaning
 - 1. Clean interior and exterior surfaces promptly after installation of equipment and components. Take care to avoid damage to protective coatings and finishes. Remove excess sealants, lubrication, dirt and other

3.07 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.

3.08 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. 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 thereof 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.
- J. WOG: Water, oil, and gas.

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), WOG.
 - 4. Body: Forged brass.
 - 5. Ends: Threaded.
 - 6. Seats: PTFE or TFE.
 - 7. Ball: Chrome-plated brass.

2.07 BRONZE, BALL VALVES

- A. General:
 - 1. Fabricate from dezincification resistant material.
 - 2. Copper alloys containing more than 15 percent zinc are not permitted.
- B. 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.
- C. 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: Forged bronze or dezincified-brass alloy.
 - 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 Style: Bi-directional dead-end service without use of 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) or Rising Stem (RS):
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 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 gauges to determine flow rates for system balance. Where flow metering devices are not installed, base flow balance on temperature difference across various heat transfer elements in the system.
- C. Adjust systems to provide specified pressure drops and flows through heat transfer elements prior to thermal testing. Perform balancing by measurement of temperature differential in conjunction with air balancing.
- D. Effect system balance with automatic control valves fully open to heat transfer elements.
- E. 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. Low Pressure Steam Piping:
 - 3. Low Pressure Steam Condensate:

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.

1.02 RELATED REQUIREMENTS

- A. Section 26 0583 - Wiring Connections: Electrical characteristics and wiring connections.
- B. Section 26 2726 - Wiring Devices: Elevation of exposed components.

1.03 REFERENCE STANDARDS

- A. NFPA 90A - Standard for the Installation of Air-Conditioning and Ventilating Systems; 2018.

1.04 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, undervoltage, 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 value control, chilled water value 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 a 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. Heating coils.
 - 2. Unit heaters.

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.

PART 2 PRODUCTS - NOT USED

PART 3 EXECUTION

3.01 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).

3.02 UNIT HEATERS

- A. Single temperature room thermostat set at 68 degrees F (20 degrees C) maintains constant space temperature by cycling unit fan motor and energizing electric heating elements.

END OF SECTION

SECTION 23 2213
STEAM AND CONDENSATE HEATING PIPING

PART 1 GENERAL

1.01 SECTION INCLUDES

- A. Pipe and pipe fittings.
- B. Pipe hangers and supports.
- C. Steam piping system.
- D. Steam condensate piping system.

1.02 RELATED REQUIREMENTS

- A. Section 23 2500 - HVAC Water Treatment: Pipe cleaning.

1.03 REFERENCE STANDARDS

- A. ASME B16.3 - Malleable Iron Threaded Fittings: Classes 150 and 300; 2016.
- B. ASME B31.1 - Power Piping; 2016.
- C. ASME B31.9 - Building Services Piping; 2014.
- D. ASTM A53/A53M - Standard Specification for Pipe, Steel, Black and Hot-Dipped, Zinc-Coated, Welded and Seamless; 2018.
- E. ASTM A234/A234M - Standard Specification for Piping Fittings of Wrought Carbon Steel and Alloy Steel for Moderate and High Temperature Service; 2017.
- F. AWS D1.1/D1.1M - Structural Welding Code - Steel; 2015, with Errata (2016).
- G. MSS SP-58 - Pipe Hangers and Supports - Materials, Design, Manufacture, Selection, Application, and Installation; 2009.

1.04 SYSTEM DESCRIPTION

- A. When more than one piping system material is selected, ensure systems components are compatible and joined to ensure the integrity of the system is not jeopardized. Provide necessary joining fittings. Ensure flanges, unions, and couplings for servicing are consistently provided.
- B. Use unions and flanges downstream of valves and at equipment or apparatus connections. Use dielectric unions where joining dissimilar materials. Do not use direct welded or threaded connections.
- C. Provide pipe hangers and supports in accordance with ASME B31.9 or MSS SP-58 unless indicated otherwise.
- D. Use gate valves for shut-off and to isolate equipment, part of systems, or vertical risers.
- E. Use gate valves for throttling, bypass, or manual flow control services.

1.05 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 catalogue information. Indicate valve data and ratings.
- C. Welders Certificate: Include welders certification of compliance with ASME BPVC-IX.

1.06 QUALITY ASSURANCE

- A. Manufacturer Qualifications: Company specializing in manufacturing the type of products specified in this section, with minimum three years of documented experience.

PART 2 PRODUCTS

2.01 REGULATORY REQUIREMENTS

- A. Comply with ASME B31.9 and ASME B31.1 code for installation of piping system.

- B. Provide certificate of compliance from Authority Having Jurisdiction indicating approval of welders.

2.02 LOW PRESSURE STEAM PIPING (15 PSIG (103 KPA) MAXIMUM)

- A. Steel Pipe: ASTM A53/A53M, Schedule 40, black.
 - 1. Fittings: ASME B16.3 malleable iron Class 150, or ASTM A234/A234M wrought steel.
 - 2. Joints: Threaded, or AWS D1.1/D1.1M welded.

2.03 LOW PRESSURE STEAM CONDENSATE PIPING

- A. Steel Pipe: ASTM A53/A53M, Schedule 80, black.
 - 1. Fittings: ASME B16.3 malleable iron Class 150, or ASTM A234/A234M wrought steel.
 - 2. Joints: Threaded, or AWS D1.1/D1.1M welded.

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.
- B. Hangers for Pipe Sizes 2 to 4 Inches (50 to 100 mm): Carbon steel, adjustable, clevis.
- C. Hangers for Pipe Sizes 6 Inches (150 mm) and Over: Adjustable steel yoke, cast iron roll, double hanger.
- D. Multiple or Trapeze Hangers for Pipe Sizes to 4 inches (100 mm): Steel channels with welded spacers and hanger rods.
- E. Multiple or Trapeze Hangers for Pipe Sizes 6 Inches (150 mm) and Over: Steel channels with welded spacers and hanger rods; cast iron roll and stand.
- F. Wall Support for Pipe Sizes to 3 Inches (70 mm): Cast iron hook.
- G. Wall Support for Pipe Sizes 4 to 5 Inches (100 to 125 mm): Welded steel bracket and wrought steel clamp.
- H. Wall Support for Pipe Sizes 6 Inches (150 mm) and Over: Welded steel bracket and wrought steel clamp; adjustable steel yoke and cast iron roll.
- I. Vertical Support: Steel riser clamp.
- J. Hanger Rods: Mild steel threaded both ends, threaded one end, or continuous threaded.
- K. Inserts: Malleable iron case of galvanized steel shell and expander plug for threaded connection with lateral adjustment, top slot for reinforcing rods, lugs for attaching to forms; size inserts to suit threaded hanger rods.

2.05 UNIONS, FLANGES, AND COUPLINGS

- A. Unions for Pipe 2 Inches (50 mm) and Under:
 - 1. Ferrous Piping: 150 psig (1034 kPa) galvanized malleable iron, threaded.
- B. Flanges for Pipe Over 2 Inches (50 mm):
 - 1. Ferrous Piping: 150 psig (1034 kPa) forged steel, slip-on.
 - 2. Gaskets: 1/16 inch (1.6 mm) thick preformed non-asbestos graphite fiber.

PART 3 EXECUTION

3.01 PREPARATION

- A. Ream pipe and tube ends. Remove burrs. Bevel plain end ferrous pipe.
- B. Remove scale and dirt on inside and outside before assembly.
- C. Prepare piping connections to equipment with flanges or unions.
- D. Keep open ends of pipe free from scale and dirt. Whenever work is suspended during construction protect open ends with temporary plugs or caps.
- E. After completion, fill, clean, and treat systems. Refer to Section 23 2500.

3.02 INSTALLATION

- A. Install in accordance with manufacturer's instructions.
- B. Route piping in orderly manner, plumb and parallel to building structure, and maintain gradient.
- C. Install piping to conserve building space and avoid interference with use of space.
- D. Install piping to allow for expansion and contraction without stressing pipe, joints, or connected equipment.
- E. Pipe Hangers and Supports:
 - 1. Install in accordance with ASME B31.9.
- F. Install valves with stems upright or horizontal, not inverted.

END OF SECTION

SECTION 23 2214
STEAM AND CONDENSATE HEATING SPECIALTIES

PART 1 GENERAL

1.01 SECTION INCLUDES

- A. Steam traps.
- B. Steam air vents.
- C. Steam safety valves.
- D. Control valves.

1.02 REFERENCE STANDARDS

- A. ASME B31.9 - Building Services Piping; 2014.
- B. ASTM A126 - Standard Specification for Gray Iron Castings for Valves, Flanges, and Pipe Fittings; 2004 (Reapproved 2014).
- C. ASTM A276/A276M - Standard Specification for Stainless Steel Bars and Shapes; 2017.
- D. ASTM A395/A395M - Standard Specification for Ferritic Ductile Iron Pressure-Retaining Castings for Use at Elevated Temperatures; 1999 (Reapproved 2014).
- E. ASTM A743/A743M - Standard Specification for Castings, Iron-Chromium, Iron-Chromium-Nickel, Corrosion Resistant, for General Application; 2021.

1.03 SUBMITTALS

- A. See Section 01 3000 - Administrative Requirements for submittal procedures.
- B. Product Data:
 - 1. Provide for manufactured products and assemblies required for this project.
 - 2. Include product description, model, dimensions, component sizes, rough-in requirements, service sizes, and finishes.
 - 3. Submit schedule indicating manufacturer, model number, size, location, rated capacity, load served, and features for each specialty.
 - 4. Include electrical characteristics and connection requirements.

1.04 QUALITY ASSURANCE

- A. Manufacturer Qualifications: Company specializing in manufacturing the types of products specified in this section, with minimum three years of documented experience.
- B. Products Requiring Electrical Connection: Listed and classified by UL as suitable for the purpose indicated.

PART 2 PRODUCTS

2.01 STEAM TRAPS

- A. Manufacturers:
 - 1. Armstrong International, Inc: www.armstronginternational.com/#sle.
 - 2. Marshall Engineered Products Company: www.mepcollc.com/#sle.
 - 3. Spirax-Sarco: www.spiraxsarco.com/us/#sle.
 - 4. or approved equal.
 - 5. Substitutions: See Section 01 6000 - Product Requirements.
- B. Steam Trap Applications:
 - 1. Use Thermostatic Steam Traps for:
 - a. Other similar terminal heating units.
 - 2. Use Float and Thermostatic Traps for:
 - a. Heating coils.
- C. Steam Trap Performance:

1. Select to handle minimum of two times maximum condensate load of apparatus served.
2. Pressure Differentials:
 - a. Low Pressure Systems (5 psi (34 kPa) and less): 1/4 psi (1.7 kPa).
- D. Float and Thermostatic Traps: ASTM A126 cast iron or semi-steel body and bolted cover, stainless steel or bronze bellows type air vent, stainless steel or copper float, stainless steel lever and valve assembly.
 1. Rating: 15 psi (103 kPa) WSP.
 2. Features: Access to internal parts without disturbing piping, bottom drain plug.
 3. Accessories: Gauge glass with shut-off cocks.
- E. Pressure Balanced Thermostatic Traps: ASTM A395/A395M cast iron body and bolted or screwed cover and integral ball joint union for 125 psi (860 kPa) WSP; phosphor bronze bellows, stainless steel valve and seat, integral stainless steel strainer.

2.02 STEAM AIR VENTS

- A. Manufacturers:
 1. Armstrong International, Inc: www.armstronginternational.com/#sle.
 2. Bell and Gossett, a xylem brand: www.bellgossett.com/#sle.
 3. Spirax-Sarco: www.spiraxsarco.com/us/#sle.
 4. or approved equal.

2.03 SAFETY RELIEF VALVES

- A. Manufacturers:
 1. Armstrong International, Inc: www.armstronginternational.com/#sle.
 2. Cash Acme, a brand of Reliance Worldwide Corporation: www.cashacme.com/#sle.
 3. ITT McDonnell & Miller, a xylem brand: www.mcdonnellmiller.com/#sle.
 4. Spirax-Sarco: www.spiraxsarco.com/us/#sle.
 5. or approved equal.
- B. Valve: Bronze body, stainless steel valve spring, stem, and trim, direct pressure actuated, capacities ASME certified and labelled.
- C. Accessories: Drip pan elbow.

2.04 CONTROL VALVES

- A. Manufacturers:
 1. Armstrong International Inc; Python Control Valve: www.armstronginternational.com/#sle.
 2. or approved equal.
- B. Materials:
 1. Valve Body: Carbon steel A216 Grade WCB.
 2. Bonnet: Carbon steel A216 Grade WCB.
 3. Valve/Valve Seat: 17-4 PH h900.
 4. Valve Spindle: Stainless steel, comply with ASTM A276/A276M, Type 431.
 5. Gland Packing:
 - a. Carbon filled V-Teflon, 450 degrees F (232 degrees C).
 6. Yoke: Ductile iron.
 7. Actuator Spring: Silicon chromium spring steel.
 8. Actuator Diaphragm: Nitrite reinforced with nylon fiber.
 9. Cage Material: Stainless steel CB30, comply with ASTM A743/A743M.
 10. Sealing Ring Material: Carbon filled V-Teflon.

PART 3 EXECUTION

3.01 INSTALLATION

- A. Install steam and steam condensate piping and specialties in accordance with ASME B31.9.
- B. Install specialties in accordance with manufacturer's instructions.

C. Steam Traps:

1. Provide minimum 3/4 inch (20 mm) size on steam mains and branches.
2. Install with union or flanged connections at both ends.
3. Provide gate valve and strainer at inlet, and gate valve and check valve at discharge.
4. Provide minimum 10 inch (250 mm) long, line size dirt pocket between apparatus and trap.

END OF SECTION

SECTION 23 3100
HVAC DUCTS AND CASINGS

PART 1 GENERAL

1.01 SECTION INCLUDES

- A. Metal ductwork.
- B. Nonmetal ductwork.
- C. Casings and plenums.
- D. Duct cleaning.

1.02 RELATED REQUIREMENTS

- A. Section 07 8400 - Firestopping.
- B. Section 23 3300 - Air Duct Accessories.

1.03 REFERENCE STANDARDS

- A. ASTM A36/A36M - Standard Specification for Carbon Structural Steel; 2014.
- B. ASTM A653/A653M - Standard Specification for Steel Sheet, Zinc-Coated (Galvanized) or Zinc-Iron Alloy-Coated (Galvannealed) by the Hot-Dip Process; 2017.
- C. ASTM E84 - Standard Test Method for Surface Burning Characteristics of Building Materials; 2018.
- D. NFPA 90A - Standard for the Installation of Air-Conditioning and Ventilating Systems; 2018.
- E. SMACNA (DCS) - HVAC Duct Construction Standards Metal and Flexible; 2005 (Revised 2009).

1.04 SUBMITTALS

- A. See Section 01 3000 - Administrative Requirements, for submittal procedures.
- B. Product Data: Provide data for duct materials.

PART 2 PRODUCTS

2.01 DUCT ASSEMBLIES

- A. Regulatory Requirements: Construct ductwork to comply with NFPA 90A standards.
- B. Ducts: Galvanized steel, unless otherwise indicated.

2.02 MATERIALS

- A. Galvanized Steel for Ducts: Hot-dipped galvanized steel sheet, ASTM A653/A653M FS Type B, with G60/Z180 coating.
- B. Joint Sealers and Sealants: Non-hardening, water resistant, mildew and mold resistant.
 - 1. Type: Heavy mastic or liquid used alone or with tape, suitable for joint configuration and compatible with substrates, and recommended by manufacturer for pressure class of ducts.
 - 2. Surface Burning Characteristics: Flame spread index of zero and smoke developed index of zero, when tested in accordance with ASTM E84.
- C. Hanger Rod: ASTM A36/A36M; steel, galvanized; threaded both ends, threaded one end, or continuously threaded.

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

- A. Round Ducts: Round lockseam duct with galvanized steel outer wall.
 - 1. Manufacture in accordance with SMACNA (DCS).
- B. Flexible Ducts: Two ply vinyl film supported by helically wound spring steel wire.
 - 1. Pressure Rating: 10 inches wg (2.50 kPa) positive and 1.0 inches wg (250 Pa) negative.
 - 2. Maximum Velocity: 4000 fpm (20.3 m/sec).
 - 3. Temperature Range: Minus 10 degrees F to 160 degrees F (Minus 23 degrees C to 71 degrees C).
- C. Round Duct Connection System: Interlocking duct connection system in accordance with SMACNA (DCS).

2.05 CASINGS AND PLENUMS

- A. Fabricate casings in accordance with SMACNA (DCS) and construct for operating pressures indicated.
- B. Mount floor mounted casings on 4 inch (100 mm) high concrete curbs. At floor, rivet panels on 8 inch (200 mm) centers to angles. Where floors are acoustically insulated, provide liner of galvanized 18 gauge, 0.0478 inch (1.21 mm) expanded metal mesh supported at 12 inch (300 mm) centers, turned up 12 inches (300 mm) at sides with sheet metal shields.
- C. Reinforce door frames with steel angles tied to horizontal and vertical plenum supporting angles. Install hinged access doors where indicated or required for access to equipment for cleaning and inspection.

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.

3.02 CLEANING

- A. Clean duct system and force air at high velocity through duct to remove accumulated dust. To obtain sufficient air, clean half the system at a time. Protect equipment that could be harmed by excessive dirt with temporary filters, or bypass during cleaning.

END OF SECTION

SECTION 23 3300
AIR DUCT ACCESSORIES

PART 1 GENERAL

1.01 SECTION INCLUDES

- A. Air turning devices/extractors.
- B. Duct access doors.
- C. Duct test holes.
- D. Flexible duct connectors.
- E. Volume control dampers.
- F. Low leakage (Class 1A) control dampers.

1.02 RELATED REQUIREMENTS

- A. Section 23 3100 - HVAC Ducts and Casings.
- B. Section 25 3523 - Integrated Automation Control Dampers: Product furnishing.

1.03 REFERENCE STANDARDS

- A. NFPA 90A - Standard for the Installation of Air-Conditioning and Ventilating Systems; 2018.
- B. SMACNA (DCS) - HVAC Duct Construction Standards Metal and Flexible; 2005 (Revised 2009).
- C. UL 555 - Standard for Fire Dampers; Current Edition, Including All Revisions.
- D. UL 555S - Standard for Smoke Dampers; Current Edition, Including All Revisions.

1.04 SUBMITTALS

- A. See Section 01 3000 - Administrative Requirements, for submittal procedures.
- B. Product Data: Provide for shop fabricated assemblies including volume control dampers. Include electrical characteristics and connection requirements.

PART 2 PRODUCTS

2.01 AIR TURNING DEVICES/EXTRACTORS

- A. Manufacturers:
 - 1. Krueger-HVAC, Division of Air System Components: www.krueger-hvac.com/#sle.
 - 2. Ruskin Company: www.ruskin.com/#sle.
 - 3. Titus HVAC, a brand of Johnson Controls: www.titus-hvac.com/#sle.
 - 4. or approved equal.

2.02 DUCT ACCESS DOORS

- A. Manufacturers:
 - 1. Nailor Industries, Inc: www.nailor.com/#sle.
 - 2. Ruskin Company: www.ruskin.com/#sle.
 - 3. SEMCO LLC: www.semcohvac.com/#sle.
 - 4. Ward Industries, a brand of Hart and Cooley, Inc: www.wardind.com/#sle.
 - 5. or approved equal.
- B. Fabricate in accordance with SMACNA (DCS) and as indicated.

2.03 DUCT TEST HOLES

- A. Temporary Test Holes: Cut or drill in ducts as required. Cap with neat patches, neoprene plugs, threaded plugs, or threaded or twist-on metal caps.

2.04 FLEXIBLE DUCT CONNECTORS

- A. Manufacturers:
 - 1. Carlisle HVAC Products; Dynair Connector Plus G90 Steel Offset Seam Neoprene Fabric: www.carlislehvac.com/#sle.
 - 2. Ductmate Industries, Inc, a DMI Company: www.ductmate.com/#sle.

3. Elgen Manufacturing Company, Inc: www.elgenmfg.com/#sle.
 4. or approved equal.
- B. Fabricate in accordance with SMACNA (DCS) and as indicated.
- C. Flexible Duct Connections: Fabric crimped into metal edging strip.

2.05 VOLUME CONTROL DAMPERS

- A. Manufacturers:
1. Nailor Industries, Inc: www.nailor.com/#sle.
 2. NCA, a brand of Metal Industries Inc: www.ncamfg.com/#sle.
 3. Ruskin Company: www.ruskin.com/#sle.
 4. United Enertech: www.unitedenertech.com/#sle.
 5. or approved equal.

2.06 LOW LEAKAGE (CLASS 1A) CONTROL DAMPERS

- A. Products furnished per Section 25 3523.
- B. Manufacturers:
1. Ruskin Company; CD50: www.ruskin.com/#sle.
 2. United Enertech: www.unitedenertech.com/#sle.
 3. or approved equal.
- C. Maximum Leakage Allowed: 3 cfm/sf at 1 inch wg (15.2 lps/sm at 0.25 kPa).
- D. Frame:
1. Material: 12 gauge galvanized steel.
 2. Free-area: Single cross section.
 3. Blanked-off: Split frame into two free-area sections to allow a smaller free-area to be used for a minimum airflow intake or exhaust application and secondary free-area fully blanked-off.
- E. Blade:
1. Type: Single-blade rectangle shape.
 2. Maximum Individual Blade Height: 8 inches (203 mm).
 3. Material: 12 gauge galvanized steel.
 4. Authority: Opposed type, 5 to 50 percent (typically 10 percent).
- F. Insulation: Water-resistant sound absorbing material.
- G. Temperature Service Range: Minus 25 to 185 degrees F (minus 32 to 85 degrees C).
- H. Other Requirements:
1. Custom: Include bird screen and insect screen.

PART 3 EXECUTION

3.01 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.
- B. Provide duct test holes where indicated and required for testing and balancing purposes.
- C. At fans and motorized equipment associated with ducts, provide flexible duct connections immediately adjacent to the equipment.
- D. At equipment supported by vibration isolators, provide flexible duct connections immediately adjacent to the equipment.
- E. Provide balancing dampers on duct take-off to diffusers, grilles, and registers, regardless of whether dampers are specified as part of the diffuser, grille, or register assembly.

END OF SECTION

SECTION 23 3700
AIR OUTLETS AND INLETS

PART 1 GENERAL

1.01 SECTION INCLUDES

- A. Diffusers:
 - 1. Rectangular ceiling diffusers.
- B. Registers/grilles:
 - 1. Ceiling-mounted, exhaust and return register/grilles.
 - 2. Ceiling-mounted, supply register/grilles.
 - 3. Wall-mounted, exhaust and return register/grilles.
- C. Door grilles.

1.02 REFERENCE STANDARDS

- A. AHRI 880 (I-P) - Performance Rating of Air Terminals; 2011 with Addendum 1.
- B. NFPA 90A - Standard for the Installation of Air-Conditioning and Ventilating Systems; 2018.
- C. NFPA 90B - Standard for the Installation of Warm Air Heating and Air-Conditioning Systems; 2018.
- D. SMACNA (DCS) - HVAC Duct Construction Standards Metal and Flexible; 2005 (Revised 2009).

1.03 SUBMITTALS

- A. See Section 01 3000 - Administrative Requirements for submittal procedures.
- B. Product Data: Provide data for equipment required for this project. Review outlets and inlets as to size, finish, and type of mounting prior to submission. Submit schedule of outlets and inlets showing type, size, location, application, and noise level.

PART 2 PRODUCTS

2.01 MANUFACTURERS

- A. Carnes, a division of Carnes Company Inc: www.carnes.com/#sle.
- B. Krueger-HVAC: www.krueger-hvac.com/#sle.
- C. Titus, a brand of Air Distribution Technologies: www.titus-hvac.com/#sle.
- D. or approved equal.

2.02 RECTANGULAR CEILING DIFFUSERS

- A. Manufacturers:
 - 1. Krueger-HVAC: www.krueger-hvac.com/#sle.
 - 2. Metalaire, a brand of Metal Industries Inc: www.metalair.com/#sle.
 - 3. Titus.
- B. Type: Provide square, stamped, multi-core, square, adjustable pattern, stamped, multi-core, square and rectangular, multi-louvered, square and rectangular, adjustable pattern, and multi-louvered diffuser to discharge air in 360 degree, one way, two way, three way, and four way pattern with sectorizing baffles where indicated.
- C. Fabrication: Steel with baked enamel finish.
- D. Color: As indicated.

2.03 CEILING SUPPLY REGISTERS/GRILLES

- A. Manufacturers:
 - 1. Krueger-HVAC: www.krueger-hvac.com/#sle.
 - 2. Metalaire, a brand of Metal Industries Inc: www.metalair.com/#sle.
 - 3. Titus.

2.04 CEILING EXHAUST AND RETURN REGISTERS/GRILLES

- A. Manufacturers:
 - 1. Krueger-HVAC: www.krueger-hvac.com/#sle.
 - 2. Titus.
 - 3. or approved equal.
- B. Color: As indicated.

2.05 WALL EXHAUST AND RETURN REGISTERS/GRILLES

- A. Manufacturers:
 - 1. Titus.
 - 2. or approved equal.
- B. Color: As indicated on the drawings.
- C. Damper: Integral, gang-operated, opposed blade type with removable key operator, operable from face.

2.06 DOOR GRILLES

- A. Manufacturers:
 - 1. Anemostat.
 - 2. or approved equal.
- B. Type: V-shaped louvers of 20 gauge, 0.0359 inch (0.91 mm) thick steel, 1 inch (25 mm) deep on 1/2 inch (13 mm) centers.
- C. Frame: 20 gauge, 0.0359 inch (0.91 mm) steel with auxiliary frame to give finished appearance on both sides of door, with factory prime coat finish.

PART 3 EXECUTION

3.01 INSTALLATION

- A. Install in accordance with manufacturer's instructions.
- B. Check location of outlets and inlets and make necessary adjustments in position to comply with architectural features, symmetry, and lighting arrangement.
- C. Install diffusers to ductwork with air tight connection.
- D. Provide balancing dampers on duct take-off to diffusers, and grilles and registers, despite whether dampers are specified as part of the diffuser, or grille and register assembly.

END OF SECTION

SECTION 23 4000
HVAC AIR CLEANING DEVICES

PART 1 GENERAL

1.01 SECTION INCLUDES

- A. Disposable panel filters.
- B. Extended surface high efficiency media filters.
- C. Filter frames and housings.
- D. Filter gauges.

1.02 REFERENCE STANDARDS

- A. AHRI 850 (I-P) - Standard for Performance Rating of Commercial and Industrial Air Filter Equipment; 2013.
- B. AHRI 851 (SI) - Performance Rating of Commercial and Industrial Air Filter Equipment; 2013.
- C. ASHRAE Std 52.2 - Method of Testing General Ventilation Air-Cleaning Devices for Removal Efficiency by Particle Size; 2017.

1.03 SUBMITTALS

- A. See Section 01 3000 - Administrative Requirements for submittal procedures.
- B. Product Data: Provide data on filter media, filter performance data, filter assembly and filter frames, dimensions, motor locations and electrical characteristics and connection requirements.

PART 2 PRODUCTS

2.01 EXTENDED SURFACE HIGH EFFICIENCY MEDIA FILTERS

- A. Media: Pleated, water-resistant glass fiber with aluminum separators; in 16 gauge, 0.0598 inch (1.52 mm) steel holding frame with corrosion resistant coating.
- B. Minimum Efficiency Reporting Value (MERV): 13, when tested in accordance with ASHRAE Std 52.2.

2.02 FILTER FRAMES AND HOUSINGS

- A. General: Fabricate filter frames and supporting structures of 16 gauge, 0.0598 inch (1.52 mm) galvanized steel or extruded aluminum T-section construction with necessary gasketing between frames and walls.
- B. Standard Sizes: Provide for interchangeability of filter media of other manufacturers; for panel filters, size for 24 by 24 inches (610 by 610 mm) filter media, minimum 2 inches (50 mm) thick; for extended surface and high efficiency particulate air filters, provide for upstream mounting of panel filters.
- C. Side Servicing Housings: Flanged for insertion into ductwork, of reinforced 16 gauge, 0.0598 inch (1.52 mm) galvanized steel; access doors with continuous gasketing and positive locking devices on both sides; extruded aluminum tracks or channels for primary secondary filters with positive sealing gaskets.

2.03 FILTER GAUGES

- A. Direct Reading Dial: 3-1/2 inch (90 mm) diameter diaphragm actuated dial in metal case, vent valves, black figures on white background, front recalibration adjustment, range 0-0.5 inch WG (0-125 Pa), 2 percent of full scale accuracy.
- B. Inclined Manometer: One piece molded plastic with epoxy coated aluminum scale, inclined-vertical indicating tube and built-in spirit level, range 0-3 inch WG (0-750 Pa), 3 percent of full scale accuracy.

PART 3 EXECUTION

3.01 INSTALLATION

- A. Install air cleaning devices in accordance with manufacturer's instructions.
- B. Prevent passage of unfiltered air around filters with felt, rubber, or neoprene gaskets.

- C. Do not operate fan system until filters (temporary or permanent) are in place. Replace temporary filters used during construction and testing, with clean set.

END OF SECTION

SECTION 23 7223

GENERAL AHU

SECTION INCLUDES

1.01 AIR HANDLING UNITS.

A. REFERENCES

1. AFBMA 9 - Load Ratings and Fatigue Life for Ball Bearings.
 - a. AMCA 99 - Standards Handbook.
 - b. AMCA 210 - Laboratory Methods of Testing Fans for Rating Purposes.
 - c. AMCA 300 - Test Code for Sound Rating Air Moving Devices.
 - d. AMCA 500 - Test Methods for Louver, Dampers, and Shutters.
 - e. ARI 410 - Forced-Circulation Air-Cooling and Air-Heating Coils.
 - f. ARI 430 - Central-Station Air-Handling Units.
 - g. ARI 435 - Application of Central-Station Air-Handling Units.
 - h. ASTM B117 - Standard Practice for Operating Salt Spray Apparatus.
 - i. NEMA MG1 - Motors and Generators.
 - j. NFPA 70 - National Electrical Code.
 - k. SMACNA - HVAC Duct Construction Standards - Metal and Flexible.
 - l. UL 723 - Test for Surface Burning Characteristics of Building Materials.
 - m. UL 900 - Test Performance of Air Filter Units.
 - n. UL 1995 - Standard for Heating and Cooling Equipment.
 - o. UL 94 - Test for Flammability of Plastic Materials for Parts in Devices and Appliances.
2. SUBMITTALS
 - a. Shop Drawings: Indicate assembly, unit dimensions, weight loading, required clearances, construction details, field connection details, and electrical characteristics and connection requirements. Computer generated fan curves for each air handling unit shall be submitted with specific design operating point noted. A computer generated psychometric chart shall be submitted for each cooling coil with design points and final operating point clearly noted.
 - b. Product Data.
 - 1) Provide literature that indicates dimensions, weights, capacities, ratings, fan performance, gauges and finishes of materials, and electrical characteristics and connection requirements.
 - 2) Provide data of filter media, filter performance data, filter assembly, and filter frames.
 - 3) Manufacturer's Installation Instructions.
3. OPERATION AND MAINTENANCE DATA
 - a. Maintenance Data: Include instructions for lubrication and filter, motor, and drive replacement.
4. QUALIFICATIONS
 - a. Manufacturer: Company specializing in manufacturing Air Handler products specified in this section must show a minimum five years documented experience and complete catalog data on total product.
5. DELIVERY, STORAGE, AND HANDLING
 - a. Deliver, store, protect and handle products to site.
 - b. Accept products on site on factory-installed shipping skids. Inspect for damage.
 - c. Store in clean dry place and protect from weather and construction traffic. Handle carefully to avoid damage to components, enclosures, and finish.
6. ENVIRONMENTAL REQUIREMENTS
 - a. Do not operate units for any purpose, temporary or permanent, until ductwork is clean, filters are in place, bearings lubricated, and fan has been test run under observation.

PART 2: PRODUCTS

2.01 ACCEPTABLE MANUFACTURERS

- A. The following manufacturers are approved for use. No substitutions.

1. Daikin Applied - 'Destiny' Air Handler is the basis of design, including standard product features and all special features required per plans and specifications.
2. ETI
3. Greenheck
4. AIR HANDLER CASING
 - a. Air handler casing shall be constructed with a corrosion resistant aluminum frame with 1" thick, double wall panels. Extruded aluminum frame and polymeric corner pieces are required for casing protection and rigidity. Unit panels shall consist of injected polyurethane foam insulation sandwiched between galvanized steel exterior and interior sheets. Formed "thermal break" panels shall have a plastic molded edge to eliminate inner and outer panels from contacting each other.
 - 1) Panels shall be fastened to frame with perimeter screws with a neoprene gasket in-between the panel and the frame to minimize air leakage and prevent thermal bridging from unit interior to unit exterior. Removable panels for blower and filter sections shall be furnished on both sides to allow full access to unit interior. Blower and filter access panels shall include a pocket handle to assist in panel removal.
5. SUPPLY FAN
 - a. The supply fan shall be a DWDI forward-curved type. Fan assemblies including fan, motor and sheaves shall be dynamically balanced by the manufacturer on all three planes at all bearing supports. Manufacturer must ensure maximum fan RPM is below the first critical speed.
 - b. Fan and motor assembly shall be mounted on vibration type isolators inside cabinetry.
6. BEARINGS AND DRIVES
 - a. Basic load rating computed in accordance with AFBMA - ANSI Standards, L-50 life at 200,000 hours heavy duty pillow block type, self-aligning, grease-lubricated ball bearings.
 - b. Shafts shall be solid, hot rolled steel, ground and polished, keyed to shaft, and protectively coated with lubricating oil. Hollow shafts are not acceptable.
 - c. V-Belt drives shall be cast iron or steel sheaves, dynamically balanced, bored to fit shafts and keyed. Variable and adjustable pitch sheaves selected so required RPM is obtained with sheaves set at mid-position and rated based on motor horsepower. Contractor to furnish fixed sheaves at final RPM as determined by balancing contractor.
7. ELECTRICAL
 - a. Motor shall be a premium efficiency open drip-proof type. Electrical characteristics shall be as shown on the schedule.
 - b. A junction box shall be furnished and mounted by fan manufacturer for field power connection to motor.
8. HEATING SECTIONS
 - a. Access to coils from drive side [opposite connection side] of unit for service and cleaning shall be provided. Coil headers and return bends shall be fully enclosed within unit casing. Coil connections shall be factory sealed with grommet on exterior and gasket sleeve between outer wall and inner liner where each pipe extends through the unit casing to minimize air and condensate leakage.
 - b. Steam Heating Coil.
 - 1) Heating performance shall be as specified on the unit schedule.
 - 2) Hot water coil fins shall have full drawn collars to provide a continuous surface cover over the entire tube for maximum heat transfer. Seamless copper 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. Bare copper tubes shall not be visible between fins.
 - 3) Water coils shall be provided with headers of seamless copper tubing with intruded tube holes to permit expansion and contraction without creating undue stress or strain. Coil connections shall be copper sweat connections with connection size to be determined by manufacturer based upon the most efficient coil circuiting. Vent and drain connections shall be furnished on the coil connection, external to the cabinet. Vent connections

provided at the highest point to assure proper venting. Drain connections shall be provided at the lowest point.

9. FILTER SECTION

- a. Filter section shall be a 2-inch deep flat type furnished with MERV 14 pleated type filter.
- b. Filter media shall be UL 900 listed, Class I or Class II.

10. MIXING BOX

- a. No mixing box required.
 - 1) A damper actuator shall be furnished and mounted by others.
 - 2) A damper actuator shall be furnished and mounted by others.

PART 3: EXECUTION

3.01 INSTALLATION

- A. The air handler shall be installed per manufacturer's Installation & Maintenance instructions.

END OF SECTION

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 contaminants. 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 gauge, 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 2416
PANELBOARDS

PART 1 GENERAL

1.01 SECTION INCLUDES

- A. 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 OVERCURRENT PROTECTIVE DEVICES (COMPATIBLE WITH EXISTING SYSTEM)

- 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.

2.04 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 RELATED REQUIREMENTS

- A. Section 26 0526 - Grounding and Bonding for Electrical Systems.
- B. Section 26 0529 - Hangers and Supports for Electrical Systems.

1.03 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.
- G. UL 1053 - Ground-Fault Sensing and Relaying Equipment; Current Edition, Including All Revisions.

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 circuit breakers, enclosures, and other installed components and accessories.

1.05 QUALITY ASSURANCE

- A. Comply with requirements of NFPA 70.

PART 2 PRODUCTS

2.01 MANUFACTURERS

- A. ABB/GE: www.electrification.us.abb.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. Frank Adams - compatible with existing system.
- F. 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:
 - a. Indoor Clean, Dry Locations: Type 1.
- H. Provide externally operable handle with means for locking in the OFF position.
- I. Ground Fault Protection: Where ground-fault protection is indicated, provide system listed and labeled as complying with UL 1053.

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 field measurements are as indicated.
- B. Verify that the ratings of the enclosed circuit breakers are consistent with the indicated requirements.
- C. Verify that mounting surfaces are ready to receive enclosed circuit breakers.
- D. 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. Provide required support and attachment in accordance with Section 26 0529.
- E. Install enclosed circuit breakers plumb.
- F. Except where indicated to be mounted adjacent to the equipment they supply, mount enclosed circuit breakers such that the highest position of the operating handle does not exceed 79 inches (2000 mm) above the floor or working platform.
- G. Provide grounding and bonding in accordance with Section 26 0526.
- H. Set field-adjustable ground fault protection pickup and time delay settings as indicated.

END OF SECTION

SECTION 26 5100
INTERIOR LIGHTING

PART 1 GENERAL

1.01 SECTION INCLUDES

- A. Interior luminaires.
- B. Emergency lighting units.
- C. Exit signs.
- D. 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-79 - Approved Method: Electrical and Photometric Measurements of Solid-State Lighting Products; 2008.
- B. IES LM-80 - Approved Method: Measuring Luminous Flux and Color Maintenance of LED Packages, Arrays, and Modules; 2015, with Errata (2017).
- C. NECA 1 - Standard for Good Workmanship in Electrical Construction; 2015.
- D. NECA/IESNA 500 - Standard for Installing Indoor Commercial Lighting Systems; 2006.
- E. NECA/IESNA 502 - Standard for Installing Industrial Lighting Systems; 2006.
- F. NFPA 70 - National Electrical Code; Most Recent Edition Adopted by Authority Having Jurisdiction, Including All Applicable Amendments and Supplements.
- G. NFPA 101 - Life Safety Code; Most Recent Edition Adopted by Authority Having Jurisdiction, Including All Applicable Amendments and Supplements.
- H. UL 924 - Emergency Lighting and Power Equipment; Current Edition, Including All Revisions.
- I. UL 1598 - Luminaires; Current Edition, Including All Revisions.
- J. UL 8750 - Light Emitting Diode (LED) Equipment for Use in Lighting Products; Current Edition, Including All Revisions.

1.04 ADMINISTRATIVE REQUIREMENTS

- A. Coordination:
 - 1. Coordinate the installation of luminaires with mounting surfaces installed under other sections or by others. Coordinate the work with placement of supports, anchors, etc. required for mounting. Coordinate compatibility of luminaires and associated trims with mounting surfaces at installed locations.
 - 2. Coordinate the placement of luminaires with structural members, ductwork, piping, equipment, diffusers, fire suppression system components, and other potential conflicts installed under other sections or by others.
 - 3. Coordinate the placement of exit signs with furniture, equipment, signage or other potential obstructions to visibility installed under other sections or by others.
 - 4. Notify Engineer of any conflicts or deviations from Contract Documents to obtain direction prior to proceeding with work.

1.05 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.

1.06 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.
- H. LED Luminaires:
 - 1. Components: UL 8750 recognized or listed as applicable.
 - 2. Tested in accordance with IES LM-79 and IES LM-80.
 - 3. LED Estimated Useful Life: Minimum of 50,000 hours at 70 percent lumen maintenance, calculated based on IES LM-80 test data.

2.03 EMERGENCY LIGHTING UNITS

- A. Manufacturers:
 - 1. Acuity Brands, Inc: www.acuitybrands.com/#sle.
 - 2. Cooper Lighting, a division of Cooper Industries: www.cooperindustries.com/#sle.
 - 3. Hubbell Lighting, Inc: www.hubbelllighting.com/#sle.
 - 4. or approved equal.
- B. Description: Emergency lighting units complying with NFPA 101 and all applicable state and local codes, and listed and labeled as complying with UL 924.
- C. Operation: Upon interruption of normal power source or brownout condition exceeding 20 percent voltage drop from nominal, solid-state control automatically switches connected lamps to integral battery power for minimum of 90 minutes of rated emergency illumination, and automatically recharges battery upon restoration of normal power source.

- D. Battery:
 - 1. Size battery to supply all connected lamps, including emergency remote heads where indicated.
- E. Diagnostics: Provide power status indicator light and accessible integral test switch to manually activate emergency operation.
- F. Provide low-voltage disconnect to prevent battery damage from deep discharge.

2.04 EXIT SIGNS

- A. Manufacturers - Powered and Self-Luminous Signs:
- B. Description: Exit signs complying with NFPA 101 and applicable state and local codes, and listed and labeled as complying with UL 924.
 - 1. Number of Faces: Single- or double-face as indicated or as required for installed location.
 - 2. Directional Arrows: As indicated or as required for installed location.

2.05 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. Emergency Lighting Units:
 - 1. Unless otherwise indicated, connect unit to unswitched power from same circuit feeding normal lighting in same room or area. Bypass local switches, contactors, or other lighting controls.
- J. Exit Signs:
 - 1. Unless otherwise indicated, connect unit to unswitched power from same circuit feeding normal lighting in same room or area. Bypass local switches, contactors, or other lighting controls.
- K. Install lamps in each luminaire.

3.03 ADJUSTING

- A. Aim and position adjustable luminaires to achieve desired illumination as indicated or as directed by Engineer. Secure locking fittings in place.

- B. Aim and position adjustable emergency lighting unit lamps to achieve optimum illumination of egress path as required or as directed by Engineer or authority having jurisdiction.
- C. Exit Signs with Field-Selectable Directional Arrows: Set as indicated or as required to properly designate egress path as directed by Engineer or authority having jurisdiction.

3.04 CLOSEOUT ACTIVITIES

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

3.05 PROTECTION

- A. Protect installed luminaires from subsequent construction operations.

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. Comply with the following; where requirements conflict, order of precedence of requirements is as listed:
 - a. ADA Standards.
 - b. The requirements of the local authority having jurisdiction.
 - c. Applicable local codes.
 - d. Contract Documents (drawings and specifications).
 - e. NFPA 72; where the word "should" is used consider that provision mandatory; where conflicts between requirements require deviation from NFPA 72, identify deviations clearly on design documents.

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. Strobes: _____.
- E. 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